WORKING PAPER 2020:1

Sick of my parents?

Consequences of parental ill health on adult children

Anna Norén

IFAU
INSTITUTE FOR EVALUATION OF LABOUR MARKET AND EDUCATION POLICY

The Institute for Evaluation of Labour Market and Education Policy (IFAU) is a research institute under the Swedish Ministry of Employment, situated in Uppsala.

IFAU's objective is to promote, support and carry out scientific evaluations. The assignment includes: the effects of labour market and educational policies, studies of the functioning of the labour market and the labour market effects of social insurance policies. IFAU shall also disseminate its results so that they become accessible to different interested parties in Sweden and abroad.

Papers published in the Working Paper Series should, according to the IFAU policy, have been discussed at seminars held at IFAU and at least one other academic forum, and have been read by one external and one internal referee. They need not, however, have undergone the standard scrutiny for publication in a scientific journal. The purpose of the Working Paper Series is to provide a factual basis for public policy and the public policy discussion.

More information about IFAU and the institute's publications can be found on the website www.ifau.se

ISSN 1651-1166

Sick of my parents?[a]

Consequences of parental ill health on adult children

by

Anna Norén[b]

2020-01-08

Abstract

I study the consequences for labor market outcomes and sick leave of having an elderly parent in need of care. Using Swedish register data I compare the labor market outcome trajectories of adult children before and after their parent suffers a health shock. I find that employment and income of adult children are slightly reduced in the years leading up to the demise of their parent, but that the size of the impact is largest in the year, and the year after, parental demise. I also find that daughter's sick leave absence increases in the year that the parent dies. No effects on labor market outcomes are found from having a parent suffering stroke. Furthermore, I find no clear gender differences between sons and daughters in the impact of having a parent with increased care demand. Taken together, the results suggest that the opportunity costs of parental care need in the form of adverse labor market impacts are small.

Keywords: Formal and Informal care, Elderly, Labor supply
JEL-codes: J14, J22

[a] I am grateful to Erik Grönqvist, Matz Dahlberg, Simen Markussen, Mikael Elinder and Helena Holmlund for helpful comments and suggestions. I would also like to thank seminar participants at IFAU.
[b] Department of Economics, Uppsala University. anna.noren@nek.uu.se

Table of contents

1 Introduction

The number of elderly is increasing in most developed countries implying that the working age population is shrinking in size relative to the number of retirees (OECD 2008). This is of concern to public policy since it imposes fiscal strains due to a larger share of the population not working. The working-age population may, in addition to the burden of financing an increasing public sector, also face a higher personal cost of care for the elderly in the form of care-needing parents.[1] Care for the elderly can either be supplied by the health care services or informally by families and relatives. Many countries promote informal care by offering financial support to the caregiver, but transfers rarely measure up to the time input of the caregiver (Wimo and Jönsson 2001). While informal care reduces the financial pressure on the health care system, there may be large opportunity costs associated with informal care provision when the caregiver is of working age. Such costs include productivity loss on the labor market, reduced labor supply, and adverse health effects of the caregiver (see for example Fevang et al. 2012; Bauer and Sousa-Poza 2015). Furthermore, there may be important gender differences in the response to parental care need. Women can be more adversely affected as they generally have the main responsibility for caring in the family (Ettner 1995; Carmichael and Charles 2003; Crespo and Mira 2014; Heitmueller and Inglis 2007). Increased care burden could thus add to the psychological pressure of the dual role sometimes referred to as the "double burden" of women (Bratberg et al. 2002). It is therefore important to study the consequences of informal care provision for the adult children and, in particular, whether the response to parental care need differs between men and women.

I analyze how employment, income, and sickness absence is affected by having an elderly parent in need of care. Care need is identified using two types of health shocks -- stroke and being in the final years of life -- where the need for care is elevated in the years preceding death and the in the years following stroke (Gerdtham and Jönsson 1990; Emanuel et al. 1999; Polder et al. 2006; Wolff et al. 2007; Yang et al. 2003; Meijer et al. 2011; Bugge et al. 1999; McCullagh et al. 2005). More specifically, I study the change in labor supply and sickness absence of adult children having parents in their last years of life or having suffered stroke. The impact of increased parental care need is studied separately for adult sons and daughters, and I also exploit within-family differences in the response to parental care need and compare brothers and sisters

[1] Although an aging population not necessarily increases the demand for care since individuals also tend to get healthier (Zweifel et al. 1999; Yang et al. 2003), it raises the demand for long-term care (Spillman and Lubitz 2000; Seshamani and Gray 2004).

to see whether there are gender differences. Rather than observing informal care provision directly, I identify increased care need following a health shock. Having a parent in need of care can affect the adult child both as a result of actual informal care provision, and also as a result of other circumstances related to having a family member suffering a health shock such as wanting to spend more time with that person and worrying about his or her well-being. While the former can be described as caring *for* a person, the latter relates to caring *about* a person (Bobinac et al. 2010). In this study, I will refer to both these types of care using the term informal care provision.

A negative correlation between provision of informal care and labor supply is well established in the earlier literature (see Lilly et al. 2010 for a literature review). It is also suggested that informal caregiving can have further implications not only on labor supply, but also on the psychological and mental well-being (Bauer and Sousa-Poza 2015) as well as health (Schmitz and Stroka 2013) and life satisfaction of the caregiver (Leigh 2010). The challenge in estimating a causal relation between the adult children's provision of informal care and their labor market outcomes is that there is likely a selection of individuals with lower alternative costs on the labor market into parental care. If not taking the unobserved characteristics affecting both informal care provision and labor market attachment into account, the impact of having a parent in need of care may be overestimated. Much of previous literature on the relation between informal care and labor supply has not addressed these endogeneity problems while some studies have drawn on instrumental variables approaches to control for the endogeneity of caregiving. These earlier studies generally document a negative relation between informal care provision and labor market outcomes (Heitmueller and Inglis 2007; Bohlin et al. 2008; Ettner 1995; Ciani 2012) and the consequences seem to be more severe for female caregivers (Hietmueller and Inglis 2007; Ettner 1995, 1996). Exceptions include Crespo and Mira (2014) and Meng (2013) who find only negligible impacts on labor market activity of the caregiver. However, since most of these studies rely on cross-sectional data and use information about parental health as instruments for the care need of the parent, the validity of these instrumental variable studies is questionable given the intergenerational transmission of health between parents and children (Björkegren et al. 2019).

There are also a few studies that more credibly utilize panel data to investigate the consequences of parental care. Using a difference-in-differences approach, Løken et al. (2016) study the related question of substitution between formal and informal care and find that expansion of formal care reduces work absence among middle-aged daughters. Spiess and Schneider (2003) use panel data with

information about changes in informal care provision over time and find that care initiation results in fewer hours worked, and also Van Houtven et al. (2013) find negative effects on labor market outcomes of female care provision in the U.S using panel data. Similarly, using a panel survey of Australians Leigh (2010) finds a negative, but small, impact on labor force participation from initiating caregiving, and that this effect is much smaller compared to the association in a cross-section setting. The paper closest related to my study is Fevang et al. (2012) who use Norwegian register data and find that employment decreases and dependence on sickness insurance increases among adult children in the years immediately prior to the death of a parent.

I will add to this literature by identifying care need using two types of parental health shocks that are likely to cause different types of care needs due to the different courses of the disease. I study the effect of parental stroke and parental demise in Sweden. While the need for care increases instantly following a stroke, the care demand often increases gradually, and is concentrated to, the final years of a person's life. Therefore, the care needs caused by these two health shocks are likely to differ. The role of the formal care differs between the two types of health shocks as formal care is involved from the start in case of a stroke. The possibility to substitute formal care with informal care may also be different between the two health shocks since informal care can only substitute formal care that does not require medical skills.

In this paper, I exploit the within-individual variation to eliminate the bias from unobserved individual characteristics affecting both the decision of informal care provision and labor market outcomes. I take advantage of rich register data covering all Swedish residents which allows me to study the individual time path of labor market outcomes of adult children in the years before and after a parental health shock. Labor market outcomes and sickness absence in periods when the need for care is unaffected by the health shock is used as counterfactual. In this way, the endogeneity of care provision can be controlled for. In the first part of the analysis, I compare the adult child's labor market outcome and sickness absence before parental stroke to the period after the stroke, when the parent's need for care has increased. In the second part of the analysis, I compare the labor market outcomes and sickness absence of the adult child before the parent is in its final years of life to the years just before, and also after the parent has died when care need of the parent has ceased. In a separate analysis I will also focus on gender differences in the impact of parental care need by studying the income gaps and sick leave gaps of brothers and sisters from the same family. By looking within families, I can control for observed and unobserved characteristics of the family that may influence the informal care provision. Moreover,

I can control for potential endogeneity in the timing of a parental health shock that may arise due to children's investments in parental health.[2]

Two separate samples are used for the analyses consisting of children to parents who suffered stroke between the years 1995 and 2005, and children whose parents died between the years 1995 and 2008.[3] Using universal administrative Swedish registers between 1990 and 2010 I am able to track adult children's employment, incomes and sick leave absences over the years before and after the parental health shock. The main part of the analysis will focus on lone parents since the primary caregiver of married elderly is typically their spouse (Ulmanen and Szebehely 2014). The register data allows me to match lone elderly with their children and also to match siblings. In this way, I can explore whether there are differences in the response to parental care need between male and female siblings.

I find no evidence of an effect of having a lone parent suffering stroke on the labor market outcomes for either sons or daughters. These results are stable across subgroups of different individual characteristics of adult children, and there seem to be no difference in response between male and female siblings. One interpretation of these findings is that stroke is such a severe health shock that it requires care from the formal caring institutions, leaving the children's labor supply unaffected. Also, the substitutability between formal and informal care may be less feasible if the care following stroke requires medical skills. There is however a short-term effect of parental stroke on sickness absence for daughters in the months just after parental stroke and also suggestive evidence of an upward shift in the sickness absence of sons, which indicates that the child's own health could be affected by having a parent suffering a severe health shock.

The results from the analysis of adult children having a lone parent in his or her final years of life suggest that there is no statistically significant impact on employment for daughters but a small marginally statistically significant negative impact for sons prior to parental demise. The negative impact on employment is largest in the year that the parent dies, and it continues to be decreased for both sons and daughters after parental demise. The results from studying income conditional on employment suggest that the income of children is reduced in the years leading up to the parent's death. As with employment, the reduction in income is largest in the year that the parent dies, and remains

[2] See Section 3 for a more detailed description.

[3] Since the period of focus for studying the effects of parental care need takes place prior to death, a shorter period of outcomes post death is required. Thus, observations where parent died in 2006 to 2008 are included as well in order to get a larger sample, although this means I can only study the outcome of these children for a shorter period after demise.

reduced for a couple of years after. I find that the reduction in income is more likely to be the result of having a parent in need of care rather than children reducing their behavior in anticipation of expected inheritance since the behavior after parental demise in a group where expectation of inheritance is less obvious (parent died suddenly) is similar to that in a group where parent did not die suddenly (and children therefore would have been able to adapt labor supply in anticipation of inheritance). Overall however, the impact on both employment and income is small suggesting that they are reduced by around 1 percent in the years around parental demise. Again, there seem to be no difference between male and female siblings within the family. If anything, the impact on income seems to be larger for sons. I also find an increase in sick leave absence of daughters in the year that the parent dies. Since no similar impact is found among daughters whose parents died suddenly, and if we assume that parents that die suddenly have lower care needs, this indicates that the increase in sick leave is not solely driven by grief but rather stems from having a parent in need of care.

The rest of the paper is organized as follows. Section 2 provides some background information about informal care provision in Sweden and how stroke and being in the final years of life affects the demand for informal care. Section 3 explains the identification and the empirical model to be estimated and Section 4 describes the data and provides some graphical evidence. Section 5 presents the results and finally, Section 6 concludes.

2 Background

The care need of an elderly parent is in some cases the result of a dramatic event such as stroke, but the care demand may also increase gradually as part of a natural aging process. How the adult children of care-needing parents are affected depends on the level of care required and on the availability of care from public or private sector[4] as well as the substitutability between formal and informal care. This section provides an overview of informal care provision in Sweden and how the two different types of health shocks affect the demand for care.

[4] Although there has been an increase during the last decade, the use of privately purchased services play a marginal role in Sweden. (Ulmanen and Szebehely 2015)

2.1 Informal care in Sweden

Around one fifth of the Swedish population provides informal care to a family member and the most common situation (around half of the cases) is that an adult child cares for his or her elderly parent (Socialstyrelsen 2014). Informal care provision may involve different activities but is usually oriented towards basic care and supervision as well as practical chores such as grocery shopping, cleaning, transportation and contacts with authorities, rather than medical attention. From an international point of view, Sweden along with the other Scandinavian countries has a comprehensive publicly funded system of care for older people. Municipalities are responsible for providing and financing both home-based care (home-help or home nursing) and institutional care facilities.[5] Services are granted based on care needs. During the last decades however, the amount of publicly provided care has been reduced and the requirements for being granted care has become stricter which, along with a shift from the more comprehensive institutional care to home-based care, has increased the demand for informal care provision provided by family members (Johansson et al. 2003; Ulmanen and Szebehely 2015). It has been estimated that 70 percent of the total care effort for elderly living in their own homes is supplied by the elderly's next of kin (Johansson et al. 2003).[6] Moreover, earlier literature suggests that the primary caregiver of an elderly parent is usually the spouse (see for example Ulmanen and Szebehely 2014). Therefore, I will focus the analyses on lone parents.

How adult children respond to informal care demand may depend on many factors. Sometimes, informal care giving can be combined with work (at the expense of leisure) but sometimes it may require that the offspring cuts back on working hours.[7] A Swedish survey in 2013 reports that 13 percent of women and 8 percent of men in Sweden reduce the number of hours worked, quit their job or retire as a consequence of providing informal care (Ulmanen and Szebehely 2014). For family members of stroke patients specifically, around one in ten of those younger than 65 years of age report to have reduced the number of hours worked or retired one year after the stroke (The Swedish Stroke Register 2016). Although these surveys cannot control for the endogeneity of care provision, they support the hypothesis that there could be effects of informal care provision on labor market outcomes. Moreover, having a family member suffering from a

[5] In 2000, around 20 percent of the population aged 80 years and older received public home help services in their private homes and around 20 percent lived permanently in nursing homes (Larsson et al. 2006).
[6] Ulmanen and Szebehely (2014) find that 42 percent of the surveyed aged 45-66 care for a family member at least once a month and that this family member is most often an elderly parent.
[7] The decision making process and what motivates children to care for their parents is described in Hietmueller (2007) and in Fevang et al. 2012.

life-threatening disease such as stroke can be a stressful experience that affects the psychological well-being of the adult child (Forsberg-Warleby et al. 2002; Jönsson et al. 2005) which in turn could spill over to a reduced labor market productivity (Bauer and Souza-Poza 2015).

There may also be important gender differences in the response to parental care need. Traditionally, women have had the main responsibility for the care of family members. Earlier literature suggests that daughters are more likely to change their labor supply in response to parental care demand (Ettner 1995; Bolin et al. 2008). According to Szebehely (2005), receiving informal care from a daughter was twice as common as receiving care from a son. However, more recent Swedish survey data suggests that men and women are more equal in providing care, but that women provide more demanding care and are more likely to be affected psychologically (Ulmanen and Szebehely 2014). In this paper, the gender difference will be addressed in two different ways: men and women will be studied separately in the main analysis, and in an additional analysis I will compare the response to a parental health shock between brothers and sisters within the same family. Whereas the first strategy compares women and men on average, the latter directly compares gender differences within the family and may hence reveal potential differences in the expectations on sons and daughters in providing family care.

