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The economics of grief

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The economics of grief[a]

by

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Abstract

We study the short-run and long-run economic impact of one of the largest losses that an individual can face; the death of a child. We utilize unique merged registers on the entire Swedish population, combining information on the date and cause of death with parents' labor market outcomes, health outcomes, marital status, and subsequent fertility. We exploit the longitudinal dimension of the data and deal with a range of selection issues. We distinguish between effects on labor and various non-labor income components and we consider patterns over time. We find that labor market effects are persistent.

Keywords: Bereavement, labor supply, child mortality, depression, sickness absenteeism, employment, marriage, death, divorce, mental health, fertility.
JEL-codes: I12, I11, J14, J12, C41.

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1 Introduction

Losing a child has been classified as one of the most extreme stressors a human can face (APA, 1987). Parents losing a child often experience numerous forms of psychological stress, such as depression, despair, anxiety, guilt, anger, hostility, and hopelessness, and may react with more adverse health behaviors (e.g. Videka-Sherman, 1982; Vance et al., 1994; Rubin and Malkinson, 2001). Some evidence also suggests an increased risk of divorce following the loss of a child (Lehman et al., 1987; Najman et al., 1993). Besides these important adverse outcomes, it is also likely that bereaved parents will face important economic consequences, through reduced labor market participation and productivity. This may put an additional burden on the exposed individuals, over and above the other adverse outcomes.

In this paper, we analyze the economic impact of losing a child. In particular, we focus on the short-term and long-run impacts on the parents' labor income. To understand the results we also consider effects on marital stability, general health, mental health, and fertility. To the best of our knowledge, no previous study has tried to quantify this set of consequences of child bereavement. We are also unaware of any previous study that analyzes the impact of child loss on economic outcomes in a developed country.

The analyses are relevant for several reasons. First, they give a comprehensive picture of the social and economic impact of child loss. This is not only important for developing countries. Although child deaths are rare events in Western countries, they are by no means negligible in numbers. Our findings may be used by policy-makers in order to improve the design of policies to help bereaved parents and to reduce the economic costs of bereavement. Second, the results provide inputs for the assessment of the cost-benefit ratios of measures aimed at preventing accidents and deaths, especially among children. Such estimates usually do not incorporate effects on family members of the deceased person. Third, and more generally, by focusing on a range of economic and social outcomes, the results provide insights into the size and range of human reactions to bereavement. In this sense our study complements the empirical literature on effects of bereavement of the spouse (see citations in Section 2), the co-twin in a twin pair (see e.g. van den Berg

and Drepper, 2012), a parent (e.g. Sanders, 1979) and bereavement of a sibling during adulthood (Rostila et al., 2012), although this empirical literature is confined to health effects only.

Fourth, and most generally, our paper provides a study of the transformation of grief into economic outcomes. As sketched in the first paragraph, the grief that occurs upon the loss of a dear one can be captured by health indicators, and this in turn may affect individual labor market outcomes. One may argue that the economic manifestation of grief is of second-order importance, coming after emotional distress. However, effects on labor market outcomes may be persistent. For example, the individual may experience a temporary loss of productivity, resulting in a lower occupational level which in turn leads to a loss of human capital that makes the reduction in productivity permanent. As a result, labor market outcomes may be affected long after the emotional distress of grief has subsided. Grief due to child loss is more informative on these issues than grief due to events that in themselves incur economic costs, such as the birth of a severely disabled child.

In this paper we use longitudinal register data on individual labor market outcomes, hospitalizations, mortality, and family structure for the entire population of Sweden. These data provide several advantages. Since child deaths are relatively rare events, large samples are needed to detect effects. Moreover, since we are able to follow people for a long time after the event, we may study the long-term impact of child loss. The observation of individual health and demographic outcomes and income components allows us to consider pathways through which child loss affects economic outcomes as well as how economic outcomes affect other outcomes in turn.

Child loss may not be exogenous and may be anticipated at the individual level. Exogeneity may be violated by reverse causality and/or by unobserved confounders affecting both child loss and parents' outcomes. We deal with this by exploiting the longitudinal dimension of the data and by focusing on child death causes that can be considered to be less anticipated than most, such as those resulting from unintentional accidents. In the next section we show that endogeneity issues have been neglected in most of the previous literature.

The size of the data enables estimation of heterogeneous effects with some precision. This allows us to answer questions such as: does the effect of child loss depend on the age of the child? Does the gender or the birth order of the child and the parent matter? And does the impact differ according to the number of children in the family?

We should point out from the outset that our study does not address effects of infant mortality (i.e., death in the first year of life). This restriction is for two reasons. First, most mothers are on parental leave during the first year, so that very few of them have labor income. This prohibits an informative analysis of the effects on labor income. Second, there are very few unintentional accidents involving a child aged zero.

The paper proceeds as follows. In Section 2, we review the relevant literature on the topic and we provide a background to our study. Section 3 presents the data used in our analysis and how our samples is constructed, and Section 4 provides descriptive statistics. In Subsection 4.2 we provide graphical evidence on the effects of child loss, and Section 5 presents our empirical strategy. Section 6 presents our main results. We find strong and significant average causal effects of child loss on almost every outcome studied. Here we also consider effects on fertility, i.e. on the likelihood that the parents replace the dead child with a new child. Subsection 6.2 presents heterogenous effects estimates by gender, age, birth order of the child, family size etc. In Section 7 we shed some light on the mechanisms behind the income effects. We explore whether the reduction in labor income coincides with a reduction in employment. Related to this, we discuss whether the reduction in labor supply is simply a choice for more leisure as the income needed to support children decreases. In additional analyses, we compare outcomes if the deceased child lived in the same household as the parents to outcomes if the child lived outside that household. We also explore whether labor market outcomes are connected to changes in marital status and (mental) health, and we consider pathways of individual events over time. Section 8 presents robustness results, and Section 9 concludes.

2 Background

2.1 Health effects

Most of the literature on bereavement effects concerns the loss of a spouse (see e.g. Parkes et al. 1969; Bowling, 1987; Kaprio et al., 1987; Bowling, 1994; Lichtenstein, Gatz and Berg, 1998; Chen et al., 1999; Nystedt, 2002; Ott and Lueger, 2002; van den Berg et al., 2011; Elwert and Christakis, 2007). A common finding is that health is reduced following bereavement and that the effect is more severe for males than for females. The effects of child loss have received much less attention in the literature. This may reflect data limitations, since child death is a relatively rare event requiring large samples to gain sufficient power in the statistical analyses. Existing studies on the topic exemplify this problem. Lehman et al. (1987) interviewed 41 parents who had lost a child and matched these with 41 parents who did not lose a child. Martinson, Davies and McClowry (1991) follow 40 mothers and 26 fathers after child death to study the extent to which the prevalence of depression depends on time since bereavement due to cancer.

The relatively sparse literature on the effect of child loss mainly focuses on health outcomes. Indeed, the loss of a child has been exploited to study the impact of high levels of stress. Several studies report that bereavement has physiological as well as emotional effects. Bereavement has been found to temporarily impair the immune response system, which could result in various diseases (Bartrop 1977; Schleiffer 1983). These findings have been used to explain a positive association between child loss and health outcomes such as cancer survival and myocardial infarction (Andersen et al. 1994; Kvikstad et al. 1995). The evidence also suggests an association between child loss and depression, and hospitalizations for mental outcomes (Li et al. 2005). A recent paper by Espinosa and Evans (2012) find a heightened mortality of mothers after the death of a child.

A common finding in the literature on the health effects is that mothers' reactions to child loss are stronger and longer lasting than the reactions of fathers (Wilson et al. 1982; Vance et al. 1995; Li et al., 2005). In discussing possible reasons for this pattern, Dyrborov (1990) mentions differences in attachment to the lost child, different methods of coping, lesser acknowledgement of feelings on the part of men, and a differing social

situation following the loss, where men commonly return faster to work. It could therefore also be expected that the labor market consequences of child loss are smaller for men.

A number of other factors have also been reported to mediate the effect on child loss on health outcomes. A larger family size, for instance, has been found to dampen the impact of child loss on health outcomes. Li et al. (2005) found that parents who lost their only child had the greatest risk of psychiatric admissions.

2.2 Possible effects on labor supply and marital status

The above-mentioned health effects may lead to a persistent reduction in a parent's productivity and labor supply. However, labor supply may also react for different reasons. Consider a standard economic labor supply decision model where the parents' utility depends on leisure and the number of children. An additional child has two effects on the parents' leisure. First, an additional child means more household expenses, which provides an incentive to work more hours. Secondly, an additional child means more utility from being home to spend time with the children. If child death entails that the number of children is rationed at a suboptimally low level, then, for reasons of symmetry, each of these effects is reversed. The first effect means that the parents need less money to take care of the children, and consequently they reduce the number of hours worked. Concerning the second effect, if the marginal utility of leisure decreases after losing a child, parents respond by increasing labor supply. In any case, the two effects go in opposite directions.

A number of empirical studies provide instrumental variable estimates of the causal effect of fertility on female labor supply, effectively determining which of the two above-mentioned effects dominates (see Waddoups, 1997, Cristia, 2008, Agüero and Marks, 2008, Angrist and Evans, 1998, and the literature survey in Nguyen, 2009). The evidence shows that women tend to work less if they voluntarily get an additional child, which means that the dominating effect is that the utility of being at home increases. Thus, observing that mothers work less after losing a child is difficult to reconcile with a conventional labor supply response.

In this paper we use an additional approach to rule out that a reduction in labor supply

is primarily a response to a decrease in household costs. Specifically, we examine if the parents' responses to child loss depend on whether the child lives in the household or not. In the latter case, the child loss does not involve a reduction in household costs. Some costs may remain, such as in vivo transfers and savings for bequests, but most likely the sum of these is smaller than the total costs if the child lives in the same household (college fees are negligible). If leisure nevertheless increases then we may conclude that this is not an economic response to a reduction of household costs. Notice that this presupposes that whether the child lived at home or not is exogenous. We deal with this by conditioning on a large set of personal characteristics including age and level of education.

Besides labor supply, unexpected changes in the number of children may affect marital stability. Having a child constitutes a long-term, couple-specific, investment in a relationship, which means that the arrival of a child increases the expected gains from marriage (Becker, 1977). A number of studies provide empirical support for this and show that an additional child increases marital stability (Huffman and Duncan, 1995; Weiss and Willis, 1997). When a child is lost, on the other hand, one may argue that some of the gains of marriage are reduced, which may increase the probability of divorce. In line with this, some studies report an increase in marital dissolutions following a child loss (Lehman et al., 1987; Najman et al., 1993).

