Child Health, Parental Well-Being, and the Social Safety Net*

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May 2023

Abstract

How do parents contend with threats to the health and survival of their children? Can the social safety net mitigate negative economic effects through transfers to affected families? We study these questions by combining the universe of cancer diagnoses among Danish children with register data for affected and matched unaffected families. Parental income declines substantially for 3-4 years following a child's cancer diagnosis. Fathers' incomes recover fully, but mothers' incomes remain 3% lower 12 years after diagnosis. Using a policy reform that introduced variation in the generosity of targeted safety net transfers to affected families, we show that such transfers play a crucial role in smoothing income for these households and, importantly, do not generate work disincentive effects. The pattern of results is most consistent with the idea that parents' preferences to personally provide care for their children during the critical years following a severe health shock drive changes in labor supply and income. Mental health and fertility effects are also observed but are likely not mediators for impacts on economic outcomes.

JEL Codes: I10, J13, J22
Keywords: child health, income, labor supply, safety net, cash transfers, disincentive effects, long-run effects, mental health, childhood cancers, Denmark

*This work has greatly benefited from the feedback of seminar participants at CU Denver, Williams, IZA, Essen Health Conference, NBER, USC, UH Manoa, and Michigan. Thanks to Therese Aunbirk Jeppesen for excellent research assistance. All errors are our own.

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1 Introduction

Economists have long sought to understand how individuals make decisions concerning work in the context of family, and how public policy affects these decisions. For example, studies have examined how labor supply and income trajectories change with the birth of children (Kleven et al., 2019; Lundborg et al., 2017); the joint timing of spouses' decisions regarding work and retirement (Blau, 1998; Gustman and Steinmeier, 2000); the impacts of maternity and paternity leave (Ginja et al., 2020; Rossin-Slater et al., 2013; Ruhm, 1998); and the effects of safety net policies related to children (Blank, 2002; Chetty et al., 2013; Grogger and Karoly, 2005; Hotz and Scholz, 2003; Kleven, 2023; Lippold, 2019; Nichols and Rothstein, 2016). This paper tackles an important but understudied set of questions within this area of inquiry: how do parents contend with shocks to the health and survival of their children? And how do preferences for work and child care interact with safety net policy during these critical events to determine labor supply and income in the long term?

The answers to these questions may have fundamental implications for our understanding of life-cycle decision-making, especially as it relates to labor supply, fertility, and health. They might also inform the design of smarter safety net policies related to paid leave, unemployment insurance, and labor market reintegration, among others. Yet rigorous evidence on these fronts remains elusive, for at least three reasons. The first is the endogeneity of child health, which is co-determined with a host of household characteristics and behaviors, including, importantly, family socioeconomic status (Case et al., 2002; Currie and Hyson, 1999; Currie and Stabile, 2003). Most determinants of child health likely directly affect family outcomes, rendering the identification of causal impacts difficult. The second issue is data constraints. In particular, it is necessary to pair detailed information on child health – including the precise timing of shocks – with panel data on families' economic outcomes extending long enough to track long-run adjustments, which may be a critical part of the overall story; that combination is rare. Third, combining these data with independent variation in – and data on individual- or family-level exposure to – the generosity of the safety net is a tall order.

Our work aims to overcome these challenges by studying the impacts of a specific health shock – childhood cancer – on parents' income and safety net transfers, labor market decisions, and mental health in Denmark. We link data on the universe of childhood cancer diagnoses in Denmark to population register data on the characteristics and outcomes of families of affected children, as well as the same data from matched families of unaffected children. We also exploit changes in the generosity of transfers to families for parents' labor market absence during their children's illnesses.

Childhood cancer has several important features that make it well suited for the study of the above-mentioned questions. First, cancers are an important determinant of population health in nearly all contexts, including among high-income countries. Cancer is the second leading cause of death in OECD countries, accounting for more than 25 percent of all deaths (OECD, 2019). While cancer is often studied in the context of aging, it can also have devastating effects across the age distribution. It is indeed is the leading cause of disease-related death among children in high-income countries (Grabas et al., 2020); for example, in the United States 1 in 285 children will be diagnosed with cancer before the age of 20 (Ward et al., 2014). The impacts of cancer diagnosis and treatment on the health and well-being of children are likely profound – studies in pediatrics and public health seek to quantify some of these impacts, usually based on samples of childhood cancer survivors (see, e.g., Armstrong et al. (2016, 2009)). But there is little rigorous evidence on the potentially substantial impacts of childhood cancer diagnosis on the short- and long-run economic outcomes of mothers and fathers.