2.2 Informal care demand following stroke

Every year around 30 000 people suffer stroke in Sweden and it is the third most common cause of death, after myocardial infarction and cancer (Socialstyrelsen 2011). Moreover, stroke is the number one cause of impairment among adults and one third of the survivors are left with some type of disability (Socialstyrelsen 2018). Stroke is a "brain attack" and can be characterized as the blood flow to an area of the brain being cut off. As a result, brain cells are deprived of oxygen and begin to die. There are two main types of stroke: the most common is ischemic stroke where blood vessels in the brain are blocked by blood clots. The less common is the hemorrhagic stroke and this happens when a weakened blood vessel leaks or a brain aneurysm bursts, often resulting in death. How a patient is affected by the stroke depends on the amount of cell death and which part of the brain that is affected. Patients with more severe strokes may be permanently paralyzed; may suffer from balance- and mobility disorders; and may lose their ability to speak. The average age of a stroke patient is around 73 for males and around 78 for females. (Socialstyrelsen 2011; Swedish Heart-Lung Foundation 2016)

Stroke is not a random event. The risk of stroke varies with socioeconomic background (Peltonen et al. 2000) and there is also a genetic component (Kiely et al. 1993). The risk of suffering stroke increases exponentially with age (Asplund 2003) and the most predominant risk factors are hypertension (high blood pressure), smoking, diabetes, atrial fibrillation, and physical inactivity (O'Donnell et al. 2010). Nevertheless, the symptom onset is usually sudden[8] and stroke is an acute condition. Being struck by stroke is a life altering event with consequences not only for the patient but also for the family members of the patient. The recovery process and the rehabilitation after a stroke varies greatly but the largest regain of function usually occurs during the first weeks after the stroke (Ullberg et al. 2015). According to a follow-up survey of patients who suffered stroke one year earlier, one in six report being dependent on others to manage daily activities. For those aged 75 years and older the corresponding share was two thirds. Since most of the stroke survivors live in their own homes[9], the need for care in the home is large (Bugge et al. 1999; McCullagh et al. 2005). Around 40 percent of the one-year stroke survivors report being dependent on the care from family members such as their adult children (The Swedish Stroke Register 2016). It is therefore reasonable to assume that a parental stroke increases the need to care for the parent. This care is not limited to informal care in the sense of providing help for someone who is ill, but it also involves caring about the parent in a broader sense like worrying about the parent's well-being and wanting to spend time together. Having a parent suffering stroke is thus used as a proxy for care need. The adult children of elderly parents are studied in the period leading up to the parental stroke, where the care needs of parents are assumed to be unaffected, and compared to the period after where the care need of the parent has increased as a result of the stroke.

2.3 Informal care demand in the final years of life

Following Fevang et al. (2012) the second health shock that is studied in this paper is death, or rather the final years of an elderly parent's life. Although it is often suggested that aging populations will increase health care expenditure, research shows that health care costs are primarily determined by proximity to death rather than age (Polder et al. 2006; Seshamani and Gray 2004; Zweifel et al. 1999).[10] Not only is the care demand increased as elderly parents approach

[8] Sudden enough to be categorized into two-hour intervals during the day. Interestingly, the incidence of stroke is highest between 10:00 am and noon (Marler et al. 1989).
[9] One year after the stroke, around 90 percent of stroke patients are able to live in their own home whereas 10 percent live in institutional homes. The average number of days spent in hospital as the result of a stroke is around 10 days (Socialstyrelsen 2011).
[10] This is often referred to as the "red herring argument" (Zweifel et al. 1999).

their death, but it is often concentrated in the final years of life (Gerdtham and Jönsson 1990; Emanuel et al 1999; Polder et al. 2006; Wolff et al. 2007; Yang et al. 2003). Time to death can therefore be used as an approximation of disability (Meijer et al. 2011). Moreover, having a parent in the final phase of life may also be associated with wanting to spend time together and with grief, both of which requires "mental attention". The potential impact on the child's labor market activity is therefore not limited to informal care provision only, but includes the consequences of these other aspects as well. Having a parent in the final phase of life is used as a proxy for this type of care need. The adult children of elderly parents are studied in the period before as well as the period leading up to parental demise, and in the period after where care need of the parent has ceased to exist. Since the initiation of increased care demand in the final years of life is less distinct (compared to the timing of e.g. stroke) it is more complex to determine when it is realistic to assume that the adult child is unaffected by the parent's increased care demand. In the analysis, it is assumed that there is no causal impact of having a parent in its final years of life more than eight years before parental demise.

3 Identification strategy

There are several challenges associated with estimating the effect of a parental health shock on labor market outcomes. To begin with, having a parent suffering from a health shock (stroke or being in the final years of life) at a certain point in the life course is not random in relation to the adult child's own health and labor market outcomes. The risk of stroke is related to lifestyle factors such as diabetes and high blood pressure, which in turn is genetic. And although everyone dies at some point, those that have parents who die during a certain period are most likely different from adult children of the same age whose parent do not die during that period. It would thus be misleading to compare adult children that experience a parental health shock to those that do not. Therefore, I study only adult children whose parent is indeed struck by stroke or die during the period studied. Since the primary caregiver of elderly is usually their spouse (Ulmanen and Szebehely 2014) I will focus the analyses on children of lone parents.

Moreover, the timing of a parental health shock over the life course cannot be assumed to be uncorrelated with characteristics of the offspring. With a positive intergenerational correlation in health (Björkegren et al. 2019), healthy individuals can expect to have a parent suffering a health shock at higher own age than less healthy individuals. Since health itself is correlated with labor market performance (for literature reviews see e.g. Strauss and Thomas 1998, Smith

1999, and Deaton 2003), cross-section estimates of the effect of a parental health shock on labor market productivity would likely be biased. Furthermore, how an adult child reacts to a parental health shock and how likely they are to supply informal care depends on the individual's attachment to the labor market. Those with weaker labor market attachment and thus a lower alternative cost of supplying informal care are likely to respond more intensely to increased demand for informal care than others. If not addressed properly, the sorting of individuals into caregiving will result in biased estimates that overestimate the effect of caregiving.

I handle these selection problems by estimating individual fixed effects models that use only the within-individual variation in labor market outcomes and sickness-absence over time. The strategy is inspired by Fevang et al. (2012), and I utilize variation between individuals, of the same birth cohort, in the timing of the parental health shock to identify the effect of having a parent in need of care, controlling for time invariant individual characteristics. I assume that there is no impact from the parental health shock in the pre-treatment period, which occurs at different points in time depending on the type of health shock studied. That is, in the analysis of children to parents who suffer stroke, the pre-treatment period is the years before the parental stroke. In the analysis of children to parents in their final years of life, the pre-treatment period is the years more than eight years before the parental demise.

The main regression model is the following individual fixed-effects model and it is estimated separately for each sample and for sons and daughters[11]:

$$y_{i(c)t} = \alpha + \gamma_i + \lambda_{ct} + \sum_{k=t}^{5} \delta_k \, \mathbf{1}[t = k] + \varepsilon_{ict} \qquad (1)$$

where $y_{i(c)t}$ is the labor market- and sickness absence outcomes for individual *i*, belonging to birth cohort *c* at time *t* and it is measured in three ways: a dummy for employment, log of annual income, and the number of days on sick-leave. The impact of the parental health shock is captured by the δ_k's and they measure the change in outcome compared to a reference level. That is, for the stroke sample the δ_k's (for $k=-4,-3,\ldots,5$ where *k* is the number of years[12] away from the parental stroke) estimate the change in outcome at $t=k$ relative to the reference level, which is an average of all available years at least five years prior to stroke ($t \leq -5$). In the analysis of children with parents in their final years of life, the

[11] All the regressions are estimated using ordinary least squares. Ideally, one would want to use a fixed effects logit model for estimations on employment. However, due to the large number of fixed effects, such a model does not converge.

[12] Since sick-leave data is available on monthly level, I will also perform a short-run analysis where I study the period 12 months before and after the parent is struck by stroke.

δ_k's (for $k=-8, -7, ...,5$ where k is the number of years away from parental demise) estimate the change in outcome at $t=k$ relative to the reference level, which is an average of all available years at least nine years prior to parental death ($t\leq -9$). The care demand of the parent is expected to increase at different points in time in the two analyses. For children of parents suffering stroke, the effect of increased informal care demand is expected to happen after $k=0$ i.e. after the parent suffers stroke. For children having a parent in his or her final years of life on the other hand, the effect of informal care demand is expected to take place in the years immediately before $k=0$.

γ_i is a vector of individual fixed effects capturing the time invariant individual specific characteristics, $\mathbf{1}[\cdot]$=1 if the expression in brackets is true, and zero otherwise, and ε_{ict} is an error term. Since I will study the time-path of the outcomes of adult children over several years, I need to control for changes in the outcome due to age. Moreover, there may be differences in the wage trajectories for different birth cohorts. To this end I will include a vector of birth cohort specific year effects, λ_{ct}, to control for time shocks so that it can vary by birth cohort (and gender). Throughout all estimations in the main analysis, the standard errors will be clustered at the individual level to account for potential within-individual correlation in the error terms.

Given the individual-level panel data structure and the difference in timing of the health shock between individuals, the identification strategy can be seen as a form of difference-in-differences approach. The main identifying assumption is that the timing of the parental health shock is exogenous, i.e. that the timing of the parental health shock is not correlated with expected changes in offspring's labor market outcomes or sick leave that would have happened in absence of a parental health shock. Put differently, exogeneity of the timing of the parental health shock implies that I assume that the change in treatment status (having a parent in need of care or not) is uncorrelated with changes in the error term, and that the timing of the parental health shock is exogenous to child behavior. Specifically, I assume that children's investment in care for their elderly parent is exogenous to the timing of parent's health shock. If children's time investments in their parents make the parents healthier (Torssander 2013), the timing of the parental health shock may not be exogenous to the offspring's labor market outcomes. This assumption is probably more important when studying children of parents in their final years of life since stroke is less likely to be affected by children's investments. When focusing on within-family impacts from a parental health shock in Section 5.4, this assumption can be relaxed.

In the stroke analysis, the pre-treatment period (all years prior to stroke) can be studied to test the assumption of parallel trends which in this case corresponds

to no causal impact on the outcome variable before treatment. For the sample with children of parents in their final years of life, the distinction of the pre-treatment period is less precise and coincides with the reference level, but I assume no significant effects on the outcomes at least eight years away from the demise (that is for $k \leq -9$ which is the reference level, and $k=-8$).

A potential threat to identification in the analysis of children with parents in their final years of life is the fact that parental demise may imply a changed budget constraint due to inheritance (Elinder et al. 2012). Individuals may change their labor supply in response to an expected inheritance. It is therefore difficult to disentangle whether any effects on labor supply are the result of increased informal care demand or a changed budget constraint. One way to get at whether it is informal care provision that is driving the results is by comparing the labor market response after parental demise in a sample where parents die suddenly, and where the expectation of inheritance therefor is less obvious, to one where they do not. If the impact on income after parental demise is smaller in the sample where parents did not die suddenly this could indicate that the children, knowing they would be inheriting in the near future, adapted their labor supply in advance rather than after parental demise.

4 Data, descriptive statistics and descriptive graphics

In this study, two different samples are analyzed: one consisting of families where the elderly parent suffers from a stroke and one of families who lose an elderly parent. Several universal Swedish administrative registers are combined to create these samples.

The underlying population in the stroke sample consists of all adult children of stroke patients who suffer stroke between 1995 and 2005. Using register information on all inpatient hospital episodes available from the Swedish National Board for Health and Welfare (NBHW), I sample all first-ever stroke patients who suffered stroke and survived for at least one month. A stroke patient is defined as an individual being admitted to hospital with the primary diagnosis of cerebrovascular disease.[13] The patient register contains detailed information on the admission date as well as diagnosis classified according to WHO's ICD9

[13] Specifically, patients admitted with the following ICD9 diagnosis are included: 433 – Occlusion and stenosis of precerebral arteries, 434 – Occlusion of cerebral arteries, and 434 – Occlusion of cerebral arteries. Patients with the following ICD10 diagnosis are included: I61.9 – Intracerebral hemorrhage, unspecified, I63.9 – Cerebral infarction, unspecified, and I64 – Stroke, not specified as hemorrhage or infarction.

and ICD10 classification system. The information is typically entered into the hospital administrative system at discharge and hospitals are obligated by law to report the data.

The underlying population in the sample of children with a parent in the final years of life consists of all adult children to parents who pass away between the years 1995 and 2008. From the Causes of Death Register held at NBHW I retrieve information on the date of death as well as the cause of death for all Swedish residents who die during these years. The information about cause of death will be used to distinguish whether the death was sudden.[14]

The stroke patients and the diseased individuals are linked to their family members using the Swedish population register from Statistics Sweden to create the two separate data sets: one of stroke families, and one of parental death families. The population register covers all persons born in Sweden and links individuals to their biological children. It also contains information on birth year and month as well as the birth order of children. I restrict attention to families where all children share the same biological mother and father. Moreover, since earlier literature suggests that the primary caregiver of an elderly parent is usually the spouse (see for example Ulmanen and Szebehely 2014), I distinguish between lone and non-lone parents. Lone parents are defined as individuals where the other parent of their children is dead at the time of the health shock.[15]

In order to avoid non-participation in the labor market due to higher education and retirement, I restrict the sample to include only observations when the child is between the ages 35 and 65. Moreover, because I want to ensure that there are observations of the outcomes prior to the parental health shock, I focus the analysis on individuals that I can follow at least five years before parental stroke or nine years before parental death. The stroke sample consist of 99 116 adult children whose parent suffered stroke between the years 1995 and 2005.[16] The parental death sample consists of 984 054 individuals who lost a parent between the years 1995 and 2008.

I focus on three outcomes: employment, annual labor market income, and number of days with sickness benefit. Employment is defined as earning at least 165 000 annually which corresponds roughly to annual labor market income

[14] The definition of sudden death is taken from Andersen and Nielsen (2011) who defines sudden death as death caused by conditions with the following ICD codes: I22-I23 (acute myocardial infarction), I46 (cardiac arrest), I50(congestive heart failure), I60-I69 (stroke), R95-R97(sudden death from unknown causes), V00-V89 (traffic accidents), V90-V99 ,X00-X59, X86-X90 (other accidents and violence).

[15] This is measured with an error. I cannot observe if an elderly has re-married or is cohabiting with a partner who is not the parent of their child, as register data on civil status is only available for individuals aged 65 and younger.

[16] Individuals where both parents suffer stroke during the studied period are excluded.

from full time work for those with minimum wages (Skedinger 2005). In order to capture impacts at the intensive margin, I also study income measured as annual income conditional on employment. I focus on employed individuals when studying income since those working fulltime are more likely to be affected by parental care needs because they face a time restriction in combining labor market work and parental care demands. However, restricting the outcome on employment implies that there could be compositional changes in the sample since only those who are employed will be studied in the analysis of impacts on income. This means that those who remain in the sample could be positively selected, implying that I possibly underestimate the impact on income of parental care need. For robustness, I will therefore also study income conditional on the lower level of earning at least 20 000 SEK annually.[17]

For each adult child I retrieve information on labor market outcomes and socioeconomic background characteristics from register data held at Statistics Sweden based on administrative records and population censuses. Information on labor income stems from annual reports from employers to the Swedish tax authorities, reporting total annual income for declaration purposes.

Data on sickness absence is retrieved from the Social Insurance Agency (SIA) and contains information about start and end date of sickness-spells that are reimbursed by the SIA. People who work or are unemployed in Sweden are entitled to sickness benefits in case of own illness. When employed, the employer pays sick-pay from day 2 to day 14 (the first day is not replaced) of the sick spell. Thereafter, the SIA pays sickness benefits. For unemployed persons, the SIA pays sickness benefits already from day 2 and onward. The register contains data on sickness absence with sickness benefit from the SIA and I therefore study number of days on sick leave from the first day of week three in a sick-spell for employed individuals and from the second day in a sick-spell for unemployed individuals. Thus, for most individuals I am not able to study short-term sickness absence but focus rather on longer-lasting sick absences.[18] I measure the number of days on sick-leave at monthly level but also at annual level to be comparable to the labor market outcomes.

Since I use data on sickness benefits from the SIA I will not capture the short absences from work (usually not more than 10 days) that are often granted by the employer through collective agreements to be able to e.g. attend a funeral or

[17] Given that it is preferable to study log income, I can only study annual incomes larger than 0.
[18] Since this implies that the number of days on sickness benefit depends on whether or not the individual is employed, and because employment may be affected by informal care provision, this outcome may be endogenous. I therefor adjust the number of days on sickness absence for unemployed individuals by reducing them with 14 days, and reassuringly this does not change the results in the analysis.

to care for a sick relative. Nor are benefits for care of closely related persons ("Närståendepenning") included.[19] This means that sickness absence studied in this paper mainly captures the adult child's own health.