2.3 Methodological considerations

The previous (mostly non-economic) literature has not paid much attention to methodological pitfalls in the evaluation of child loss. Dijkstra and Stroebe (1998) argue that, as a result, conclusions in this literature should remain tentative until more methodologically-sound evidence is available. Arguably the three main problems are (i) selection on unobservables, (ii) anticipation of the child death, and (iii) reverse causality. Concerning (i), it is clear that households in which a child dies may have systematically different characteristics than those in which no child dies. Environmental and genetic confounders and household-specific cognitive ability and personality traits may influence both the probability of child loss as well as the parents' labor market and social outcomes and their health. This leads to an association between child loss and parental outcomes. Ignoring

this causes the estimated effects of interest to be biased. Concerning (ii), notice that deaths due to certain causes, like cancer, are often predictable some months or years in advance. Parents may therefore modify their behavior before the actual death of the child, because of the care for the child and/or because of anticipatory grief. A simple before/after death comparison of outcomes such as earnings would then typically underestimate the effect of child death, although it is also possible that a planned divorce is postponed, so that the effect on divorce is over-estimated. An example of reverse causality (iii) occurs when a child of a parent with increasing psychiatric problems faces a greater risk of dying because of the parent's problem. It has been found that infants of schizophrenic mothers, for example, face twice the risk of death by sudden infant death syndrome (Bennedsen et al. 2001). Similarly, low expectations about labor market prospects or upcoming job loss may cause depression and an increased risk of child death.

In our study we deal with these potential problems in various ways. First, we exploit the fact that we follow all parents (with or without child losses) over a large number of years. These observations allow us to apply fixed-effects panel data methods as well as combinations of panel data methods and propensity score matching methods, like conditional difference-in-differences (Heckman et al., 1998). This way, we control for observed covariates and unobserved time-invariant systematic determinants of child loss and the outcomes of interest. Moreover, if we observe in the data that parents' outcomes deviate from their trend in the year(s) before the child death then this indicates anticipation and/or reverse causality.

To further deal with the methodological issues, we focus on death causes that are unexpected from the parents' point of view and hence are unanticipated. Specifically, we focus on deaths due to non-intentional accidents (see the next section for the operationalization). This prevents us from having to choose how many years before death the parents start to change their behavior in anticipation of the death. At the extreme, certain genetic defects and cancers may already be prevalent within the first year of life of the child, so that anticipation of the corresponding death causes may commence more or less concurrently with the birth of the child.

Notice that the likelihood of exposure to non-intentional accidents (like traffic acci-

dents) may be related to certain household characteristics, like residential location. Some of the latter may be difficult to measure, but many of those will be constant over time, in which case fixed-effects estimation methods control for this. With pre-death matching on covariates (notably, on characteristics of the parents, the child and the household), we effectively estimate average treatment effects on the treated (ATT). This requires a common support for the background characteristics among treated and controls.

As noted above, we aim to shed some light on the pathway from child death to the various outcomes of the parents. Notably, we may expect an immediate effect on mental health followed by a reduction of labor supply and/or wages. We then expect the latter reductions to be larger for those who experienced mental health problems right after the child loss. Empirical analyses along this route place high demands on the extent to which observed sequences of events occur in temporal concurrence with the underlying causal pathway. With divorce and job loss, the underlying decisions may have occurred a substantial amount of time before the observed event. We feel that the estimation of a dynamic multidimensional panel data model might lead to unreliable estimates of the causal pathways. This is why we restrict attention to simpler descriptions of common patterns in the data over time.

3 Data and sample selection

3.1 Registers and death causes

The data set used in the analysis is compiled from several different databases. The first database, the *population register* (called Louise) provides yearly information on the entire Swedish population in age 16-64. It contains a rich set of socio-economic and background variables (e.g. age, sex, income, immigration status, marital status, employment status and social insurance benefits). In our analyses, we use data between 1990-2007. The second register, the *National Causes of Death register* records deaths of individuals who have a permanent residence in Sweden. It includes information on date of death, place of death, and the underlying cause of death (through the International Classification of Diseases, ICD), up to the 6th contributing cause of death for the whole period 1987-2005.

It also reports whether an injury was caused by an accident or by deliberate force. The information is provided by either the medical doctor or through a clinical or forensic autopsy, where the autopsy share was around 14 percent. The cause of death is registered for 99.5 percent of all deaths. The third register, the *multi-generational register* links individuals to their biological mother and father.[1] The multi-generational register also contains information on year and month of birth. Additional registers and data are used to measure parents' outcomes (see the next subsection).

We use the three above-mentioned registers to construct the data for our main analyses. Since we want to have information on parental outcomes a number of years before the potential death of a child, and since we want to be able to follow the parents for a number of years after the potential child loss, we study child losses that occur in the years 1993-2003. For each year in this period we select all male and females from the population register who according to the multi-generational register have at least one child aged 1-24. We restrict our analysis to parents aged 20-55. This is because most of the parents below 20 have not yet entered the labor market and some of the parents above 55 retire early from the labor market, prohibiting an analysis of long-term labor market outcomes.

To the parental data set we merge selected covariates from the population register. Most of these are measured in November each year. In our analyses, we include the values of these variables for the year before the potential death year, since many of the variables may be affected by child loss. We have also merged detailed family information. This information is constructed using the multi-generational register and includes e.g. the number of kids, order of the child and the genders of all children with the same biological mother and father.

We use ICD codes in the National Causes of Death register in order to be able to restrict attention to non-intentional accidents as death causes. This means, first of all, that the death must be due to an external cause (ICD 9: 800-999, ICD-10: S00-T98,V01-Y98). Within these categories, we use the supplementary information to distinguish between deaths that are due to non-intentional accidents from deaths due to suicide and homi-

[1] For individuals born between 1979 and 2003 the biological mother is identified in 96 percent of all cases. The number for fathers is somewhat lower (94 percent).

cide. Among child deaths due to external causes, non-intentional accidents make up 68%, whereas suicide and homicide make up 31%. Among child deaths due to non-intentional accidents, the four most common types of non-intentional accidents are: motor vehicle traffic accidents (53%), accidents caused by submersion, suffocation, or foreign bodies (15%), "other accidents" (electric current, steam, falling object etc., 6%), and surgical and medical procedures as the cause of abnormal reaction of patient or later complication (5%).[2]

We exclude all parents who have a recorded injury in the same month as the death of the child, since we wish to measure the effect of child loss and not the effect of the health shock that parents experience who are injured at the same time as their child. To this aim we use information from the Swedish National Hospital Patient Register, which includes provides information on all hospital discharges at Swedish hospitals.[3]

If we regard those who experience child loss as "the treated", then, broadly speaking, the controls are the parents who do not experience this event. More specifically, we only take "controls" who never experience child loss in the observation window. We aim to estimate average treatment effects on the treated. For each "treated" parent, we choose ten "control" parents using nearest neighbor propensity score matching on covariates measured one year before the child loss or potential child loss. We match on gender and age of the child, and parents level of education (7 categories), type of education (8 categories), age and age squared, number of children, sector on a two digit level, region of residence (22 regions) and calender year. This produces the "matched" sample for the econometric inference.

3.2 Outcome variables

Our main economic outcome is annual labor income. This measure captures all cash compensation paid by employers. It is taken from the population register and is based on

[2]In the US, child and adolescent deaths from non-intentional accidents, suicides, and homicides have increased over the past 2 decades and now account for 80% of all deaths among youth and young adults (National Center for Health Statistics, 2000). In Sweden, deaths from accidents are the most common cause of deaths among children (Socialstyrelsen, 2011).

[3]Note that all parents who die at the same time as their child are implicitly removed since they are not recorded in subsequent years in the population register that we use to obtain our outcome variables.

tax records. From this register we also use annual information on income support from sickness insurance (SI), unemployment insurance (UI) and parental leave insurance (PI). All these variables are in real Swedish Crowns (SEK) on a yearly basis. The labor income variable is also used to construct a binary indicator of employment status. This indicator has the value 1 if annual labor income exceeds one "Price Base Amount" (between 33,000 SEK (€3,300) and 38,000 SEK (€3,800) depending on year).[4]

We have information on the health of the parents from the National Hospital Patient Register. As already mentioned, it includes information on all hospital discharges at Swedish hospitals, with date of admission and contributing causes according to the International Classification of Diseases. We use the occurrence of at least one overnight stay in a hospital as our health indicator. We distinguish between hospital stays in general and stays due to mental health problems (ICD 9: 290-319, ICD-10: F00-F99) in particular.

These data do not allow us to separately analyze specific diagnoses, but rather groups of diagnoses. In an alternative data set, we have information on specific diagnoses, but only for children above the age of 16.[5] We use this data to analyze the effects on specific mental diagnoses.[6]

Finally, we use information from the population register on yearly marital status, which allows us to construct the entire marriage and divorce history of each parent during the study period. In our analyses, we focus on the probability of divorce.

[4]The Price Base Amount is set every year by the Swedish Government. It depends on changes in the consumer price index. The Price Base Amount has various uses, including inflationary correction for sickness benefits and study support.

[5]With these data we restrict attention to child loss in 1990-1996. The reason for this is that ICD 10 was introduced in Sweden in 1997 and some specific mental diagnosis can not directly be translated from ICD 9 to ICD 10.

[6]We focus on psychoses (ICD 9: 295-299) and mental disorders (neurotic disorders, personality disorders, and other non-psychotic mental disorders) (ICD 9: 300-316), and specific disorders, including adjustment reaction (ICD 9: 309), depression (ICD 9: 311), neurotic disorders (ICD 9: 300), personality disorders (ICD 9: 301) and alcohol or drug problems (ICD 9: 303-305).

4 Descriptive statistics

4.1 Summary statistics

The Appendix (*Table A-1*) provides descriptive statistics on child losses in Sweden during our sampling period 1993-2003. It shows that child loss is a rare event. In a given year only about 0.025% of all children in age 1-24 die, and among these, about 31% are due to non-intentional accidents. This demonstrates the importance of using population data for a large number of years.

Table 1 reports child mortality by age and gender. Significantly more boys than girls die. This holds for the total number of deaths and even more so for non-intentional deaths. There is also a pronounced age pattern, where the total number of deaths are high during the first two years, then decreases and again increases during the teenage years (16-24). This age pattern is even more striking if one focuses on accidents. As a result, much of the variation in child deaths comes from older children.[7]

Table 2 presents statistics on a subset of the background variables. The statistics in the table are by child loss status and are presented separately for mothers and fathers. The gender and age of the child, the age of the parent and his/her educational status have a clear predictive power for losing a child. This means that controlling for these key variables is important and that there is reason to pay attention to missing variables that may be systematically related to social and economic outcomes and losing a child.[8] *Table 2* also displays statistics for all our economic and social outcome measures. This shows expected patterns. On average, fathers have higher income, lower parental leave insurance income, and a stronger attachment to the labor market than mothers. The statistics confirm that parents experiencing child loss more often come from lower socio-economic groups.

[7] Note that the number of deaths is somewhat lower in *Table 1* than in *Table A-1*. The reason for this is that *Table 1* reports summary statistics for our analysis sample. Due to missing background characteristics and missing links to biological parents we can only use about 85 percent of all accidents.

[8] The number of mothers is not exactly the same as the number of fathers. The reasons for this is that we only use parents in age 20-55 and fathers in general are older, and because a larger number of fathers than mothers could not be identified in the multi-generational data register.

