# Parental job loss and child human capital in the short and long run

## An analysis of workplace closures 1995–2000

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by

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## Abstract

We study the effects of parental job loss on children's health, educational achievement and labor market success as young adults. Past evidence shows mixed results which could be due to small sample sizes and that workers who suffer job loss are a selected group. Using Swedish register data, including more than 140,000 children whose parents were displaced due to workplace closures, and conditioning on a wide set of pretreatment outcomes of both parents and children, we find no effects of parental job loss on childhood health, school performance or outcomes as young adults although parents are negatively affected.

**Keywords**: Parental unemployment, workplace closure, child health, human capital formation
**JEL-codes**: I12, J1

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# 1    Introduction

In a globalized, competitive world, firm startups and closures are an integral part of the process of economic growth and restructuring, generating overall gains. Nevertheless, some individuals are clearly on the losing side in this restructuring process as their jobs disappear. Earlier empirical work has shown that experiencing a job loss has negative long-term consequences for affected workers' future employment, earnings, health and marriage stability.[1] Given that financial resources as well as the quantity and quality of parental care are important inputs in shaping the human capital of children, some of the burden of this restructuring process may also be transmitted to the children of affected workers. The purpose of this paper is to examine whether this is indeed the case. Developing a better understanding of how negative labor market shocks affect children is necessary if we are to develop policies that adequately support the human capital development of children.

There exists an extensive earlier literature analyzing how parental job loss affects children's health, educational achievement and labor market success, but this literature has produced mixed results. One explanation for these mixed findings could be that there are several methodological challenges that need to be addressed, and earlier work differs in how it has tackled these challenges.[2]

Most earlier studies from the US and Canada (see, e.g., Schaller and Zerpa, 2015, Brand and Thomas, 2014, Wigthman, 2012, Lindo, 2011, Coelli, 2011, Stevens and Schaller, 2011 and Page et al., 2009) have relied on survey data. This is also the case in Bubonya et al. (2017), who use Australian data, Peter (2016), who uses German data, Ruiz-Valenzuela (2015), who uses Spanish data and Liu and Zhong (2014), who use Chinese data. Because surveys are, by nature, limited to a small number of respondents, these studies have struggled with small sample sizes, which have consequences for how treatment is defined. Analyzing the causal effects of job loss, one would ideally like to observe workers who have experienced job loss as a result of an exogenous chock, but at the same time, one needs a sufficient number of children who have experienced parental job loss. As a compromise between these two goals, many earlier studies have focused

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[1] See for example, Jacobsen et al. 1993; Stevens 1997; Eliason and Storrie, 2009a; Sullivan and von Wachter, 2009; Eliason, 2011.

[2] Table A 1 in the Appendix gives a summary of research questions addressed, as well as well as methodological choices and main findings of earlier studies that have analyzed how parental job loss affects children's short and medium run outcomes.

on cases where a parent has suffered an involuntary job loss, resulting from either firm closure or dismissals, where the latter is likely endogenous to factors related to productivity and health. Whereas Schaller and Zerpa (2015) report that their results are robust to focusing only on job loss due to firm closures, Page et al. (2009) find that their results are sensitive to the definition of displacement. Furthermore, even when focusing on both types of involuntary job loss, the limited sample sizes still restrict the ability to obtain precise estimates.

Oreopoulos et al. (2008), Bratberg et al. (2008) and Rege et al. (2011) instead rely on register data from Canada and Norway, which enables a focus solely on job loss due to firm or plant closures and at the same time makes it possible to obtain larger samples. Another advantage with register data is that it avoids problems with recall errors and non-responses. However, even though job loss due to firm closure is arguably more exogenous than dismissal, it is possible that firms that close are different with respect to worker characteristics, as has been shown in earlier Nordic studies analyzing the effects of plant closures on displaced workers' outcomes (see, e.g., Browning et al., 2006; Eliason and Storrie, 2009a, b). To control for selection, these studies have used propensity score matching with a battery of covariates, including lagged worker outcomes, to obtain comparative treatment and control groups. Hilger (2016) highlights the problems that arise when controlling for selection in the analysis of long-run outcomes that cannot be observed prior to parental job loss, such as educational achievements and labor market success. By relying on US register data on federal tax returns and by studying the effects of paternal job loss on children's educational outcomes and early career earnings, he shows that it is necessary to combine matching with a difference-in-differences approach to fully account for that fact that children whose fathers experience job loss differ from other children. Hence, it is uncertain to what extent earlier work on the effects of parental job loss on children has managed to control for all relevant differences between children with displaced parents and other children, especially in cases where the analyzed outcome cannot be observed before exposure to parental job loss.[3] A general pattern is that the

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[3] Both the papers utilizing survey data when analyzing effects of involuntary job losses and the papers utilizing register data when analyzing effects of firm closures apply different strategies in order to control for selection, including controlling for family pre-displacement earnings or parental or child fixed effects. In addition, several studies have conducted different types of placebo experiments where the effects of future job loss are analyzed. See column 6 in Table A1 in the Appendix for a detailed description.

effects on worker and child outcomes are smaller in studies controlling for lagged outcome variables.

A further challenge is how to measure health outcomes. Most previous papers studying the health outcomes of children whose parents experience involuntary job loss rely on survey data. Whereas Lindo (2011) and Liu and Zhao (2014) study outcomes that are easily measured (Lindo: birth weight; Liu and Zhao: height and weight for age), Bubonya et al., Schaller and Zerpa and Brand and Thomas all focus on health measures that are more subjective, especially when reported by parents (Schaller and Zerpa, however, also study health insurance coverage and health care utilization). An exception is Mörk et al. (2014), who study effects of parental unemployment on registered hospitalizations rather than effects of job loss. Relying on health measures reported by parents is problematic if parents' evaluations of their children's health are affected by parental job loss. For example, parents who are themselves experiencing worse health may also believe that their children are experiencing similar problems. It could also be the case that spending more time with the child affects parents' attention to different health problems. As a result, it is not clear to what extent the differences found in earlier studies reflect genuine differences in child health.

The aim of this paper is to study the consequences of parental job loss on health, educational and labor market outcomes for both children and their parents. Similar to Bratberg et al., Rege et al., Hilger and Oreopoulos et al., we have access to rich administrative register data, in our case from Sweden, allowing us to link parents and children, employees and workplaces and to identify workplaces that have been closed down. We also have access to register data on mortality, hospitalizations, earnings, unemployment spells, social assistance for both children and parents, school outcomes for children, household disposable income and family stability. Not having to rely on survey data has several advantages: we do not have to rely on self-reported reasons for job loss but can identify genuine workplace closures. We can also follow individuals over an extended period of time, from childhood into young adulthood, and we have access to a relatively large population, which is important when analyzing relatively rare events such as workplace closures. Observing all workplace closures in Sweden during the period 1995–2000 gives us a total of 141,533 children experiencing maternal or paternal job loss (56,509 maternal and 85,024 paternal).

The health outcomes that we study, mortality and hospitalization, have not previously been analyzed for children whose parents experience job loss due to plant/firm closures. An important strength of these register-based health measures is that they are in some sense objective and unlikely to suffer from the self-serving biases discussed above. When interpreting the results, however, it is important to keep in mind that the measures of health used in this study capture relatively severe negative health conditions rather than milder illnesses. While this means we are focusing on conditions that are more likely to have long-run consequences for the children, it also means we may miss detecting less severe health effects. In addition, mortality is, thankfully, a very rare event among children and young adults, which may lead to problems with statistical power in spite of large samples.

Following earlier Nordic studies analyzing the effects of plant closures (e.g., Browning et al., 2006; Eliason and Storrie, 2009a, b), we apply propensity score matching to account for non-random matching of workers to workplaces. We match on a wide set of conditioning variables, including pre-displacement health outcomes of both children and parents. We apply an event-study approach when studying effects on hospitalization, where we compare hospitalization rates of children who experience parental job loss to hospitalization rates for a matched sample of children whose parents work in workplaces that will not be closed, both before and after job displacement, making it possible to validate the identifying assumption of no pre-displacement effects. When analyzing outcomes that are not observable in the pre-displacement period, such as educational and labor market outcomes for children, we conduct placebo analyses comparing outcomes in the years preceding the job loss for children whose parents' workplaces later close down with outcomes of children whose parents' workplaces do not close down.

We contribute to the existing literature in several ways. In addition to addressing a number of methodological challenges, we study several outcomes for both parents and their children. We are thus able to present a more complete picture of what happens in the family, and we can assess the consequences of parental job loss for the human capital accumulation of children more fully than earlier studies, which have mostly focused on either adults or children and on either health or educational outcomes. Furthermore, we analyze a Scandinavian context where, compared to other settings (i) the financial consequences of job loss may be less severe due to generous unemployment insurance

and free health care and education, and (ii) the strong dual earner norm together with individual taxation and high marginal tax rates may put greater stress on displaced mothers to find new employment.

Similar to earlier Swedish studies, we find that job displacement among Swedish parents leads to lower future earnings and lower household income as well as worse parental health, particularly increased mortality for fathers and increased hospitalizations due to mental health problems and alcohol-related diagnoses for mothers. However, these negative consequences do not seem to spill over to child health. Parental job loss due to workplace closures has no statistically significant effects on the likelihood of child hospitalization or mortality over a ten-year follow-up period. The analysis of education and labor market performance, in which it is not possible to match lagged child outcomes, indicates that the estimated effects may be driven by negative selection of affected families. In particular, the performance of children with displaced and non-displaced parents differs both before and after workplace closure in spite of matching on a wide set of covariates, and the point estimates vary from year to year.

The rest of the paper is organized as follows: First, we discuss the channels through which parental job loss may affect child well-being and human capital accumulation, and we review the literature on job loss and child outcomes. Second, we provide a short description of the Swedish institutional setting. Thereafter, we present the data and empirical strategy before turning to the results. Finally, we summarize and discuss our findings.

## 2    Parental job loss and child human capital: theory and previous findings

When considering how parental exposure to job loss affects child human capital, both in the short and the longer run, it makes sense to take a child human capital production function as a point of departure. The main inputs in such a production function are parenting and parental care, consumption of market goods and services, and publicly provided goods and care, such as schooling and preventive health care programs as well as other forms of publicly provided human capital investments in school or otherwise. The child's stock of human capital, i.e., previous health condition, genetic disposition and

other cognitive and non-cognitive skills, is also an input in the production function (see, for example, Almond and Currie, 2011).

When a parent loses his/her job, it affects the inputs in the production function in a number of ways. The first and perhaps most immediate effect is lost earnings, which in turn is likely to directly affect the families' consumption of market goods and services. There is also vast empirical evidence that workers whose plants close experience lasting negative effects on earnings and increased unemployment (see, e.g., Eliason and Storrie, 2006; Bratberg et al., 2008; Hilger, 2016).

A second channel through which job loss might affect child human capital development is through the quantity and quality of parental care and parenting. A parent who loses his/her job may initially have more time to spend with the child and, for example, have more time to help with homework, engage in preventive health care, etc. However, the financial distress caused by lost earnings and lost labor market attachment may cause stress and poor health and thereby have a negative impact on the home environment and parenting, thus reducing the quality of the time spent with children (see Conger and Conger, 2007). Depending on the extent to which mothers and fathers differ in how they choose to spend these extra hours with their children, we might expect maternal job loss to have different effects than paternal job loss. Gender norms and gender differences in labor market attachment are likely to influence how displaced mothers and fathers reallocate their time.

Earlier empirical evidence shows that plant closures indeed hurt displaced workers' health in ways that could affect their ability to parent and care for their children, i.e., by increasing alcohol-related illness and reducing mental health (see, e.g., Eliason and Storrie, 2009b; Browning and Heinesen, 2012; Kuhn et al., 2009)[4]. In addition, there is even evidence of increased mortality among displaced workers (Eliason and Storrie, 2009a; Eliason, 2014; Browning and Heinesen, 2012).[5] Parental job displacement may also adversely affect children by causing family dissolution (see, e.g., Eliason, 2012; Huttunen and Kellokumpu, 2016). Hence, there are theoretical arguments that parental job loss may affect children's outcomes, but it is not clear in which direction.

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[4] There are also several studies on U.S. and Canadian data, see, e.g., Schaller and Stevens (2015) and Strully (2009).
[5] However, the finding of increased mortality among displaced workers is not supported by evidence from Finland; see Martikainen et al. (2007). Note that the Finnish study uses a somewhat different empirical strategy and does not distinguish among different causes of death.

As mentioned in the introduction, earlier evidence on child outcomes is mixed, which could reflect the different ways in which methodological challenges have been handled. Therefore, some caution is warranted when interpreting the results. Several studies have shown that parental job loss is associated with worse health outcomes. Lindo (2011) finds a 4–5 percent decline in birth weight for U.S. children born to mothers whose partner experienced job loss during pregnancy. Hong Liu and Zhong Zhao (2014), studying Chinese children, find a decline in height- and weight-for-age with 0.3–0.4 standard deviations in case of paternal job loss. The estimates for maternal job loss are smaller and not statistically significant. Using U.S. data, Schaller and Zerpa (2015) instead study parental reported health conditions and find that both paternal and maternal job loss result in reductions in parent ratings of children's physical and mental health. However, whereas paternal job loss increases the incidence of anxiety and depression (in families with low socioeconomic status (SES), also the incidence of injuries), maternal job loss instead reduces the incidence of infectious illness among high-SES families. [6] Mörk et al. (2014) do not study the effects of involuntary job loss but instead focus on the effects of parental unemployment using Swedish register data. Comparing the same child in years when both parents work with years when at least one parent is unemployed, they find that parental unemployment is associated with an immediate increase in hospitalization, with 1 percent and a 5 percent increase in the long run. Moreover, maternal job loss seems to be more detrimental to health than does paternal job loss.

Analyzing schooling outcomes, Rege et al. (2011) find that Norwegian children suffer from paternal job loss (grade point average is reduced by 6 percent of a standard deviation) but gain form maternal job loss (although the latter positive effect is not statistically significant). Additionally, Stevens and Schaller (2011) find negative effects on schooling outcomes when U.S. fathers (or mothers in case of single-household families) are displaced; the likelihood of grade retention increases by 15 percent as a result of job loss. Finally, Bratberg et al. (2008) and Hilger (2016) find negligible or no effects on the future earnings of children of parental job loss when analyzing Norway and

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[6] Using U.S. data and a shift-share approach, Page et al (2017) investigate how gender-specific labor demand shocks affect (parental reported) general child health as well as the prevalence of a number of specific conditions such as asthma, ear infections, injuries and emotional difficulties. They find that better labor market conditions for women are detrimental to child health, whereas worse labor market conditions for men instead improve child health.

the U.S.[7] We will return to these earlier findings and relate them to our findings later in the paper.

## 3    The Swedish setting

The way in which the financial and psychological strain caused by parental job loss is passed on to children is likely to depend on institutional factors such as the presence of unemployment insurance, active labor market programs, childcare arrangements, and the organization of schools and health care. This section will therefore present some institutional details about the Swedish system that are likely to influence how children are affected by parental job loss.

First, it is worth noting that the dual income earner norm is strong in Sweden. Individual taxation, high marginal tax rates, and earnings-related benefits for sick leave, parental leave and pensions provide strong economic incentives for both spouses to contribute to the family income. Labor force participation is consequently high among both men and women, including parents. Lundin et al. (2008) show that even among mothers of pre-school aged children, 75–80 percent are employed. Yet, far from all mothers work full time.[8]

To enable high labor force participation, subsidized, high-quality childcare is provided by local governments. In the middle of the 1990s, which is the time period when the job losses we study occurred, approximately 50 percent of 1–2 year olds and 70 percent of 3–6 year olds attended publicly provided childcare (Lundin et al., 2008). However, in many municipalities, childcare and after-school care slots were reserved for children whose parents were working, and it was up to the municipality to determine whether children were allowed to keep their child care slot if parents became unemployed. Losing access to high quality childcare was thus also a possible consequence of parental job loss

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[7] Oreopoulos et al. (2008) find significant negative effects on future earnings of experiencing paternal job loss as a child, but the findings in Hilger (2016) indicate that their estimates are likely to be biased by selection. Note that the same problem might also be present in Bratberg et al. (2008).