Descriptive statistics of the samples are found in Table 1 which shows the summary statistics in the year of the parental health shock (*t=0*). The number of observations per event year for the two samples (i.e. for *t=−9, −8, ...,5*) is found in Table A1 in Appendix.

Table 1 Descriptive statistics of the studied samples in the year of the health shock, t=0

	Stroke sample		Death sample	
	(1) All	(2) Lone parent	(3) All	(4) Lone parent
Child's age at shock	50.22	51.63	52.26	54.18
	(5.441)	(5.412)	(7.356)	(6.744)
log Income (hundreds SEK)	8.007	8.001	8.045	8.039
	(0.373)	(0.368)	(0.384)	(0.380)
Employed (%)	69.16	67.35	65.9	63.5
	(46.18)	(46.90)	(47.4)	(48.2)
Sick days per yr	19.20	20.46	16.85	17.64
	(67.63)	(69.78)	(62.86)	(64.39)
Parental age	79.89	81.47	82.46	84.46
	(5.765)	(5.489)	(7.348)	(6.488)
Year of shock	2000.1	2000.2	2003.5	2003.6
	(3.193)	(3.165)	(4.459)	(4.410)
Share w. paternal shock(%)	45.49	24.47	47.03	29.89
	(49.80)	(42.99)	(49.91)	(45.78)
Share w. university educ.(%)	37.94	36.12	37.53	36.12
	(48.52)	(48.04)	(48.42)	(48.03)
Living in same muni.(%)	50.95	51.38	52.06	52.28
	(49.99)	(49.98)	(49.96)	(49.95)
Singleton child (%)	15.16	16.09	14.52	15.93
	(35.87)	(36.75)	(35.23)	(36.60)
Sudden death (%)	-	-	15.71	17.41
			(36.39)	(37.92)
Observations	99 116	44 020	984 054	613 089

Note: Means of individual characteristics in the year that the parent suffers a stroke or dies. Standard deviations in parenthesis. The log annual income conditional on employment (deflated) is measured in hundreds SEK.

[19] Benefit for care of closely related persons is a cash benefit paid by SIA for caring for a close relative who has a life-threatening condition.

4.1 Descriptive evidence

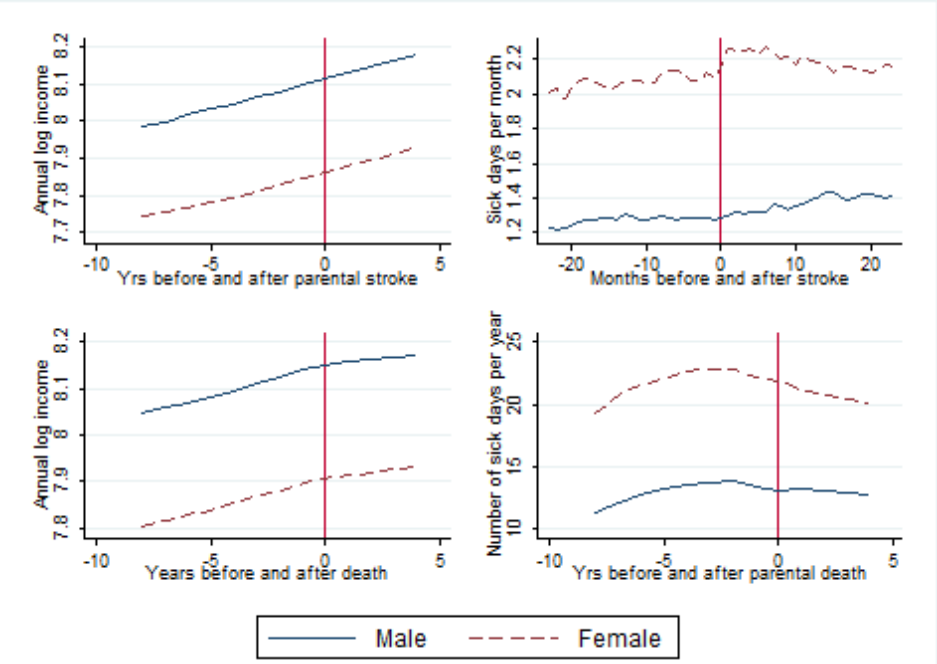
Figure 1 illustrates the pooled cross-section relation between time distance to parental health shock and the log income and number of days on sickness absence for children for the two samples. The upper-left graph shows the time distance in years to a parental stroke and the annual log income (deflated and measured in hundreds SEK) for sons and daughters. The log income profiles of sons and daughters appear to be unrelated to the timing of a lone parent's stroke. The upper-right graph shows time distance to parental stroke in months and days of sickness benefit. It shows a jump in the number of sick days for daughters in the month right after the lone parent suffers stroke.[20] The increase in number of days continues for a few months after parental stroke. This is indicative of increased care demand of the parent resulting in daughters being on sick leave from work.

In the lower-left graph, the relation between the time distance to parental demise in years and the log income of sons and daughters is illustrated. There is no apparent pattern of a decreased income due to increased care need in the final years of the parent. On the other hand, the increase in log income seems to be reduced slightly after the parent has died. The relation between time distance to parental demise and the number of days on sick leave at an annual level is shown in the lower-right graph of Figure 1. There is an increase in the number of sick days, peaking in the year before the parent dies, and is then reduced in the year that the parent dies and onward. This could suggest that children increase the number of sick days due to increased care demand of the parent, and when the parent has died and the care is no longer needed the number of days on sick leave decreases.

While Figure 1 shows the pooled cross-section relations between the timing of the parental health shock and the outcomes, they do not take the endogeneity of caregiving into account. In the next section the results when controlling for this endogeneity by using individual fixed effects estimations are presented.

[20] The number of days on sick leave at annual level in the years before and after stroke is found in Figure A1 in Appendix.

Figure 1 Log income (deflated and measured in hundreds SEK) and sick leave absence in the years (and months) before and after parental stroke and parental demise



5 Results

This section presents the regression results on labor market outcomes and sick leave of having an elderly parent who suffers from a health shock. The estimated effects, separately by sons and daughters, are presented graphically with 95 percent confidence intervals represented by vertical bars.[21] First, I present the results of the individual fixed effects regressions for the parental stroke sample. Thereafter, I present the main results for the parental demise sample, followed by subgroup analyses. Finally, I explore whether there are gender differences within the family in the response to a parental health shock.

5.1 Main results - Parental stroke

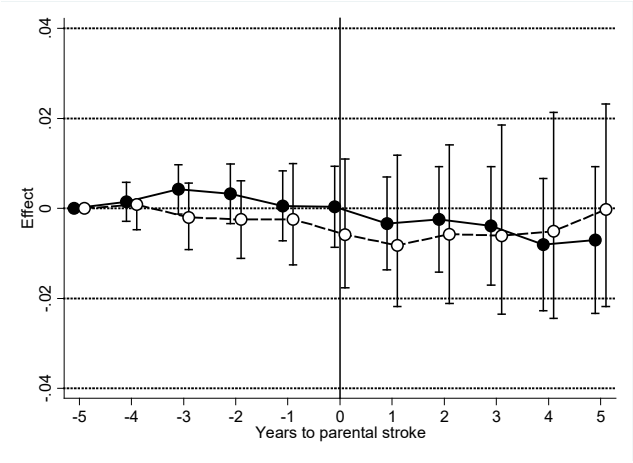
Figure 2 shows the estimated effects of having a lone elderly parent suffering from stroke on employment and income. The point estimates in Figure 2a can be interpreted as percentage point change in employment relative to the reference level, which is all available years at least five years prior to parental stroke. The

[21] Tables with the estimates for the corresponding graphs are found in the Appendix.

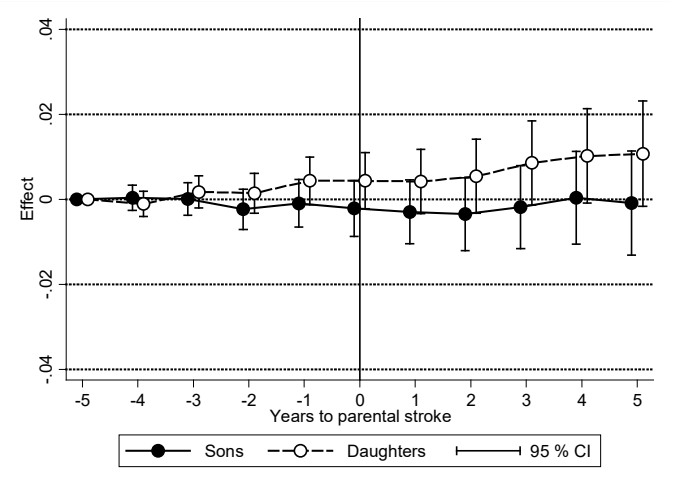
results suggest that there is no impact on employment of sons and daughters following a parental stroke; the estimates in the years following the stroke are small and not statistically significant. Similarly, Figure 2b indicates that there is no significant impact on the income conditional on employment following a parental stroke. By using the logarithm of the offspring's income, the impacts in Figure 2b can be interpreted as percentage change in income relative to the reference level. Reassuringly, there are no statistically significant effects from the parental stroke in the years prior to the stroke which suggests that the assumption of parallel trends is fulfilled.

In Figure 2b, I focus on offspring's income conditional on employment since individuals who work full time are more likely to have their income affected because they need to combine labor market work and a parent with care needs. As discussed in Section 4, this implies that there may be a compositional change in the studied population since only those who are employed remain in the sample. Estimations using income conditional on earning the lower level of 20 000 SEK annually reassuringly show very similar results, apart from a small marginally statistically significant decrease in income for daughters in the year after parental stroke (these results are presented in Table A14 in the Appendix). Overall however, the results from this analysis confirm the conclusion that there are no impacts from parental stroke on income of adult offspring.

Figure 2 Individual fixed effects estimates of the effects of parental stroke on employment and log income conditional on employment, lone parents.



(a) Employment



(b) Log income

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

The estimated impacts on the sick leave of the offspring are presented in Figure 3, where the first two graphs study the immediate response of a parental stroke of sons and daughters using monthly data[22], and the bottom graph studies the more long-term effect by studying sick leave at an annual level. In the monthly analysis, I have included children where both parents are alive at the time of the

[22] Since I use data on sick leave absence I will only capture long term sick leave (at least 14 days) for employed individuals.

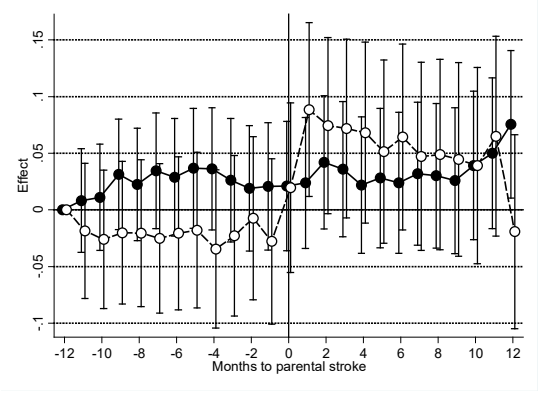
stroke because there may be short term adjustment effects in the months just after a stroke also among children of parents where the primary caregiver is likely the spouse of the stroke patient. The impact on the number of days on sickness benefit month -- by -- month one year before and after the stroke for this sample is presented in Figure 3a. The results indicate that the number of sick days per month increases significantly by around 0.1 day (or 8.8 percent) for daughters in the month following the stroke and that the number of days on sick leave is increased for up to four months after the parent suffers stroke (where point estimates in months 2-4 are significant at the 10 percent level). For sons, on the other hand, there seems to be no effect. When focusing on children of lone parents only, there is no statistically significant effect for sons or daughters, as seen in Figure 3b, but the point estimates for daughters follow the same pattern as in Figure 3a.

Figure 3c shows the more aggregated effects of having a parent suffer stroke for children of lone parents. The dependent variable is the total number of days on sick leave at an annual level. For sons, the number of days on sick leave increases significantly in the years after the parental stroke by around 2 days. This corresponds to an increase of 34 percent compared to the average level at least five years prior to stroke. Moreover, there is a positive impact for each of the studied years following the stroke, suggesting that there is an upward shift in sick leave in the post-stroke period. These results should however be interpreted with some caution as there seem to be significant positive pre-treatment estimates. Although the size of the estimates is larger in the post-stroke period, the significant effects on sick leave before the stroke has occurred suggest that sons' sick leave may also be affected by something other than a parental stroke, or that there are variations in sickness absences over time not captured by the cohort-specific time fixed effects. There are no significant effects on the sick leave at annual level for daughters. Again, there are significant pre-treatment effects suggesting that the assumption that any changes in the development of the offspring's sick leave may be due to increased care demand of the parent is violated.

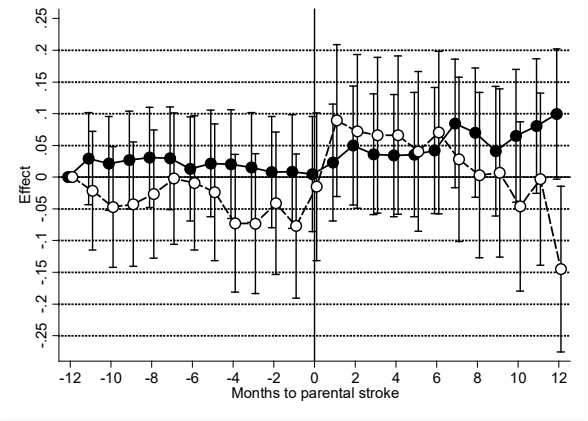
Taken together, there seem to be no effect on children's labor market outcomes following a parental stroke apart from a temporary increase in sick leave in the months right after the stroke. Whether this increase in sick leave is due to the child's own illness or whether children use the sick leave in order to be able to take care of the parent is not clear from this analysis. It could be that a parental stroke comes as shock for the child causing mental suffering and the need to cope with the stress. Having a parent suffering a serious health event could also imply that the child would want to spend more time with the parent.

The more long-term analysis suggests that the temporary impact on sick leave for daughters is not substantial enough to be detectable at an annual level.

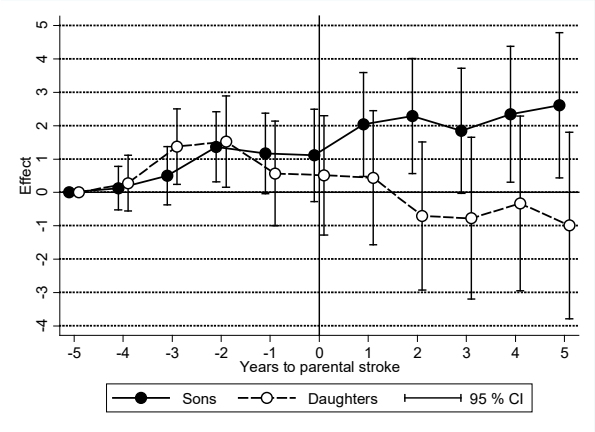
Figure 3 Individual fixed effects estimates of the effects of parental stroke on sick days at monthly and annual level.



(a) Sick days per month, all parents



(b) Sick days per month, lone parents



(c) Sick days per year, lone parents

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

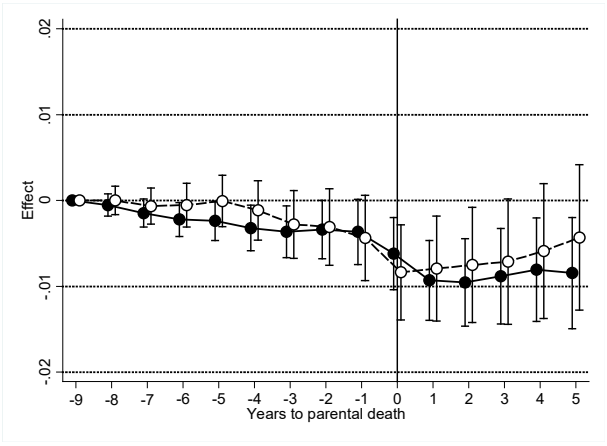
5.2 Main results - Parent in final years of life

Figure 4 shows the estimates of the effect of having a lone parent in the final years of life and who dies at *t=0* on the employment and income of sons and daughters. Figure 4a show that there is no statistically significant effect on employment prior to parental death for daughters relative to the reference level at least nine years prior to parental death. There is however a reduction in employment in the year that the parent dies and it continues to be significantly reduced in the following three years. For sons, there is a marginally statistically significant reduction in employment already seven years prior to the death of the parent, but the size of the point estimates is small and similar to that of daughters. Again, the reduction is larger in the year that the parent dies and onwards; the point estimate of -0.009 in *t=1* suggest that employment is reduced by almost 1 percentage point (or 1.2 percent relative to the average level at least nine years prior to parental death) the year after parental demise.