Table 1: Summary statistics for number of deaths by age and gender

Age of child	Total		Boys		Girls	
	# deaths	# fatal non-intentional accidents	# deaths	# fatal non-intentional accidents	# deaths	# fatal non-intentional accidents
1	661	30	377	20	284	10
2	224	34	127	20	97	14
3	175	28	105	20	70	8
4	142	25	93	20	49	5
5	140	39	84	24	56	15
6	134	35	75	28	59	7
7	120	36	79	27	41	9
8	117	26	66	20	51	6
9	112	26	63	19	49	7
10	127	26	76	19	51	7
11	130	24	74	11	56	13
12	107	26	58	14	49	12
13	137	36	83	26	54	10
14	154	47	83	24	71	23
15	215	87	117	52	98	35
16	249	87	148	57	101	30
17	283	106	173	71	110	35
18	340	118	222	85	118	33
19	433	175	301	30	132	45
20	498	179	353	46	145	33
21	454	177	316	43	138	34
22	482	152	372	29	110	23
23	491	156	363	28	128	28
24	441	136	336	13	105	23
Total	6,448	1,824	4,196	1,354	2,252	470

Notes: The numbers in the table come from our sample of mothers.

Table 2: Summary statistics for our main analysis sample

	Mothers		Fathers	
	Non-intentional accidents	Matched control group	Non-intentional accidents	Matched control group
# individuals	1,811	18,110	1,560	15,600
Parental characteristics				
Age	43.2	43.2	45.2	45.2
Less than high school (%)	27.7	27.6	32.8	32.3
High school (%)	51.6	51.6	50.1	50.1
University (%)	20.8	20.8	17.2	17.6
Stockholm (%)	16.0	16.1	15.4	15.6
Largest three cities (%)	38.9	39.0	39.0	39.2
Nr. Children	2.51	2.50	2.57	2.58
Nr. Boys	1.54	1.51	1.55	1.55
Child characteristics				
Boy (%)	74.3	74.1	74.5	73.5
Age	17.0	17.1	16.6	16.5
Economic outcomes (Year before death year)				
Labor income	111,894	114,665	164,886	175,418
Unemployment insurance	6,074	5,793	7,520	6,877
Sickness insurance	6,603	5,719	6,825	5,272
Parental leave insurance	4,208	3,888	852.2	795.8
Income below empl. threshold (%)	30.8	30.4	29.5	27.6
Social outcomes (Year before death year)				
Hospitalization (%)	13.2	11.0	8.46	6.65
Mental hospitalization (%)	1.66	0.93	1.03	1.01
Married (%)	59.0	65.0	60.6	67.3

Notes: Labor income, unemployment insurance, sickness insurance and parental leave insurance are in SEK. Reported numbers are averages or fractions.

4.2 Graphical evidence

We now provide some graphical illustrations on the long-term impact on earnings of losing a child using the "matched" samples of treated and controls. *Figure 1* and *Figure 2* show the average labor income for parents not losing a child, parents losing a child due to a non-intentional accident, and parents losing a child due to cancer. The average labor income is displayed by time since the child death year (time=0), i.e. the year in which the treated parents lose a child and the year parents in the control group potentially could have lost a child. The figures cover 4 years before and 6 years after the death year.[9] These two figures indicate a number of interesting patterns. First of all, non-intentional accidents are not completely random events, as they are more common among low income households. This is pronounced for fathers but also holds to some extent for mothers.

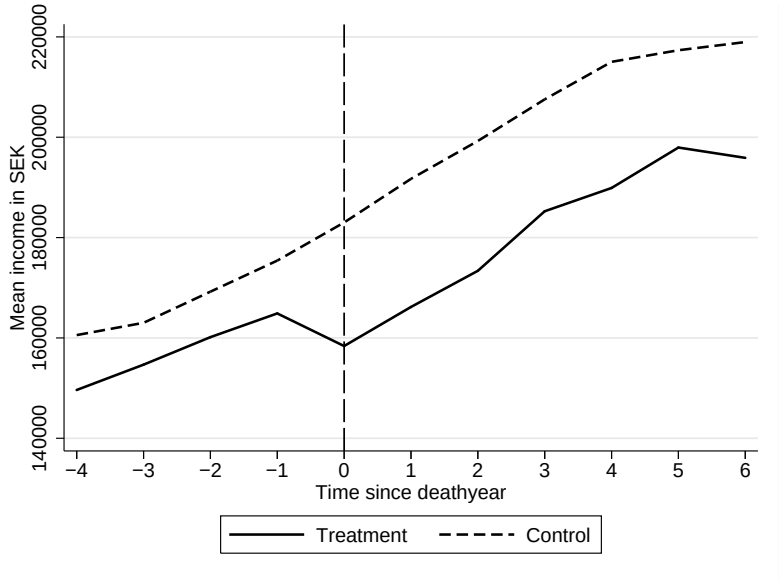
Second, even though non-intentional accidents seem to be related to average labor income they seem to be unanticipated. The drop in labor income upon a child loss occurs precisely in the death year. For mothers there are some indications of differences in pre-death trends in labor income. In our analysis we will therefore control for such differences in trends. The pattern obtained for accidents resulting in child loss can be compared to the pattern in income for parents who lose a child from cancer, which is also in *Figure 1* and *Figure 2*. For these parents, there are large income changes already several years before the actual death, compared to the parents with surviving children. This most likely reflects that cancer death often is anticipated. This complicates the identification of causal ex-post effects of bereavement after death due to cancer.

Third, besides the short-term income loss following a child loss *Figure 1* and *Figure 2* also suggest that there are long-term impacts of losing a child. Thus, it seems that parents who lose a child end up on a lower long-term income trajectory, with long-lasting impacts on income.

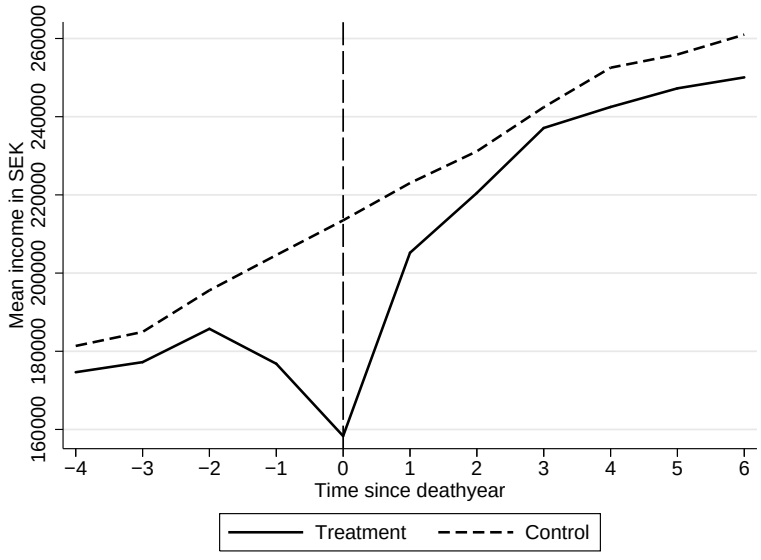
Summing up, these figures provide three insights for our empirical strategy: i) it is necessary to control for the pre-existent level (and trend) in labor income, ii) one should focus on non-intentional accidents in order to exploit deaths that are unexpected, and iii) it is important to distinguish between short-term and long-run impacts of child loss.

[9] Note that we have two separate control groups for the non-intentional accident and cancer sample, respectively.

Figure 1: Outcomes for fathers losing a child due to non-intentional accidents and cancer and parents losing no child

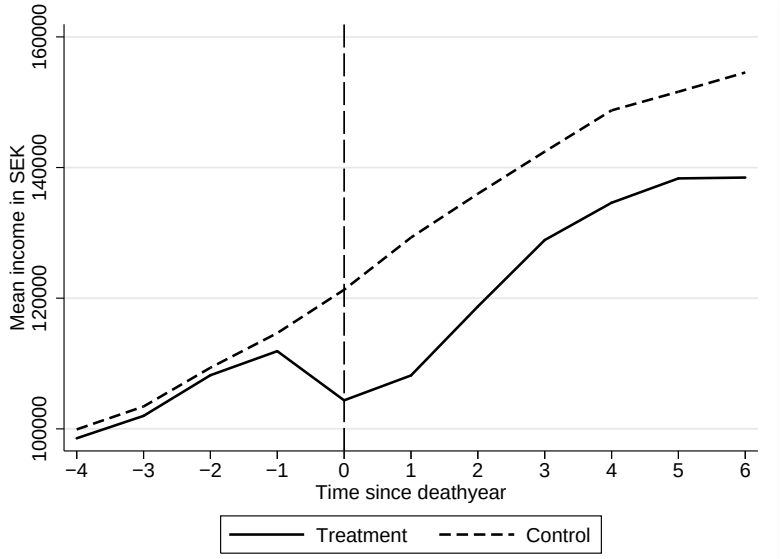


(a) Non-intentional accidents

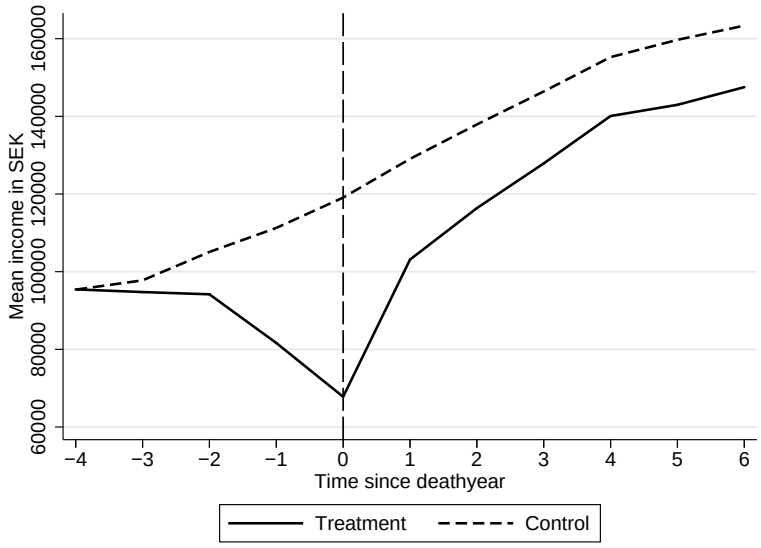


(b) Cancer

Figure 2: Outcomes for mothers losing a child due to non-intentional accidents and cancer and parents losing no child



(a) Non-intentional accidents



(b) Cancer

5 Estimation approach

We now discuss the specification of the equations to be estimated as outlined in Subsection 2.3. For ease of exposition we focus on annual labor income as the outcome variable. We are interested in the average short-term effect directly after the child loss, the average effect one year after the shock, etc., until the long-term average effects at years exceeding one year after the child loss. These are denoted by $\delta_0, \delta_1, \ldots, \delta_S$, respectively, where S is determined by the size of the observation window. Consider a parent i having experienced child loss in calendar year τ_i. The baseline model for his/her annual labor income in calendar year t is

$$y_{it} \;=\; \lambda_t \;+\; \mu_i \;+\; \delta_{t-\tau_i} \cdot \mathrm{I}(\tau_i \leq t \leq \tau_i + S) \;+\; \varepsilon_{it}. \tag{1}$$

If a parent does not suffer child losses then $\tau_i = \infty$ so we may take annual labor income to follow equation (1) with the exception of the terms involving $\delta_{t-\tau_i}$. We control for calendar-time fixed effects λ_t and individual fixed effects μ_i. The latter capture all time-invariant factors at the individual level including environmental and genetic factors. These factors are difficult to measure but it is not far-fetched to assume that they are stable over time.