[8] Although there is strong emphasis on gender equality, Swedish women carry a greater responsibility for parenting and household work. According to the Swedish time use survey in 1990, mothers of small children in two-parent households did over seven hours of household work per day while fathers did fewer than four hours. Out of that time, mothers spent 2h 45m caring for and parenting children, and fathers spent 1h 10m. As a comparison, Guryan et al. (2008) report that U.S. mothers of young children in 2004 spent on average 21h per week on child-related activities, while fathers spent 9h 40m.

in the mid-1990s in Sweden. Moreover, parents may also opt not to have the child in childcare to reduce costs.

Second, access to schools, higher education or high-quality health care does not determine families' financial resources. There are no school fees in Sweden, and school lunches are provided free of charge in compulsory school (ages 6–16) and high school (ages 17–19). University tuition is free, and subsidized student loans are available for all students. In addition, health care in Sweden is free of charge for children and is heavily subsidized for adults. Moreover, during the studied period, unemployed workers were typically covered by unemployment insurance benefits with a replacement rate of 80 percent of lost earnings up to a ceiling. These quite generous replacement rates were combined with an active labor market policy, requiring recipients of unemployment benefits to take part in labor market programs. Unemployed individuals with very low unemployment benefits or individuals who did not qualify for unemployment benefits had to turn to the municipalities and apply for social assistance if in need of financial support. Social assistance was means-tested at the household level, and to receive assistance, the household could not have any other means of supporting themselves. The municipalities typically required recipients to take part in activation programs to receive assistance.

There are reasons to believe that the presence of generous unemployment insurance and free access to health care and education limit the financial stress that Swedish families suffer when a parent loses a job. However, a strong dual worker norm may imply that both mothers and fathers are likely to experience the stress imposed on parents who lose their roles as providers and their identity as workers. Because unemployment insurance and social assistance are conditional on actively seeking employment or participating in other activation programs, the time that can be reallocated toward household work or parenting may be limited. In addition, parental unemployment is likely associated with the loss of high quality childcare. It is therefore possible that the positive effects of maternal job loss found in, e.g., Rege et al. (2009) and Schaller and Zerpa (2015), may not be present in the Swedish case.

# 4 Empirical approach

We study the effects of parents' job loss on child health and family outcomes. By focusing only on job loss due to workplace closure, we reduce the selection problem, i.e., that the job loss is due to worker characteristics, which may also be correlated with their children's outcomes. The argument is that the closing down of a workplace is close to a natural experiment because all workers are separated from their job regardless of personal characteristics. However, there may be important differences between workers (and their children) who work at workplaces that later close down and those at workplaces that do not. For example, it may be the case that closing workplaces are concentrated in certain regions or industries or that workplaces with low-productivity workers are more likely to close down. If workers and their children in these regions, industries or firms have worse health or will have worse health in the future, then the estimated effects of parental job loss will be biased in a direction that exaggerates the impact of workplace closures.

## 4.1 Empirical strategy

Following, e.g., Browning et al. (2006) Eliason and Storrie (2009a, b), we will use propensity score matching to create a control group that is as similar as possible to the treatment group. When estimating the propensity score, it is important to include all confounders that are likely to affect both the probability of being exposed to a workplace closure and the outcome. Because we have access to rich panel data, we estimate the propensity score including pre-closure measures (measured two or three years before the potential job loss) of the outcomes of interest, such as various income measures, health of worker and child, and whether the biological parents lived together before the job loss. We also include covariates describing the other parent and the child because they may be correlated with relevant unobservable characteristics of the worker.[9] A complete list of the variables and definitions can be found in Appendix Table A 2 and Table A 3, respectively.

We estimate ATET for each year from the workplace closure up to ten years after closure. As a placebo, we also provide estimates for up to eight years before closure. For some outcomes, we also aggregate years into pre- and post-treatment periods. For the

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outcomes that cannot be observed prior to parental job loss, we estimate pre-closure effects using children whose parents will be displaced in the future as a placebo.

## 4.2    Data

The data base on which we build the empirical analysis combines individual-level register data from the following sources: the in-patient hospital discharge and causes-of-death registers provided by the National Board of Health and Welfare; the population register, education register, tax registers and workplace register[10] provided by Statistics Sweden; and the unemployment registers provided by the Public Employment Service's register of job-seekers. Variables include individual demographic information (sex, age, family indicator); socio-economic information (education level, earnings from work, total income and income from social assistance); health (hospitalization, all causes and special diagnoses, mortality); and workplace information (size, industry, county); as well as information about workplaces that close. Our data include information on individuals aged 0–18 during the years 1987–2010 and information on their (biological) parents.

### 4.2.1    Structure of sample

Our sample consists of children whose parents were employed at workplaces at risk of closing in 1995–2000. These years are chosen to allow for a long follow-up period of effects on both children and parents, while also allowing us to study measures of pretreatment outcomes. We define *t* as the base year when a workplace is potentially closed. For each base year, we include children who are at least two years old and at most 18 years old when the parents potentially experience a workplace closure. We restrict our sample to children whose parents worked at the same workplace in both period *t-2* and *t-3* and to workplaces with least ten employees in the year of the potential closure. We exclude workplaces with less than ten employees because it is more likely that the individual worker characteristics may be causing the firm to close down. To retain 'early leavers' in the sample, we do not condition working at the same workplace at *t-1*, the year directly before the potential closure. Early leavers are potentially a selected group. They may, on the one hand, have many options on the labor market and thus be able to find

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[10] In order to follow firms and workplaces, Statistics Sweden has constructed a database on firm dynamics called 'The database on dynamics of enterprises and establishments', where they have carefully investigated changes in order to correctly categorize firm and workplace closures and separate true closures from mergers and other organizational changes.

other employment in anticipation of the closure. On the other hand, early leavers may have unobserved characteristics, making them the first to be let go if the workplace is downsized prior to closure.

A workplace is defined as closing in year *t* if it is categorized as closed down between year *t* and *t+1*. A child is considered treated if the parent worked at a workplace that was closed. We append the sample for all base years 1995–2000. [11] As discussed above, a requirement for inclusion in the sample is to have worked at the workplace in *t-2* and *t-3*, but we do not put any restrictions on what happens in the following periods. Thus, we compare outcomes for children with displaced parents with the outcomes of children whose parents may or may not lose their job in the future. After restricting the sample to children for whose parents we have information on the covariates used in the matching as well as information on outcome variables, we are left with 56,509 children whose mothers experience job loss and 85,024 children whose fathers experience job loss. For the children whose parents' workplace is not closed, we draw a random sample of 25 percent of the population on which we conduct the matching procedure to find our comparison group. The children and their parents are followed, for some outcomes, as far back as 8 years before the possible job displacement and up to 10 years after. This implies that the children at the end of the observed period are 12–28 years old.

### 4.2.2 Outcome variables

Our main objective is to study how job displacement due to workplace closure affects human capital development and, more specifically, child health, school outcomes and outcomes as young adults. To capture health, we rely on two different measures. First, we study to what extent children of displaced parents die prematurely (*mortality*). Death is arguably an extreme measure of health but is nevertheless an objective measure. Fortunately, very few young people die; however, this also means that mortality is less likely to capture any health effects. Second, we study hospitalizations. We investigate whether a child has been hospitalized for *any* diagnosis (except pregnancy/child birth) during the year (*hospitalization*). We also study particular health problems that could be a result of parental neglect or a stressful family environment, including (i) diagnoses related to conditions where hospitalization is avoidable if a child is given sufficient

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[11] 1.35 percent of the children have a displaced mother and 1.74 percent of the children have a displaced father.

preventive care (*avoidable*),[12] and (ii) diagnoses related to mental illness, alcohol-related conditions, self-harm or exposure to abuse (*mental and behavior*).[13] We also construct aggregate indicators of hospitalization for whether a child is hospitalized in any year 2–4 years prior to and during the ten-year period following parental job loss. We do this for any diagnoses and for the specific diagnoses.

A concern is whether our hospitalization measures capture poor health or whether they capture demand and availability of health care. The existing evidence from Sweden shows that unemployed adults are less likely to seek care compared to employed adults, given the same level of self-assessed health (Burström, 2002; Åhs and Westerling, 2006). Whether this is also the case for children has not been studied. The likelihood of being admitted, given a specific health condition, may vary with social status. As health care for children is heavily subsidized in Sweden, differences in financial resources should not affect the probability of being admitted. Moreover, earlier studies (see, e.g., Mörk et al., 2014) have shown that our hospitalization measures are strongly negatively correlated with family income. It is thus not the case that children with wealthy parents in general consume more health care.

Next, we study educational outcomes for children of compulsory and high school-leaving age. To measure performance in compulsory school, we use the grade point rank in the national distribution in the final year (GPA) at age 16. We also investigate whether the child has completed at least three years of high school at age 20 (high school). Finally, we look at outcomes as young adults, more specifically, whether the young adults, at ages 20–23, experience any unemployment (unemployed)[14] or live in a household that received social assistance (SA).

To explore possible pathways and mechanisms and to investigate how the effects of job displacement on our sample of parents compare to findings in other studies, we

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[12] Avoidable conditions, sometimes referred to as ambulatory care-sensitive conditions, are conditions which should not be cause for hospitalization if properly cared for at an early stage. These conditions can be divided into three categories: conditions that can be prevented through vaccination; selected chronic conditions that can be managed by pharmaceuticals, patient education and lifestyle; acute conditions for which hospitalization is commonly avoidable with antibiotics or other medical intervention. The frequency of avoidable conditions has been used as a measure of quality of primary care as well as in research. Billings et al. (1993) for example study the association between socioeconomic status and hospitalization rates due to avoidable conditions among communities in the U.S. We use the definition of avoidable conditions for children suggested by the Public Health Information Development Unit in Australia (Page et al., 2007).

[13] See Table A2 for a detailed description of the diagnoses, including ICD-codes, used to construct the health measures.

[14] An individual is defined as unemployed if he/she is registered as unemployed or participates in a labor market program at any occasion during the year.

present estimates of the effects of job displacement on unemployment (unemployed), earnings from employment and self-employment (earnings), family disposable income (disposable income), whether the family receives social assistance (SA) and whether the biological parents cohabit or if they live in separate households (separated).[15] We also study effects on parental mortality (mortality), health (using a measure of in-patient care (hospitalization)), and hospitalization for diagnoses connected to excess alcohol consumption (alcohol) or mental health problems (mental).

## 4.3    Descriptive statistics

Table 1 shows summary statistics for children and their parents. We consider children with mothers at a closing workplace, children with fathers at a closing workplace, as well as the 25-percent sample of children whose parents are not displaced. Looking at the figures in the table, we note that there are indeed some important differences between parents who work at workplaces that close and those working at surviving workplaces. There is clear evidence of negative selection in terms of both worker characteristics and the human capital of their children. Children with displaced parents are somewhat younger and have lower GPA rank, and children with displaced mothers are somewhat more likely to be hospitalized. Displaced workers are younger, have a lower education level, are less likely to be born in Sweden, have shorter tenure and are less likely to cohabit with the biological parent. Displaced mothers seem to have worse health compared to mothers who are not exposed to job loss, whereas there are no differences between displaced and non-displaced fathers. Some workers are already registered at the unemployment agency two years before the workplace is closed. Reasons could be that they are part-time unemployed or participating in a labor market program.

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[15] Disposable income is calculated by Statistics Sweden and includes all types of income for all adults in the household.

## Table 1 Summary statistics

| | Workplace not closed | Workplace closed | Difference | (p-value) |
|---|---|---|---|---|
| **Mother sample** | | | | |
| **Child characteristics** | | | | |
| Boy | 1.49 | 1.49 | -0.00 | 0.00 |
| Age | 8.77 | 8.55 | 0.22 | 0.00 |
| Hospitalization | 45.25 | 46.29 | -1.04 | 0.25 |
| Mental and behavior | 1.56 | 1.82 | -0.26 | 0.13 |
| Avoidable | 6.29 | 6.65 | -0.37 | 0.28 |
| GPA rank | 53.05 | 50.16 | 2.89 | 0.00 |
| **Mother characteristics** | | | | |
| Age | 37.95 | 37.49 | 0.46 | 0.00 |
| Compulsory education | 0.12 | 0.16 | -0.04 | 0.00 |
| Secondary education | 0.50 | 0.53 | -0.03 | 0.00 |
| University education | 0.38 | 0.31 | 0.07 | 0.00 |
| Swedish born | 0.90 | 0.88 | 0.02 | 0.00 |
| Separated | 0.18 | 0.22 | -0.04 | 0.00 |
| Tenure | 4.94 | 4.44 | 0.50 | 0.00 |
| Unemployed | 0.06 | 0.09 | -0.02 | 0.00 |
| Disposable income | 366,377 | 362,523 | 3,854 | 0.00 |
| Income | 186,236 | 185,518 | 718 | 0.05 |
| Social assistance | 0.04 | 0.05 | -0.01 | 0.00 |
| Hospitalization | 50.79 | 55.23 | -4.44 | 0.00 |
| Alcohol | 0.56 | 1.08 | -0.52 | 0.00 |
| Mental | 2.26 | 3.06 | -0.80 | 0.00 |
| No obs. | 1,004,172 | 56,509 | | |
| **Father sample** | | | | |
| **Child characteristics** | | | | |
| Boy | 1.49 | 1.49 | -0.00 | 0.93 |
| Age | 7.80 | 7.69 | 0.11 | 0.00 |
| Hospitalization | 52.64 | 52.34 | 0.31 | 0.70 |
| Mental and behavior | 1.61 | 1.54 | 0.07 | 0.62 |
| Avoidable | 8.77 | 8.70 | 0.07 | 0.84 |
| GPA rank | 52.64 | 50.38 | 2.27 | 0.00 |
| **Father characteristics** | | | | |
| Age | 39.20 | 39.01 | 0.19 | 0.00 |
| Compulsory education | 0.19 | 0.20 | -0.00 | 0.01 |
| Secondary education | 0.48 | 0.48 | -0.01 | 0.00 |
| University education | 0.33 | 0.32 | 0.01 | 0.00 |
| Swedish born | 0.90 | 0.89 | 0.01 | 0.00 |
| Separated | 0.16 | 0.17 | -0.01 | 0.00 |
| Tenure | 5.21 | 4.64 | 0.57 | 0.00 |
| Unemployed | 0.06 | 0.09 | -0.03 | 0.00 |
| Disposable income | 368,028 | 368,447 | -419 | 0.93 |
| Income | 304,597 | 301,808 | 2,789 | 0.00 |
| Social assistance | 0.03 | 0.04 | -0.01 | 0.00 |
| Hospitalization | 44.63 | 43.95 | 0.68 | 0.35 |
| Alcohol | 1.61 | 1.55 | 0.05 | 0.71 |
| Mental | 2.81 | 2.67 | 0.14 | 0.45 |
| No obs. | 1,193,596 | 85,024 | | |

Notes: All variables measured in $t-2$. Hospitalization, avoidable, mental and behavior, mental health problems, and alcohol-related problems are measured in persons per 1,000. Tenure is censored at 7 years; unemployment is measured as being registered at the public employment service as unemployed or in an active labor market program. When studying GPA rank, the samples only include individuals who are 16 years old. The samples are smaller and include, when summarizing all years, 3,201 children with displaced mothers and 3,922 children with displaced fathers.