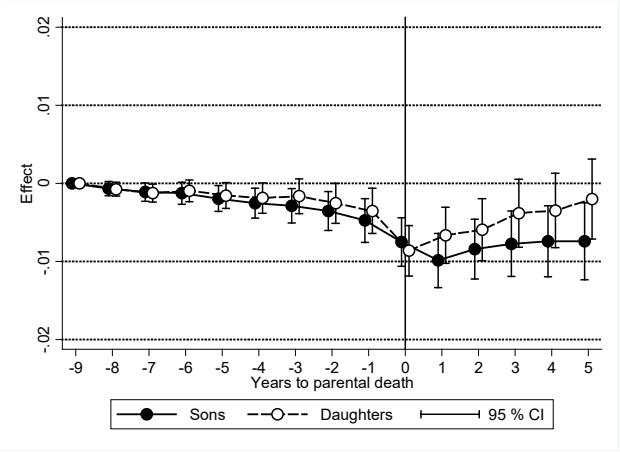
Figure 4b shows the estimated impacts on income conditional on employment for sons and daughters. The income is significantly reduced for sons in the final five years of the parent's life relative to the average income level at least nine years before the parent's death. In the year that the parent dies, the income is even more reduced, and it continues to be reduced throughout the studied period. The estimate of -0.008 at *t=0* suggests that the income is reduced by 0.8 percent compared to the level where it is assumed that the parent has limited or non-existent care needs. The negative impacts on daughter's income appear to be

slightly smaller and are statistically significant only between t−2 and t+2. After that, the income of daughters picks up again.

Figure 4 Individual fixed effects estimates of the effects of parental demise on employment and log income conditional on employment, lone parents.



(a) Employment



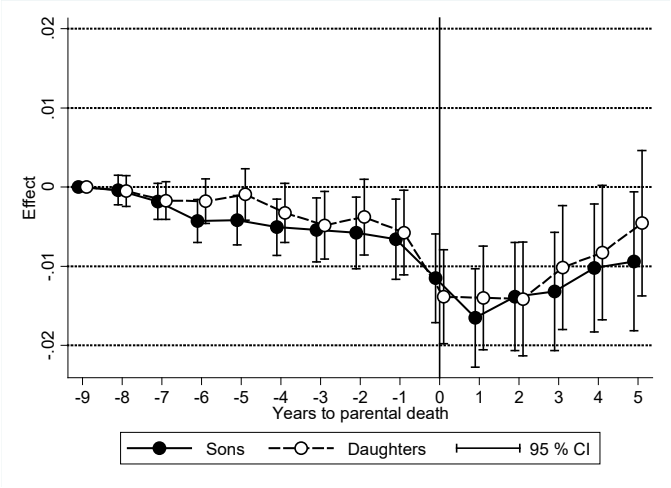
(b) Log Income

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

As discussed earlier, focusing on offspring's income conditional on employment implies that there may be a compositional change in the studied population. In order to see whether this has important implications for the impact on income, I also study the effect on log income conditional on earning at least 20 000 SEK annually. These results are presented in Figure 5 and they show that the size of the point estimates is somewhat larger than those presented in Figure 4b,

suggesting that conditioning income on full employment most likely means that I underestimate the impact on income (results from this analysis is also found in Table A14 in the Appendix). Still, the impacts follow a similar pattern as in Figure 4b, again with sons and daughters being similarly affected, and do not give reasons to revise the conclusion that the impact on income prior to parental demise is generally small.

Figure 5 Individual fixed effects estimates of the effects of parental demise on log income conditional on earning more than 20 000 SEK annually, lone parents.



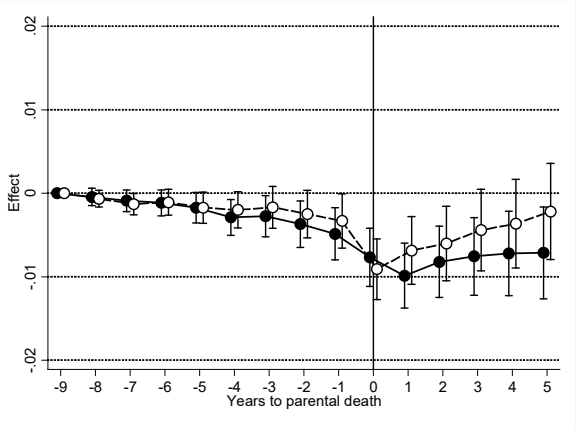
Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

As discussed earlier, it is difficult to disentangle the effects of informal caregiving from the effects of expected inheritance. A reduction in income prior to parental death could stem from the offspring adapting their labor supply to an expected increase in income from inheritance. One aspect in Figure 4b that speaks against this is that the reduction in income is larger when the parent has died which it would not be if children gradually reduce their income due to anticipated inheritance.[23] Another way to get at whether the reduction in income stems from parental care demand or anticipated inheritance is by comparing the behavior of the offspring after parental demise for groups where anticipation of inheritance is likely to differ. To this end, I separate the analysis according to whether the parent died suddenly (so that the anticipation of parental death is less obvious) or not. The drop in income after parental demise would arguably be the largest for those children where the death of the parent is less expected so

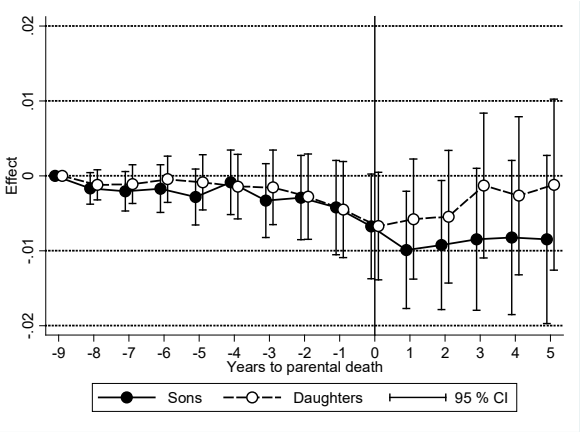
[23] This is true if individuals are able to borrow against future inheritance.

that they had not been able to adjust their labor supply in anticipation of expected inheritance. Using the Causes of Death Register I can distinguish those parents that die suddenly according to the definition of sudden death in Andersen and Nielsen (2011), who characterize a sudden death as unexpected and the result of abrupt change in the person's clinical state. The results on income separated according to whether the parent died suddenly or not is found in Figure 6. When comparing the estimates of the drop in income in the two samples (Figure 6a and b), the size of the drop is similar (point estimate is -0.01 at time $t=1$ for sons in both samples). That is, the response in income (conditional on employment) following the realization of a potential increase in income due to inheritance is equal for both types of deaths which it should not be had the offspring already adapted labor supply, and started to consume the inheritance already before parental demise. These findings are consistent with a reduction in labor supply due to increased informal care provision rather than intentional labor supply smoothing of the offspring.

Figure 6 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment, lone parents: type of parental death



(a) Log income, Not sudden death



(b) Log income, Sudden death

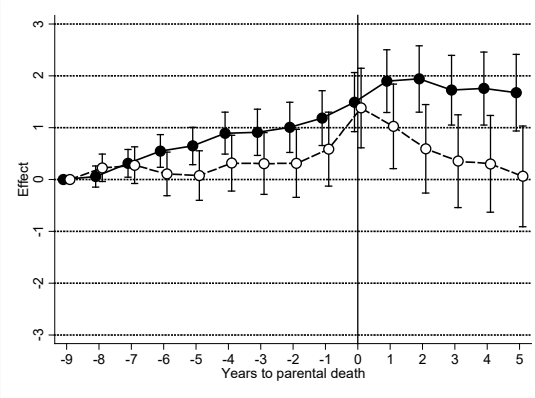
Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Taken together, the results on labor market outcomes from having a parent in his or her final years of life suggest that although there is a small reduction in employment and income in the years around parental demise, the opportunity costs of parental care need for adult children in the form of adverse labor market outcomes are small. Employment and income are both reduced by less than 1 percent in the year prior to parental death relative to the average level at least nine years prior to parental demise. The reduction in employment and income after parental demise could be the result of grief or a reduction in labor supply due to realized inheritance. Results do however suggest that the small reduction in income prior to parental demise is likely the result of informal care provision

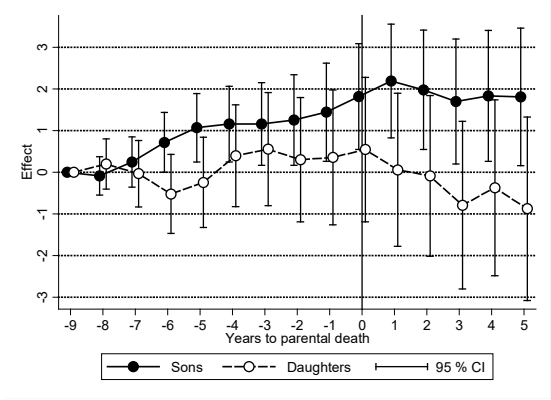
rather than labor supply smoothing in expectation of inheritance. Interestingly, the estimated effects of parental demise for sons and daughters follow the same pattern, suggesting that there are no clear gender differences in the impact of parental demise on labor market outcomes.

Turning to the effects of having a lone parent in his or her final years of life on sickness absence, Figure 7 shows the estimated impact on the total number of days on sick benefit per year in the years leading up to and after parental demise. Figure 7a presents the results for the full sample of children of lone parents and shows that for sons there is a positive effect on the number of days on sick leave for almost all years prior to and following parental demise. This suggests that there seems to be an underlying trend in the number of sick days that my model does not capture and that the results for sons should be interpreted with some caution. For daughters, there is a significant increase of around 1.4 days (corresponding to almost 14 percent) in the year that the parent dies relative to the level at least nine years prior to parental demise, and it is increased also in the year after the parent has died. Although this could be a grieving effect since it coincides with parental demise, no similar increase is found when separately studying daughters whose parent dies suddenly, and who also likely mourn their parent (as seen in Figure 7b). If it can be assumed that the care need in the final year of life is larger for parents who do not die suddenly compared to those that do, this finding would indicate that the impact on sick leave absence is not solely driven by grief, but may be the result of increased care need in the final year of the parent's life. It should however be noted that parental care need would not be able to explain the increased level of sick leave that remains also the year after parental death.

Figure 7 Individual fixed effects estimates of the effects of parental demise on sick days, lone parents.



(a) Sick days, All



(b) Sick days, Sudden death

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

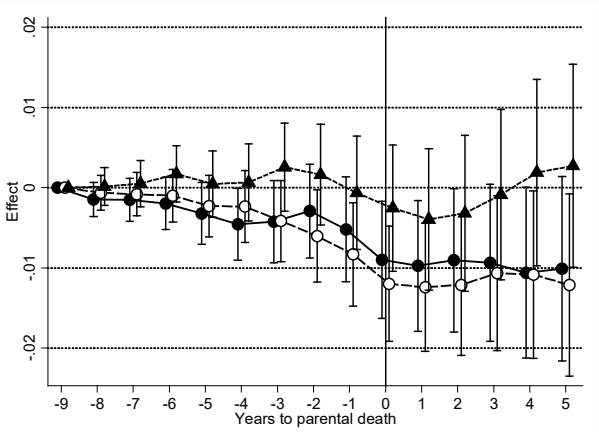
5.3 Subgroup analyses

The characteristics of the adult child may be associated with his or her labor market attachment as well as the sensitivity in the response to a parental health shock. To see whether there are heterogeneities in the impact on the child's income I analyze offsprings with different characteristics.

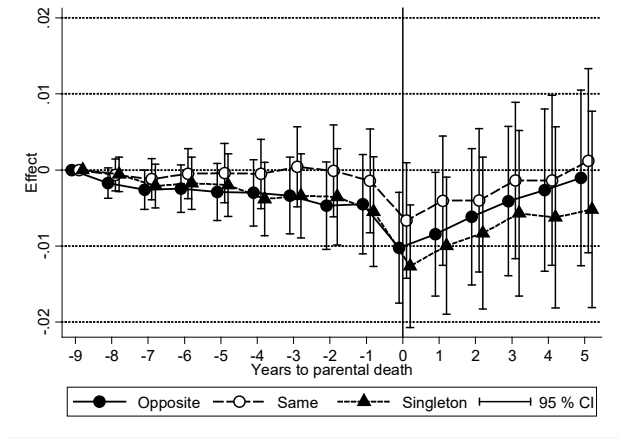
There may be differences in how the adult child is affected depending on whether he or she has siblings to share the informal care burden with. Moreover, it may also matter whether that sibling is male or female since earlier literature has suggested that daughters are more likely to care for their elderly parent (Szebehely 2005). Using a sample including only families with two adult siblings and with a single adult child, I estimate the impact of having a parent in his or

her final years of life separately according to whether the adult child has a brother, a sister, or whether he or she has no siblings. Figure 8 shows the impact on income separately for sons and daughters of lone parents. The results indicate that the negative impact on income prior to lone parent's death is statistically significant only for sons with a brother (Figure 8a) and that the point estimates are somewhat smaller for daughters with a sister, compared to other daughters (Figure 8b). One interpretation of these results is that the negative impact is found where there is no female sibling to share the burden with. Surprisingly, there is no impact on income for singleton men. Given that they have no sibling to share the care burden with, it would have been expected to see a larger impact for these men, similar to that found for singleton daughters. The corresponding analysis for the children of parents who suffer stroke (found in Figure A2 in Appendix) reveals no differences among different types of sibling constellations; there is no statistically significant effect of a parental stroke on income in either subsample.

Figure 8 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment, lone parents: different sibling constellations



(a) Income of sons



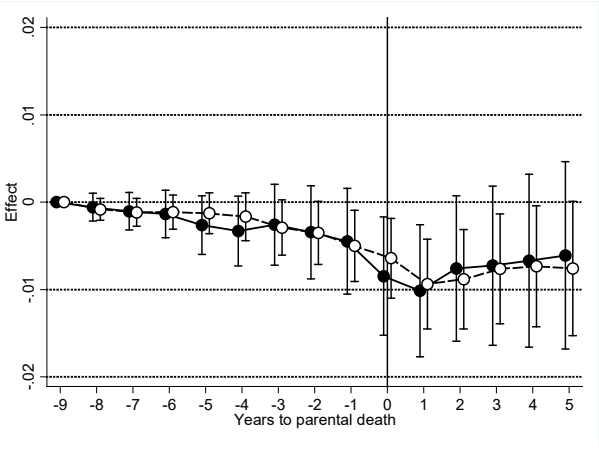
(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

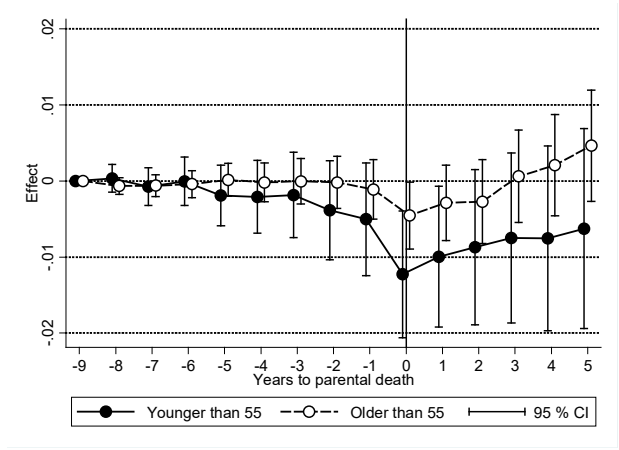
Another potentially important aspect that may impact how the offspring responds is at what point in the child's life course the parent suffers a health shock. If the health shock occurs at a point in time when the adult child is about to make career advancements, or if it happens when the adult child is deciding whether or not to remain on the labor market because of high own age, could have implications for the size of the impact on income. One way to study this is to split the sample according to the age of the offspring at the time of the parental health shock. I therefore separate the analysis according to whether the adult child was older or younger than 55 at the time of the health shock. As seen in Figure 9a, the point

estimates of older and younger sons follow the same pattern. For daughters on the other hand, younger adult children seem to be driving the impact on income. The results could indicate that women who are in the middle of their career are more sensitive to circumstances in their private life. It should be noted that since the group of adult children who are below the age of 55 is smaller, the impact is more imprecisely measured for both sons and daughters and becomes noisy when moving farther away from the reference level. None of the point estimates prior to parental demise in Figure 9b is statistically significant. For children of parents suffering stroke, there seem to be no difference depending on the child's own age at the time of the stroke. Results from this analysis are presented in Figure A3 in Appendix.