We estimate the above equation with fixed-effect panel data estimation methods. For each value of $t - \tau_i = 0, 1, 2, \ldots, S$, we take the relevant individual outcome for a bereaved parent to be the difference between labor income at $t - \tau_i$ years after child loss and the average labor income over the 4 years before the child loss. Intuitively, each of these differences identifies one of the coefficients $\delta_0, \ldots, \delta_S$, namely $\delta_{t-\tau_i}$. Since we use a "matched" sample (recall Subsection 3.1), the estimation method resembles conditional difference-in-differences. In such a setting, standard errors need to take into account that there is sampling variation in the first "matching" step. However, this involves a large computational burden. Indeed, with a large number of estimations, as in our case, the burden would be insurmountable. We therefore provide estimates for given matched samples and subsequently validate the most important results by performing genuine conditional

difference-in-differences, using nearest neighbor mahalanobis-metric matching and the Abadie and Imbens (2006) estimator of the standard errors. As a further check we also apply kernel matching, using the bootstrap to obtain standard errors.

We perform several robustness analyses. This includes placebo estimation, where the"treatment" is misplaced to take place at various time periods before the actual event. This may reveal any remaining anticipation effects. We also run estimations using deaths due to cancer and other causes that are usually not unexpected. If we find important pre-treatment effects for cancer, but not for the non-intentional accidents that we use in our analysis, then this can be seen as a confirmation of our empirical strategy. In addition, we replicate our analyses for non-fatal non-intentional accidents. The results of these robustness analyses are discussed in the next sections.

6 Short-term and long-run effects on labor income and the other main outcome variables

6.1 Labor income

In the first column of *Table 3*, we present estimates of short-term and long-run effects of child loss on labor income. In line with the graphical evidence shown in Figures 1a and 2a, the results in the first row of the upper and lower panel show a negative instantaneous effect of child death on labor income. We should point out that the estimates in the death year do not correct for the fact that on average the child death occurs in the middle of the year. Hence, the income loss per month is substantially larger than $1/12$ of the estimates in the tables. On the other hand, child loss may have instantaneous effects due to unpaid leave to organize the funeral and so on. This may inflate the costs in the death year. The monetary costs associated with such instantaneous effects are of a very-short-run nature.

The subsequent rows of *Table 3* show that the average effect of child loss on income has a long-run character, as was already suggested in *Figure 1-Figure 2*. For both genders, the average effects are significant at the 1 percent level. For mothers, six years after the loss, the estimated average effect amounts to 13,500 SEK (about $ 2070) per year. This is 12% of the mean labor income among the affected women in the year prior to the child

Table 3: Long-run effects of child loss

	(1) Labor income	(2) Marital status	(3) General health	(4) Mental health	(5) Fertility
Mothers					
Death year	-15,214***	-0.033***	0.012	0.010***	-0.0020
	(1,268)	(0.0075)	(0.0080)	(0.0032)	(0.0039)
Death year + 1	-19,704***	-0.040***	0.022**	0.0098***	0.037***
	(1,594)	(0.0089)	(0.0084)	(0.0031)	(0.0052)
Death year + 2	-15,747***	-0.041***	0.019**	0.0050**	0.015***
	(1,735)	(0.0097)	(0.0082)	(0.0025)	(0.0046)
Death year + 3	-11,998***	-0.047***	0.0019	-0.0011	0.017***
	(1,889)	(0.011)	(0.0076)	(0.0019)	(0.0043)
Death year + 4	-12,527***	-0.051***	0.00014	-0.00089	0.0049
	(2,053)	(0.011)	(0.0076)	(0.0019)	(0.0038)
Death year + 5	-12,131***	-0.053***	0.013	0.00031	0.00069
	(2,252)	(0.012)	(0.0083)	(0.0019)	(0.0038)
Death year + 6	-13,495***	-0.053***	0.018**	0.0012	-0.0023
	(2,428)	(0.013)	(0.0080)	(0.0022)	(0.0038)
# observations	210,401	123,463	153,161	210,623	210,401
# individuals	19,921	11,671	13,981	19,261	19,921
Fathers					
Death year	-15,713***	-0.027***	0.016**	0.0081***	
	(1,844)	(0.0079)	(0.0072)	(0.0030)	
Death year + 1	-16,582***	-0.027***	0.012	0.0078***	
	(2,602)	(0.0091)	(0.0073)	(0.0029)	
Death year + 2	-16,805***	-0.028***	0.00035	0.0015	
	(2,709)	(0.0099)	(0.0071)	(0.0020)	
Death year + 3	-13,293***	-0.029***	-0.0040	0.0042*	
	(2,931)	(0.011)	(0.0071)	(0.0025)	
Death year + 4	-16,568***	-0.029**	-0.0023	-0.00077	
	(3,076)	(0.011)	(0.0073)	(0.0017)	
Death year + 5	-12,266***	-0.033***	-0.0030	0.0045*	
	(3,895)	(0.012)	(0.0072)	(0.0025)	
Death year + 6	-16,953***	-0.036***	0.00047	0.0010	
	(3,790)	(0.013)	(0.0071)	(0.0019)	
# observations	180,575	107,520	155,307	181,385	
# individuals	17,160	10,175	14,212	16,621	

Notes: FE estimates using the pre-matched sample described in the data section. Outcomes labor income in SEK and indicator variables for being married, having at least one hospitalization and giving birth, respectively. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

loss. Equivalently, this is 0.15 times the standard deviation of labor income among these women in the year prior to child loss. Among fathers, the estimated absolute level of

the average long-run effect is even larger at almost 17,000 SEK (about $ 2,600) per year. Relatively speaking, the average effect has the same order of magnitude as for women (10% of the mean labor income among the affected men in the year prior to the loss). In terms of the standard deviation of labor income among these men in the year prior to the loss, the average effect amounts to 0.10. Our results show that losing a child has persistent effects on income that stretch way beyond the initial grief period. In Subsection 7.1 below we shall see that the average effects are to some extent driven by exits out of employment (i.e., at the extensive margin).

Table A-2 in the Appendix presents conditional difference-in-differences estimates that correct standard errors for the first-stage matching. Both with nearest-neighbor mahalanobis-metric matching with the Abadie and Imbens (2006) estimator of the standard errors and with kernel matching with bootstrap, we obtain very similar standard errors as with our main approach. Moreover, 1-nearest neighbor matching produces very similar point estimates as those obtained with our main approach. The only difference is, as expected, a somewhat lower precision.

6.2 Labor income effect heterogeneity

We next consider heterogeneity in the impact of child death on income according to the gender of the child, age of the child, sibling sex composition, birth order of the child, and sibship size. In these cases, obviously, drawing the matched sample involves exact matching on the characteristic of interest. The estimation results are shown in *Table A-3* to *Table A-7* in the Appendix.

Differences in the effects according to the gender of the child could arise if there are gender preferences among the parents. We do not find such differences. For mothers, the income loss is of equal magnitude whether or not the child was a boy or a girl (*Table A-3*). For fathers, there is a slightly larger effect if the deceased child was a boy, but the differences are not statistically significant.

Another way to test if the gender of the deceased child matters is to examine the role of the gender composition of the siblings. For instance, if parents have preferences for mixed genders among their children. Previous studies have shown that parents are more

likely to have an additional child if the two first children are of the same gender (Angrist and Evans 1998). For this purpose, we rely on two-sibling families and examine if the impact of child loss on income varies by the gender of the remaining child. The results are reported in *Table A-5* in the Appendix. For mothers, we find some significant differences by gender of the remaining child. If anything, the long-run effects are somewhat smaller if a girl is lost. Note, however, that this only holds for families with exactly two children. For fathers there is more heterogeneity and we find that the grief effect is substantially smaller if both the lost child and the remaining child is a girl.

We also test if the effects depend on both the gender *and* the age of the child. *Table A-6* reports these estimates. We again obtain some evidence that fathers react more to the loss of a boy compared to the loss of a girl. Moreover, the results suggest that fathers react more strongly to the death of a young girl compared to the death of a older girl. However, none of the differences across age are significant. Among mothers the effects are quite homogenous across both the gender and the age of the child.

Finally, we test if the effects vary by family size and birth order. If there is decreasing marginal utility of children, one would expect the effect of child loss to be smaller in large families. This does not appear to the case, however, according to the results in *Table A-4* in the Appendix. On the contrary, if anything the long-run effects are somewhat smaller for one-child families, both among mothers and fathers, perhaps reflecting that preferences for children were weaker in such families in the first place. It could also be that the disutility of being at home increases to a larger extent when there is no children in the household. The effect of child loss may also differ by birth order if, for instance, parents have closer connections with children of certain birth orders. We present separate estimates for the last and first born. Interestingly, we find no significant differences by birth order, as shown in *Table A-7* in the Appendix.

6.3 Marital stability, health and fertility

Divorce. Studying additional outcome measures is interesting in its own right but it may also help to understand through which mechanisms the long-run effects on labor income arise. For example, child loss may threaten marital stability, so that part of the effect of

child loss on income we observe may run through increased divorce rates following the loss.

To proceed, we relate child loss to the probability of divorce, in the sample of parents who were married two, three and four years before the loss of the child (or potential loss). To measure divorce, we use an indicator variable for being divorced at the end of the death year, one year after, and so on.[10]

The results in column 2 of *Table 3* show that child loss has both short-run and long-run consequences for marital stability. For married mothers, the risk of divorce increases with 3.3 percentage points during the year of the child loss. This effect increases over time: six years after the loss, it is 5.3 percentage points higher. Fathers also face a heightened divorce risk, although to a somewhat lower extent. After six years, their probability of still being married is reduced by 3.6 percentage points. These results confirm that marital stability is affected by child loss. The results are also consistent with the idea that the gains from marriage decrease when a child is unexpectedly lost.

Health. As suggested in the previous literature, child loss may have detrimental effects on both physical and mental health. To test for this, we estimate the effect of child loss on overall health and mental health for the sub-sample of parents who were in good health before they experience, or could have experienced, a child loss. First, we focus on the probability of having at least one inpatient care hospitalization of any cause. This is a rather strong health indicator which is not affected by minor health problems that only warrant a brief visit to the physician. As shown in the third column of *Table 3*, we find no significant effects on general health in the year of the child loss for mothers, whereas in the following year, the probability increases with 2.2 percentage points or by 23.7 percent. Among fathers, we find significant effects of child loss on general health already in the death year, and in the following year, the probability of having a hospitalization has increased with 1.2 percentage points or about 12.1 percent.

Next, consider the estimates for mental health presented in column 4. These estimates show that the probability of having a hospitalization with a mental diagnosis increases with 1 percentage points or almost 150 percent for mothers and 0.84 percentage points,

[10] In our data, marital status is recorded in November each year.