## 4.4 Evaluation of matching

The descriptive statistics presented above show that workplace closures do not hit workers randomly; rather, workers who experience job loss due to a closure are negatively selected. In line with the earlier literature, we use propensity score matching to find a suitable control group; see Table A3 for details of the conditioning set. To the extent possible, we match on pretreatment outcomes of both parents and children. There are a number of requirements that need to be fulfilled for propensity score matching to produce unbiased estimates of the treatment effect: i) selection is on observables rather than unobservables; ii) common support, i.e., for any value of the propensity score, an individual can potentially be observed as treated and not treated; iii) there is balancing of covariates in the control and treatment group. Whereas the first requirement is impossible to formally test, the other two are testable. One way to assess the presence of selection on unobservable characteristics is to estimate placebo models. We do this by investigating whether treated and untreated children and parents also have different outcomes prior to the workplace closure, and we present the estimates in the next section. In Appendix B, we present evidence in support of fulfilling requirements (i) and (ii).

## 5 Results

We start by investigating how parental job loss affects children's health outcomes in the short and long run. Thereafter, we turn to the effects on school performance and outcomes in early adulthood. Then, we turn to an analysis of the effects on the parents themselves to explore possible pathways for how parents' job loss affects their children. We present (graphically) coefficient estimates of the difference between treated and untreated children and parents before and after workplace closure.[16]

## 5.1 The effects of parental job loss on child health

Let us first focus on the most objective and severe measure of health, mortality.[17] Figure 1 plots the estimated coefficient of the effect of parental job loss due to workplace closures on the cumulative difference in deaths per 1,000 children between treated and untreated children for each year up to 10 years after workplace closure. The graph to the

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[16] The estimate for each time period is from a separate estimation. Tables with all estimates are available in the online appendix C.

[17] A methodological weakness is that we cannot condition on lagged value of the outcome in question (people only die once).

left shows the effects of maternal job loss, and the graph to the right shows the effects of paternal job loss. The dark grey area indicates the 90 percent confidence interval, whereas the light grey area indicates the 95 percent confidence interval. For maternal job loss, there is an increase, although not statistically significant, in child deaths. The estimate for paternal job loss is zero.

Figure 1 Effect of exposure to parental job loss on the cumulative number of deaths per 1,000 children from the year of closure and up to 10 years after.
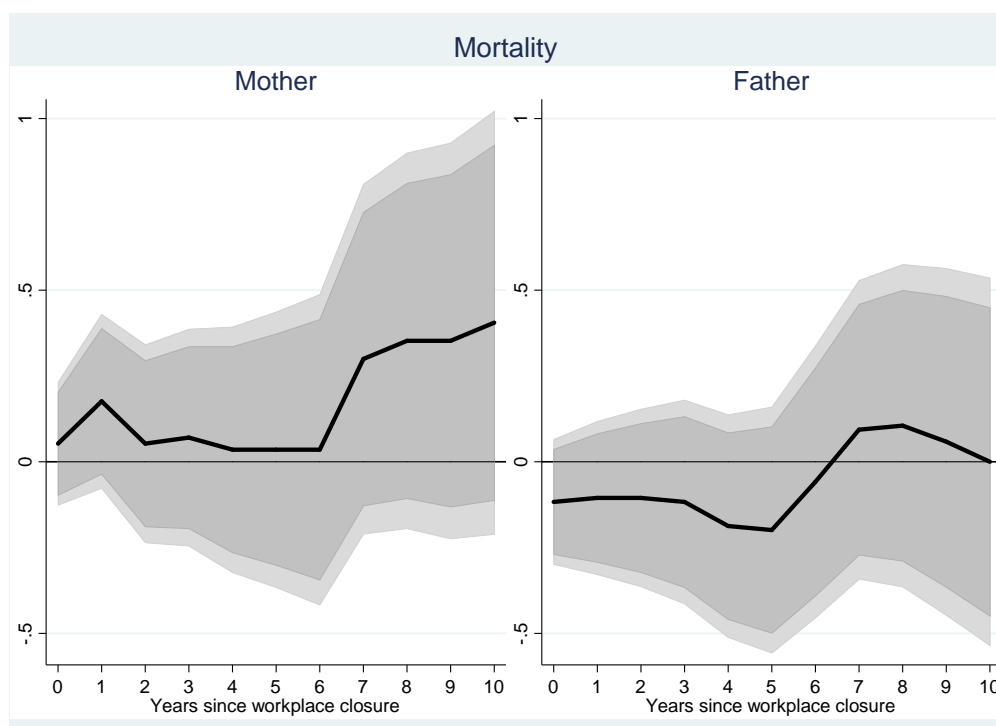


Note: Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors take into account that the propensity score is estimated. The dark grey area indicates the 90 % confidence interval, whereas the light grey area indicates the 95 % confidence interval.

Next, we turn to a less dramatic and a considerably more common event, namely hospitalization. Still, hospitalization is relatively rare; using the matched samples, only approximately 280 out of 1,000 children are hospitalized during the ten-year period following parental job loss. Figure 2 shows event-type graphs, where we show (for eight years before and up to ten years after maternal/paternal job loss) the percentage difference in hospitalizations between the treatment and control group for overall hospitalizations (top), hospitalizations due to avoidable diagnoses (middle) and hospitalizations due to diagnoses related to mental illness, alcohol related conditions, self-harm and exposure to abuse (mental and behavior in the bottom graph). Note that because children in our sample

are 2–18 years old at $t = 0$, the age composition of children will change as we move away from that year, and we know that hospitalization rates differ with respect to child age. As the estimates in Figure 2 show the difference in hospitalization rate between treated and non-treated children and since we condition on child age at $t = 0$ the age compositions in the two groups are the same over the whole period.

Although confidence intervals are rather wide, particularly in the bottom two graphs, we can conclude that there is no sharp increase or decrease in hospitalizations as a parent loses his/her job. Neither is there evidence of a deterioration of or improvement in health over time. The estimates fluctuate, and for maternal job loss, there is a statistically significant decrease in hospitalizations due to any cause, six years after workplace closure and an increase, ten years after closure. Overall, the results show no clear pattern.

Figure 2 The effect of exposure to parental job loss on hospitalization (percent): 8 years before to 10 years after closure
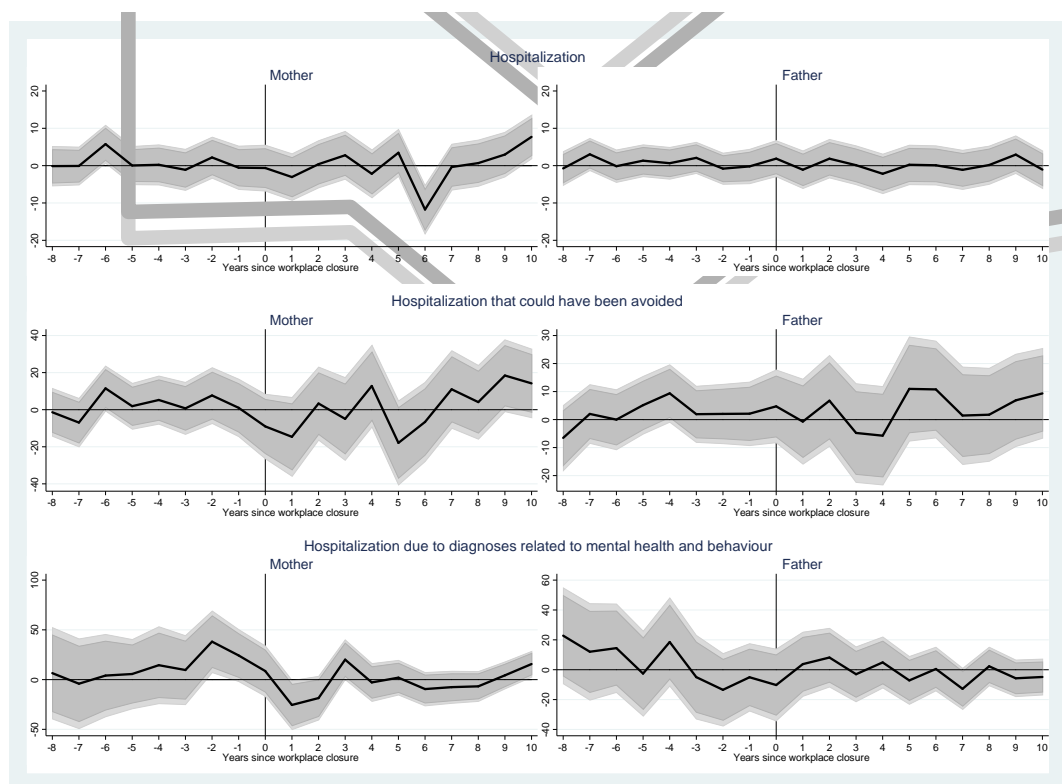


Note: Estimated using propensity score matching (nearest neighbor with replacement). Standard errors take into account that the propensity score is estimated. The dark (light) grey area indicates the 90 % (95%) confidence interval.

In Table 2, we formally test whether there are any differences between treated and untreated children five to three years before, and in the ten-year period after, parents' workplaces are closed. Note that the outcome in these estimations is measured as an

indicator taking the value zero if the child has not been hospitalized and one if the child has been hospitalized at least once during the ten-year period. The results displayed in Figure 2 show the effect for each year after the closure of the workplace.[18] First, we note that we cannot reject that the estimates for the pretreatment period are zero, suggesting that pretreatment trends are similar in the treatment and control groups.[19] Turning to estimates that show the difference in hospitalization between the treated and the untreated children during the first ten years after parental job loss, the estimates are typically economically and statistically insignificant. For example, the estimate for experiencing maternal job loss indicates an increase in hospitalization rate of 1.8 more children per 1,000, which corresponds to an increase of 0.6 percent compared to the mean of 278. The only statistically significant result is a decrease of 2.8 hospitalizations per 1,000 children for diagnoses related to *mental and behavior* in the ten years post paternal job loss, which corresponds to an 8.3 percent decline compared to the mean of close to 33 hospitalizations per 1,000 children.

Table 2 Effect of exposure to parental job loss on probability of hospitalization 0-10 years after closure

| | Hospitalization | Avoidable | Mental and behavior |
|---|---|---|---|
| | Mother at closing workplace | | |
| Effect 0-10 years *after* closure | 1.796 | -0.345 | 0.417 |
| | (2.785) | (1.069) | (1.171) |
| # observations | 1,033,977 | 1,033,977 | 1,033,977 |
| # treated children | 55,114 | 55,114 | 55,114 |
| Mean of outcome variable | 278 | 30 | 37 |
| Effect 3-5 years *before* closure | 1.875 | 0.918 | 0.0987 |
| | (2.171) | (0.977) | (0.379) |
| # observations | 960,923 | 960,923 | 960,923 |
| # treated children | 50,665 | 50,665 | 50,665 |
| | Father at closing workplace | | |
| Effect 0-10 years *after* closure | -0.0665 | 0.647 | -2.755** |
| | (2.282) | (0.893) | (0.917) |
| # observations | 1,245,045 | 1,245,045 | 1,245,045 |
| # treated children | 82,750 | 82,750 | 82,750 |
| Mean of outcome variable | 277 | 31 | 33 |
| Effect 3-5 years *before* closure | 0.740 | 0.890 | 0.000 |
| | (1.902) | (0.880) | (0.338) |
| # observations | 1,064,475 | 1,064,475 | 1,064,475 |
| # treated children | 70,264 | 70,264 | 70,264 |

Note: Standard errors in parentheses, ** $p<0.01$, * $p<0.05$. Estimated using propensity score matching. Standard errors take into account that the propensity score is estimated. Means are calculated using the matched sample.

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[18] Thus the results presented in Table 2 are not simply an aggregation of the estimates displayed in Figure 2.
[19] Since the pre-period and the post-period are of different lengths (in addition, the age composition of the children is different in the pre- and post-period), it is not informative to compare the size of the point estimates.

To conclude, the overall picture shows no systematic negative effects of parental job loss on child health measured as admissions to hospital or mortality of children exposed to maternal job loss. After fathers' displacement, there is, however, possibly a small decrease in hospitalizations due to mental health and behavioral problems.

## 5.2 The effect of parental job loss on education performance and outcomes as young adults

We turn next to educational achievement and other outcomes as young adults.[20] Educational performance is measured as the GPA percentile rank at the end of compulsory school in 9th grade (age 16) and by high school completion by age 20. To measure how the child fares as a young adult, we study the effect on the probability of being unemployed or living in a household that receives social assistance at least once during ages 20–23.

First, consider the effects on compulsory school GPA rank, shown in Figure 3. We only observe GPA rank when children leave high school at age 16. Depending on how old children were when their parent experienced a job loss, the period between treatment and the observed outcome will differ. The estimate at *age at workplace closure = 16* hence corresponds to the difference in GPA rank between treated and untreated children for those whose parents' workplaces closed when the child was 16, and the estimate for *age at workplace closure = 15* corresponds to the effect for those treated one year before graduation. The placebo estimates for the pre-period for children who were older than 16 when the workplace closed down show the difference in GPA rank between treated and untreated children who had already graduated when the parent lost their job.

A first observation from the graph is that the estimates change substantially from year to year and that the confidence intervals are wide. Most of the estimates are not significantly different from zero, although for children whose mother's workplace closed three to five years before they graduated from compulsory school, i.e., when they were 12–14 years old, there is a statistically significant negative effect on the order of magnitude of approximately 1.5 percentile ranks, which corresponds to approximately 5 percent of a standard deviation. There are also significant negative point estimates for children who were 9–10 and 7 years old when treated in the case of paternal job loss.

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[20] As in the case of mortality, we cannot, in the propensity score, condition on lagged values of the outcome variable, which is a shortcoming when controlling for potential selection.

However, estimates are rather unstable and that there are also statistically significant estimates for the children who had already graduated when their parent was displaced, suggesting that in spite of matching on a rich set of child outcomes, we are unable to properly balance pre-displacement characteristics in child school outcomes.

Figure 3 Effect of exposure to parental job loss on GPA rank percentile at age 16 for children graduating *t* years after closure
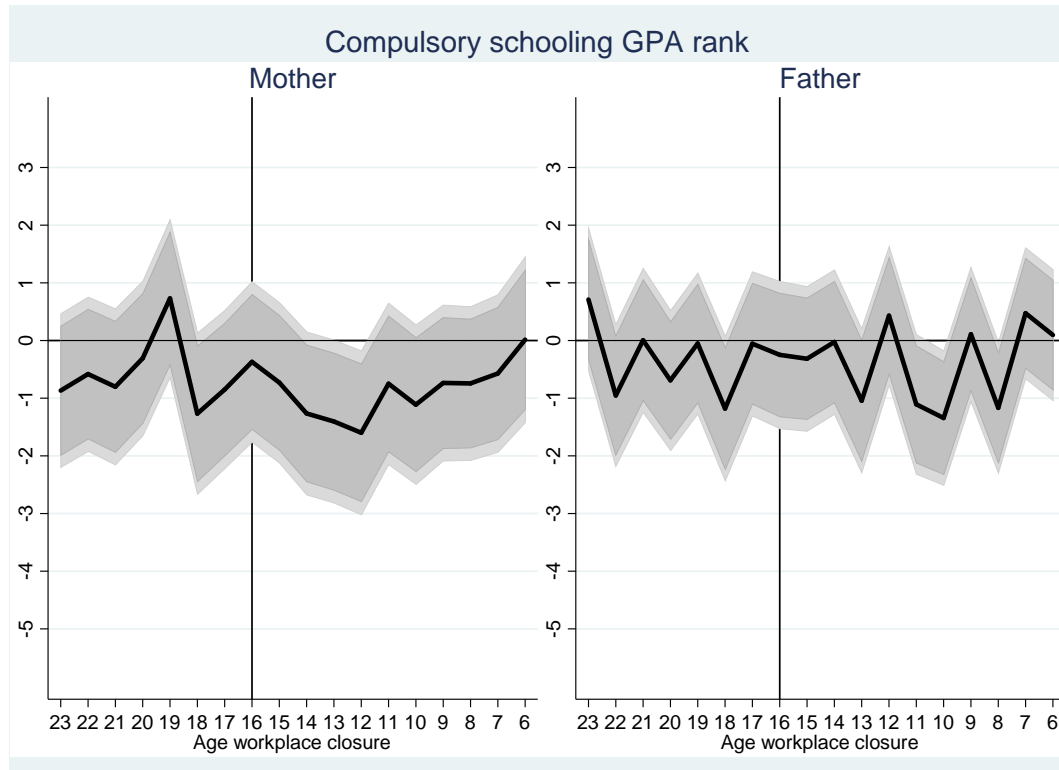


Note: Estimated using propensity score matching (nearest neighbor with replacement). Standard errors take into account that the propensity score is estimated. The dark (light) grey area indicates the 90 % (95%) confidence interval.