Figure 9 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment, lone parents: different ages of the child



(a) Income of sons



(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

The impact from a parental health shock could also differ depending on whether it is the mother or the father that is affected. For example, women who suffer stroke are often older and fare worse following the stroke (Glader et al. 2003). Moreover, women usually die at higher age and could therefore have different care demands compared to aging men. The results from the stroke sample when comparing maternal and paternal stroke (found in Figure A4 in Appendix) reveals no difference in the impact. For daughters, the impact of having a father in its final years of life is larger compared to having a mother in its final years.

For sons on the other hand, there is no difference in impact between having a lone mother or father (results are presented in Figure A7 in Appendix).

How the adult child's income is affected by the parent's health could also differ depending on whether he or she lives in the same municipality as the parent. On one hand, children living close to their parent may be more likely to provide informal care. On the other hand, living farther away from the parent may imply that it takes more effort to provide the informal care. However, I find no difference in the impact from a parental health shock on income in either sample depending on whether the offspring and parent live in the same municipality or not (results are found in Figures A5 and A8 in Appendix). When comparing the difference in impact from a parental health shock depending on child's educational level, there is no difference in impact on income for sons. For daughters however, the point estimates are larger for women without post high school education in the years prior to parental demise, but they are not statistically significant (results found in Figures A6 and A9 in Appendix).

5.4 Gender differences within the family

In this section, I turn to the analysis of gender differences in the response to a parental health shock within the family. Whereas the previous analysis compares daughters to sons in general, the analysis in this section will compare a daughter to her brother. Differences in impact of the outcomes between sons and daughters within the family may reveal differences in the expectations of sons and daughters in providing family care. By looking at within-family differences in the outcomes I can control for observed and unobserved characteristics of the parent as well as inherited health and human capital that may influence informal care provision and labor market outcomes. Siblings share the same upbringing and, on average, 50 percent of their genes, and they are also affected by the exact same severity and type of parental health shock. Moreover, studying the within-sibling change in income implies that I control for offspring's investment in parental health before the health shock and thereby relax the assumption that children's investment in parental health is exogenous to timing of parent's health shock. I focus the analysis on a sample where each family consists of two children of opposite sex, and estimate the following model (which is inspired by Angelov et al. 2016):

$$\tilde{y}_{ijt} = \alpha + \lambda_t + \sum_j^J \alpha_j \, \mathbf{1}[t = j] + \tilde{x}'_{it}\beta + u_{ijt} \qquad (2)$$

where $\tilde{y}_{ijt}$=$y_{bjt} - y_{sjt}$ is the within-sibling difference between *(b)*rother's and *(s)*ister's outcome for siblings i, j years away from the parental health shock

measured in calendar year *t*. $\tilde{x}$ is a vector of sibling differences in covariates measured prior to the health shock, $\mathbf{1}[\cdot]$=1 if the expression in brackets is true, and zero otherwise, and u_{ijt} is an error term. The parameters of interest α_j for $j=-4, -3, ...,J$ in the stroke analysis, and $j=-8, -7, ...,J$ in the parental demise analysis, identify the impact of parental ill health on the sibling outcome difference up to J years after the health shock relative to the pre-health shock gender difference in income. I estimate equation 2 using birth cohort-specific calendar year fixed effects λ_t[24] and with controls for the within-sibling age difference and within-sibling difference in education.[25]

The main identifying assumption is that the timing of the parental health shock is exogenous to changes in outcomes of the offspring. That is, conditional on any secular trends in the outcome (and the difference in pre-health shock covariates) the timing of the health shock cannot be related to expected future changes in the outcomes that would have happened in absence of the parental health shock.

Figure 10 shows the results on the income gap of siblings whose lone parent suffer a health shock, with 95 percent confidence intervals represented by vertical bars. There is no statistically significant impact on the within-sibling income gap after the parent suffers stroke, as seen in Figure 10a. Figure 10b shows the results on the income gap of siblings whose lone parents are in their final years of life. The results indicate a small negative impact on the income gap between brothers and sisters of close to 2 percentage points (2 log points) in the year prior to parental death. This effect is small and, if anything, suggest that the negative impact on the son's income is larger compared to his sister's. Results when studying wage gaps using the lower income threshold of 20 000 SEK are found in Figure A11 in the Appendix and they show similar results as in Figure 10.

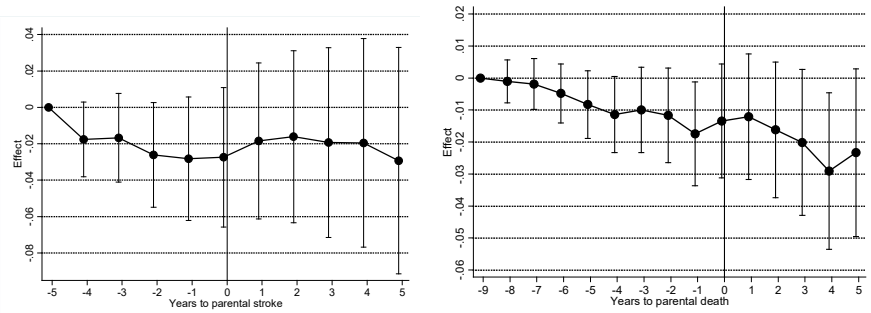
I also examine whether there are gender differences within siblings in the response of a parental health shock on the number of days on sick leave; these results are presented in Figure 11. In Figure 11a I show the results of estimating equation 2 using monthly data on the sibling gap in number of sick days for the children of parents suffering stroke. There is no significant effect on the within-sibling difference in monthly sickness absence found for either the full sample of adult children or when focusing on adult children of lone parent's only. In Figure 11b, I present the results on the sick gap between siblings whose lone

[24] I use the birth year of the older sibling as the birth cohort.

[25] I also estimate equation 2 using calendar year fixed effects only and with birth cohort-specific year fixed effects but without controls siblings differences in covariates. These results, as well as those presented in Figures 10 and 11 are found in Tables A2, A3, A4, and A5 in Appendix.

parent is in his or her final years of life and, similarly, they suggest that there is no statistically significant effect on the sick gap between siblings.

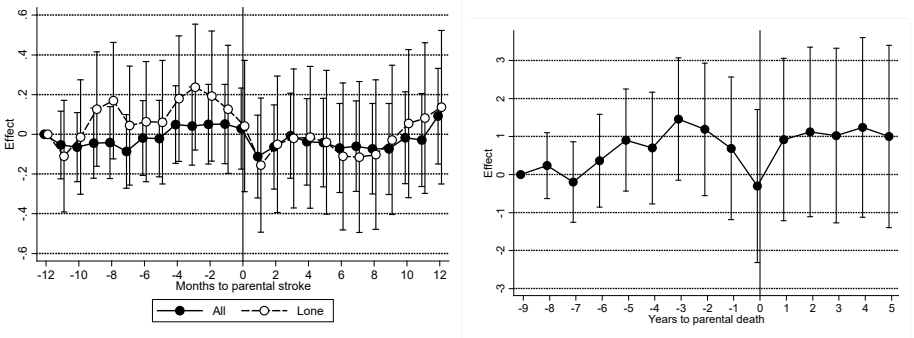
Figure 10 Yearly effects of parental health shock in t=0 on the within-sibling change in income gap



(a) Effects of parental stroke (b) Effects of parental death

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\alpha_j{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure 11 Monthly and yearly effects of parental health shock in t=0 on the within-sibling change in sick gap



(a) Monthly effects of parental stroke (b) Yearly effects of parental death

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\alpha_j{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

6 Conclusion

In this paper I have studied the effects of parental stroke and parental demise on labor market outcomes and sick leave for adult sons and daughters. A large literature documents a negative relation between informal care provision and labor supply, but if not taking the endogeneity of caregiving into account the consequences of having a parent in need of care is most likely overestimated. I

handle the selection into caregiving by estimating individual fixed effect models and utilizing the timing of a parental health shock to identify the effects of parental ill health on the outcomes of adult children.

I find that the income of both sons and daughters significantly decreases in the period from five to two years prior to parental demise. For sons, there is also a negative impact on employment prior to parental demise but for daughters this effect is not statistically significant. The negative impact could stem from informal care provision, but may also be the result of caring in a broad sense involving also the desire to spend time with the parent in his or her final years of life. The negative impact on both employment and income is largest in the year that the parent dies and the years immediately after, which could be due to grief or realization of inheritance. The results do however suggest that impacts on income stem from parental care demand rather than from the expectation of inheritance; when comparing the impact after parental demise between children to parents that die suddenly and those that do not, where the former arguably have less obvious reasons to expect inheritance, I find that the reduction in income is equal in size which it would not be had the offspring adapted labor supply and started consuming expected inheritance already before parental demise. Compared to the results found in Fevang et al. (2012), I find no statistically significant effect on employment for daughters prior to parental demise. Moreover, I find that having a parent in the final years of life has larger impacts on the child's income rather than employment. Nevertheless, I find that the size of the impact from parental demise on labor market outcomes is small, suggesting that employment and income is reduced by less than 1 percent from having a parent in his or her final years of life.

There are no effects on adult children's labor market outcomes following a parental stroke. Although surveys suggest that children do provide informal care for their stroke-suffering parents, the analysis in this study shows that this care provision does not affect the child's labor market activity. One reason for not finding any results on income from a parental stroke can be that since stroke requires medical attention from the beginning, the parent becomes a part of the public caring system which may ease the care giving burden on adult children. Also, the substitutability between formal an informal care may be restricted if the care that follows after a stroke requires medical skills. I find suggestive results of a temporary increase in sick leave for daughters in the months just after a parent suffers stroke. This could suggest that providing informal care to a lone elderly parent has a negative effect on adult daughter's own health. Another interpretation is that daughters use sick leave benefit as a way of reducing time spent on working in order to manage providing informal care. This temporary

increase in sick leave for daughters is however not visible at an aggregated level. At annual level, there is rather an upward shift in sick days for sons in the years following the stroke. Conclusions from this aggregated analysis is however not certain since there seems to be a positive trend in the level of sick leave days for sons not captured by my model.

As for the analysis of the effects on sick leave of having a lone parent in its final years of life, the results suggest that daughter's sick leave absence increases in the year that the parent dies. Since this increase coincides with the death of the parent, it could be the result of grief. However, since I find no similar increase for children whose parent's dies suddenly, the increase is not solely driven by grief. If it can be assumed that the care need of parents who die suddenly is lower than that of those who do not, the result would indicate that having a parent in need of care has negative impact on sickness absence, which extends also to the year after parental demise. Sons' sick leave absence increases throughout the studied period and the increase may therefore not be attributable to parental care needs.

I also analyze whether there are differences between brothers and sisters in the impact of a parental health shock. Contrary to surveys and previous research I find that, if affected at all, brothers' income decreases to a larger extent than daughters'. There may be many reasons for this result. First, it may be that men are employed to a larger degree and therefore have to cut back on worked hours to have time to care for their parent whereas women's informal care supply mainly affects their leisure. Second, if women have higher productivity in combining caring responsibilities with work, their labor supply may not be as affected. Moreover, the effects found in other studies may be overestimated if they have not considered the potential selection of women into caring.

Taken together, the results suggest that the opportunity costs of parental care need in the form of adverse labor market outcomes are small. Sweden has a comprehensive publicly funded system of care for older people, which is likely to limit the negative consequences on the labor market for adult children. By comparing the results of two different types of health shocks -- one instant and severe shock requiring medical attention (stroke), and one with a more gradual development of care demand (being in the final years of life) -- I find that the impact, albeit small, is more pronounced when care demand increases gradually and when care is not necessarily provided formally by the health care services.

References

Andersen, Steffen, and Kasper Meisner Nielsen. 2011. “Participation constraints in the stock market: Evidence from unexpected inheritance due to sudden death.” *Review of Financial Studies* 24 (5): 1667–1697.

Angelov, Nikolay, Per Johansson, and Erica Lindahl. 2016. “Parenthood and the gender gap in pay.” *Journal of Labor Economics* 34 (3): 545–579.

Asplund, Kjell. 2003. “Stroke – riskfaktorer och primärprevention.” Läkartidningen 100 (44): 3500–3505.

Bauer, Jan Michael, and Alfonso Sousa-Poza. 2015. “Impacts of informal caregiving on caregiver employment, health, and family.” *Journal of Population Ageing* 8 (3): 113–145.

Björkegren, Evelina., Mikael Lindahl, Mårten Palme, och Emilia Simeonova. 2019. “Pre- and Post-Birth Components of Intergenerational Persistance in Health and Longevity: Lessons from a Large Sample of Adoptees”. IZA DP No. 12451.

Bobinac, Ana, N Job A Van Exel, Frans FH Rutten, and Werner BF Brouwer. 2010. “Caring for and caring about: disentangling the caregiver effect and the family effect.” *Journal of Health Economics* 29 (4): 549–556.

Bolin, Kristian, Björn Lindgren, and Petter Lundborg. 2008. “Your next of kin or your own career?: Caring and working among the 50+ of Europe.” *Journal of Health Economics* 27 (3): 718–738.

Bratberg, Espen, Svenn-Åge Dahl, and Alf Erling Risa. 2002. “"The double burden": Do combinations of career and family obligations increase sickness absence among women?” *European Sociological Review* 18 (2): 233–249.

Bugge, Carol, Helen Alexander, and Suzanne Hagen. 1999. “Stroke patients’ informal caregivers.” *Stroke* 30 (8): 1517–1523.

Carmichael, Fiona, and Susan Charles. 2003. “The opportunity costs of informal care: Does gender matter?” *Journal of Health Economics* 22 (5): 781–803.

Ciani, Emanuele. 2012. “Informal adult care and caregivers’ employment in Europe.” *Labour Economics* 19 (2): 155–164.

Crespo, Laura, and Pedro Mira. 2014. “Caregiving to elderly parents and employment status of European mature women.” *Review of Economics and Statistics* 96 (4): 693–709.

Deaton, Angus. 2003. “Health, inequality, and economic development.” *Journal of Economic Literature* 41 (1): 113–158.

Elinder, Mikael, Oscar Erixson, Henry Ohlsson, et al. 2012. “The impact of inheritances on heirs’ labor and capital income.” *BE Journal of Economic Analysis & Policy* 12 (1): 1–35.

Emanuel, Ezekiel J, Diane L Fairclough, Julia Slutsman, Hillel Alpert, DeWitt Baldwin, and Linda L Emanuel. 1999. “Assistance from family members, friends, paid care givers, and volunteers in the care of terminally ill patients.” *New England Journal of Medicine* 341 (13): 956–963.

Ettner, Susan L. 1995. “The impact of "parent care" on female labor supply decisions.” *Demography* 32 (1): 63–80.

--------. 1996. “The opportunity costs of elder care.” *Journal of Human Resources*: 189–205.

Fevang, Elisabeth, Snorre Kverndokk, and Knut Røed. 2012. “Labor supply in the terminal stages of lone parents’ lives.” *Journal of Population Economics* 25 (4): 1399–1422.

Forsberg-Warleby, Gunilla, Anders Moller, and Christian Blomstrand. 2002. “Spouses of first-ever stroke victims: sense of coherence in the first phase after stroke.” *Journal of Rehabilitation Medicine* 34 (3): 128–133.