Second, unlike some cancers, which are strongly hereditary, the occurrence of most childhood cancers is very difficult to predict, in that they are, by and large, not associated with cancer prevalence in past generations, nor with the genetic or physical traits of infants and young children, nor with socioeconomic characteristics of households (Birch, 1999; Lichtenstein et al., 2000). This means that for most families (regardless of socioeconomic or demographic categories), a child's cancer diagnosis is an unanticipated event – that is, truly a shock.[1]

Third, childhood cancer is a large and potentially life-changing event for families. Depending on the severity of the cancer and the health impacts of treatment, children may require intensive care and resources, thus affecting parents' choices regarding income generation, labor market participation, saving, debt, and the like. This particular shock may thus plausibly affect both short- and long-term economic well-being for families.

We use population data to identify close matches for each cancer household from a large pool of

[1] It bears mention here that in the Danish context, health care access is universal, and thus the timing of diagnosis — and relatedly, access to timely treatment and ultimately survival — does not vary by socioeconomic status; this is not true in the United States, where unequal access to the health care system delays diagnosis and treatment for low-income individuals.

unaffected “controls” based on households’ socioeconomic characteristics and demographic structure prior to diagnosis. We identify treatment effects by leveraging the plausible exogeneity of the occurrence and timing of cancer diagnosis. Long observation periods (twelve years before and twelve years after diagnosis) allow for the rigorous evaluation of potential pre-trends across affected and unaffected households.

We find that both mothers’ and fathers’ incomes decrease markedly immediately following a cancer diagnosis for their child. This decline is more pronounced for mothers, whose income drops by twenty percent in the year following diagnosis; father’s income drops by less than ten percent in the same period. The drop in maternal income is due to a large fraction of affected mothers shifting from full- to part-time employment, and also in smaller part to a decline in labor force participation. Fathers also shift from full- to part-time work, but do not drop out of the labor force in response to the shock. Both parents’ incomes rebound 3-4 years after initial diagnosis, but only father’s income fully recovers – mother’s income reaches a new steady state that is approximately three percent lower than controls.

Safety net transfers track the inverse of parents’ market earnings – they spike following diagnosis, peaking at nearly ten times their pre-diagnosis levels, and return to *ex ante* levels 4-5 years after diagnosis. Public transfers thus buffer peak earnings losses, such that total parental income does not decline substantially immediately after cancer diagnosis. However, the eventual weaning of public resources, combined with sustained losses of market earnings for mothers, lowers long-run family income by about 2.5 percent relative to controls.

To delve further into the role of the social safety net in buffering impacts, we leverage a 1998 policy change related to the generosity of transfers specifically concerning adverse child health events, which substantially expanded both transfer amounts (from a fixed amount equal to the maximum level of unemployment benefits to full wage replacement) as well as transfer duration (from one year to as long as is deemed medically necessary). Comparing cohorts diagnosed with cancer in the years just before and just after the policy change, we find that under the more generous transfer policy, households were better able to smooth income in the initial years after cancer diagnosis, and experienced less detrimental effects of the shock on income in the long run (though the latter result suffers somewhat from statistical imprecision).

Strikingly, greater transfer generosity *did not* generate work disincentive effects: if anything, labor supply responses were somewhat larger under the *less* generous policy regime. Finally, while transfers in the initial period following diagnosis are larger under the new regime (congruent with the increased generosity of the new policy), in the medium-run transfers are actually slightly larger in the old regime, reflecting the fact that parents take longer to reintegrate into the labor force under the less generous policy. Putting the transfer and income results together, we find that the increase in transfers after the policy change is far outweighed by the total increase in market earnings that the additional transfers unlock, suggesting that at prevailing tax rates, the new policy was largely self-funding.

What underlying economic mechanisms drive these effects? We contend that the pattern of results is most consistent with the idea that parents prefer to personally care for their children in the initial period following cancer diagnosis, when affected children receive treatment and likely have intensive care needs. This drives parents (particularly mothers) to scale down work and spend more time with their sick children.

Several pieces of empirical evidence support this interpretation. First, the impacts of childhood cancer diagnosis are identical across high- and low-SES parents.[2] This finding suggests that higher levels of financial resources – which might change households' decisions regarding external care providers or other types of help at home during critical illness periods – do not appear to result in a differential scaling back of labor supply.

Second, we study heterogeneity by child survival, specifically, comparing responses among households in which the child dies within five years and those in which the child survives at least five years.[3] We find that effects on labor supply and income are larger and more persistent among households in which the child does not survive (but both samples exhibit the same pattern of impacts). We also examine heterogeneity in fertility responses and find a strong "replacement fertility" response[4] for households in which the child does not survive, but zero response when the child does. This analysis has several implications. It first implies that when the cancer is more

[2] While access to health care does not vary substantially by SES in the Danish context (as it does, for example, in the United States), higher-income parents' labor supply responses to shocks and ensuing income changes might still be very different from those of lower-income parents. We employ two commonly used proxies for SES: mothers' completed schooling and household market income prior to the diagnosis event.