Table 4: Effect of losing a child on different mental problems. Children in ages 16-24

	(1) Mothers	(2) Fathers
General mental health		
Child death	0.015***	0.0065**
	(0.0036)	(0.0032)
Disorders		
Child death	0.015***	0.0061*
	(0.0035)	(0.0031)
Psychoses		
Child death	0.00079	0.00053
	(0.0012)	(0.00079)
Specific disorders		
Anxiety and other syndromes		
Child death	0.0011	-0.000028
	(0.0012)	(0.00082)
Adjustment reaction		
Child death	0.012***	0.0066***
	(0.0029)	(0.0024)
Depression		
Child death	0.0016	-0.00045**
	(0.0012)	(0.00018)
Alcohol and drugs		
Child death	0.00024	0.00055
	(0.00099)	(0.0020)

Notes: Outcomes are indicator variables for having at least one hospitalization in the specific category during the death year, using the pre-matched sample described in the data section (sub-sample children in ages 16-24). Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

or about 100 percent, for fathers in the death year. This confirms the results from the previous literature, which suggests that child loss affect the probability of experiencing mental diagnoses. Our results also indicate that the health effect for mothers appears to be quite long-lasting, whereas for fathers the effect is insignificant two years after the child loss took place.

In order to obtain more specific insights into the type of mental conditions that are affected by child loss, we use the sub-sample where we have more detailed information on diagnoses (children aged 16-24). *Table 4* presents results. First, note that the estimates for general mental health are similar to those in our main sample. Secondly, the effect on mental health mainly concerns disorders. Within the category of disorders, the effect

for mothers is concentrated in the category of "adjustment reaction (disorder)". The latter finding is almost tautological, as this condition is defined by the inability to adjust or cope with a particular stressor, such as a major life event like death in the family. We obtain no effect on disorders due to alcohol or drug use, which means that our findings do not suggest an increased alcohol or drug use following a child loss. This holds for both mothers and fathers.

Fertility. If parents have strong preferences for a certain number of children, the loss of a child could also affect fertility patterns. We study this by estimating regression models on an indicator for having at least one additional child within a certain calendar year. As before, the sample consists of our mothers who lose a child and the matched controls. The results presented in column 5 of *Table 3* show that child loss leads to a strong increase in the fertility rate. In the year of the child loss we find, as expected, no fertility effects, but one, two and three years after the child loss the effects are sizeable. For instance, one year after the loss of the child the probability of giving birth increases with 3.7 percentage points or almost 186 %. The fact that we find sizeable fertility effects already one year after the child loss indicates that a substantial share of the parents quickly decide to replace the lost child.

7 Decomposing the effects involving labor income

7.1 Effects on labor market status and non-labor income components

This section aims to provide some insights into the mechanisms behind the income effects, notably the long-run effects. We start by decomposing total labor and non-labor income into categories that are informative on the labor market status of the parent. Specifically, we estimate models as in equation (1), using employment status and the amounts of unemployment insurance (UI) benefits, sickness insurance benefits, and parental leave insurance benefits, respectively, as separate outcome variables.

The results are summarized in *Table 5*. They suggest that exits from the labor market, for instance to early retirement or sick-leave, constitute an important mechanism through which labor income losses arise. For mothers, the probability of being non-employed

increases by 2.1 percentage points during the year of the child loss, and this increases to 6.3 percentage points two years later. The corresponding figures for fathers are 2 and 2.7 percentage points. All of these effects are statistically significant. Considering that the average employment rate among parents in our analysis sample is about 70 %, the estimated effects are of substantial size. Specifically, an additional 3.5% of men and women who were employed at the time of the child loss are not in employment five years later, compared to their situation in the absence of the child loss,

The (average) labor income effect of child loss, as estimated in Subsection 6.1, aggregates the effects for those who exit employment and the effects for those who stay employed. (There are also effects for those who were non-employed, but since they have no pre-bereavement labor income and they typically remain non-employed, their contribution to the total effect is negligible.) On average, the subgroup who exit employment experiences much larger income losses than the subgroup who stay employed. At the same time, the latter subgroup is much larger. In the end, each of these groups makes a substantial contribution to the total average effect. Furthermore, in each subgroup, the effects of child loss on labor income remain adverse in the long run.

Our data do not enable us to decompose the effect on those who stay employed into an hours reduction and a wage rate (or productivity) reduction. Given the high prevalence of full-time work among men, it seems likely that at least for them, the effect mostly concerns their productivity rate.

The results in *Table 5* further show that the increase in non-employment mainly reflects exits from the labor force rather than increased unemployment, since effects on UI benefits are either significantly negative or insignificant. Sickness benefits partly compensate for the income losses following a child loss. Among mothers, sickness benefits increase by 13,400 SEK and 7,200 SEK the year after and two years after the child loss, respectively. Among fathers, sickness benefits also increase significantly, but the corresponding compensation of income loss is smaller than among mothers.

Table 5: Effects on labor market status and non-labor income components

	(1) Employment	(2) Unemployment	(3) Sickness absence	(4) Parental leave
Mothers				
Death year	-0.021***	-944.3***	13,361.0***	-843.7***
	(0.0081)	(356.8)	(750.4)	(327.5)
Death year + 1	-0.058***	-918.2**	15,770.8***	754.4**
	(0.0091)	(403.0)	(1,003.7)	(363.4)
Death year + 2	-0.063***	-626.7	7,222.9***	2,785.4***
	(0.0096)	(440.7)	(875.8)	(429.5)
Death year + 3	-0.038***	-588.9	3,491.4***	2,086.0***
	(0.0099)	(439.7)	(842.7)	(389.4)
Death year + 4	-0.033***	-127.0	1,842.1**	1,301.8***
	(0.010)	(503.7)	(856.0)	(385.3)
Death year + 5	-0.024**	406.4	743.9	534.7
	(0.011)	(537.3)	(880.9)	(375.9)
Death year + 6	-0.021*	537.6	16.3	305.1
	(0.012)	(571.4)	(900.8)	(386.4)
# observations	210,401	210,401	210,401	210,401
# individuals	19,921	19,921	19,921	19,921
Fathers				
Death year	-0.020***	-656.6	10,059.2***	-221.3
	(0.0077)	(496.4)	(766.3)	(146.3)
Death year + 1	-0.043***	-999.8*	8,548.6***	103.3
	(0.0086)	(583.5)	(964.0)	(143.8)
Death year + 2	-0.027***	-848.3	3,670.6***	357.8**
	(0.0094)	(601.2)	(903.9)	(167.0)
Death year + 3	-0.020**	-1,198.4*	2,343.2***	320.6*
	(0.0097)	(620.0)	(866.1)	(194.0)
Death year + 4	-0.028***	27.5	709.1	119.2
	(0.010)	(719.7)	(857.0)	(132.6)
Death year + 5	-0.025**	-1,163.2*	937.4	15.3
	(0.011)	(694.8)	(921.3)	(138.1)
Death year + 6	-0.021*	-904.2	158.9	108.9
	(0.011)	(721.5)	(940.2)	(160.7)
# observations	180,575	180,575	180,575	180,575
# individuals	17,160	17,160	17,160	17,160

Notes: FE estimates using the pre-matched sample described in the data section. Outcomes are employment as an indicator for employment status and incomes from unemployment, sickness and parental leave insurance measured in SEK. The models also include calender time fixed. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table 6: Heterogenous effects on labor income by if parent and child live together. Children in ages 19-24

	Mothers		Fathers	
	Est.	s.e.	Est.	s.e.
Death year	-10,703.3***	2,777.3	-8,459.9***	3,279.1
Death year + 1	-12,667.9***	3,289.8	-9,078.9**	4,095.1
Death year + 2	-11,057.6***	3,573.2	-6,732.5	4,595.2
Death year + 3	-7,088.2*	4,182.9	-12,763.7**	5,222.3
Death year + 4	-9,045.4**	4,359.7	-11,842.4**	5,271.9
Death year + 5	-10,193.7**	4,890.2	-8,201.9	5,840.6
Death year + 6	-11,657.6**	5,144.7	-9,283.5	6,399.6
Same*Death	-3,951.4	3,550.6	-5,863.8	5,288.1
Same*Death year + 1	-2,982.5	4,309.4	-3,292.5	6,820.2
Same*Death year + 2	1,155.9	4,655.0	-10,802.3	7,132.8
Same*Death year + 3	-606.3	5,335.8	-1,347.9	8,187.5
Same*Death year + 4	377.1	5,626.7	-4,418.6	8,544.5
Same*Death year + 5	140.6	6,259.2	-3,236.0	10,109.9
Same*Death year + 6	623.0	6,651.8	-8,172.7	10,343.6
# observations	115,090		92,923	
# individuals	10,893		8,835	

Notes: Same family is defined as being registered in the same family in the population register. FE estimates using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

7.2 Labor supply response to a change in children's costs

As argued in Subsection 2, effects on employment or hours worked may reflect a labor supply response to a change in the number of children, since fewer children also means lower household costs. Recall, however, that previous studies on the causal effect of an additional child on labor supply suggest that labor supply is inversely related to the number of children. To investigate this further, we analyze whether the effect on income is different for children who die but who do not live with their parents. We perform this test using the sample of children aged 19-24 amongst whom there is substantial variation in whether the child was living with his or her parents or not (57.3 percent live with their parent).

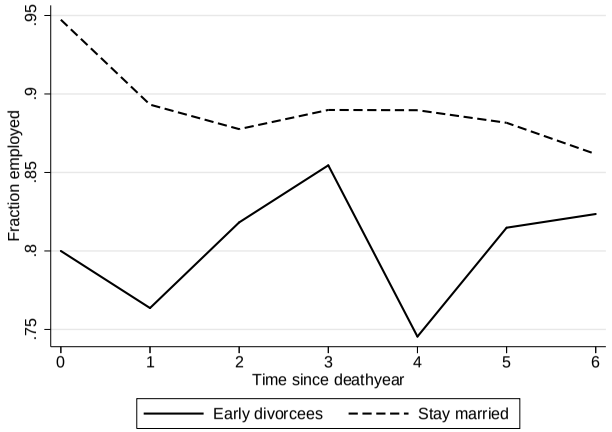
Table 6 shows the results of this exercise. We find no evidence that the effects for mothers depend on whether the child lives at home or not, as the interaction effect between living at home and child loss is insignificant in all specifications. This all suggests that

the income effects of child loss are mainly due to grief and are not driven by factors determining more usual labor supply responses.

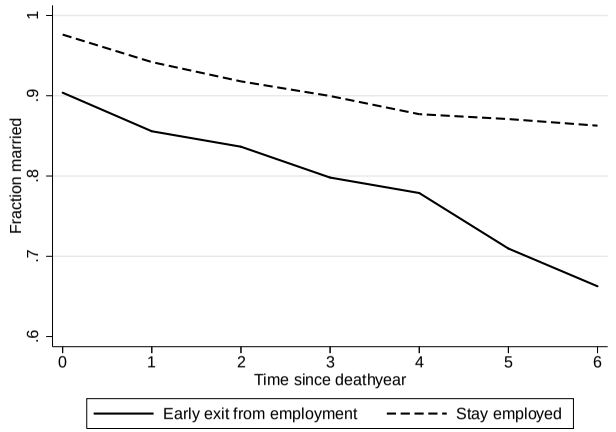
7.3 Sequences of outcomes

Summing up the results of the previous subsections, the earnings loss following bereavement reflects for some individuals an exit from the labor market and increased use of sickness insurance. To some extent it also reflects a reduced labor income while employed. We now focus more in detail on the exits from the labor force, and we examine whether these cause the deteriorated health and increased divorce rate among parents who lost a child, or whether the pathways run the other way around with worsened health and increased divorce rate leading to exit from the labor market in the long-run. For this purpose, we explore relationships between early exits from employment and health problems in terms of hospitalizations that occur shortly after the child loss. We restrict attention to parents who are employed and in good health before the child loss or (in case of the "control" group) potential child loss. Good health is defined as having no hospitalizations in the year before the child loss. 4(c) and 5(c) present employment by time since the child loss for parents with and without at least one hospitalization within one year after the child loss, 4(d) and 5(d) instead show health over time by employment status during the first year following the loss of the child. These four figures indicate no strong relationship between initial health status and employment over time and initial employment status and health over time, respectively. The only exception is that health deteriorates in the long-run for fathers who experience an early exit from employment, whereas we see no such deterioration among fathers who lose a child but do not suffer an initial income loss.