Next, we turn to high school completion and other outcomes in young adulthood.[21] The results are presented in Table 3. Starting with the main effects, it seems that maternal job loss increases the likelihood of living in a household that receives social assistance (with 6.8 percent) and unemployment (with 1.9 percent). However, turning to the placebo estimates, which show how young adults whose parents will experience job loss in the future compare to those whose parents will not experience a future job loss, we find that the former group is more likely to receive social assistance and experience unemployment. Hence, they seem to be negatively selected with respect to labor market

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[21] Similar to GPA, these outcomes can only be measured once per child, limiting the possibility to control for pretreatment differences between the groups.

outcomes, suggesting that the estimated effect is not causal. The estimated effects of father's job loss are small and statistically insignificant.

Table 3 Effect of exposure to parental job loss on long-term outcomes: High school diploma by age 23, social assistance and unemployment at age 20–23

| | High school completion at age 20 | Social assistance age 20–23 | Unemployed age 20–23 |
|---|---|---|---|
| | Mother at closing workplace | | |
| Parent workplace closure | -0.00284 | 0.00730** | 0.00845* |
| at age 6–16 | (0.00271) | (0.00223) | (0.00359) |
| # observations | 631,816 | 780,514 | 780,514 |
| # treated children | 33,427 | 41,051 | 41,051 |
| Mean of outcome variable | 0.832 | 0.108 | 0.446 |
| Parent workplace closure | 0.00190 | 0.0103* | 0.0106* |
| at age >23 | (0.00360) | (0.00406) | (0.00491) |
| # observations | 380,587 | 414,787 | 414,745 |
| # treated children | 18,672 | 20,170 | 20,169 |
| | Father at closing workplace | | |
| Parent workplace closure | 0.000697 | 0.00280 | 0.00130 |
| at age 6–16 | (0.00231) | (0.00197) | (0.00312) |
| # observations | 686,799 | 832,901 | 832,901 |
| # treated children | 45,221 | 54,754 | 54,754 |
| Mean of outcome variable | 0.838 | 0.111 | 0.453 |
| Parent workplace closure | -0.00121 | 0.00790* | 0.00204 |
| at age >23 | (0.00323) | (0.00366) | (0.00456) |
| # observations | 338,630 | 368,065 | 368,031 |
| # treated children | 22,307 | 24,064 | 24,062 |

Note: Standard errors in parentheses, ** p<0.01, * p<0.05. Estimated using propensity score matching. Standard errors take into account that the propensity score is estimated. Means are calculated using the matched sample.

To conclude, even though we have access to rich register data, including past health outcomes of both parents and children, the results in this section suggest that this is not enough to control for potential selection in regard to studying educational and labor market outcomes, making it difficult to draw firm conclusions regarding the effects of parental job loss on child human capital. Our results, however, do not suggest large negative effects on educational and labor market outcomes.

## 5.3    The effects of parental job loss on the family

The results above indicate that children's health, measured as hospitalization, was not negatively affected by parental job loss, and although it is problematic to draw firm conclusions about other effects on human capital, there are no indications of large negative effects. There are at least two possible explanations for this. First, it might be the case that the parents themselves and the families were not affected by the closure of their workplace. Although earlier studies suggest long-lasting negative effects on affected workers' income, unemployment and health, those studies focus on a different period and

do not focus specifically on parents. It might be the case that parents, for some reason, are less hurt by job loss; for example, they are typically younger than the average worker is, or it may be that the general situation of the labor market matters. Second, it might be the case that the parents are indeed affected but that this does not spill over to the children, possibly because the Swedish welfare state allows parents to shield their children from the negative effects. To shed light on the potential mechanism behind the results for children, we will next investigate the effect of job loss on the parents themselves. The outcomes we investigate are unemployment, earnings, disposable family income, social assistance recipiency, family separations, mortality and hospitalization.

We first consider labor market outcomes. The top panel in Figure 4 shows the difference (in the fraction) in unemployment of mothers (left) and fathers (right) who are exposed to workplace closure compared to parents in the matched control group, seven years prior to the exposure and up to ten years after. As is clear from the figure, there are very small differences between treated and untreated parents two years or more before the workplace closes down.[22] However, once the workplace closes, unemployment increases sharply for both treated mothers and fathers. In the year of closure and the following year, the increase relative to controls is 7.2 percentage points for mothers and 8.4 percentage points for fathers, which implies an increase of 100 percent for fathers and 81 percent for mothers in unemployment risk compared to mean levels for these years for the control group. The differences in unemployment diminish gradually over time. There is, however, still after 10 years, a higher risk of unemployment (1.3 percentage points for mothers and 1.4 percentage point for fathers) among workers who were displaced.

The middle panel in Figure 4 shows the effect on the labor earnings of the affected parent. At the time of the workplace closure, earnings drop by 5–6 percent for both mothers and fathers; earnings do slowly recover but are still approximately 4–5 percent lower for the displaced parents compared to the untreated parents 10 years after the workplace closed. The bottom panel shows the difference in family disposable income in percent between treated and untreated families. Disposable income in treated families shows a persistent decline compared to untreated families – a decline of approximately

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[22] Since we condition on parents working in the workplace at t-2, it should come as no surprise that there are no differences in unemployment in this year.

2–3 percent as mothers' workplaces close and somewhat larger effects as fathers' workplaces close.

Figure 4 Parental outcomes: Unemployment (fraction), Earnings (percent) and Disposable income (percent) 8(7) years before and up to 10 years after closure
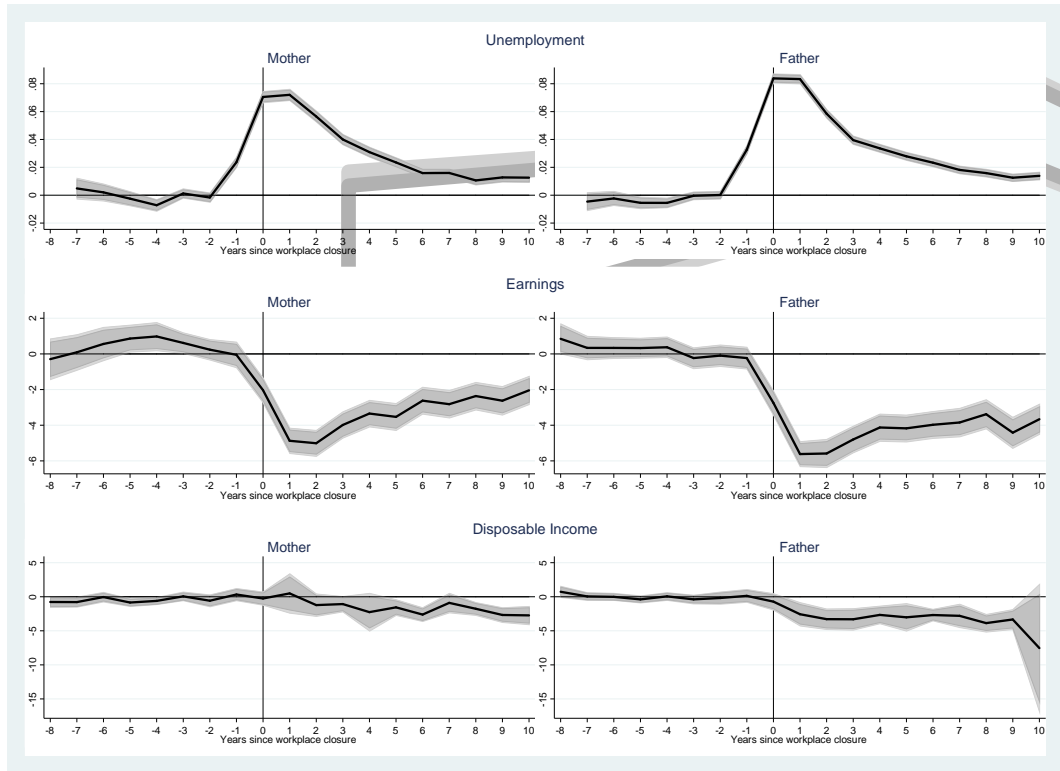


Note: Estimated using propensity score matching (nearest neighbor with replacement). Standard errors take into account that the propensity score is estimated. The dark (light) grey area indicates the 90 % (95%) confidence interval. Unemployment has only been observed in the data since 1992; therefore, the pre-period is only 7 years instead of 8.

In Figure 5, we consider the effects of job loss on the incidence of receiving social assistance (top panel) and on family separations (bottom panel). As mothers' workplaces close, there is some evidence of an increase in the share of families receiving social assistance on the order of magnitude of 0.5 percentage points in the years after displacement. The fraction of households receiving social assistance prior to job loss was 0.04, and hence, the effect corresponds to a 12.5 percent increase. However, although we can match treatment and controls on receiving social assistance at $t - 2$, there are significant differences between the two groups in the pretreatment period, more so when mothers are displaced. This casts doubts on whether treatment effects on social assistance can be interpreted causally. In the bottom panel, the results suggest that family separations increase as mothers' workplaces close. Two and three years after workplace closure, the share of separated families increases by between 0.5 and 1 percentage points compared to the control group. As 27 percent of the children in the control group did not live with

both their biological parents two years after the job loss, this corresponds to an increase of 2–3 percent.

Figure 5 Effect of exposure to job loss on social assistance (share) and likelihood of biological parents being separated (share) eight years before and up to 10 years after closure



Note: Estimated using propensity score matching (nearest neighbor with replacement). Standard errors take into account that the propensity score is estimated. The dark (light) grey area indicates the 90 % (95%) confidence interval.

Next, we turn to parental health. Figure 6 presents effects of workplace closure on parental mortality (top panel), hospitalizations in general (second panel), hospitalizations related to alcohol (third panel), and hospitalizations related to mental health (bottom panel). Note that the scale on the y-axes differs for mothers and fathers in the two bottom panels. The mortality of mothers and fathers increases relative to the control group as workplaces close. For fathers, the increase of one death per thousand fathers (9.8 percent) 6–7 years after workplace closure is statistically significant. For mothers, there is no statistically significant effect.

Figure 6 Effect of exposure to job loss on parental mortality (number of deaths per 1,000 between closure and year t) and hospitalization (percent)
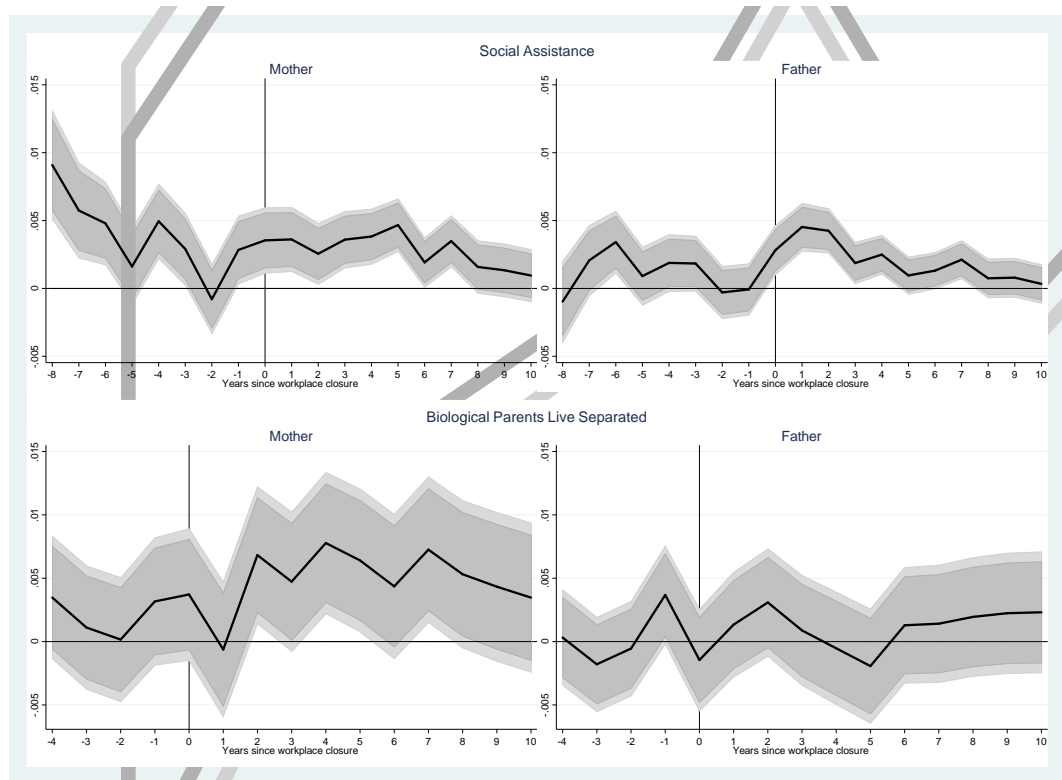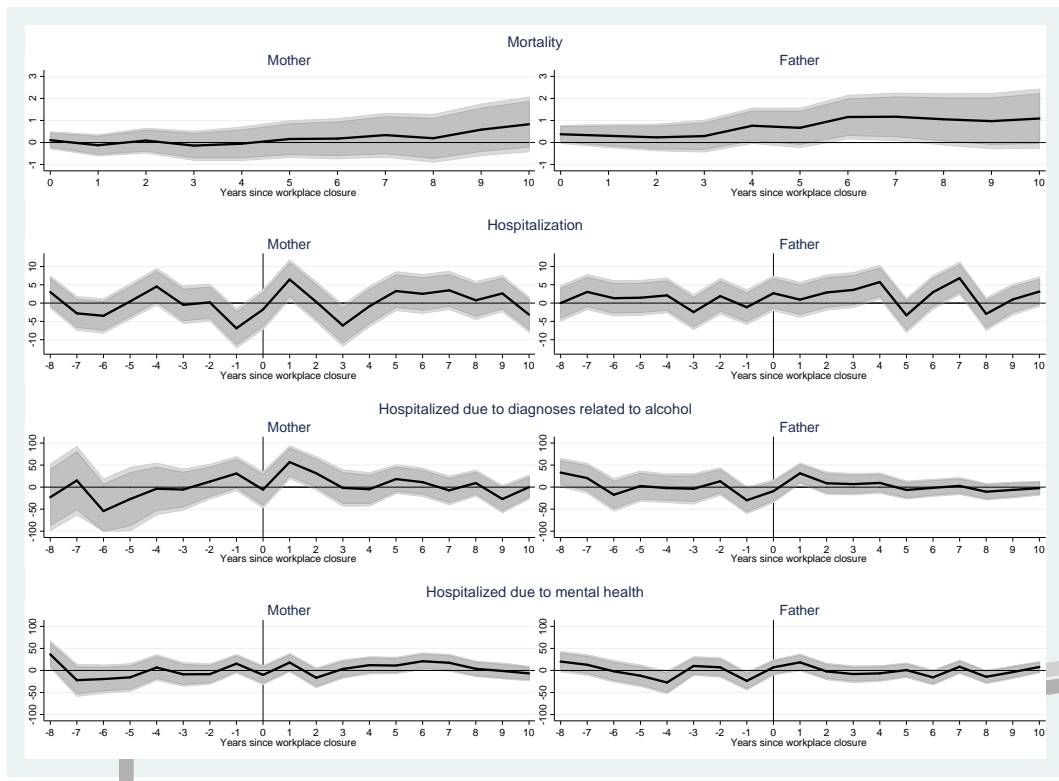


Note: Estimated using propensity score matching (nearest neighbor with replacement). Standard errors take into account that the propensity score is estimated. The dark (light) grey area indicates the 90 % (95%) confidence interval. There is no estimate for the effect on hospitalization due to alcohol or mental health for mothers in period -8 because no one received any of these diagnoses.