[3] With appropriate and timely cancer treatment (which is the norm in Denmark given universal access to health care), child survival is largely determined by the inherent aggressiveness of the cancer, which varies quite idiosyncratically based on the child's genetic makeup. In our sample, about twenty percent of childhood cancer episodes lead to the death of child within five years of diagnosis.

[4] See, e.g., Ben-Porath (1976); Rosenzweig and Schultz (1983); Schultz (1978); Wolpin (1984).

severe, the reduction in labor supply — and thus the care response — is also stronger, consistent with the mechanism described above. It also implies that labor supply responses in the long run are not driven by children's persistent health issues in this context, given that responses are indeed larger and more persistent among households in which the child did not survive. Last, because we find increases in fertility only among households where the child did not survive, but labor market impacts for both sub-samples, these results also reveal that our labor market responses are not primarily driven by fertility changes.

Finally, we study mental health impacts – specifically, impacts on contacts with psychologists and general practitioners licensed for mental health counselling. We find an almost doubling of the share receiving psychological counselling in the 1-2 years following diagnosis for both mothers and fathers. Elevated mental health care demand persists for nearly a decade following diagnosis, equalizing with control levels thereafter. Once again, responses are similar across the socioeconomic distribution but much larger for households who experience a child death, suggesting that there is a role for mental health in explaining economic impacts. However, controlling for fertility and mental health effects does not change the magnitude and impacts on income and labor supply.

Our study has two main takeaways. First, shocks to child health have long-term economic consequences for families, even in a country like Denmark, with its high *per capita* income, universal health care access, and strong social safety net. Our results suggest substantial declines in parental labor supply immediately following a child's cancer diagnosis. Mothers suffer permanent labor market penalties while fathers' labor market outcomes fully recover in the long-run. Second – and perhaps more surprising – increasing the intensity of targeted public safety net transfers, which allow parents to take time off of work to care for their sick children, can entirely smooth parental income during the child's critical illness period and reduce long-run economics impacts to zero without generating any additional work disincentive effects. This evidence is thus critical in informing the debate, which still rages across many developed nations, regarding the importance (or lack thereof) of potential negative incentive effects of the social safety net (see, e.g., Aizer et al. (2022); Bitler et al. (2020)).

This study is closely related to recent work examining how child health affects parental labor market outcomes. Breivik and Costa-Ramón (2021) examine the short-run economic effects of child hospitalizations, Gunnsteinsson and Steingrimsdottir (2021) examine the effects of children with disabilities, Eriksen et al. (2021) study the impacts of a child's diagnosis with type-I diabetes, and Vaalavuo et al. (2022) investigate shorter-run responses to child cancer in Finland. The most important value added of our study is the investigation of the role of public policy: none of the above-mentioned studies leverages policy variation to examine how the social safety net can mitigate the negative impacts of health shocks to children. The relatively temporary nature of our shock (compared to diabetes in Eriksen et al. (2021) and disabilities in Gunnsteinsson and Steingrimsdottir (2021)), combined with our much longer follow-up period (compared to Breivik and Costa-Ramón (2021) and Vaalavuo et al. (2022)), also distinguish our paper from previous work.

We also contribute to the understanding of the link between socioeconomic status (SES) and health (Adler et al., 1994). SES and child health are strongly positively associated in both low- and high-income contexts (Case et al., 2002; Currie, 2009; Currie and Hyson, 1999; Currie and Stabile, 2003; McGovern et al., 2017). Most of the work in this space in economics has focused on the direction of causality running from household income and resources to children's health (see, e.g., Currie (2009); Gertler (2004); Hoynes et al. (2015)). There is a dearth of rigorous evidence for causality running in the opposite direction – that is, on the question of whether child health affects parents' short- and long-run economic outcomes, which would further help explain the observed association between the two.[5] Our work aims to fill this evidence gap.

2 Institutional Background

2.1 Diagnosis and Treatment of Childhood Cancers in Denmark

Childhood cancers are an important public concern in Denmark. Approximately 200 children are diagnosed with childhood cancer every year and childhood cancers remain the leading cause of disease-related death among 1 to 17 year-olds (Grabas et al., 2020). Survival rates are similar to those of other high-income countries, with four out of five children having successful remission (Schrøder et al., 2016).[6]

Importantly, health care services, including all stages in the diagnosis and treatment of childhood

[5] Related work – e.g., Dobkin et al. (2018); Fadlon and Nielsen (2021); Finkelstein and McKnight (2008); Gupta et al. (2018) – has demonstrated the impacts of shocks to the health of prime-age and elderly adults on economic outcomes.