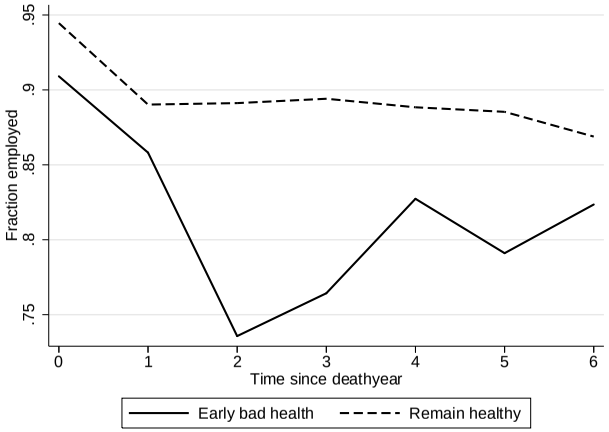
Figure 3: Pathways for employment, health and marital status. Mothers



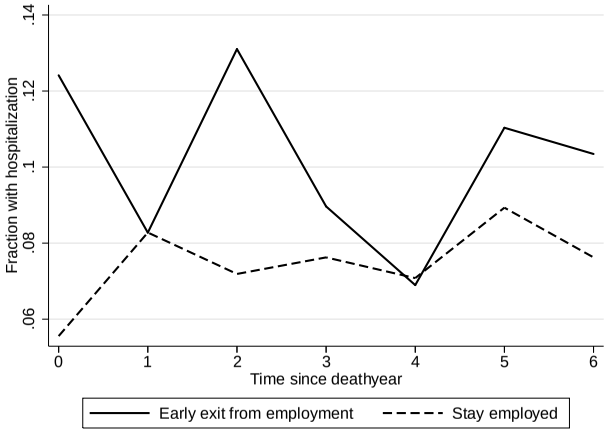
(a) Employment by initial marital status



(b) Marital status by employment

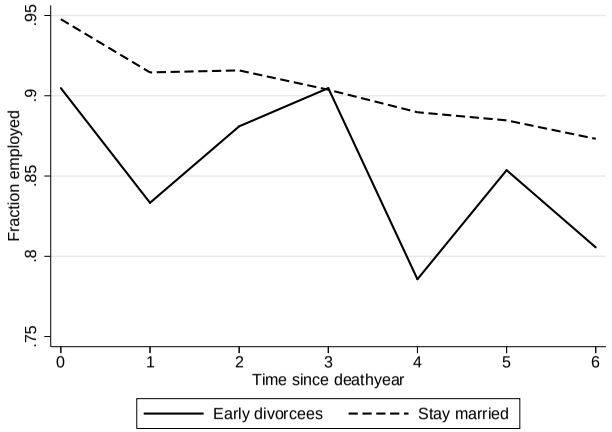


(c) Employment by health status

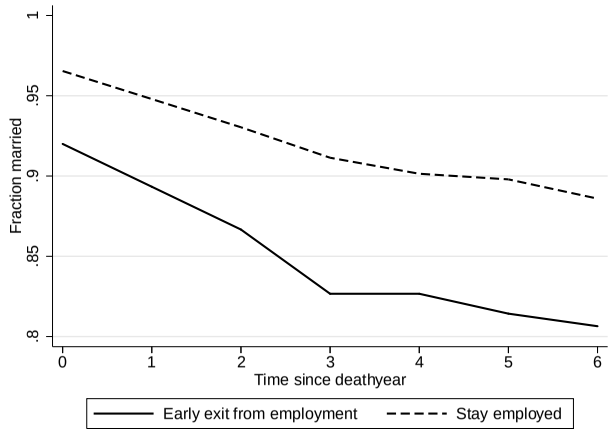


(d) Health status by employment

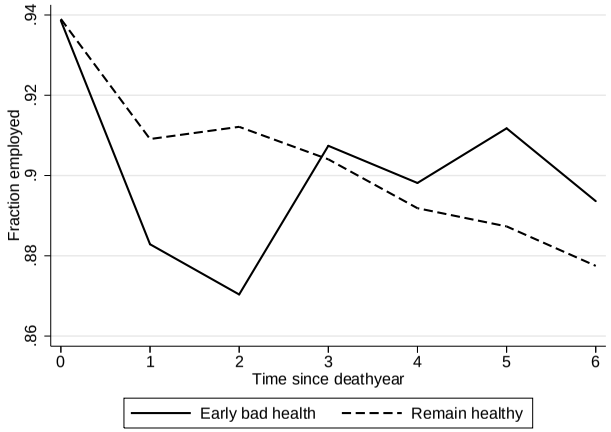
Figure 4: Pathways for employment, health and marital status. Fathers



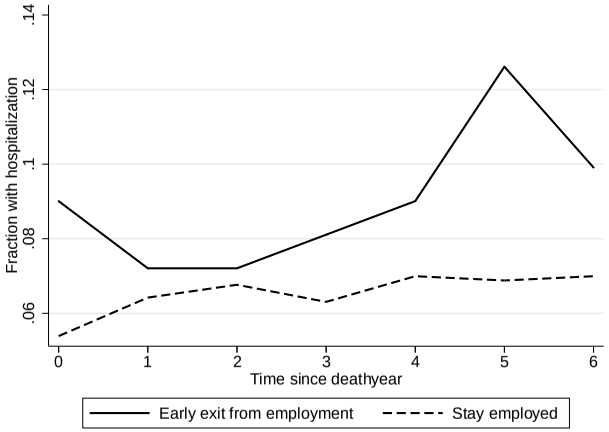
(a) Employment by initial marital status



(b) Marital status by employment



(c) Employment by health status



(d) Health status by employment

Next, we examine how the divorce rates varies with time since the child loss among parents with and without an immediate drop in labor income, and how employment evolves over time for parents who divorce shortly after the child loss and for parents who decide to stay married. If parents who separate after the child's death do this after some years, whereas the transition away from work occurs immediately after the death and most divorcees occur among parents with large income losses we take this as evidence that the main pathways runs from decreased income to divorce and not the other way around. We sample all mother and fathers who were married and employed in the year before the child loss. We then split this sample either by employment status one year after the loss of the child or by the marital status at this time point.

4(a) and 5(a) display average employment among parents who divorce within one year after the child loss and for those who stay married at least one year, and 4(b) and 5(b) instead show the fraction married over time for parents who exit from the labor force within one year after the child loss and for parents who stay employed. For both mother and fathers we see that the fraction staying married gradually decreases with time since the child loss, among parents who exit from employment quickly after the child loss. For parents who stay employed we do not observe such a sharp increase in the divorce rates. Along the other dimension we see a large initial drop in the fraction employed among both mothers and fathers who divorce within one year after the child loss. In the long-run these parents catch-up and especially for mothers there is only a very small difference in employment levels between early divorces and those who stay married. Taken together, this suggests that in most cases the long-run pathways out of the labor market and into broken marriages start with income losses and exits from the labor force and then continue with increased divorce rates. Here we should make the caveat that divorces may be planned one or more years in advance, so that reverse causality or confounding may affect the results. Apart from that, the general impression of the findings in this subsection seems to be that fast exit from employment after child loss has substantial effects on the long-run outcomes of the parents.

Table 7: Average labor income effects of child loss, adjusted for effects of subsequent additional child births

	(1) Unadjusted income effects	(2) Add. births death year +1	(3) Add. births death year +2	(4) Add. births death year +3	(5) All add. births	(6) Adjusted income effects
Death year	-15,254	0	0	0	0	-15,254
[1em] Death year + 1	-19,777	-1,971	0	0	-1,971	-17,806
[1em] Death year + 2	-15,839	-2,700	-799	0	-3,499	-12,340
[1em] Death year + 3	-12,093	-1,024	-1,095	-906	-3,025	-9,068

Notes: column 1 reports the estimated labor income effects from Table *Table 3*. Columns 2-5 provide the calculated labor income effects from additional births in death year +1, death year +2 and death year +3, respectively. They are calculated using our fertility rate estimates from Table *Table 3* and the income estimates from Kennerberg (2007). Column 5 reports the total income effect from all additional births due to child loss, and column 6 reports the adjusted labor income effects.

7.4 Fertility-adjusted income effects

In Subsection 6.3 we documented that child loss leads to an increased fertility rate. Since child birth often negatively affects the mother's labor income, it is possible that part of the estimated long-run labor income effect for mothers is due to this. To investigate this, we use the estimated fertility effects presented in *Table 3*, together with previous estimates on the effect of child birth on income in Sweden from Kennerberg (2007). Her results show that average labor income decreases with about 49 % in the birth year and 68 % and 25 % in the two following years. Note that these are averages over mothers giving birth early and late during the year, which explains why the effect is smaller during the birth year compared to the following years.

Column 1 of *Table 7* replicates the unadjusted average labor income effects from *Table 3*. Columns 2-4 show the calculated fertility-induced income effects from additional births at one, two and three years after the child loss.[11] In column 1, the estimate in the second row, denoted "Death year +1", is interpreted as the average effect on income due to a birth one year after the death of the child. The second and third row then show the average effect on income due to a birth one year after the death year on income 2 and 3 years, respectively, after the death year. Columns 3-4 shows the corresponding effects

[11] In the calculations, we use the fact that the average labor income among mothers losing a child is 111,894.

of having a birth 2 and 3 years after the death of the child, while column 5 shows the corresponding effect of all births taking place 1-3 years after the death year. In column 6 we then present the fertility-adjusted labor income effects. These figures show that the additional births one year after the death year account for the main part of the fertility-induced income effect. Moreover, the figures in column 6 show that the fertility-induced income effect of a birth the year after the death year accounts for about 10 % of the total average effect of child loss on labor income the year after the death of the child. Two and three years after the child loss this number increases to 22.1 % and 25.0 %, respectively. From this exercise, we conclude that most of the income loss following child loss can not be explained by increased "replacement" fertility among mothers who lost a child.

8 Robustness analyses

One might be concerned that, even though we rely on unexpected accidents, our empirical results may still be affected by selection on unobservables. To some extent, placebo regressions provide an additional check. To proceed, we regress child loss on income changes taking place before the actual child loss. For this purpose we use the same sample and model as in our main analysis, but in addition we allow for placebo effects for each of three years before the child loss. These placebo estimates are included in column 1 of *Table 8*. We find that all placebo estimates for both mothers fathers are small and insignificant, which is consistent with the assumption that these accidents were truly unexpected from the parents point of view.

We may also contrast these placebo estimates with those obtained by looking at deaths that can be assumed to be anticipated to some extent. For example, with deaths from child cancer, a grief effect may occur already some time before the actual death of the child, as there may be a time lag between the cancer diagnosis and the subsequent death.