Turning to the effects on hospitalization for any reason, similar to the case for children, confidence intervals are rather wide, and we do not detect an obvious pattern of increased hospitalization rates after the workplace closure. For fathers, there is a small increase (approximately 5 percent) in some of the years in connection with and following the job loss. When focusing on specific diagnoses (alcohol-related conditions and mental health problems), there seem to be some negative consequences of workplace closures, particularly for mothers. Hospitalization due to alcohol-related conditions showed a large increase (as much as a 60 percent increase at $t = 1$) in the years around the closure as well as some increase in hospitalization due to mental conditions (significant at $t = 6$).

Table 4 Effect of exposure to job loss on probability of hospitalization 0-10 years after closure

| | Hospitalization | Mental health | Alcohol |
|---|---|---|---|
| | **Mother at closing workplace** | | |
| Effect 0-10 years *after* closure | 1.154 | 2.758** | 1.568* |
| | (2.971) | (1.015) | (0.618) |
| # observations | 1,041,576 | 1,041,576 | 1,041,576 |
| # treated children | 55,474 | 55,474 | 55,474 |
| Mean of outcome variable | 352 | 28 | 10 |
| Effect 3-8 years *before* closure | 0.555 | -0.0358 | -0.430 |
| | (2.782) | (0.584) | (0.292) |
| # observations | 1,051,724 | 1,051,724 | 1,051,724 |
| # treated children | 55,878 | 55,878 | 55,878 |
| | **Father at closing workplace** | | |
| Effect 0-10 years *after* closure | 2.961 | 0.171 | -0.524 |
| | (2.403) | (0.843) | (0.655) |
| # observations | 1,237,751 | 1,237,751 | 1,237,751 |
| # treated children | 82,078 | 82,078 | 82,078 |
| Mean of outcome variable | 326 | 28 | 17 |
| Effect 3-8 years *before* closure | 0.470 | 0.349 | 0.144 |
| | (2.039) | (0.503) | (0.366) |
| # observations | 1,252,236 | 1,252,236 | 1,252,236 |
| # treated children | 83,063 | 83,063 | 83,063 |

Note: Standard errors in parentheses, ** p<0.01, * p<0.05 Estimated using propensity score matching. Standard errors take into account that the propensity score is estimated. Means are calculated using the matched sample.

Next, we study whether workers exposed to job loss are more likely to be admitted to the hospital at any time up to 10 years after closure of the workplace. The results in Table 4 show a statistically significant effect on hospitalization for conditions related to mental health and due to alcohol-related conditions for mothers. Compared to the average likelihood of being admitted to the hospital, being exposed to a workplace closure increases the likelihood of receiving treatment for mental health problems by 10 percent and for alcohol-related conditions by 16 percent. The next row shows the differences in hospitalization between treated and untreated workers 3–8 years *before* the workplace closure. As the estimates are fairly small and statistically insignificant, we conclude that there is no evidence of selection causing the results. The results in the lower panel show no effects on fathers who are exposed to job loss. Overall, our results show that families are indeed negatively affected by parental job loss in a number of ways. In particular, unemployment risk increases, parental earnings decline and family disposable income is lower for ten years following the closure of a parent's workplace. The evidence on social assistance is less clear, but when mothers suffer job loss, the risk of family separation increases. Parental health is also affected. In particular, this is manifested in increased

mortality for fathers and, for mothers, an increase in mortality due to alcohol-related conditions and poor mental health.

## 5.4    Discussion of results

Parental job loss does not seem to have large negative consequences for children, although parents are hurt by job loss in a number of ways. First, we do not find evidence of increased mortality or increased hospitalizations of the exposed children. Instead, there is a small decline in hospitalization due to diagnoses related to mental illness, alcohol-related conditions, self-harm or exposure to abuse (mental and behavior) following paternal job loss. When studying educational and early adulthood outcomes, we similarly do not find convincing evidence of large negative effects. Although we find negative effects on compulsory school GPA and possibly small increases in the probability of receiving social assistance as well as being unemployed, the credibility of these results can be questioned because pretreatment patterns indicate remaining negative selection in the treatment group compared to the matched control group. The effects on long-term outcomes are precisely enough estimated to rule out large effects.

Our results for children's outcomes are somewhat at odds with previous studies. We cannot confirm that parental job loss is associated with worse mental health (Schaller and Zerpa, 2015) and socio-behavioral problems (Peter, 2016) or with worse schooling outcomes (Rege et al., 2011; Stevens and Schaller, 2011; Ruiz-Valenzuela, 2015). Our results are hence more consistent with the longer-run findings of negligible or no effects on or future earnings in (Bratberg et al., 2008; Hilger, 2016).[23]

Considering the effects on compulsory school GPA, when focusing on children who were 12–14 years at the time of job loss, our results are similar to the results presented in Rege et al. (2011), i.e., children whose parents suffer job loss a few years before they are about to graduate from compulsory school have 1.5 percentile ranks, which corresponds to approximately 5 percent of a standard deviation. Unlike Rege et al., who find negative effects of paternal job loss and positive (although statistically insignificant) effects of maternal job loss, we find negative effects for both paternal and maternal job loss.[24]

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[23] Since the children we study are at least 2 years of age when hit by parental unemployment, we cannot compare our results to (Lindo, 2011) and (Hong Liu and Zhong Zhao, 2014) who study birth weight and height- and weight-for age, respectively.

[24] Mörk et al. (2014) find that maternal unemployment, if anything, is more detrimental to child health than is paternal unemployment.

However, as is clear from Figure 3, for some of the cohorts graduating *before* parental job loss, there are significant estimates of similar magnitude. Additionally, because we do not find any evidence that high school completion was affected, our conclusion is that the negative effects found for GPA are likely driven by selection or are only spurious correlations. The overall pattern is not convincing enough to conclude that schooling outcomes were indeed negatively affected.

Our results regarding the effects of job loss on the labor market outcomes of parents, situation of the family and parental health show effects that are in line with what has been found in the earlier literature for the Nordic countries. First, we find that parental unemployment rises sharply with job loss by some 7–9 percentage points. There is also a small increase in unemployment risk ten years after job loss. This is somewhat smaller than the effect found in Eliason and Storrie (2006) but larger than the effects reported in Rege et al. (2011).[25] The effects on earnings, approximately a 2–6 percent decline in the years after workplace closure, are similar to the effects found in Eliason (2009, 2011) and Rege et al. (2011) but smaller than those found in Bratberg et al. (2008) and in the most studies from North America.[26]

Our results on family stability and parental health also point in the same direction as those found for workers in general. There are some noticeable differences. Whereas Eliason (2012) and Huttunen and Kellokumpu (2016) find that job loss increases the risk of divorce for men, we find that job loss increases the risk that the biological parents live separated if the mother lost her job. Regarding health Eliason and Storrie (2009) and Eliason (2014) find evidence of increased alcohol-related hospitalization following job loss among men (including men with and without children). We find that the negative health consequences are stronger for mothers.

To conclude, it is not the case that the absence of effects on children in our study is explained by a similar absence of effects on the Swedish parents who lost their jobs in the late 1990s. The consequences of job loss for these parents were as negative as the consequences for other workers.

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[25] Eliason and Storrie (2006) find that unemployment increases with 13 pp. and employment with 7 pp. the year after job loss. The results presented in Rege et al. (2011) show that fathers (mothers) full-time employment decreases with 2.7 (3.9) pp. and take-up of unemployment insurance increases with 4.6 (3.9) pp. among fathers.

[26] Studies from the Nordic countries usually find a smaller effect of firm closure on unemployment compared to the effect found in studies from North America. One explanation may be that firms are obliged by law to give advance notice of layoffs. In Sweden workers have to be noticed 4-12 months in advance, depending on worker tenure and how many the firm would like to dismiss. This will give the worker time to find new employment.

# 6 Conclusions

We study the short-term and long-term consequences of parental job displacement due to the closing of workplaces on child health, educational performance, unemployment and reliance on social assistance as young adults. Overall, our results show effects on child outcomes. We find negative effects of parental job loss neither on mortality and hospitalization nor on educational outcomes and labor market outcomes as young adults. The absence of effects on children is, however, not a result of parents and the family being unaffected by workplace closure. Similar to previous literature, we find that parents are more likely to be unemployed and have lower earnings for several years after job loss. In addition, parental health is negatively affected; fathers show increased mortality risk, and mothers are more likely to be hospitalized due to mental health problems and alcohol-related conditions.

Our results regarding educational outcomes cannot confirm previous evidence of negative effects on school performance (Rege et al. 2009). Instead, they are more in line with the previous evidence on effects in early adulthood (Bratberg 2008 and Hilger, 2016). Importantly, our results show that selection issues remain, even though we match on a richer set of child and parent characteristics than has been done in previous studies. This finding points to the importance of controlling for lagged outcome variables, as emphasized in Hilger (2016).

How should we understand the absence of negative effects on child health, measured as hospitalizations, given that families seem to be negatively affected by workplace closures and that the effects are very similar for maternal and paternal job loss? It is possible that the Swedish context, with a welfare state and a dual-earner norm, can in part explain this result. First, the welfare state institutions of unemployment benefits, subsidized childcare, free tuition and health care insure families and children against the consequences of job loss and financial distress. Second, the dual-earner norm may, on the one hand, imply that families are more severely hit by maternal job loss in terms of separations and increased reliance on social assistance, but on the other hand, it may imply that mothers' ability and willingness to reallocate time towards parenting is limited by a need to regain employment, hence reducing the scope for positive effects of maternal job loss on children's human capital accumulation.

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# Appendix A

Table A 1 Earlier studies

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|-------|------|---------|-----------|------------------------|-------|---------|
| **Health** | | | | | | |
| Lindo (2011) | US, survey data: PSID | Birth weight (self-reported) | Children born to mothers whose partner (the father) experienced job loss during pregnancy<br><br>No. of treated children: 797 | Involuntary job loss due to plant closure, lay-off or due to being fired (self-reported) | Control for mother-fixed effects, mother's age and the year of birth, and child's sex and birth order fixed effects<br>Placebo: No effects on children born two years before paternal job loss | Parents: Family income declines by 13 %.<br>Children: A decline in birth weight of 4-5 %. Suggestive evidence of larger effects at the bottom of weight distribution. |
| Liu and Zhao (2014) | China, survey data: China Health and Nutrition Survey | Height-for-age and weight-for-age z-scores (self-reported)<br>z-score =(actual height(weight)-mean height(weight)/st. dev. height(weight) | Children aged 0-18 with parents with working history in public institutions, state owned enterprises, or collectives.<br><br>No. of treated children: 247 | Layoffs caused by restructuring of state owned enterprises in connection with urban labor market reform (self-reported) | Control for child-fixed effects as well as co-variates including lagged health<br>Placebo: No effects of future job loss | Parents: Household income decreases (50% of average household income) with paternal job loss but not with maternal job loss, in which case time spent caring for children increases.<br><br>Children: A decline in height- and weight-for-age with 0.33-0.37 standard deviations in case of paternal job loss. Smaller and insignificant effect of maternal job loss. The effect is driven by poor households. |
| Mörk, Svaleryd and Sjögren (2014) | Sweden, register data | Hospitalization | Children 3-18 years old, where the biological parent participates in the labor force.<br><br>No. of treated children: 1,603,459 | Being registered as openly unemployed or participating in a labor market program. | Control for child-fixed effects as well as child age and gender, parental age, education level and immigrant background, parental health, family disposable income, | Children: Parental unemployment is associated with an immediate 1 % increase in hospitalization and a 5 % increase in the long run. Stronger effects for maternal unemployment. |

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|---|---|---|---|---|---|---|
| | | | | | intact family and local unemployment | |
| Schaller and Zerpa (2015) | US, survey data Medical Expenditure Panel Survey (MEPS) | Parental-reported health and mental health<br><br>Health conditions (parental-reported): infectious illnesses, bronchitis, asthma, injuries, ADD, stress-related mental disorders (anxiety and depression)<br><br>Health insurance status<br><br>Health care and prescription drug utilization expenditures (parental-reported, but with complementary information collected from a sample of medical providers) | Children 1-16 years old with at least one employed parent at first interview (when looking at mental health outcomes: children 6-16).<br><br>No. of treated children: 1,969/1,618 (paternal/maternal job loss) | Involuntary job loss for the following reasons "job ended", "business dissolved or sold", "laid off" (self-reported)<br>Sensitivity: only job loss due to firm closures | Control for child-fixed effects co-variates and linear time trend<br>Placebo: No effects of future job loss | Children: Both paternal and maternal job loss result in reductions in parent ratings of children's health and mental health.<br>Paternal job loss increases the incidence of anxiety and depression, and among low-SES families increases the incidence of injuries.<br>Maternal job loss reduced the incidence of infectious illness among high-SES families.<br>Paternal job loss implies a reduction in private insurance coverage counteracted by an increase in public health insurance coverage<br>Health care visits:<br>Fathers: increase in mental health visits<br>Mothers: reductions in drug prescriptions |
| Peter (2016) | Germany, survey data: Socio Economic Panel Study | Non-cognitive skills: 5/6-year olds: socio emotional behavior 17-year olds: Locus of control | Preschool sample: children aged five/six whose mother was 20 or older when giving birth.<br><br>Adolescents-sample: Children aged 17 living with their parents, and whose mother was 20 or older when giving birth Study maternal job loss | Involuntary job loss due to plant closures or dismissal by employer (self-reported)<br><br>Sensitivity: separate the two reasons for job loss | Regression-adjusted matching approach | Parents: Decreased life-satisfaction for preschool mothers and decreased household income for mothers with older children.<br><br>Children: Increases preschool children's socio-behavioral problems by 51 % of a standard deviation and decrease adolescents' locus |