Gerdtham, Ulf-G, and Bengt Jönsson. 1990. “Sjukvårdskostnader i framtiden – vad betyder åldersfaktorn.” *Ds 1990 39*.

Glader, Eva-Lotta, Birgitta Stegmayr, Bo Norrving, Andreas Terént, Kerstin Hulter-Åsberg, Per-Olov Wester, Kjell Asplund, et al. 2003. “Sex differences in management and outcome after stroke.” *Stroke* 34 (8): 1970–1975.

Heitmueller, Axel. 2007. “The chicken or the egg?: Endogeneity in labour market participation of informal carers in England.” *Journal of Health Economics* 26 (3): 536–559.

Heitmueller, Axel, and Kirsty Inglis. 2007. “The earnings of informal carers: Wage differentials and opportunity costs.” *Journal of Health Economics* 26 (4): 821–841.

Johansson, Lennarth, Gerdt Sundström, and Linda B Hassing. 2003. “State provision down, offspring’s up: the reverse substitution of old-age care in Sweden.” *Ageing and Society* 23 (03): 269–280.

Jönsson, Ann-Cathrin, Ingrid Lindgren, Björn Hallström, Bo Norrving, and Arne Lindgren. 2005. "Determinants of quality of life in stroke survivors and their informal caregivers." *Stroke* 36 (4): 803–808.

Kiely, Dan K, Philip A Wolf, L Adrienne Cupples, Alexa S Beiser, and Richard H Myers. 1993. "Familial aggregation of stroke. The Framingham Study." *Stroke* 24 (9): 1366–1371.

Larsson, Kristina, Mats Thorslund, and Ingemar Kåreholt. 2006. "Are public care and services for older people targeted according to need? Applying the behavioural model on longitudinal data of a Swedish urban older population." *European Journal of Ageing* 3 (1): 22–33.

Leigh, Andrew. 2010. "Informal care and labor market participation." *Labour Economics* 17 (1): 140–149.

Lilly, Meredith B, Audrey Laporte, and Peter C Coyte. 2007. "Labor market work and home care's unpaid caregivers: a systematic review of labor force participation rates, predictors of labor market withdrawal, and hours of work." *Milbank Quarterly* 85 (4): 641–690.

Løken, Katrine V, Shelly Lundberg, and Julie Riise. 2016. "Lifting the burden: Formal care of the elderly and labor supply of adult children." *Journal of Human Resources*: 0614–6447R1.

Marler, John R, Thomas R Price, Gregory L Clark, James E Muller, Thomas Robertson, Jay P Mohr, Daniel B Hier, Philip A Wolf, Louis R Caplan, and Mary A Foulkes. 1989. "Morning increase in onset of ischemic stroke." *Stroke* 20 (4): 473–476.

McCullagh, Emily, Gavin Brigstocke, Nora Donaldson, and Lalit Kalra.2005. "Determinants of caregiving burden and quality of life in caregivers of stroke patients." *Stroke* 36 (10): 2181–2186.

Meijer, Claudine de, Marc Koopmanschap, Teresa Bago d'Uva, and Eddy van Doorslaer. 2011. "Determinants of long-term care spending: Age, time to death or disability?" *Journal of Health Economics* 30 (2): 425–438.

Meng, Annika. 2013. "Informal home care and labor-force participation of household members." *Empirical Economics* 44 (2): 959–979.

O'Donnell, Martin J, Denis Xavier, Lisheng Liu, Hongye Zhang, Siu Lim Chin, Purnima Rao-Melacini, Sumathy Rangarajan, Shofiqul Islam, Prem Pais, Matthew J McQueen, et al. 2010. "Risk factors for ischaemic and

intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study." *The Lancet* 376 (9735): 112–123.

OECD. 2008. "Aging OECD societies."

Peltonen, Markku, Måns Rosén, Vivan Lundberg, and Kjell Asplund. 2000. "Social patterning of myocardial infarction and stroke in Sweden: incidence and survival." *American Journal of Epidemiology* 151 (3): 283–292.

Polder, Johan J, Jan J Barendregt, and Hans van Oers. 2006. "Health care costs in the last year of lif – the Dutch experience." *Social Science & Medicine* 63 (7): 1720–1731.

Schmitz, Hendrik, and Magdalena A Stroka. 2013. "Health and the double burden of full-time work and informal care provision – Evidence from administrative data." *Labour Economics* 24:305–322.

Seshamani, Meena, and Alastair Gray. 2004. "Time to death and health expenditure: an improved model for the impact of demographic change on health care costs." *Age and Ageing* 33 (6): 556–561.

Skedinger, Per. 2005. *Hur höga är minimilönerna*? Working Paper. Institutet för arbetsmarknadspolitisk utvärdering (IFAU).

Smith, James P. 1999. "Healthy bodies and thick wallets: the dual relation between health and economic status." *The Journal of Economic Perspectives: A Journal of the American Economic Association* 13 (2): 145–166.

Socialstyrelsen. 2011. "Nationell utvärdering 2011 - Strokevård, Bilaga 5: Riskfaktorer, sjuklighet, dödlighet, vårdkonsumtion och kostnader."

----------. 2014. "Anhöriga som ger omsorg till närstående."

----------. 2018. "Nationella riktlinjer för vård vid stroke." https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/nationella-riktlinjer/2018-3-11.pdf

Spiess, Christa Katharina, and A Ulrike Schneider. 2003. "Interactions between care-giving and paid work hours among European midlife women, 1994 to 1996." *Ageing & Society* 23 (01): 41–68.

Spillman, Brenda C, and James Lubitz. 2000. "The effect of longevity on spending for acute and long-term care." *New England Journal of Medicine* 342 (19): 1409–1415.

Strauss, John, and Duncan Thomas. 1998. "Health, nutrition, and economic development." *Journal of Economic Literature* 36 (2): 766–817.

Swedish Heart-Lung Foundation. 2016. “Stroke – En skrift om slaganfall och TIA.”

Szebehely. 2005. Anhörigas betalda och obetalda äldreomsorgsinsatser. In: SOU 2005:66. Forskarrapporter till Jämställdhetspolitiska utredningen.

The Swedish Stroke Register. 2016. “Ett år efter stroke, 1-årsuppföljning 2015.”Torssander, Jenny. 2013. “From child to parent? The significance of children’s education for their parents’ longevity.” *Demography* 50 (2): 637–659.

Ullberg, Teresa, Elisabet Zia, Jesper Petersson, and Bo Norrving. 2015. “Changes in functional outcome over the first year after stroke.” *Stroke* 46 (2): 389–394.

Ulmanen and Szebehely. 2014. ”Att ge omsorg mitt i livet: hur påverkar det arbete och försörjning?” Working Paper. Department of Social Work, 2014:1, Stockholm University.

Ulmanen, Petra, and Marta Szebehely. 2015. “From the state to the family or to the market? Consequences of reduced residential eldercare in Sweden.” *International Journal of Social Welfare* 24 (1): 81–92.

van Houtven, Courtney Harold, Norma B Coe, and Meghan M Skira. 2013. “The effect of informal care on work and wages.” *Journal of Health Economics* 32 (1): 240–252.

Wimo, Anders, and Linus Jönsson. 2001. “Kan kostnaderna för äldres framtida vård-och omsorgsbehov beräknas?” *Läkartidningen* 98 (38): 4042–4048.

Wolff, Jennifer L, Sydney M Dy, Kevin D Frick, and Judith D Kasper. 2007. “End-of-life care: findings from a national survey of informal caregivers.” *Archives of Internal Medicine* 167 (1): 40–46.

Yang, Zhou, Edward C Norton, and Sally C Stearns. 2003. “Longevity and health care expenditures the real reasons older people spend more.” *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 58 (1): 2–10.

Zweifel, Peter, Stefan Felder, and Markus Meiers. 1999. “Ageing of population and health care expenditure: a red herring?” *Health Economics* 8 (6): 485–496.

Appendix

Table 1

	Stroke sample				Death sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Obs	Sickdays	Obs	log Inc	Obs	Sickdays	Obs	log Inc
t=-9					489 579	12.55	313 283	7.93
						(54.43)		(0.35)
t=-8					48 9579	14.99	314 329	7.95
						(59.64)		(0.36)
t=-7					489 579	17.22	314 548	7.97
						(64.33)		(0.36)
t=-6					489 579	18.83	314 076	7.98
						(67.35)		(0.37)
t=-5	44 020	10.73	28 184	7.93	489 579	19.77	313 487	7.99
		(50.08)		(0.35)		(68.74)		(0.37)
t=-4	44 020	13.22	28 372	7.94	489 579	20.24	311 275	8.02
		(56.19)		(0.35)		(69.75)		(0.37)
t=-3	44 020	16.33	28 461	7.95	489 579	20.19	308 081	8.03
		(62.45)		(0.36)		(69.74)		(0.38)
t=-2	44 020	19.08	28 395	7.97	489 579	19.87	303 515	8.05
		(67.89)		(0.36)		(69.17)		(0.38)
t=-1	44 020	20.02	28 324	7.99	489 579	19.38	296 770	8.06
		(69.09)		(0.37)		(68.28)		(0.38)
t=0	44 020	20.46	28 164	8.00	489 579	18.15	286 958	8.07
		(69.78)		(0.37)		(65.74)		(0.38)
t=1	43 954	21.20	27 831	8.02	438 507	17.90	250 890	8.07
		(71.66)		(0.37)		(65.80)		(0.38)
t=2	43 757	20.99	27 564	8.03	388 831	17.05	216 898	8.08
		(71.63)		(0.38)		(64.43)		(0.38)
t=3	43 396	20.74	27 016	8.04	339 291	15.85	1841 78	8.08
		(70.50)		(0.38)		(61.93)		(0.38)
t=4	42 822	20.80	26 274	8.06	291 312	14.59	153 847	8.08
		(71.01)		(0.38)		(59.40)		(0.38)
t=5	38 221	20.80	25 507	8.07	246 067	13.00	125 755	8.09
		(71.01)		(0.38)		(55.60)		(0.38)

Figure A1 Sick leave absence in the years before and after parental stroke

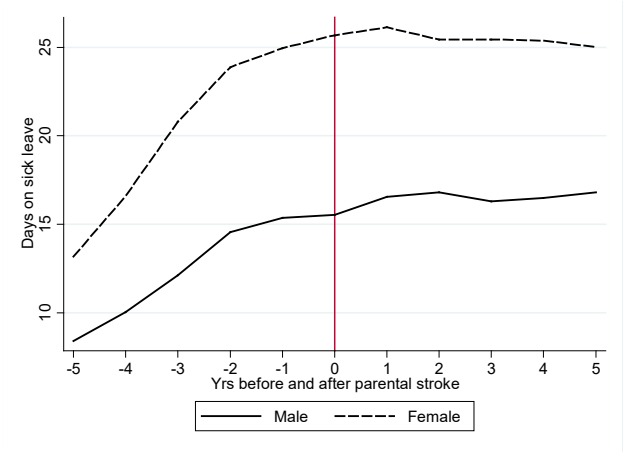
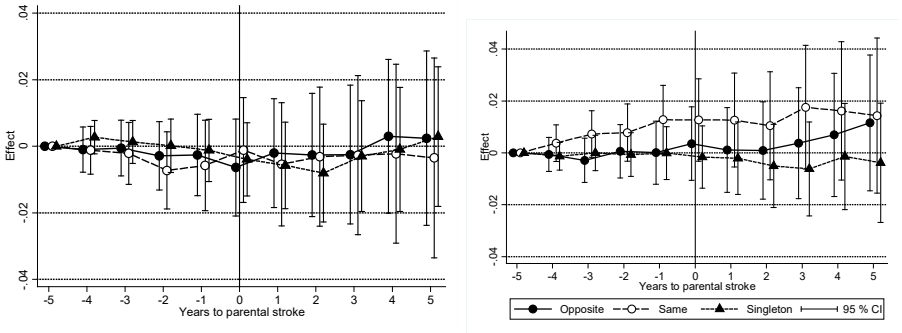


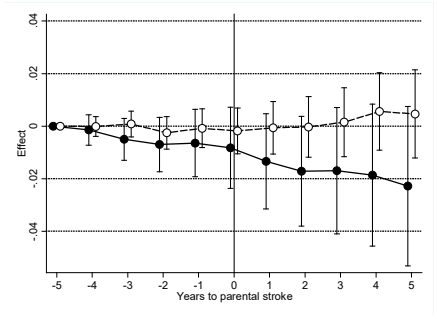
Figure A2 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment in different sibling constellations, lone parents.



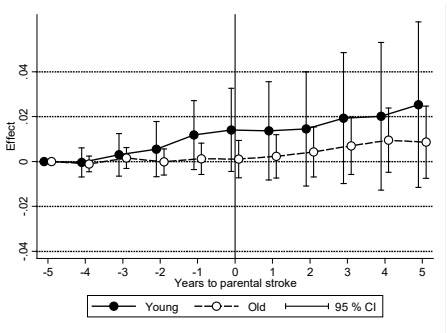
(a) Income of sons (b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A3 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment depending on whether the child is older than 50 or not, lone parents.



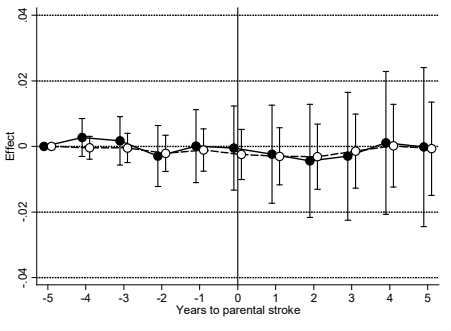
(a) Income of sons



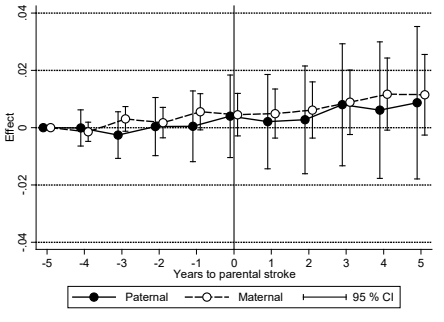
(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A4 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment for maternal or paternal stroke, lone parents.



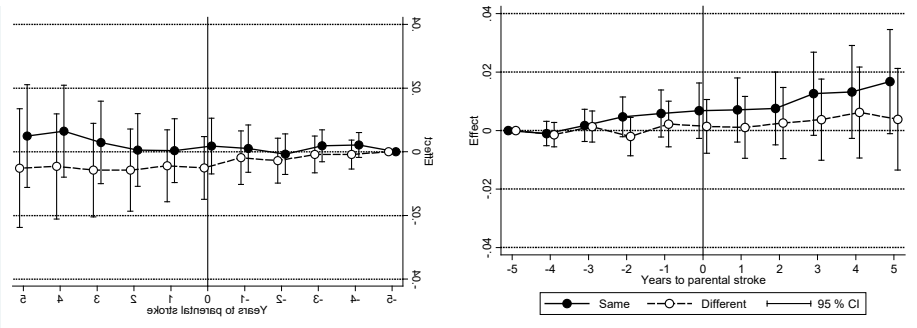
(a) Income of sons



(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

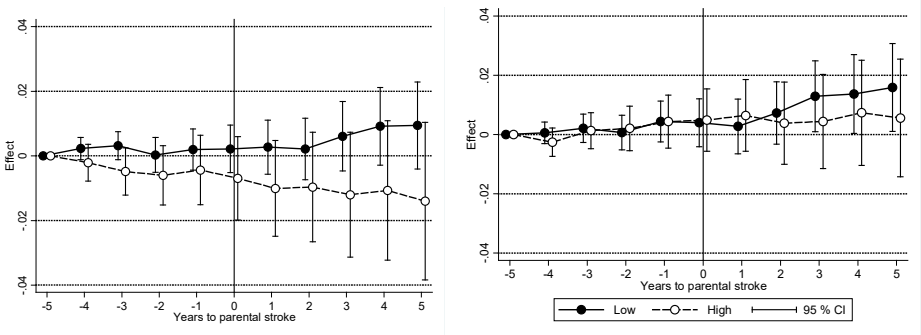
Figure A5 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment depending on whether the child and the parent lives in the same municipality or not, lone parents.