We classify child deaths into 6 groups. Besides non-intentional accidents and intentional accidents, we focus on child deaths due to cancer, heart, and nerve related problems. These latter three types of deaths are besides accidents the most common causes of child deaths. All other causes of child deaths are then lumped together in one residual category.

We perform similar pre-matching and estimate similar models as for non-intentional accidents. The estimates are presented in *Table 8*. First of all, note the large and significant pre-death effects for child loss due to cancer. Mothers' income is reduced by 32,000 SEK already one year before the child loss, whereas the corresponding figure for fathers is 21,300 SEK. This is accounts for the grief following the cancer diagnosis as well as for the care-giving costs for the sick child. Clearly, the estimates differ from those obtained from unexpected deaths, which supports our approach.

Notice that five years after the child loss, the effects are quite similar across the different death causes. For instance, for mothers the smallest estimate is 7,100 SEK for intentional accidents, while the largest is 17,200 SEK for child cancer, and the estimate for non-intentional accidents being in between at 12,400 SEK. We thus conclude that after some time, unexpected and expected deaths generate rather similar effects. This suggest that after the initial differences, the long-run effects of child loss are largely driven by pure grief and not by (selectivity due to) the degree to which the deaths were expected or not.

We also compare the effect of fatal accidents on income with the corresponding effect of non-fatal accidents. While non-fatal accidents of a child may also be traumatic events, they probably not involve the same grief that occurs after fatal accidents, whereas they may lead to larger instantaneous monetary costs. We select all accidents that lead to a hospitalization of a child between ages 1-24. Such accidents are identified using ICD-codes recorded by the medical doctors. We use the same empirical approach as before, matching each affected parent with 10 parents of children experiencing no accidents, and estimating the equivalent of equation (1). The results are reported in *Table A-8* in the Appendix. Non-fatal accidents have long-lasting but rather small effects on labor income. For mothers, the effect two years after the accident equals an income reduction of 3,200 SEK. This is less than 25% of the effect of losing a child in an accident. For fathers, the corresponding figures are 1,200 SEK and less than 10%. In sum, any features that are common for non-fatal and fatal accidents only account for a small part of the full income effect of fatal accidents. This confirms that the income effects of child loss are due to grief.

Table 8: Long-term effects on labor income of losing a child by cause of death

	(1) Non-intentional	(2) Intentional	(3) Cancer	(4) Heart	(5) Nerve	(6) Other
Mothers						
Death year - 3	-29.1	-1,766	-5,352***	4,020	2,224	191
	(1,108)	(1,720)	(1,823)	(2,896)	(3,559)	(1,298)
Death year - 2	261	-1,322	-13,229***	3,626	3,935	1,047
	(1,381)	(2,225)	(2,182)	(3,876)	(4,067)	(1,624)
Death year - 1	-1,366	753	-31,962***	6,582	13,060**	7,720***
	(1,598)	(2,633)	(2,590)	(4,405)	(5,478)	(1,932)
Death year	-15,508***	-13,352***	-53,623***	-9,394**	-849	-7,749***
	(1,765)	(2,722)	(2,833)	(4,539)	(6,073)	(1,948)
Death year + 1	-19,997***	-21,629***	-28,115***	-16,130***	-12,769*	-18,949***
	(1,992)	(2,929)	(3,054)	(4,801)	(6,706)	(2,141)
Death year + 2	-16,040***	-12,294***	-23,382***	-12,528**	-12,955**	-16,172***
	(2,122)	(3,038)	(3,076)	(5,328)	(6,477)	(2,312)
Death year + 3	-12,292***	-10,783***	-20,194***	-19,335***	-11,218*	-11,650***
	(2,256)	(3,312)	(3,189)	(5,391)	(6,387)	(2,505)
Death year + 4	-12,820***	-8,376**	-16,632***	-15,518***	-11,612*	-9,840***
	(2,370)	(3,463)	(3,408)	(5,819)	(7,011)	(2,638)
Death year + 5	-12,425***	-7,135**	-17,248***	-9,113	-9,641	-9,353***
	(2,571)	(3,626)	(3,755)	(6,072)	(7,673)	(2,849)
Death year + 6	-13,789***	-7,405*	-16,662***	-10,079	-3,604	-8,729***
	(2,699)	(3,918)	(4,010)	(6,732)	(8,400)	(3,080)
# individuals	19,921	10,307	10,054	3,333	4,191	21,230
Fathers						
Death year - 3	-766	1,500	-1,159	-4,178	-3,822	2,031
	(2,045)	(2,284)	(2,360)	(3,845)	(4,131)	(1,572)
Death year - 2	-1,458	1,042	-3,288	251	-597	611
	(2,249)	(2,971)	(3,160)	(4,292)	(5,252)	(1,953)
Death year - 1	-2,942	1,715	-21,262***	-160	-5,923	-667
	(3,353)	(3,260)	(4,072)	(5,851)	(6,059)	(2,323)
Death year	-17,052***	-12,633***	-48,716***	-8,774	-21,933***	-11,072***
	(2,808)	(3,897)	(4,118)	(6,150)	(6,534)	(2,626)
Death year + 1	-17,920***	-17,654***	-11,517**	-1,667	-16,365**	-5,435*
	(2,965)	(4,304)	(4,831)	(7,709)	(7,210)	(2,902)
Death year + 2	-18,144***	-14,498***	-4,925	-8,053	-10,764	-6,003*
	(3,133)	(4,591)	(5,140)	(8,666)	(7,988)	(3,281)
Death year + 3	-14,631***	-14,926***	761	-7,767	-13,825	-7,432**
	(3,379)	(4,841)	(6,150)	(10,768)	(8,412)	(3,452)
Death year + 4	-17,906***	-17,327***	-3,418	1,450	-10,638	-9,952***
	(3,540)	(5,250)	(6,011)	(13,248)	(8,979)	(3,709)
Death year + 5	-13,606***	-16,272***	-1,822	-9,999	-20,251**	-7,350*
	(4,165)	(5,875)	(6,702)	(10,227)	(9,896)	(3,941)
Death year + 6	-18,294***	-14,033**	-5,920	-7,795	-15,786	-9,618**
	(4,125)	(6,575)	(6,872)	(11,376)	(10,526)	(4,279)
# individuals	17,160	8,459	9,295	3,025	3,751	19,294

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

9 Conclusions

The loss of a child has significant adverse effects on almost every outcome studied, confirming the common wisdom that losing a child is one of the most stressing events that a human can face. On average, child loss not only results in reduced labor income in employment, but also in increased probabilities of leaving the labor market, marital dissolution, and experiencing a reduction of mental health. To the best of our knowledge, we are the first to show (average population) effects on such a comprehensive set of outcomes. With a few exceptions, the estimated average effects are invariant to characteristics of the child. They do not depend on the age of the child, birth order of the child, or family size. We do find some evidence that men suffer more adverse labor market outcomes after the loss of a son than after the loss of a daughter.

The reduction in labor income is partly due to individual exit out of employment. The latter does not involve an increase in unemployment but rather an increase in sick-leave (notably, due to mental health disorders) and, more generally, exit out of the labor force. This is mostly driven by intense grief rather than by a leisure adjustment in response to a change in the number of children. In the latter case, leisure would increase simply because household expenses go down after the loss of a child. In that case, however, we would find less of an effect in families where the deceased child did not live at home in the first place, which we do not. Since we find a negative income effect following child death, we can also rule out the possibility that labor supply increases as a result of a decreased value of leisure when the child is deceased.

We observe that an early exit from employment and an early large loss of earnings after child loss often precede other adverse outcomes. For fathers who exit from employment shortly after bereavement, the long-run health deteriorates relatively often. No such deterioration is observed among fathers who do not suffer immediate income losses. Similarly, pathways into broken marriages tend to start with income losses and exits from the labor force.

We believe that there are several important policy implications of our results. Since a child loss has severe consequences for a wide range of outcomes, it is useful to consider

policies that may help bereaved parents to better cope with their trauma. In this respect it seems particularly relevant to target parents who leave work shortly after bereavement. These job exits are often driven by emotional distress and mental health disorders, but they may have effects that are more persistent than the grief itself. In particular, we observe that a fraction of these individuals tend to stay out of work and separate from their partner. In addition, in the case of fathers, the long-run health tends to deteriorate. To some extent, such patterns of consecutive observed outcomes could be affected by selectivity of intermediate events as determinants of subsequent events. With this caveat in mind, the results suggest that it is sensible to communicate to parents who just lost a child that they should try to continue their labor force participation. In addition, if such parents do actually quit employment, it may be sensible to expose them to tailored active labor market programs and therapies to prevent a downward spiral in their subsequent life.

Another policy implication of our results concerns the assessment of cost-benefit ratios of measures aimed at preventing accidents and deaths, especially among children. Such estimates usually do not take into account the effects on other persons close to the deceased person, which, according to our results, may lead to a severe underestimation of the value of such policies.

At the most general level, our paper provides new evidence on the range of human reactions to extreme events. Our results show that the grief that follows from the loss of a child translates into long-run economic and social impacts at the individual level.

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Appendix

Table A-1: Descriptive statistics for number of deaths. Children in age 1-24

	Full population # children	All deaths		Fatal non-intentional accidents	
		# deaths	% of # children	# deaths	% of # deaths
1993	2,619,757	745	0.028	243	32.6
1994	2,648,019	651	0.025	202	31.0
1995	2,649,211	656	0.025	206	31.4
1996	2,635,564	597	0.023	175	29.3
1997	2,616,359	645	0.025	176	27.3
1998	2,596,560	678	0.026	226	33.3
1999	2,576,397	594	0.023	157	26.4
2000	2,565,386	624	0.024	194	31.1
2001	2,563,316	614	0.024	211	34.4
2002	2,565,129	619	0.024	172	27.8
2003	2,573,077	613	0.024	188	30.7

Notes: The population numbers are from Statistic Sweden and recorded 31 December each year.