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|-------|------|---------|-----------|------------------------|-------|---------|
| | | | No. of treated children: 229/522 (preschool-/adolescent-sample | | | of control by 26% of a standard deviation (the latter only for dismissals) |
| Bubonya, Cobb-Clark and Wooden (2017) | Australia, survey data HILDA | Self-reported mental health: experiencing anxiety and mood disturbances over a four-week period | Children aged 15-20 living with at least one parent  No. of treated children: 245/221 (paternal/maternal job loss) | Involuntary job loss due to lay-off, retrenchment, redundancy, dismissal and firm closures (self-reported) Sensitivity: unexpected job loss | Control for individual-specific fixed effects and co-variates | Parents: Mental health of women (but not men) declines following a spouse's job loss, but only if that job loss results in a sustained period of non-employment or if the couple experienced prior financial hardship or relationship strain Children: A negative effect of parental job loss on the mental health of adolescent girls, especially in case of maternal job loss. |
| **Grades** | | | | | | |
| Rege, Telle and Votruba (2011) | Norway, register data | Grade point average of 10th graders | Tenth graders (typically 16 years old) whose parents were employed in a plant three years before, that closed during the next two years or was stable, and had at least one year of tenure and worked full time.  No. of treated children: 1,672 (paternal job loss) | Workers in plants with a plant downsizing rate of 90 % or more | Control for industry-, municipality- and school-fixed effects as well as covariates including past earnings Placebo: No effects of future plant closures | Parents: A decline in fathers'/mothers' earnings of 5.7/10.2 %. Fathers/mothers are 2.7/3.9 pp. less likely to be fulltime employed and 4.6/5.1 pp. more likely to take up unemployment insurance year after. No immediate effect on divorce. Children: Negative effect of paternal job loss (6 % of a standard dev) Positive (non-significant) effect of maternal job loss |
| Stevens and Schaller (2011) | US, survey data Survey of Income and Program Participation (SIPP) | Grade retention the year after parental job loss | Children 5-19 whose fathers (or mothers in single households) experienced job loss | Involuntary job loss: fired or discharged, employer sold or bankrupt, slack | Control for child-fixed effects and time-varying and fixed family, school and child factors as well | Parents: Family income declines by 10 % and family earnings by 15 %. An increase in likelihood of |

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|---|---|---|---|---|---|---|
| | | | No. of treated children: 2,170 | work or business conditions (self-reported) Sensitivity: only job loss due to employer sold or bankrupt, slack work or business conditions | as regional unemployment Placebo: No effects of job loss in the current year | divorce/relocation of 3/7.5 % in the short run Children: Increase in the probability of grade retention by 15 %. Larger effects in families with high pre-period income |
| Ruiz-Valenzuela (2015) | Spain: survey data | Average grades during an academic year | Students aged 3-16 in Barcelona, in two-parent households No. of treated children: 54 | Unemployed during the Great recession (self-reported and retrospective) | Control for children-fixed effects as well as year X group effects Placebo: No effect of future unemployment (only cross-section estimates) | Children: Father's job loss reduces grades by 13% of a standard dev, especially for boys. No effects of maternal unemployment |
| Long run outcomes including post-secondary schooling | | | | | | |
| Oreopoulos, Page and Stevens (2008) | Canada, register data Intergenerational Income Database (IID) | Earnings, unemployment insurance and social assistance at age 25-32. | Boys 10-14 when fathers lost job. Fathers aged 30-50, with at least two-year tenure at the firm No. of treated children: 1,411 | Job loss due to firm closures | Controlling for family income in the pre-displacement years, as well as region, industry and firm size fixed effects. | Parents: Fathers earnings are reduced by 30 % in the short run and 18 % after 8 year. Unemployment increased with 24 pp. in the short run. Family income is reduced by 10 %. Children: Earnings reduced by 9 % as adults. Effects concentrated in the bottom of distribution. The likelihood of receiving unemployment insurance/social assistance increases by 4/1.5 pp. |
| Bratberg, Nilsen and Vaage (2008) | Norway: Register data | Earnings at age 25-30 (15 years after paternal job loss | Children 12-15 when their father experienced job loss Fathers with at least four years tenure at the firm. | Job loss due to downsizing (at least 30 % of the labor stock) or plant closures | Control for fathers' pre-displacement earnings and industry, as well as gender and cohort of the child | Parents: Fathers' earnings are reduced by 5-10% (10-20 % for those on closing plants) and employment is reduced by 40 pp. initially and with 10-13 pp. after 7 years. |

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|-------|------|---------|------------|------------------------|-------|---------|
| | | | No. of treated children: 2,486/720 (all displaced/plant closures) | | | Children: No effects on earnings in the aggregate or anywhere in the earnings distribution. |
| Page, Stevens and Lindo (2009) | US, survey data PSID | Education, income, earnings, unemployment, AFDC | Children aged 15 or younger when family head experienced job loss.<br><br>No. of treated children: 673/242 (all displaced/only job closures) | Job loss due to layoffs or firm closures (self-reported).<br>Focus on firm closures in most of the paper. | Control for average family income 3-5 years before job loss (control for gender, age, business cycle) | Parents: Earnings and family income are 20-30 % lower up to 6 years after job loss.<br><br>Children: When all job losses are included, future earnings drop by 10 % due to job loss, but only when firm closures are considered are earnings not affected.<br>For children from poor families, negative effects on education, unemployment and AFDC.<br>Larger effects for children who were young at parent job loss |
| Coelli (2011) | Canada, survey data Canadian Survey of Labour and Income Dynamics (SLID) | Post-secondary enrollment at ages 16-19/29 | Children whose main income earner experienced job loss when children were 16-18.<br><br>No. of treated children: 174 | Involuntary job loss due to permanent layoff (redundancy) or business failure (self-reported).<br><br>Sensitivity: separate between layoffs due to redundancy and business closures | Control for after tax parental income at age 16, parental education, gender, distance to closest university as well as city, rural, time and province dummies<br><br>Placebo: Finds no effects of future job loss | Parents: Family income drops by 17 %. No evidence of increased stress (self-reported).<br><br>Children: Probability of enrollment lowered by 10 pp.. Larger effect for children whose parents had higher pre-displacement income<br>If anything, larger effects for firm closures |
| Wightman (2012) | US, survey data PSID | Post-secondary educational attainment at 21 | Children where the household head experienced job loss. | Involuntary job loss due to layoffs or plant/firm closures (self-reported). | Control for gender, race, family structure, parental income and education, parental | Children: parental job loss due to layoffs/firm closures reduces the probability of |

| Study | Data | Outcome | Population | Definition of job loss | Model | Results |
|---|---|---|---|---|---|---|
| | | | No. of treated children: 1038/616 (layoffs/firm closures) | Separate between the two causes for job loss | cognitive ability and non-cognitive attitudes parental ability at child birth Sensitivity: use industry-specific demand as instrument for job loss | obtaining post-secondary education with 15/5 %. IV estimates show larger negative effects |
| Brand and Thomas (2014) | US, survey data The National Longitudinal Survey of Youth (NLSY) and The National Longitudinal Survey's Child-Mother File (NLSCM) | High school completion at age 19, college attendance at age 21, college completion at age 25, depressive symptoms at ages 20-24, depressive symptoms at ages 25-29 | Children aged 0-17 to single (when displaced) mothers. No. of treated children: 5,697 | Involuntary job loss due to layoffs or plant closures (self-reported) | Propensity score matching, on maternal cognitive and non-cognitive skill, delinquent activity, race, education, employment and family history (at child's birth/age 6/age 12) Also investigates heterogeneous effects with respect to the propensity score | Children: Maternal job loss leads to 4-6 pp. lower high school/college completion and 2.5 pp. more depressive symptoms at ages 25-29. The effects larger for mothers less likely to be displaced and in "better" times. The negative effects are driven by children whose mothers were displaced when child was >5 |
| Hilger 2016) | US, register data Federal tax returns | College enrollment, college quality, early career earnings | Children aged 12-18 at paternal job loss No. of treated children: Not clear from the paper | Uptake of unemployment insurance benefits. In a sensitivity analysis: involuntary job loss due to firm closures | Difference-in-differences approach: First difference: Children of laid off parents and children whose parents remained at the firm. Second difference: Those that reach 19 before layoff and those that reach 19 after layoff | Parents: Reductions in household income. Children: College enrollment declines by less than half of one percentage point. Marginally negative effects on college quality. No effects on early career earnings. Biggest effects for middle-incomes |

Table A 2 ICID-codes for different diagnoses

| Variable | Definition based on ICD10 codes |
|---|---|
| Hospitalization | = 1 000 if admitted to hospital that year |
| Avoidable | = 1 000 if admitted to hospital with diagnosis codes:<br>Asthma J45, J46 (main or sub diagnosis)<br>Diabetes E101–E108 (main or sub diagnosis)<br><br>E110–E118, E130-E138, E140-E148 (main or sub diagnosis)<br>Nutrition E40-E43, E550, E643 (main or sub diagnosis)<br>Anemia D501-509 (main or sub diagnosis)<br>hypertension i110,i119 (main or sub diagnosis)<br>Chronic obstructive lung disease J41, J42, J43, J44, J47 (main diagnosis);<br>*J20 (main diagnosis together with) J41, J42, J43, J44, J47 (sub-diagnosis)<br>The following main diagnoses:<br>Diarrhea E86, K522, K528, K529<br>Epileptic cramps O15, G40, G41, R56<br>Infections H66, H67, J02, J03, J06, J312<br>Vaccine preventable:<br>B16, B26, B05, B06, A15-A19, A37, A36<br>Influenza and pneumonia j10, J11, J13, J14, j153, j154, j157 j159, j168, j181, j188<br>Tooth related K02-K06, A690, K08, K098, K099, K12, k13 |
| Mental and behavior | Hospitalization for self-harm<br>Hospitalization for mental health problems<br>Hospitalization for abuse by partner or parent<br>See definitions below |
| Hospitalization for self-harm | =1000 if admitted to hospital with main diagnosis or any of the first five sub-diagnoses<br>Self-destructive behavior X60-X84, Y10-Y34 |
| Hospitalization for mental health problems | =1000 if admitted to hospital with main diagnosis or any of the first five sub-diagnoses<br>mental health problems F00-F99 |
| Hospitalization for abuse by partner or parent | =1000 if admitted to hospital with main diagnosis or any of the first five sub-diagnoses or e-code: Y070 (partner/spouse), Y071 (parent), Abuse syndromes: T74 |
| Alcohol | =1000 if admitted to hospital at any time during the year with main diagnosis or any of the first five sub-diagnoses:<br>alcohol poisoning (T51, X45, X65, Y15),<br>alcohol use disorder (F10),<br>alcoholic liver disease or alcohol-induced pancreatitis (K70,K85, K86.0–1),<br>other alcohol-related diseases or conditions (E24.4, G31.2, G62.1, G72.1, I42.6, K29.2, 035.4) |

Table A 3 Overview of covariates used to estimate the propensity score

| Variable | Definition |
|---|---|
| Age (child, worker) | Years of age |
| Age^2 (child, worker) | Years of age, squared |
| Female (child) | =1 if girl |
| Hospitalization t-2 and t-3 (worker), t-2 or t-3 (other parent) and t-2 (child) | =1000 if admitted to hospital that year |
| Hospitalization for diagnoses indicating mental health problems t-2 or t-3 (worker) | =1000 if admitted to hospital with diagnosis code indicating mental health problems according to Table A2 |
| Hospitalization for diagnoses indicating alcohol abuse t-2 or t-3 (worker) | =1000 if admitted to hospital with diagnosis code indicating alcohol related disease according to Table A2 |
| Hospitalization for diagnoses indicating alcohol abuse or mental health problems t-2 or t-3 (other parent) | =1000 if admitted to hospital with diagnosis code indicating alcohol related disease or mental health problems according to Table A2 |
| Mental and behavior (child) | =1000 if admitted to hospital with diagnosis code indicating mental health problems, self-destructive behavior, alcohol related conditions i.e., disease or abuse according to Table A2 |
| Separated (child) | Dummy indicating biological parents do not live together |
| Years in Sweden (worker, other parent) | Dummy indicating time living in Sweden (8)<br>0: born in Sweden<br>1: time in Sweden < 6 years<br>2: 5 < time in Sweden < 11<br>3: 10 < time in Sweden < 16<br>4: 15 < time in Sweden < 21<br>5: 20 < time in Sweden < 31<br>6: 30 < time in Sweden < 41<br>7: time in Sweden > 40 |
| Unemployed in t-2 and t-3 (worker) and in t-2 (other parent) | Dummy indicating if the individual is registered at the PES |
| Unemployed long (worker, other parent) | Dummy indicating if the individual has been registered at the PES more than 180 days |
| Income from employment (worker) | Income from employment or self-employment, deflated with CPI to 2014 year prices |
| Household disposable income (worker, other parent) | Log household disposable income in 100 s SEK, deflated with CPI to 2014 year prices |
| Income from social assistance (worker, other parent) | Log social assistance in 100 s SEK, deflated with CPI to 2014 year prices in the individual's household |
| Swe * social assistance (worker, other parent) | Interaction variable between born in Sweden and income from social assistance in the individual's household |
| Education (worker, other parent) | Dummy variables for years of schooling (3)<br>1: years of school < 10<br>2: 9 < years of school < 13<br>3: years of school > 12 |
| Tenure (worker) | Dummy variables for number of years employed at the current workplace. Categories: 2, 3, 4 and 5 or more years. |
| Size of workplace (worker) | Number of workers at workplace |
| Size of workplace ^2 (worker) | Number of workers at workplace, squared |
| Small workplace (worker) | Dummy variable indicating if the workplace has fewer than 50 workers |
| Medium sized workplace (worker) | Dummy variable indicating if the workplace has more than 49 but fewer than 250 workers |
| Industry sector (worker) | Dummy variables for industry sector, SNI code (9) |
| County (worker) | Dummy variables for county (25) |
| Sample year | Dummy variables for sample year 1995-2000 |

## Appendix B: Common support and balancing of covariates

To assess the common-support assumption, Figure B 1 displays the estimated density of the predicted probabilities that a non-displaced worker is not displaced and the estimated density of the predicted probabilities that a displaced worker is not displaced, shown for mothers (left panel) and fathers (right panel). The figure shows that there is considerable overlap across the two groups. The common support assumption is thus fulfilled for all displaced workers.

Figure B 1. Distribution of propensity score for displaced and non-displaced workers
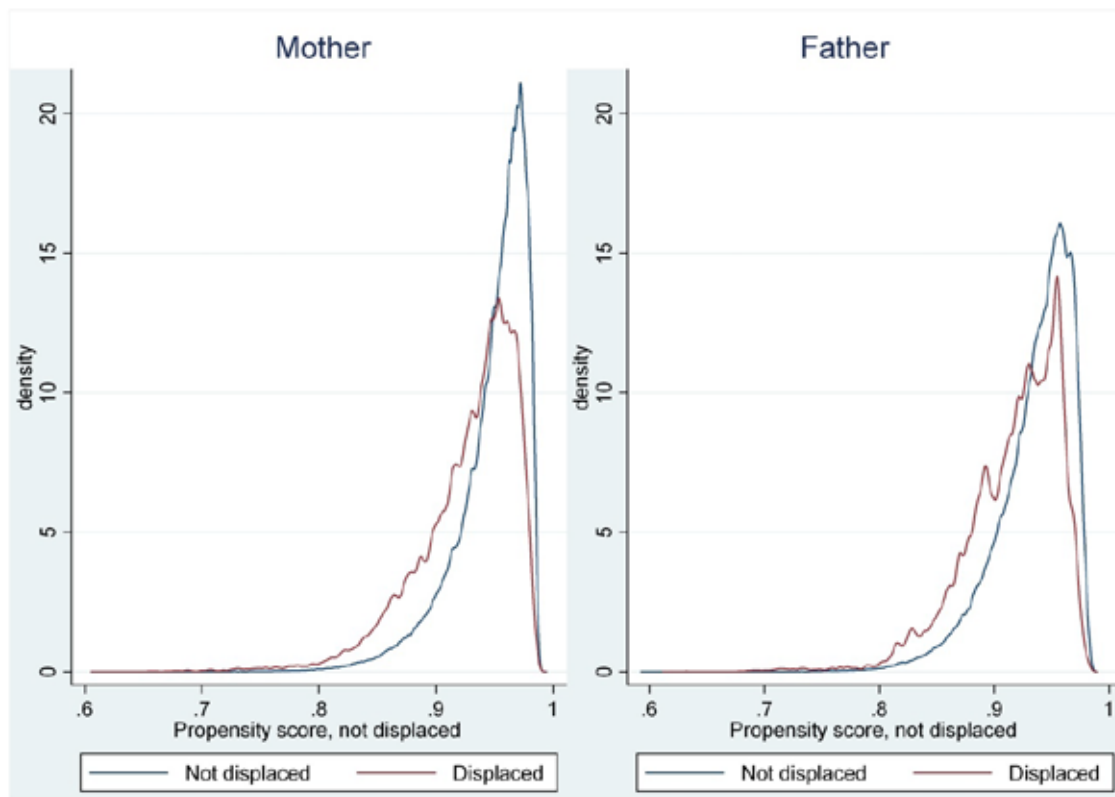


Next, we check the matching quality by evaluating the balance of the covariates between the displaced workers sample and the non-displaced workers sample. Figure B 2 shows the standardized bias in the covariates, an indicator suggested by Rosenbaum and Rubin (1985), both before and after the matching. As is evident from the figure, the biases in the covariates are considerably reduced in the matched samples.