(a) Income of sons (b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

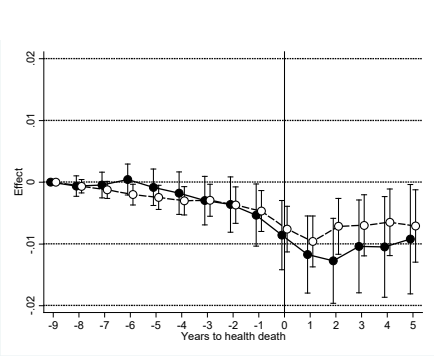
Figure A6 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment depending on whether the child has post high school education (high) or not (low), lone parents.



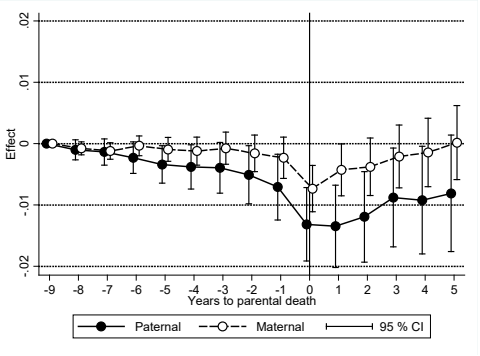
(a) Income of sons (b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A7 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment for maternal or paternal death, lone parents.



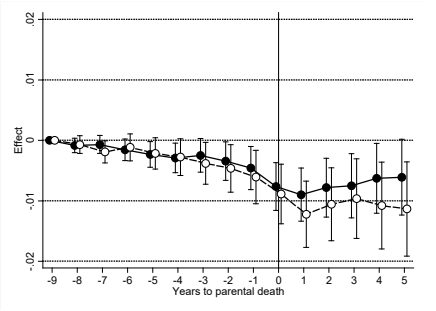
(a) Income of sons



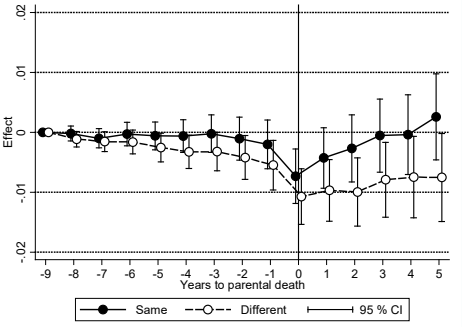
(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A8 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment depending on whether the child and parent lives in the same municipality or not, lone parents.



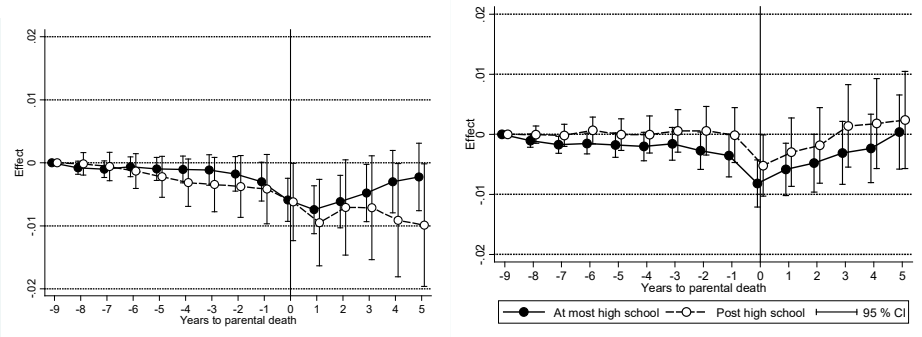
(a) Income of sons



(b) Income of daughters

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

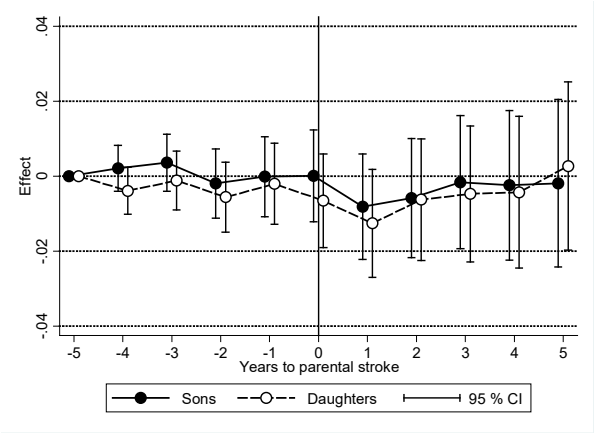
Figure A9 Individual fixed effects estimates of the effects of parental demise on log income conditional on employment depending on whether the child has post high school education (high) or not (low), lone parents.



(a) Income of sons (b) Income of daughters

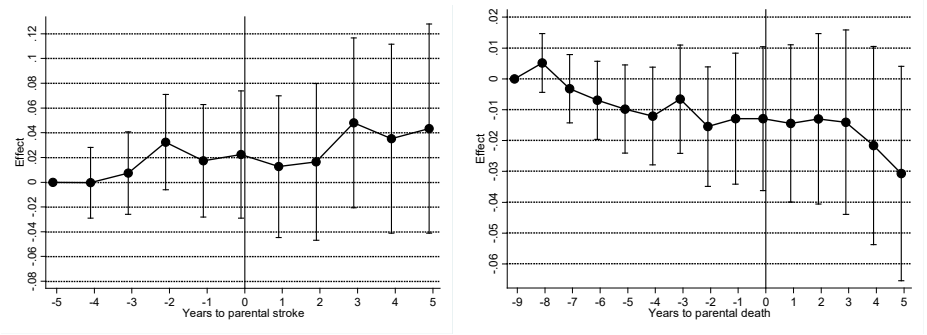
Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A10 Individual fixed effects impacts on log income conditional on earning at least 20 000 SEK annually in the years before and after parental stroke.



Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the $\delta_k{}'$s and the 95 percent confidence intervals are represented by the vertical bars.

Figure A11 Yearly effects of parental health shock in t=0 on the within-sibling change in income gap using incomes above 20 000 SEK annually.



(a) Effects of parental stroke (b) Effects of parental death

Note: The figure displays the individual fixed effects estimates where each dot represents the point estimates for the α_j's and the 95 percent confidence intervals are represented by the vertical bars.

Table A2 Yearly effects of parental stroke in t=0 on the within-sibling change in income gap (log income conditional on employment)

	(1) Yr FE	(2) Yr*Coh FE	(3) Controls
t=-4	-0.006	-0.016	-0.018*
	(0.010)	(0.011)	(0.010)
t=-3	-0.001	-0.011	-0.017
	(0.012)	(0.013)	(0.012)
t=-2	-0.013	-0.024	-0.026*
	(0.015)	(0.015)	(0.015)
t=-1	-0.014	-0.029	-0.028
	(0.017)	(0.018)	(0.017)
t=0	-0.015	-0.029	-0.027
	(0.019)	(0.020)	(0.020)
t=1	-0.003	-0.019	-0.018
	(0.022)	(0.023)	(0.022)
t=2	-0.003	-0.019	-0.016
	(0.024)	(0.025)	(0.024)
t=3	-0.006	-0.021	-0.019
	(0.026)	(0.028)	(0.027)
t=4	-0.004	-0.022	-0.020
	(0.029)	(0.031)	(0.029)
t=5	-0.013	-0.032	-0.029
	(0.031)	(0.033)	(0.032)
Constant	0.280***	0.309***	0.339***
	(0.009)	(0.040)	(0.037)
YearFE	Yes	Yes	Yes
Cohort*YearFE	No	Yes	Yes
Controls	No	No	Yes
N	29 067	29 067	28 677
Clusters	3 056	3 056	2 952

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A3 Yearly effects of parental demise in t=0 on the within-sibling change in income gap (log income conditional on employment)

	Yr FE	Yr*Coh FE	Controls
t=-8	0.002	-0.002	-0.001
	(0.004)	(0.004)	(0.003)
t=-7	0.002	-0.002	-0.002
	(0.004)	(0.004)	(0.004)
t=-6	-0.001	-0.005	-0.005
	(0.005)	(0.005)	(0.005)
t=-5	-0.004	-0.009*	-0.008
	(0.006)	(0.006)	(0.005)
t=-4	-0.006	-0.012*	-0.011*
	(0.006)	(0.006)	(0.006)
t=-3	-0.004	-0.011	-0.010
	(0.007)	(0.007)	(0.007)
t=-2	-0.005	-0.012	-0.012
	(0.008)	(0.008)	(0.008)
t=-1	-0.013	-0.019**	-0.017**
	(0.009)	(0.009)	(0.008)
t=0	-0.009	-0.015	-0.013
	(0.009)	(0.010)	(0.009)
t=1	-0.006	-0.013	-0.012
	(0.010)	(0.011)	(0.010)
t=2	-0.011	-0.018	-0.016
	(0.011)	(0.011)	(0.011)
t=3	-0.015	-0.021*	-0.020*
	(0.012)	(0.012)	(0.012)
t=4	-0.025*	-0.031**	-0.029**
	(0.013)	(0.013)	(0.012)
t=5	-0.019	-0.024*	-0.023*
	(0.014)	(0.014)	(0.013)
Constant	0.275***	0.315***	0.328***
	(0.003)	(0.014)	(0.014)
YearFE	Yes	Yes	Yes
Cohort*YearFE	No	Yes	Yes
Controls	No	No	Yes
N	304 863	304 863	301 549
Clusters	27 984	27 984	27 198

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A4 Monthly effects of parental stroke in m=0 on the within-sibling change in sick gap

	All			Lone Parent		
	YrFE	YrMoFE	Controls	YrFE	YrMoFE	Controls
m=-11	-0.055	-0.054	-0.054	-0.047	-0.048	-0.110
	(0.083)	(0.083)	(0.087)	(0.136)	(0.136)	(0.143)
m=-10	-0.080	-0.079	-0.065	0.027	0.024	-0.014
	(0.084)	(0.084)	(0.089)	(0.139)	(0.140)	(0.147)
m=-9	-0.057	-0.058	-0.044	0.168	0.163	0.126
	(0.085)	(0.086)	(0.090)	(0.140)	(0.140)	(0.147)
m=-8	-0.071	-0.072	-0.042	0.177	0.174	0.170
	(0.088)	(0.088)	(0.092)	(0.143)	(0.143)	(0.150)
m=-7	-0.104	-0.105	-0.087	0.060	0.058	0.044
	(0.090)	(0.090)	(0.095)	(0.146)	(0.146)	(0.153)
m=-6	-0.039	-0.040	-0.019	0.098	0.094	0.064
	(0.091)	(0.091)	(0.096)	(0.148)	(0.148)	(0.154)
m=-5	-0.032	-0.032	-0.022	0.131	0.126	0.060
	(0.093)	(0.093)	(0.098)	(0.151)	(0.151)	(0.159)
m=-4	0.053	0.052	0.049	0.259*	0.252	0.180
	(0.095)	(0.095)	(0.100)	(0.153)	(0.154)	(0.161)
m=-3	0.055	0.054	0.041	0.330**	0.326**	0.237
	(0.095)	(0.095)	(0.101)	(0.154)	(0.154)	(0.162)
m=-2	0.055	0.055	0.051	0.279*	0.277*	0.192
	(0.097)	(0.097)	(0.102)	(0.158)	(0.159)	(0.167)
m=-1	0.045	0.046	0.052	0.231	0.233	0.126
	(0.097)	(0.097)	(0.102)	(0.157)	(0.157)	(0.165)
m=0	0.020	0.021	0.029	0.128	0.131	0.042
	(0.099)	(0.099)	(0.104)	(0.161)	(0.161)	(0.169)
m=1	-0.110	-0.109	-0.112	-0.088	-0.086	-0.156
	(0.100)	(0.100)	(0.106)	(0.164)	(0.164)	(0.172)
m=2	-0.073	-0.070	-0.064	-0.005	-0.003	-0.050
	(0.102)	(0.102)	(0.108)	(0.167)	(0.167)	(0.175)
m=3	-0.012	-0.010	-0.007	0.031	0.035	-0.021
	(0.103)	(0.103)	(0.109)	(0.169)	(0.170)	(0.178)
m=4	-0.027	-0.023	-0.038	0.045	0.052	-0.015
	(0.105)	(0.105)	(0.111)	(0.172)	(0.173)	(0.182)
m=5	-0.001	0.003	-0.041	0.062	0.069	-0.041
	(0.107)	(0.107)	(0.114)	(0.174)	(0.175)	(0.185)
m=6	-0.028	-0.025	-0.069	-0.026	-0.023	-0.111
	(0.107)	(0.108)	(0.114)	(0.178)	(0.179)	(0.189)
m=7	-0.016	-0.014	-0.060	-0.020	-0.019	-0.115
	(0.109)	(0.109)	(0.116)	(0.183)	(0.183)	(0.194)
m=8	-0.032	-0.031	-0.073	-0.031	-0.031	-0.102
	(0.109)	(0.110)	(0.116)	(0.182)	(0.182)	(0.192)
m=9	-0.035	-0.033	-0.074	0.032	0.036	-0.028
	(0.110)	(0.110)	(0.117)	(0.181)	(0.181)	(0.191)

	All			Lone Parent		
	YrFE	YrMoFE	Controls	YrFE	YrMoFE	Controls
m=10	0.024	0.026	-0.018	0.120	0.122	0.054
	(0.111)	(0.111)	(0.118)	(0.180)	(0.180)	(0.190)
m=11	0.009	0.011	-0.029	0.149	0.152	0.082
	(0.112)	(0.112)	(0.119)	(0.183)	(0.183)	(0.194)
m=12	0.119	0.118	0.091	0.216	0.215	0.137
	(0.114)	(0.115)	(0.123)	(0.184)	(0.185)	(0.197)
Constant	-0.045***	-0.035**	-0.046***	-0.078***	-0.059***	-0.068***
	(0.016)	(0.015)	(0.016)	(0.024)	(0.022)	(0.025)
YearFE	Yes	No	No	Yes	No	No
YearMonthFE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
N	2 385 720	2 385 720	2 168 928	989 556	989 556	901 080
Clusters	10 753	10 753	9 782	4 418	4 418	4 025

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A5 Yearly effects of parental demise in t=0 on the within-sibling change in sick gap

	Yr FE	Yr*Coh FE	Controls
t=-8	0.024	0.134	0.224
	(0.415)	(0.416)	(0.442)
t=-7	-0.410	-0.204	-0.186
	(0.507)	(0.510)	(0.541)
t=-6	-0.055	0.221	0.364
	(0.583)	(0.588)	(0.623)
t=-5	0.306	0.656	0.892
	(0.638)	(0.646)	(0.685)
t=-4	0.213	0.585	0.456
	(0.701)	(0.712)	(0.757)
t=-3	1.096	1.453*	1.254
	(0.762)	(0.776)	(0.826)
t=-2	0.757	1.059	0.895
	(0.826)	(0.842)	(0.897)
t=-1	0.264	0.508	0.336
	(0.887)	(0.904)	(0.964)
t=0	0.908	1.012	0.692
	(0.923)	(0.943)	(1.004)
t=1	1.362	1.342	0.890
	(1.002)	(1.022)	(1.090)
t=2	1.748*	1.577	1.087
	(1.046)	(1.066)	(1.138)
t=3	1.714	1.419	1.001
	(1.079)	(1.100)	(1.173)
t=4	1.920*	1.499	1.226
	(1.108)	(1.130)	(1.205)
t=5	1.727	1.234	0.966
	(1.127)	(1.150)	(1.223)
Constant	-0.396***	-0.748	-0.248
	(0.112)	(0.524)	(0.489)
YearFE	Yes	Yes	Yes
Cohort*YearFE	No	Yes	Yes
Controls	No	No	Yes
N	745 376	745 376	671 644
Clusters	39 651	39 651	35 689

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A6 Individual fixed effects estimates of the effects of parental stroke on log income conditional on employment and on employment, lone parents