Table A-2: Robustness analysis using different matching estimators. Labor income effects of losing a child for mothers

	(1) Main two step specification	(2) 1-Nearest neighbor (AI s.e.)	(3) 10-Nearest neighbor (AI s.e.)	(4) PS Kernel matching (bootstrap s.e.)
Death year	-15,214***	-16.014***	-15,490***	-16,459***
	(1,268)	(1,588)	(1,234)	(1,204)
Death year + 1	-19,704***	-19,647***	-19,319***	-21,175***
	(1,594)	(1,992)	(1,611)	(1,503)
Death year + 2	-15,747***	-15,837***	-15,831***	-17,651***
	(1,735)	(2,217)	(1,701)	(1,557)
Death year + 3	-11,998***	-13,691***	-12,779***	-14,696***
	(1,889)	(2,466)	(1,862)	(1,900)
Death year + 4	-12,527***	-14,275***	-13,438***	-15,815***
	(2,053)	(2,825)	(2,034)	(2,051)
Death year + 5	-12,131***	-13,368***	-14,556***	-14,369***
	(2,252)	(3,093)	(2,229)	(2,026)
Death year + 6	-13,495***	-17,584***	***	-14,958***
	(2,428)	(3,292)	(2,416)	(1,778)

Notes: column 1 presents our main FE estimates using the pre-matched sample described in the data section. Columns 2-3 report conditional DID estimates using nearest neighbor mahalanobis-metric matching with Abadie and Imbens (2006) heteroskedasticity robust standard errors. Column 4 presents conditional DID kernel matching estimates using the epanechnikov kernel with bandwidth 0.001 and standard errors obtained using bootstrap (99 replications). The outcome in column 1 is labor income in SEK and in columns 2-4 the difference in labor income in SEK between average pre child loss income and the labor income in the death year, one year after the child loss and so on. The rows in columns 2-4 present separate matching estimates. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-3: Heterogenous effects by gender of the child

	(1) Mothers Boy death	(2) Mothers Girl death	(3) Fathers Boy death	(4) Fathers Girl death
Death year	-16,212***	-14,839***	-14,817***	-15,299***
	(1,476)	(2,440)	(2,181)	(3,942)
Death year + 1	-18,774***	-22,464***	-13,120***	-17,734***
	(1,842)	(3,170)	(2,868)	(5,962)
Death year + 2	-16,590***	-13,135***	-15,773***	-10,006*
	(1,982)	(3,478)	(3,006)	(5,832)
Death year + 3	-13,174***	-9,254**	-10,235***	-8,445
	(2,171)	(3,724)	(3,232)	(6,167)
Death year + 4	-11,845***	-13,199***	-11,621***	-16,308**
	(2,345)	(4,106)	(3,419)	(6,502)
Death year + 5	-12,383***	-9,552**	-4,869	-17,372**
	(2,587)	(4,399)	(4,554)	(7,360)
Death year + 6	-13,731***	-15,416***	-11,972***	-17,274**
	(2,805)	(4,843)	(4,260)	(7,907)
# observations	156,231	54,109	132,416	48,130
# individuals	14,806	5,115	12,606	4,554

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-4: Heterogenous effects on labor income by number of children

	(1) Mothers One	(2) Mothers Two	(3) Mothers Three or more	(4) Fathers One	(5) Fathers Two	(6) Fathers Three or more
Death year	-13,264***	-18,242***	-14,792***	-16,035***	-18,104***	-12,472***
	(2,605)	(2,109)	(1,957)	(4,854)	(2,915)	(2,691)
Death year + 1	-15,250***	-24,074***	-19,015***	-14,330**	-18,336***	-15,040***
	(3,233)	(2,707)	(2,409)	(5,800)	(3,516)	(4,507)
Death year + 2	-10,200***	-18,790***	-15,644***	-10,163	-18,572***	-17,046***
	(3,641)	(2,833)	(2,661)	(6,364)	(4,041)	(4,560)
Death year + 3	-6,753	-14,538***	-12,699***	-8,163	-13,276***	-9,513**
	(4,222)	(3,002)	(2,906)	(6,285)	(4,626)	(4,693)
Death year + 4	-6,573	-16,417***	-13,320***	-2,788	-19,797***	-12,299**
	(4,535)	(3,240)	(3,179)	(6,496)	(5,095)	(4,833)
Death year + 5	-4,360	-16,982***	-12,209***	2,111	-17,585***	-5,529
	(4,948)	(3,552)	(3,480)	(7,280)	(5,875)	(6,595)
Death year + 6	-2,675	-17,223***	-17,432***	1,497	-24,992***	-8,550
	(5,376)	(3,835)	(3,814)	(7,770)	(6,361)	(5,832)
# observations	38,561	81,776	90,013	31,503	69,117	79,825
# individuals	3,641	7,755	8,525	3,003	6,578	7,579

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-5: Heterogenous effects on labor income by gender and gender composition. Families with two kids

	(1) Boy death with brother	(2) Boy death with sister	(3) Girl death with brother	(4) Girl death with sister
Mothers				
Death year	-16,674***	-16,856***	-18,583***	-16,765***
	(3,956)	(3,201)	(4,840)	(6,231)
Death year + 1	-14,658***	-20,949***	-32,248***	-37,284***
	(4,905)	(4,058)	(6,071)	(9,268)
Death year + 2	-9,267*	-16,405***	-27,663***	-24,676**
	(5,117)	(4,114)	(6,511)	(10,286)
Death year + 3	-5,445	-14,939***	-17,266**	-13,847
	(5,756)	(4,273)	(7,310)	(9,272)
Death year + 4	-12,626**	-13,511***	-8,121	-25,077**
	(5,782)	(4,899)	(7,788)	(10,369)
Death year + 5	-13,354**	-17,286***	-4,002	-24,802**
	(6,619)	(5,254)	(7,926)	(11,614)
Death year + 6	-10,927	-16,250***	-10,327	-24,048*
	(7,023)	(5,620)	(9,584)	(12,388)
# observations	26,675	33,108	12,576	9,438
# individuals	2,552	3,113	1,188	902
Fathers				
Death year	-21,871***	-17,065***	-24,679***	3,292
	(5,455)	(4,128)	(8,357)	(7,835)
Death year + 1	-21,313***	-14,076***	-19,878**	-4,313
	(6,903)	(4,836)	(10,087)	(8,756)
Death year + 2	-25,513***	-16,932***	-21,923**	7,149
	(7,283)	(5,699)	(9,773)	(10,947)
Death year + 3	-24,459***	-11,094*	-22,805*	12,814
	(8,416)	(6,537)	(13,374)	(11,888)
Death year + 4	-26,230***	-22,292***	-28,891**	7,545
	(9,327)	(7,262)	(14,036)	(12,527)
Death year + 5	-22,534**	-16,674*	-36,309**	7,959
	(9,299)	(9,798)	(15,268)	(15,334)
Death year + 6	-28,041***	-28,627***	-33,033*	-16,097
	(10,795)	(9,208)	(18,868)	(18,053)
# observations	21,925	28,256	10,042	9,037
# individuals	2,090	2,684	946	858

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-6: Heterogenous effects on labor income by gender and age of the child

	(1) Boy 1-10	(2) Boy 11-20	(3) Boy 21-24	(4) Girl 1-10	(5) Girl 11-20	(6) Girl 21-24
Mothers						
Death year	-19,981***	-17,398***	-14,780***	-17,813***	-15,205***	-13,249***
	(3,287)	(2,174)	(2,499)	(6,478)	(3,048)	(5,021)
Death year + 1	-31,867***	-17,432***	-16,598***	-20,361***	-23,879***	-19,074***
	(4,202)	(2,823)	(2,937)	(7,200)	(4,154)	(6,498)
Death year + 2	-36,937***	-11,269***	-15,840***	-16,204*	-16,375***	-6,611
	(4,592)	(2,970)	(3,152)	(9,494)	(4,427)	(6,700)
Death year + 3	-35,093***	-6,890**	-13,554***	-18,953**	-11,909**	1,827
	(4,979)	(3,166)	(3,612)	(9,323)	(4,729)	(8,122)
Death year + 4	-22,784***	-6,389*	-17,214***	-21,592**	-14,199***	-8,809
	(5,665)	(3,487)	(3,708)	(9,557)	(5,162)	(9,383)
Death year + 5	-20,279***	-9,106**	-16,603***	-21,944**	-8,469	-11,751
	(5,974)	(3,841)	(4,183)	(9,278)	(5,652)	(10,206)
Death year + 6	-20,552***	-10,230**	-17,342***	-24,902**	-12,394**	-12,855
	(6,419)	(4,178)	(4,467)	(10,721)	(6,312)	(10,362)
# observations	25,277	71,415	59,681	10,294	31,214	12,628
# individuals	2,387	6,776	5,643	968	2,959	1,188
Fathers						
Death year	-26,340***	-13,471***	-11,721***	-11,766*	-14,320***	-10,677
	(4,971)	(3,209)	(3,742)	(6,394)	(4,528)	(7,200)
Death year + 1	-26,969***	-10,476***	-13,421***	-28,928	-19,819***	-116
	(8,092)	(3,590)	(5,144)	(20,458)	(5,535)	(7,825)
Death year + 2	-29,859***	-12,770***	-15,039***	-30,158	-9,137*	-15,410
	(7,506)	(4,299)	(5,060)	(20,758)	(5,541)	(13,053)
Death year + 3	-8,779	-7,676*	-13,981**	-24,628	-8,188	-8,288
	(8,128)	(4,529)	(5,531)	(19,671)	(6,310)	(13,000)
Death year + 4	-16,091*	-7,475	-15,706***	-27,776	-15,058**	-23,310
	(8,719)	(4,910)	(5,632)	(18,763)	(7,221)	(15,611)
Death year + 5	825	-1,836	-9,066	-34,485	-20,154***	-11,941
	(15,215)	(6,064)	(6,400)	(21,671)	(7,803)	(15,153)
Death year + 6	-8,495	-14,309**	-8,736	-21,781	-21,280**	-17,600
	(11,631)	(6,084)	(7,015)	(22,067)	(8,524)	(16,476)
# observations	23,735	60,878	47,831	10,246	27,764	10,055
# individuals	2,255	5,797	4,554	968	2,640	946

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-7: Heterogenous effects on labor income by order of child

	(1) Mothers Death last born	(2) Mothers Death first born	(3) Fathers Death last born	(4) Fathers Death last born
Death year	-17,739***	-17,944***	-15,626***	-17,483***
	(3,049)	(2,159)	(3,588)	(3,133)
Death year + 1	-22,339***	-22,108***	-23,949***	-15,756***
	(3,827)	(2,798)	(7,246)	(4,211)
Death year + 2	-18,238***	-17,378***	-23,668***	-15,387***
	(3,883)	(3,060)	(8,041)	(4,198)
Death year + 3	-19,426***	-11,023***	-18,593**	-12,633**
	(3,953)	(3,314)	(8,040)	(4,981)
Death year + 4	-16,947***	-14,030***	-20,779***	-19,171***
	(4,230)	(3,588)	(8,045)	(5,290)
Death year + 5	-18,812***	-13,275***	-18,866**	-15,772**
	(4,933)	(3,824)	(8,857)	(6,275)
Death year + 6	-22,270***	-14,071***	-18,958**	-28,117***
	(5,503)	(4,188)	(9,515)	(6,413)
# observations	42,053	76,797	34,665	65,250
# individuals	3,982	7,271	3,289	6,204

Notes: FE estimates for labor income in SEK using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

Table A-8: Long-term effects on labor income of having a child involved in a non-fatal accident

	(1) Mothers	(2) Fathers
Accident year	-4,974.8***	-3,228.3***
	(254.6)	(431.9)
Accident year + 1	-4,446.9***	-2,018.7***
	(295.0)	(528.2)
Accident year + 2	-3,163.9***	-1,242.4**
	(328.9)	(582.1)
Accident year + 3	-3,164.9***	-2,013.7***
	(364.3)	(643.3)
Accident year + 4	-3,419.0***	-1,937.6***
	(398.8)	(711.5)
Accident year + 5	-3,544.4***	-2,133.3***
	(435.2)	(761.3)
Accident year + 6	-4,106.2***	-1,736.4**
	(475.9)	(816.9)
# observations	5,232,069	4,806,108
# individuals	492,459	453,453

Notes: FE estimates using the pre-matched sample described in the data section. The models also include calender time fixed effects. Robust standard errors in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels.

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