Figure B 2. Standardized percentage bias across covariates, unmatched and matched samples



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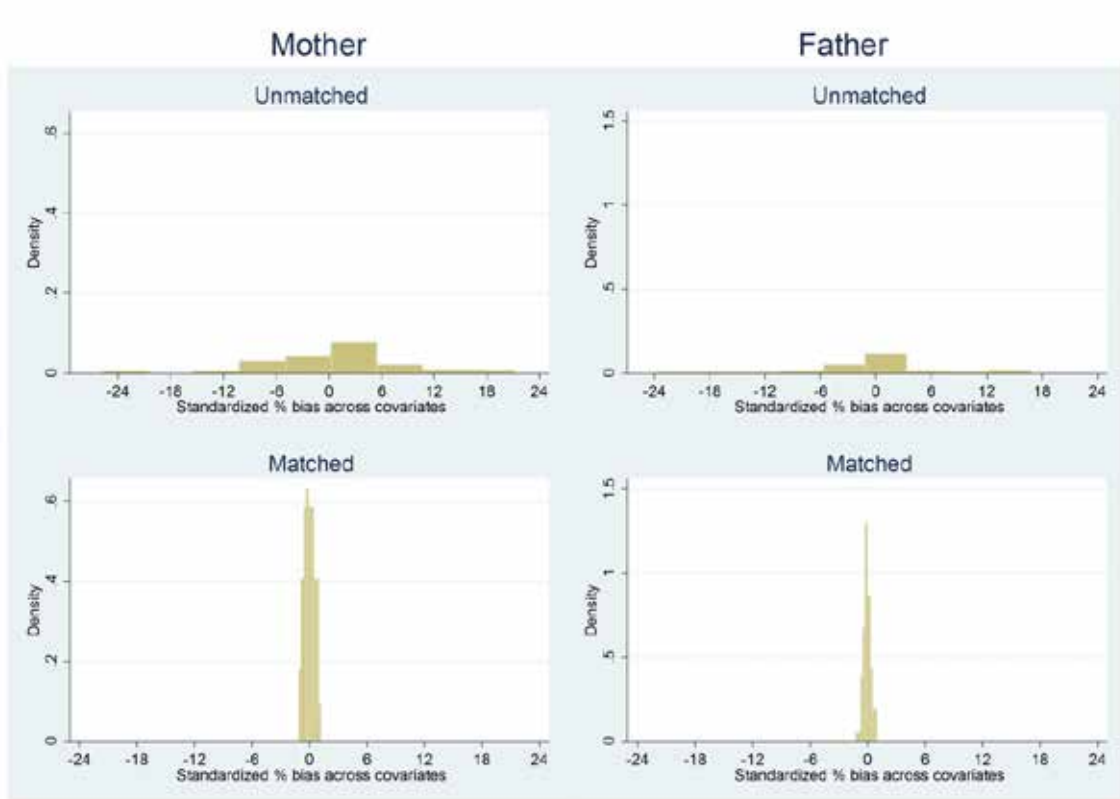
## Online appendix C

Table C 1. Effect of exposure to parental job loss on the cumulative number of deaths per 1 000 children from the year of closure and up to 10 years after. Corresponds to Figure 1

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | # Obs |
|--------|----------|------------|-------|----------|------------|-------|
|        | Mother   |            |       | Father   |            |       |
| 0 | 0.0529 | (0.0912) | 1,064,756 | -0.117 | (0.0928) | 1,285,125 |
| 1 | 0.176 | (0.129) | 1,064,756 | -0.105 | (0.114) | 1,285,125 |
| 2 | 0.0529 | (0.147) | 1,064,756 | -0.105 | (0.132) | 1,285,125 |
| 3 | 0.0705 | (0.161) | 1,064,756 | -0.117 | (0.151) | 1,285,125 |
| 4 | 0.0352 | (0.182) | 1,064,756 | -0.187 | (0.165) | 1,285,125 |
| 5 | 0.0352 | (0.205) | 1,064,756 | -0.199 | (0.183) | 1,285,125 |
| 6 | 0.0352 | (0.231) | 1,064,756 | -0.0585 | (0.202) | 1,285,125 |
| 7 | 0.300 | (0.260) | 1,064,756 | 0.0936 | (0.222) | 1,285,125 |
| 8 | 0.352 | (0.279) | 1,064,756 | 0.105 | (0.240) | 1,285,125 |
| 9 | 0.352 | (0.294) | 1,064,756 | 0.0585 | (0.258) | 1,285,125 |
| 10 | 0.405 | (0.314) | 1,064,756 | 0 | (0.273) | 1,285,125 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.

Table C 2. The effect of exposure to parental job loss on hospitalization (percent) 8 years before to 10 years after closure, yearly estimates. Corresponds to Figure 2 mother

| Period | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|---|
| | Hospitalization | | Avoidable | | Mental & behavior | | |
| -8 | -0.0879 | (1.871) | -0.163 | (0.785) | 0.0754 | (0.271) | 767,651 |
| -7 | -0.0572 | (1.749) | -0.778 | (0.746) | -0.0457 | (0.255) | 837,957 |
| -6 | 3.560* | (1.597) | 1.236 | (0.663) | 0.0423 | (0.220) | 901,789 |
| -5 | 0.0296 | (1.524) | 0.197 | (0.652) | 0.0691 | (0.216) | 961,032 |
| -4 | 0.123 | (1.426) | 0.492 | (0.619) | 0.170 | (0.231) | 999,054 |
| -3 | -0.525 | (1.318) | 0.0553 | (0.538) | 0.129 | (0.236) | 1,022,688 |
| -2 | 1.004 | (1.282) | 0.493 | (0.490) | 0.582* | (0.240) | 1,064,756 |
| -1 | -0.230 | (1.241) | 0.0618 | (0.485) | 0.512 | (0.280) | 1,062,808 |
| 0 | -0.239 | (1.183) | -0.416 | (0.409) | 0.195 | (0.291) | 1,061,060 |
| 1 | -1.099 | (1.143) | -0.505 | (0.375) | -0.638* | (0.316) | 1,059,608 |
| 2 | 0.142 | (1.143) | 0.124 | (0.373) | -0.585 | (0.353) | 1,058,507 |
| 3 | 0.949 | (1.111) | -0.142 | (0.327) | 0.683* | (0.345) | 1,057,497 |
| 4 | -0.754 | (1.136) | 0.391 | (0.342) | -0.115 | (0.398) | 1,056,470 |
| 5 | 1.236 | (1.143) | -0.524 | (0.339) | 0.0889 | (0.403) | 1,055,512 |
| 6 | -4.056** | (1.139) | -0.213 | (0.351) | -0.498 | (0.445) | 1,054,542 |
| 7 | -0.134 | (1.143) | 0.356 | (0.345) | -0.419 | (0.457) | 1,053,219 |
| 8 | 0.259 | (1.182) | 0.143 | (0.352) | -0.437 | (0.493) | 1,051,571 |
| 9 | 1.144 | (1.166) | 0.688 | (0.368) | 0.322 | (0.513) | 1,049,748 |
| 10 | 3.045** | (1.178) | 0.573 | (0.380) | 1.289* | (0.538) | 1,047,530 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.

Table C 3. The effect of exposure to parental job loss on hospitalization (percent) 8 years before to 10 years after closure, yearly estimates. Corresponds to Figure 2 father

| Period | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error | # Obs |
|--------|----------|------------|----------|------------|----------|------------|-------|
| | Hospitalization | | Avoidable | | Mental & behavior | | |
| -8 | -0.540 | (1.678) | -0.792 | (0.719) | 0.339 | (0.243) | 808,763 |
| -7 | 2.140 | (1.540) | 0.255 | (0.670) | 0.161 | (0.221) | 895,613 |
| -6 | -0.0928 | (1.432) | 0 | (0.621) | 0.217 | (0.225) | 981,647 |
| -5 | 0.825 | (1.344) | 0.576 | (0.586) | -0.0356 | (0.200) | 1,064,687 |
| -4 | 0.383 | (1.254) | 0.984 | (0.548) | 0.238 | (0.193) | 1,143,628 |
| -3 | 1.153 | (1.174) | 0.194 | (0.515) | -0.0743 | (0.214) | 1,217,722 |
| -2 | -0.421 | (1.124) | 0.176 | (0.468) | -0.222 | (0.205) | 1,285,125 |
| -1 | -0.0880 | (1.048) | 0.158 | (0.435) | -0.0939 | (0.215) | 1,281,482 |
| 0 | 0.753 | (0.980) | 0.265 | (0.370) | -0.188 | (0.225) | 1,278,620 |
| 1 | -0.407 | (0.959) | -0.0295 | (0.321) | 0.0825 | (0.243) | 1,276,271 |
| 2 | 0.667 | (0.934) | 0.248 | (0.303) | 0.212 | (0.260) | 1,274,546 |
| 3 | 0.0413 | (0.925) | -0.154 | (0.289) | -0.0886 | (0.277) | 1,273,162 |
| 4 | -0.751 | (0.927) | -0.183 | (0.287) | 0.166 | (0.294) | 1,271,921 |
| 5 | 0.0828 | (0.920) | 0.313 | (0.271) | -0.272 | (0.311) | 1,270,989 |
| 6 | 0.0355 | (0.924) | 0.349 | (0.285) | 0.0237 | (0.345) | 1,269,896 |
| 7 | -0.391 | (0.931) | 0.0474 | (0.290) | -0.646 | (0.355) | 1,268,575 |
| 8 | 0.0594 | (0.935) | 0.0594 | (0.287) | 0.131 | (0.371) | 1,266,762 |
| 9 | 1.118 | (0.963) | 0.238 | (0.291) | -0.381 | (0.413) | 1,264,894 |
| 10 | -0.399 | (0.975) | 0.364 | (0.317) | -0.346 | (0.435) | 1,262,610 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.

Table C 4. Grades, yearly estimates. Corresponds to Figure 3

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | # Obs |
|--------|----------|------------|-------|----------|------------|-------|
| | Mother | | | Father | | |
| -8 | -0.0175 | (0.760) | 77,675 | -0.978 | (0.687) | 70,784 |
| -7 | -0.868 | (0.679) | 77,699 | 0.710 | (0.630) | 69,854 |
| -6 | -0.581 | (0.682) | 76,148 | -0.953 | (0.627) | 69,661 |
| -5 | -0.802 | (0.690) | 75,008 | 0.00600 | (0.636) | 69,597 |
| -4 | -0.308 | (0.685) | 73,399 | -0.691 | (0.618) | 69,075 |
| -3 | 0.731 | (0.698) | 71,701 | -0.0514 | (0.624) | 68,45 |
| -2 | -1.268 | (0.713) | 71,179 | -1.180 | (0.639) | 68,358 |
| -1 | -0.850 | (0.699) | 70,186 | -0.0556 | (0.636) | 68,081 |
| 0 | -0.370 | (0.711) | 69,432 | -0.249 | (0.651) | 68,619 |
| 1 | -0.729 | (0.710) | 68,783 | -0.316 | (0.640) | 69,46 |
| 2 | -1.265 | (0.720) | 68,396 | -0.0256 | (0.638) | 69,898 |
| 3 | -1.404 | (0.721) | 67,796 | -1.044 | (0.638) | 71,593 |
| 4 | -1.599* | (0.725) | 69,087 | 0.431 | (0.612) | 74,113 |
| 5 | -0.749 | (0.714) | 70,118 | -1.105 | (0.618) | 76,775 |
| 6 | -1.112 | (0.705) | 71,064 | -1.344* | (0.594) | 80,06 |
| 7 | -0.736 | (0.689) | 72,271 | 0.108 | (0.593) | 82,857 |
| 8 | -0.744 | (0.679) | 72,273 | -1.167* | (0.578) | 84,798 |
| 9 | -0.572 | (0.696) | 69,433 | 0.474 | (0.578) | 85,695 |
| 10 | 0.0150 | (0.734) | 62,858 | 0.0958 | (0.579) | 84,443 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.

Table C 5. Parental outcomes: Unemployment (fraction), earnings and disposable income in SEK 8(7) years before and up to 10 years after closure. Corresponds to Figure 4 mother

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|---|---|
| | Unemployment | | | Earnings | | Disposable Income | | |
| -8 | | | | -372.8 | (743.1) | -2,514 | (1,29) | 538,827 |
| -7 | 0.00488 | (0.00380) | 361,977 | 117.5 | (662.8) | -2,612* | (1,224) | 714,67 |
| -6 | 0.00205 | (0.00308) | 541,985 | 760.3 | (643.3) | -133.9 | (1,196) | 888,217 |
| -5 | -0.00246 | (0.00261) | 717,275 | 1,229* | (546.1) | -2,926** | (1,021) | 1,062,772 |
| -4 | -0.00718** | (0.00212) | 890,222 | 1,511* | (621.1) | -2,152* | (961.2) | 1,063,759 |
| -3 | 0.00125 | (0.00169) | 1,064,385 | 1,084* | (519.8) | 212.9 | (1,145) | 1,064,385 |
| -2 | -0.00166 | (0.00171) | 1,064,385 | 442.6 | (543.3) | -2,092 | (1,621) | 1,064,385 |
| -1 | 0.0237** | (0.00189) | 1,062,484 | -94.38 | (682.7) | 1,236 | (1,699) | 1,062,484 |
| 0 | 0.0705** | (0.00205) | 1,060,579 | -4,017** | (700.7) | -971.2 | (1,921) | 1,060,579 |
| 1 | 0.0720** | (0.00207) | 1,059,007 | -10,002** | (749.6) | 1,995 | (6,028) | 1,059,007 |
| 2 | 0.0565** | (0.00199) | 1,057,753 | -10,754** | (798.7) | -5,118 | (3,543) | 1,057,753 |
| 3 | 0.0400** | (0.00192) | 1,056,556 | -8,906** | (844.2) | -4,638 | (2,487) | 1,056,556 |
| 4 | 0.0310** | (0.00185) | 1,055,454 | -7,760** | (877.5) | -10,101 | (6,298) | 1,055,454 |
| 5 | 0.0235** | (0.00179) | 1,054,264 | -8,464** | (918.9) | -7,147** | (2,679) | 1,054,264 |
| 6 | 0.0159** | (0.00177) | 1,053,024 | -6,494** | (950.4) | -12,274** | (2,441) | 1,053,024 |
| 7 | 0.0160** | (0.00171) | 1,051,739 | -7,195** | (1,003) | -4,362 | (3,562) | 1,051,739 |
| 8 | 0.0106** | (0.00169) | 1,050,280 | -6,206** | (1,032) | -8,780** | (2,386) | 1,050,280 |
| 9 | 0.0128** | (0.00167) | 1,048,736 | -7,109** | (1,095) | -13,707** | (2,859) | 1,048,736 |
| 10 | 0.0126** | (0.00169) | 1,047,166 | -5,673** | (1,114) | -14,493** | (3,619) | 1,047,166 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes p<0.05 and ** denotes p<0.01. Unemployment has only been observed in the data since 1992; therefore, the pre-period is only 7 years instead of 8.