	Log Income		Employment	
	Sons	Daughters	Sons	Daughters
t=-4	0.000	-0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.003)
t=-3	0.000	0.002	0.004	-0.002
	(0.002)	(0.002)	(0.003)	(0.004)
t=-2	-0.002	0.001	0.003	-0.002
	(0.002)	(0.002)	(0.003)	(0.004)
t=-1	-0.001	0.004	0.001	-0.002
	(0.003)	(0.003)	(0.004)	(0.005)
t=0	-0.002	0.004	0.000	-0.006
	(0.003)	(0.003)	(0.005)	(0.006)
t=1	-0.003	0.004	-0.003	-0.008
	(0.004)	(0.004)	(0.005)	(0.007)
t=2	-0.003	0.005	-0.002	-0.006
	(0.004)	(0.004)	(0.006)	(0.008)
t=3	-0.002	0.009*	-0.004	-0.006
	(0.005)	(0.005)	(0.007)	(0.009)
t=4	0.000	0.010*	-0.008	-0.005
	(0.006)	(0.006)	(0.008)	(0.010)
t=5	-0.001	0.011*	-0.007	-0.000
	(0.006)	(0.006)	(0.008)	(0.011)
Constant	8.038***	7.760***	0.883***	0.618***
	(0.008)	(0.003)	(0.008)	(0.008)
Cohort*YearFE	Yes	Yes	Yes	Yes
N	247 844	190 977	342 080	323 670
Clusters	19 636	17 349	22 190	20 865

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A7 Individual fixed effects estimates of the effects of parental stroke on number of sick days per month, lone parents

	All		Widow	
	Men	Women	Men	Women
m=-11	0.005	-0.025	0.025	-0.028
	(0.023)	(0.030)	(0.037)	(0.048)
m=-10	0.012	-0.024	0.022	-0.049
	(0.024)	(0.031)	(0.038)	(0.049)
m=-9	0.030	-0.023	0.025	-0.048
	(0.025)	(0.032)	(0.039)	(0.050)
m=-8	0.026	-0.018	0.037	-0.016
	(0.025)	(0.033)	(0.040)	(0.052)
m=-7	0.034	-0.022	0.029	0.001
	(0.026)	(0.034)	(0.041)	(0.053)
m=-6	0.031	-0.023	0.016	-0.007
	(0.027)	(0.035)	(0.042)	(0.054)
m=-5	0.035	-0.016	0.020	-0.022
	(0.027)	(0.035)	(0.043)	(0.055)
m=-4	0.035	-0.036	0.024	-0.076
	(0.028)	(0.036)	(0.044)	(0.055)
m=-3	0.023	-0.026	0.015	-0.079
	(0.028)	(0.036)	(0.044)	(0.056)
m=-2	0.022	-0.010	0.015	-0.041
	(0.028)	(0.037)	(0.045)	(0.057)
m=-1	0.021	-0.032	0.006	-0.078
	(0.029)	(0.037)	(0.046)	(0.058)
m=0	0.023	0.020	0.012	-0.010
	(0.029)	(0.038)	(0.047)	(0.060)
m=1	0.025	0.090**	0.024	0.088
	(0.030)	(0.039)	(0.047)	(0.061)
m=2	0.043	0.075*	0.051	0.069
	(0.030)	(0.040)	(0.048)	(0.062)
m=3	0.033	0.070*	0.037	0.071
	(0.031)	(0.040)	(0.049)	(0.063)
m=4	0.026	0.069*	0.041	0.069
	(0.031)	(0.041)	(0.049)	(0.064)
m=5	0.029	0.048	0.039	0.038
	(0.031)	(0.041)	(0.050)	(0.064)
m=6	0.024	0.066	0.044	0.071
	(0.032)	(0.042)	(0.051)	(0.065)
m=7	0.031	0.048	0.085	0.028
	(0.032)	(0.042)	(0.052)	(0.066)
m=8	0.032	0.048	0.070	0.001
	(0.033)	(0.043)	(0.052)	(0.067)
m=9	0.031	0.045	0.047	0.004
	(0.033)	(0.044)	(0.052)	(0.068)

	All		Widow	
	Men	Women	Men	Women
m=10	0.043	0.033	0.069	-0.048
	(0.034)	(0.044)	(0.054)	(0.068)
m=11	0.049	0.064	0.083	-0.004
	(0.034)	(0.045)	(0.054)	(0.069)
m=12	0.075**	-0.021	0.100*	-0.147**
	(0.033)	(0.044)	(0.053)	(0.067)
Constant	0.009	0.048**	0.018	0.059**
	(0.016)	(0.021)	(0.022)	(0.027)
N	11 638 728	11 058 420	5 217 252	4 924 320
Clusters	50 813	48 303	22 656	21 364

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A8 Individual fixed effects estimates of the effects of parental stroke sick days at annual level, lone parents

	Annual total, Men	Annual total, women
Year-4	0.184	0.629
	(0.348)	(0.448)
Year-3	0.885*	1.211**
	(0.470)	(0.612)
Year-2	1.212**	0.800
	(0.559)	(0.737)
Year-1	0.937	-0.003
	(0.651)	(0.850)
Year0	1.309*	0.898
	(0.746)	(0.967)
Year1	2.245***	-0.478
	(0.834)	(1.075)
Year2	1.921**	-1.159
	(0.919)	(1.185)
Year3	2.134**	-1.132
	(1.003)	(1.290)
Year4	2.320**	-0.748
	(1.089)	(1.398)
Constant	0.438	-2.116*
	(0.771)	(1.256)
N	332 955	313 308
Clusters	22 656	21 364

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A9 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on employment and on employment, lone parents

	Income		Employment	
	Sons	Daughters	Sons	Daughers
t=-8	-0.001	-0.001*	-0.001	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)
t=-7	-0.001*	-0.001**	-0.001*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-6	-0.001*	-0.001	-0.002**	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-5	-0.002**	-0.002*	-0.002**	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)
t=-4	-0.003***	-0.002*	-0.003**	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)
t=-3	-0.003**	-0.002	-0.004**	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)
t=-2	-0.004***	-0.003*	-0.003*	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)
t=-1	-0.005***	-0.004**	-0.004*	-0.004*
	(0.001)	(0.001)	(0.002)	(0.003)
t=0	-0.008***	-0.009***	-0.006***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.003)
t=1	-0.010***	-0.007***	-0.009***	-0.008**
	(0.002)	(0.002)	(0.002)	(0.003)
t=2	-0.008***	-0.006***	-0.010***	-0.008**
	(0.002)	(0.002)	(0.003)	(0.003)
t=3	-0.008***	-0.004*	-0.009***	-0.007*
	(0.002)	(0.002)	(0.003)	(0.004)
t=4	-0.007***	-0.003	-0.008***	-0.006
	(0.002)	(0.002)	(0.003)	(0.004)
t=5	-0.007***	-0.002	-0.008**	-0.004
	(0.003)	(0.003)	(0.003)	(0.004)
Constant	8.023***	7.724***	0.868***	0.591***
	(0.002)	(0.002)	(0.002)	(0.003)
Cohort*YearFE	Yes	Yes	Yes	Yes
N	3 195 130	2 535 584	4 447 489	4 265 636
Clusters	218 139	196 136	244 841	232 512

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A10 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on employment and on employment, separated according to type of parental death

	Not sudden death		Sudden death	
	Sons	Daughters	Sons	Daughers
t=-8	-0.000	-0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-7	-0.001	-0.001**	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-6	-0.001	-0.001	-0.002	-0.000
	(0.001)	(0.001)	(0.002)	(0.002)
t=-5	-0.002*	-0.002*	-0.003	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)
t=-4	-0.003***	-0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)
t=-3	-0.003**	-0.002	-0.003	-0.002
	(0.001)	(0.001)	(0.003)	(0.003)
t=-2	-0.004***	-0.003*	-0.003	-0.003
	(0.001)	(0.001)	(0.003)	(0.003)
t=-1	-0.005***	-0.003**	-0.004	-0.005
	(0.002)	(0.002)	(0.003)	(0.003)
t=0	-0.008***	-0.009***	-0.007*	-0.007*
	(0.002)	(0.002)	(0.004)	(0.004)
t=1	-0.010***	-0.007***	-0.010**	-0.006
	(0.002)	(0.002)	(0.004)	(0.004)
t=2	-0.008***	-0.006***	-0.009**	-0.005
	(0.002)	(0.002)	(0.004)	(0.005)
t=3	-0.008***	-0.004*	-0.008*	-0.001
	(0.002)	(0.002)	(0.005)	(0.005)
t=4	-0.007***	-0.004	-0.008	-0.003
	(0.003)	(0.003)	(0.005)	(0.005)
t=5	-0.007**	-0.002	-0.008	-0.001
	(0.003)	(0.003)	(0.006)	(0.006)
Constant	8.023***	7.725***	8.020***	7.719***
	(0.003)	(0.002)	(0.005)	(0.005)
Cohort*YearFE	Yes	Yes	Yes	Yes
N	2 585 380	2 049 674	609 750	485 910
Clusters	176 611	158 750	41 528	37 386

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A11 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on sick leave

	All		Sudden death	
	Sons	Daughters	Sons	Daughters
t=-8	0.059	0.226*	-0.087	0.194
	(0.104)	(0.136)	(0.234)	(0.308)
t=-7	0.314**	0.276	0.242	-0.037
	(0.136)	(0.180)	(0.309)	(0.408)
t=-6	0.550***	0.110	0.714*	-0.522
	(0.162)	(0.214)	(0.367)	(0.482)
t=-5	0.649***	0.078	1.066**	-0.246
	(0.184)	(0.245)	(0.418)	(0.552)
t=-4	0.896***	0.318	1.153**	0.396
	(0.206)	(0.275)	(0.462)	(0.625)
t=-3	0.911***	0.309	1.156**	0.553
	(0.227)	(0.305)	(0.507)	(0.693)
t=-2	1.008***	0.312	1.252**	0.297
	(0.248)	(0.334)	(0.554)	(0.761)
t=-1	1.185***	0.587	1.440**	0.356
	(0.269)	(0.364)	(0.601)	(0.825)
t=0	1.495***	1.381***	1.815***	0.542
	(0.290)	(0.391)	(0.649)	(0.884)
t=1	1.899***	1.026**	2.188***	0.058
	(0.310)	(0.415)	(0.695)	(0.937)
t=2	1.943***	0.596	1.975***	-0.090
	(0.327)	(0.436)	(0.730)	(0.984)
t=3	1.727***	0.355	1.695**	-0.794
	(0.343)	(0.456)	(0.764)	(1.026)
t=4	1.758***	0.303	1.828**	-0.372
	(0.360)	(0.476)	(0.802)	(1.076)
t=5	1.679***	0.063	1.810**	-0.877
	(0.377)	(0.496)	(0.841)	(1.122)
Constant	1.114***	2.775***	0.785	3.962***
	(0.295)	(0.414)	(0.599)	(1.215)
N	4 709 334	4 485 667	899 787	859 002
Clusters	250 738	238 841	47 795	45 625

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A12 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on employment and on employment, lone parents, different sibling constellations

	Sons			Daughters		
	Opp. sex	Same sex	Singleton	Opp. sex	Same sex	Singleton
t=-8	-0.001	-0.001	0.000	-0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
t=-7	-0.002	-0.001	0.000	-0.003**	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
t=-6	-0.002	-0.001	0.002	-0.002	-0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
t=-5	-0.003	-0.002	0.000	-0.003	-0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
t=-4	-0.005**	-0.002	0.001	-0.003	-0.001	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
t=-3	-0.004	-0.004	0.003	-0.003	0.000	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
t=-2	-0.003	-0.006**	0.002	-0.005	-0.000	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
t=-1	-0.005	-0.008**	-0.001	-0.005	-0.001	-0.005
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
t=0	-0.009**	-0.012***	-0.003	-0.010***	-0.007*	-0.013***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
t=1	-0.010**	-0.012***	-0.004	-0.008**	-0.004	-0.010**
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
t=2	-0.009**	-0.012***	-0.003	-0.006	-0.004	-0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
t=3	-0.009*	-0.011**	-0.001	-0.004	-0.001	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
t=4	-0.011*	-0.011**	0.002	-0.003	-0.001	-0.006
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)
t=5	-0.010*	-0.012**	0.003	-0.001	0.001	-0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Constant	7.996***	7.994***	7.994***	7.690***	7.692***	7.707***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Cohort*YearFE	Yes	Yes	Yes	Yes	Yes	Yes
N	619 707	600 353	479 649	516 213	460 508	370 535
Clusters	41 883	40 350	33 275	39 423	34 997	29 060

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A13 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on employment and on employment, lone parents, split according to age at parental demise

	Sons		Daughters	
	<55	≥55	<55	≥55
t=-8	-0.001	-0.001	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-7	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
t=-6	-0.001	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.002)	(0.001)
t=-5	-0.003	-0.001	-0.002	0.000
	(0.002)	(0.001)	(0.002)	(0.001)
t=-4	-0.003	-0.002	-0.002	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)
t=-3	-0.003	-0.003*	-0.002	-0.000
	(0.002)	(0.002)	(0.003)	(0.002)
t=-2	-0.003	-0.004*	-0.004	-0.000
	(0.003)	(0.002)	(0.003)	(0.002)
t=-1	-0.004	-0.005**	-0.005	-0.001
	(0.003)	(0.002)	(0.004)	(0.002)
t=0	-0.008**	-0.006***	-0.012***	-0.005**
	(0.003)	(0.002)	(0.004)	(0.002)
t=1	-0.010***	-0.009***	-0.010**	-0.003
	(0.004)	(0.003)	(0.005)	(0.003)
t=2	-0.008*	-0.009***	-0.009*	-0.003
	(0.004)	(0.003)	(0.005)	(0.003)
t=3	-0.007	-0.008**	-0.008	0.001
	(0.005)	(0.003)	(0.006)	(0.003)
t=4	-0.007	-0.007**	-0.008	0.002
	(0.005)	(0.004)	(0.006)	(0.003)
t=5	-0.006	-0.008*	-0.006	0.005
	(0.005)	(0.004)	(0.007)	(0.004)
Constant	7.915***	8.010***	7.637***	7.712***
	(0.002)	(0.001)	(0.003)	(0.001)
Cohort*YearFE	Yes	Yes	Yes	Yes
N	1 249 390	1 945 740	976 998	1 558 586
Clusters	87 029	131 110	79 730	116 406

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.

Table A14 Individual fixed effects estimates of the effects of having a lone parent in the final years of life on log income conditional on earning at least 20 000 SEK annually, lone parents

	Parental demise		Parental stroke	
	Sons	Daughters	Sons	Daughters
t=-8	-0.000	-0.000		
	(0.001)	(0.001)		
t=-7	-0.002	-0.002		
	(0.001)	(0.001)		
t=-6	-0.004***	-0.002		
	(0.001)	(0.001)		
t=-5	-0.004***	-0.001		
	(0.002)	(0.002)		
t=-4	-0.005***	-0.003*	0.002	-0.004
	(0.002)	(0.002)	(0.003)	(0.003)
t=-3	-0.005***	-0.005**	0.004	-0.001
	(0.002)	(0.002)	(0.004)	(0.004)
t=-2	-0.006**	-0.004	-0.002	-0.006
	(0.002)	(0.002)	(0.005)	(0.005)
t=-1	-0.007**	-0.006**	-0.000	-0.002
	(0.003)	(0.003)	(0.005)	(0.006)
t=0	-0.012***	-0.014***	0.000	-0.007
	(0.003)	(0.003)	(0.006)	(0.006)
t=1	-0.017***	-0.014***	-0.008	-0.013*
	(0.003)	(0.003)	(0.007)	(0.007)
t=2	-0.014***	-0.014***	-0.006	-0.006
	(0.003)	(0.004)	(0.008)	(0.008)
t=3	-0.013***	-0.010**	-0.002	-0.005
	(0.004)	(0.004)	(0.009)	(0.009)
t=4	-0.010**	-0.008*	-0.002	-0.004
	(0.004)	(0.004)	(0.010)	(0.010)
t=5	-0.009**	-0.005	-0.002	0.003
	(0.004)	(0.005)	(0.011)	(0.011)
Constant	8.008***	7.545***	8.028***	7.666***
	(0.004)	(0.005)	(0.043)	(0.054)
Cohort*YearFE	Yes	Yes	Yes	Yes
N	3 630 603	3 532 779	281 708	271 279
Clusters	229 848	220 594	20 836	19 754

Note: Standard errors are clustered at parental level. * significant at 10 %, ** at 5 %, *** at 1 %.