Table C 6. Parental outcomes: Unemployment (fraction), earnings and disposable income in SEK 8(7) years before and up to 10 years after closure. Corresponds to Figure 4 father

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|---|---|
| | Unemployment | | | Earnings | | Disposable income | | |
| -8 | | | | 2,094* | (1,057) | 2,411 | (1,355) | 634,613 |
| -7 | -0.00459 | (0.00328) | 423,889 | 846.6 | (837.3) | 167.7 | (989.2) | 850,769 |
| -6 | -0.00230 | (0.00260) | 642,831 | 863.8 | (773.0) | -33.42 | (894.6) | 1,065,608 |
| -5 | -0.00546* | (0.00215) | 858,292 | 865.5 | (754.0) | -1,333 | (906.1) | 1,279,784 |
| -4 | -0.00550** | (0.00175) | 1,071,644 | 1,031 | (804.4) | 219.5 | (1,039) | 1,282,797 |
| -3 | -0.000374 | (0.00145) | 1,285,125 | -668.2 | (856.8) | -1,36 | (1,165) | 1,285,125 |
| -2 | 0.000164 | (0.00141) | 1,285,125 | -281.6 | (917.4) | -657.0 | (1,658) | 1,285,125 |
| -1 | 0.0326** | (0.00153) | 1,280,815 | -713.0 | (966.7) | 505.1 | (1,79) | 1,280,815 |
| 0 | 0.0839** | (0.00167) | 1,277,001 | -8,790** | (1,112) | -2,785 | (2,374) | 1,277,001 |
| 1 | 0.0833** | (0.00165) | 1,273,769 | -18,410** | (1,177) | -10,382** | (3,518) | 1,273,769 |
| 2 | 0.0585** | (0.00156) | 1,271,194 | -18,892** | (1,36) | -13,811** | (3,256) | 1,271,194 |
| 3 | 0.0396** | (0.00150) | 1,268,811 | -16,612** | (1,326) | -14,453** | (3,531) | 1,268,811 |
| 4 | 0.0336** | (0.00148) | 1,266,196 | -14,593** | (1,376) | -12,037** | (2,979) | 1,266,196 |
| 5 | 0.0279** | (0.00145) | 1,263,830 | -15,025** | (1,376) | -14,057** | (4,781) | 1,263,830 |
| 6 | 0.0234** | (0.00144) | 1,261,751 | -14,460** | (1,396) | -12,706** | (2,061) | 1,261,751 |
| 7 | 0.0182** | (0.00141) | 1,258,891 | -14,182** | (1,499) | -13,784** | (4,278) | 1,258,892 |
| 8 | 0.0159** | (0.00139) | 1,255,787 | -12,633** | (1,553) | -19,691** | (3,31) | 1,255,788 |
| 9 | 0.0126** | (0.00138) | 1,252,455 | -16,701** | (1,678) | -17,558** | (3,92) | 1,252,457 |
| 10 | 0.0139** | (0.00139) | 1,248,925 | -13,961** | (1,646) | -40,994 | (26,065) | 1,248,927 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes p<0.05 and ** denotes p<0.01. Unemployment has only been observed in the data since 1992; therefore, the pre-period is only 7 years instead of 8.

Table C 7. Effect of exposure to job loss on social assistance (share) and likelihood of biological parents being separated (share) eight years before and up to 10 years after closure. Corresponds to Figure 5 mother

| | Estimate | Std. Error | # Obs | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|
| | Social Assistance | | | Separated | | |
| -8 | 0.00909** | (0.00203) | 543,707 | | | |
| -7 | 0.00574** | (0.00178) | 718,44 | | | |
| -6 | 0.00480** | (0.00155) | 890,769 | | | |
| -5 | 0.00162 | (0.00141) | 1,064,385 | | | |
| -4 | 0.00495** | (0.00140) | 1,064,385 | 0.00348 | (0.00246) | 1,063,026 |
| -3 | 0.00291* | (0.00135) | 1,064,385 | 0.00111 | (0.00248) | 1,064,385 |
| -2 | -0.000793 | (0.00129) | 1,064,385 | 0.000159 | (0.00249) | 1,064,385 |
| -1 | 0.00284* | (0.00127) | 1,064,385 | 0.00317 | (0.00256) | 1,059,665 |
| 0 | 0.00354** | (0.00123) | 1,064,385 | 0.00372 | (0.00264) | 1,054,933 |
| 1 | 0.00361** | (0.00120) | 1,064,385 | -0.000625 | (0.00271) | 1,050,716 |
| 2 | 0.00256* | (0.00114) | 1,064,385 | 0.00683* | (0.00275) | 1,046,925 |
| 3 | 0.00360** | (0.00106) | 1,064,385 | 0.00473 | (0.00281) | 1,043,311 |
| 4 | 0.00382** | (0.00103) | 1,064,385 | 0.00778** | (0.00284) | 1,039,987 |
| 5 | 0.00467** | (0.000988) | 1,064,385 | 0.00641* | (0.00287) | 1,036,791 |
| 6 | 0.00192* | (0.000924) | 1,064,385 | 0.00436 | (0.00290) | 1,033,938 |
| 7 | 0.00349** | (0.000957) | 1,064,385 | 0.00726* | (0.00292) | 1,029,754 |
| 8 | 0.00159 | (0.000988) | 1,064,385 | 0.00531 | (0.00296) | 1,024,873 |
| 9 | 0.00134 | (0.000992) | 1,064,385 | 0.00433 | (0.00299) | 1,019,509 |
| 10 | 0.000952 | (0.000976) | 1,064,385 | 0.00347 | (0.00300) | 1,014,022 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.

Table C 8. Effect of exposure to job loss on social assistance (share) and likelihood of biological parents being separated (share) eight years before and up to 10 years after closure. Corresponds to Figure 5 father

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | # Obs |
|--------|----------|------------|-------|----------|------------|-------|
| | Social Assistance | | | Separated | | |
| -8 | -0.000963 | (0.00152) | 648,07 | | | |
| -7 | 0.00207 | (0.00132) | 862,092 | | | |
| -6 | 0.00341** | (0.00116) | 1,073,665 | | | |
| -5 | 0.000913 | (0.00109) | 1,285,125 | | | |
| -4 | 0.00188 | (0.00106) | 1,285,125 | 0.000317 | (0.00192) | 1,281,768 |
| -3 | 0.00184 | (0.00103) | 1,285,125 | -0.00179 | (0.00189) | 1,285,125 |
| -2 | -0.000293 | (0.000979) | 1,285,125 | -0.000550 | (0.00190) | 1,285,125 |
| -1 | -7.02e-05 | (0.000961) | 1,285,125 | 0.00368 | (0.00197) | 1,279,548 |
| 0 | 0.00282** | (0.000924) | 1,285,125 | -0.00145 | (0.00204) | 1,274,724 |
| 1 | 0.00453** | (0.000895) | 1,285,125 | 0.00134 | (0.00211) | 1,270,376 |
| 2 | 0.00425** | (0.000830) | 1,285,125 | 0.00309 | (0.00216) | 1,266,639 |
| 3 | 0.00187* | (0.000775) | 1,285,125 | 0.000882 | (0.00221) | 1,263,065 |
| 4 | 0.00249** | (0.000724) | 1,285,125 | -0.000526 | (0.00226) | 1,259,141 |
| 5 | 0.000959 | (0.000697) | 1,285,125 | -0.00193 | (0.00229) | 1,255,420 |
| 6 | 0.00131 | (0.000680) | 1,285,125 | 0.00129 | (0.00233) | 1,251,987 |
| 7 | 0.00212** | (0.000710) | 1,285,125 | 0.00141 | (0.00236) | 1,247,691 |
| 8 | 0.000749 | (0.000725) | 1,285,125 | 0.00195 | (0.00239) | 1,243,020 |
| 9 | 0.000796 | (0.000727) | 1,285,125 | 0.00224 | (0.00242) | 1,237,955 |
| 10 | 0.000339 | (0.000724) | 1,285,125 | 0.00231 | (0.00243) | 1,232,566 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$

Table C 9. Effect of exposure to job loss on parental mortality (number of deaths per 1 000 between closure and year t). Corresponds to Figure 6

| Period | Estimate | Std. Error | # Obs | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|
| | Mother | | | Father | | |
| 0 | 0.106 | (0.194) | 1,064,385 | 0.374 | (0.207) | 1,285,125 |
| 1 | -0.123 | (0.245) | 1,064,385 | 0.304 | (0.266) | 1,285,125 |
| 2 | 0.0881 | (0.289) | 1,064,385 | 0.234 | (0.311) | 1,285,125 |
| 3 | -0.141 | (0.336) | 1,064,385 | 0.293 | (0.366) | 1,285,125 |
| 4 | -0.0529 | (0.384) | 1,064,385 | 0.761 | (0.407) | 1,285,125 |
| 5 | 0.159 | (0.424) | 1,064,385 | 0.667 | (0.455) | 1,285,125 |
| 6 | 0.176 | (0.466) | 1,064,385 | 1.158* | (0.505) | 1,285,125 |
| 7 | 0.335 | (0.506) | 1,064,385 | 1.170* | (0.548) | 1,285,125 |
| 8 | 0.194 | (0.552) | 1,064,385 | 1.053 | (0.591) | 1,285,125 |
| 9 | 0.582 | (0.596) | 1,064,385 | 0.971 | (0.639) | 1,285,125 |
| 10 | 0.828 | (0.632) | 1,064,385 | 1.088 | (0.686) | 1,285,125 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes p<0.05 and ** denotes p<0.01.

Table C 10. Effect of exposure to job loss on hospitalization. Corresponding to Figure 6 mother

| Period | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error | # Obs |
|---|---|---|---|---|---|---|---|
| | Hospitalization | | Alcohol | | Mental health | | |
| -8 | 2.127 | (1.585) | -0.0715 | (0.120) | 0.608* | (0.260) | 1,053,034 |
| -7 | -1.847 | (1.536) | 0.0355 | (0.0937) | -0.302 | (0.254) | 1,058,003 |
| -6 | -2.192 | (1.503) | -0.177 | (0.121) | -0.301 | (0.253) | 1,061,068 |
| -5 | 0.265 | (1.448) | -0.0882 | (0.120) | -0.265 | (0.269) | 1,062,772 |
| -4 | 2.522 | (1.416) | -0.0176 | (0.145) | 0.123 | (0.274) | 1,063,759 |
| -3 | -0.247 | (1.377) | -0.0352 | (0.155) | -0.194 | (0.304) | 1,064,385 |
| -2 | 0.106 | (1.396) | 0.123 | (0.197) | -0.247 | (0.347) | 1,064,385 |
| -1 | -3.355* | (1.332) | 0.318 | (0.202) | 0.494 | (0.343) | 1,062,484 |
| 0 | -0.849 | (1.346) | -0.0531 | (0.195) | -0.319 | (0.344) | 1,060,579 |
| 1 | 3.119* | (1.337) | 0.691** | (0.231) | 0.620 | (0.369) | 1,059,007 |
| 2 | 0.160 | (1.333) | 0.355 | (0.217) | -0.514 | (0.359) | 1,057,753 |
| 3 | -2.892* | (1.354) | -0.0177 | (0.220) | 0.124 | (0.386) | 1,056,556 |
| 4 | -0.409 | (1.332) | -0.0533 | (0.212) | 0.480 | (0.395) | 1,055,454 |
| 5 | 1.636 | (1.341) | 0.249 | (0.225) | 0.462 | (0.390) | 1,054,264 |
| 6 | 1.282 | (1.362) | 0.160 | (0.234) | 0.855* | (0.391) | 1,053,024 |
| 7 | 1.837 | (1.386) | -0.107 | (0.245) | 0.749 | (0.414) | 1,051,739 |
| 8 | 0.411 | (1.418) | 0.161 | (0.261) | 0.179 | (0.424) | 1,050,280 |
| 9 | 1.503 | (1.435) | -0.465 | (0.270) | -0.0537 | (0.460) | 1,048,736 |
| 10 | -1.882 | (1.461) | 0 | (0.301) | -0.376 | (0.469) | 1,047,166 |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes p<0.05 and ** denotes p<0.01.

Table C 11. Effect of exposure to job loss on hospitalization. Corresponding to Figure 6 father

| Period | Estimate | Std. Error | Estimate | Std. Error | Estimate | Std. Error | # Obs | |
|---|---|---|---|---|---|---|---|---|
| | Hospitalization | | | Alcohol | | Mental health | | |
| -8 | 0 | (1.029) | 0.360* | (0.179) | 0.409 | (0.233) | 1,254,907 | |
| -7 | 1.285 | (1.027) | 0.202 | (0.171) | 0.250 | (0.229) | 1,266,714 | |
| -6 | 0.567 | (1.025) | -0.165 | (0.180) | -0.0354 | (0.235) | 1,275,015 | |
| -5 | 0.623 | (1.028) | 0.0235 | (0.171) | -0.223 | (0.232) | 1,279,784 | |
| -4 | 0.903 | (1.033) | -0.0234 | (0.185) | -0.504* | (0.242) | 1,282,797 | |
| -3 | -1.041 | (1.029) | -0.0351 | (0.172) | 0.234 | (0.245) | 1,285,125 | |
| -2 | 0.796 | (1.030) | 0.164 | (0.193) | 0.164 | (0.256) | 1,285,125 | |
| -1 | -0.482 | (1.037) | -0.399 | (0.209) | -0.622* | (0.271) | 1,280,815 | |
| 0 | 1.166 | (1.044) | -0.165 | (0.235) | 0.247 | (0.305) | 1,277,001 | |
| 1 | 0.402 | (1.032) | 0.614** | (0.236) | 0.591 | (0.307) | 1,273,769 | |
| 2 | 1.231 | (1.039) | 0.166 | (0.245) | -0.0710 | (0.311) | 1,271,194 | |
| 3 | 1.566 | (1.056) | 0.142 | (0.254) | -0.261 | (0.309) | 1,268,811 | |
| 4 | 2.616* | (1.069) | 0.214 | (0.267) | -0.238 | (0.328) | 1,266,196 | |
| 5 | -1.501 | (1.077) | -0.167 | (0.274) | 0.0357 | (0.343) | 1,263,830 | |
| 6 | 1.421 | (1.112) | -0.0477 | (0.290) | -0.668 | (0.357) | 1,261,751 | |
| 7 | 3.399** | (1.131) | 0.0838 | (0.288) | 0.383 | (0.349) | 1,258,891 | |
| 8 | -1.500 | (1.149) | -0.324 | (0.295) | -0.696 | (0.366) | 1,255,787 | |
| 9 | 0.541 | (1.162) | -0.205 | (0.296) | -0.192 | (0.383) | 1,252,455 | |
| 10 | 1.883 | (1.213) | -0.0845 | (0.318) | 0.495 | (0.396) | 1,248,925 | |

*Note:* Estimated using propensity score matching. The matching method used is nearest neighbor with replacement. Standard errors in parentheses take into account that the propensity score is estimated. Statistical significance: * denotes $p<0.05$ and ** denotes $p<0.01$.