[6] Survivors sometimes experience persistent health issues ranging from balance problems to impaired hearing and vision to sleep and hormonal problems (Hewitt et al., 2013).

cancers, are free of charge for all residents (Danish Ministry of Health and Prevention, 2008). Furthermore, guidelines that outline diagnosis and treatment pathways for the most common types of childhood cancers, including leukemias, tumors of the central nervous system, and lymphomas are well established (Sundhedsstyrelsen, 2016). Treatment is therefore unlikely to be held up due to direct costs, or due to lack of information on the appropriate procedures.

Children's health care is organized in primary and secondary systems with general practitioners acting as gatekeepers for specialist treatment (Mathiesen et al., 2016). General practitioners are responsible for regular consultations as well as the provision of preventive health examinations at the age of 5 weeks, 5 months, and annually until the age of 5 years.[7] Diagnosis of childhood cancers begins with the general practitioner's physical examination. If the general practitioner is concerned about a potential childhood cancer, the patient is referred to a hospital-based pediatric department for further checks, including clinical examination, blood tests, and imaging. Depending on the results, the children are further referred to a pediatric oncology unit in specific university hospitals where they receive surgical biopsies, laboratory and pathological studies, and imaging tests (e.g., computed tomographic scans, magnetic resonance imaging scans). Existing guidelines indicate that the time from the general practitioner's referral until arrival at the pediatric oncology unit should be 24 hours.[8]

Children who are diagnosed with cancer receive care in pediatric oncology units by a dedicated, multi-disciplinary team that not only includes oncologists, radiologists, surgeons, and pathologists but also nutritionists and psychologists. Denmark follows international protocols when determining the appropriate treatment options. The specific treatment regimen provided to each patient depends on many factors, including cancer characteristics (e.g., type, site, stage, and histology) as well as characteristics of the child (e.g., age, general health status). Common treatments include surgery, chemotherapy, radiation therapy, and immunotherapy. Most children receive a combination of two or three therapies (Hewitt et al., 2013).

The lengthy treatment process coupled with latent health effects often require substantial parental involvement in the monitoring and management of the child's treatment and side effects.

[7]More than 90% of children attend the first three preventive examinations (Mathiesen et al., 2016).

[8]According to the guidelines, CT scans should be conducted within 24 hours of the general practitioner's referral. Similarly, MRI scans should be conducted within 3 days of referral. In 2014, the median number of days from date of diagnosis to initiation of therapy was 7 days, and 80% of children started treatment within 14 days of diagnosis (Schrøder et al., 2016).

In the next section, we briefly describe the resources available in assisting parents of children with cancer.

2.2 Income Insurance Against Child Health Shocks

Denmark has a generous sickness benefit scheme that compensates parents of disabled and severely sick children for earning losses.[9] The benefit scheme is managed by the municipalities and the required documentation is minimal: employee's paychecks from the last few months, documentation from the child's healthcare provider detailing the diagnosis and the need for care, and a contract from the employer confirming that the employee is on leave or working reduced hours (and not receiving wages).[10] Once eligible, the employee receives benefits directly from the municipality, including retrospective payments for the application period.

While parents of sick children enjoy high income security, they have low job protection. The sickness benefit scheme does not explicitly provide job protection. Flexibility in hiring and firing rules generates low job protection in the labor market in general. According to Andersen and Svarer (2007), the Danish Labor Market is characterized by a high level of temporary lay-offs. For example, in 1998, temporary lay-offs accounted for 10% of total unemployment. That same year, 40% of unemployment spells ended with the individual getting rehired by the previous employer within 26 weeks. The effects of welfare generosity on labor market outcomes of parents of sick children need to be considered in this context where the employers have great freedom over staff turnover.

In addition to compensation for lost earnings, parents can receive support for day-to-day activities (e.g., cleaning, care for healthy siblings) through additional municipality-based programs. Importantly, pediatric oncology departments have in-house social workers who inform families of the different benefit schemes and help them with the administrative procedures for accessing the relevant welfare programs.

[9] Parents of sick children can also receive financial compensation from the Danish Public Benefits Administration (Udbetaling Danmark) through the Danish Parental Leave Act. However, this scheme targets employed parents in families where children are temporarily hospitalized instead of families where children are disabled or require long-term treatment. We confirm in our data that families where a child has a cancer diagnosis do not experience differential increases in parental leave transfers.

[10] Data on processing times do not exist but conversations with several municipality administrators indicate current processing times to be around two months.

2.2.1 Social Service Act in 1998 and other important legal changes

There have been several changes to the rules governing eligibility for financial compensation through the sickness benefit scheme as well as to the benefit duration and the wage replacement rate. Until 1998, the scheme covered parents of severely sick children under the age of 14 and offered fixed benefits at the maximum level of Danish unemployment insurance benefits for a maximum of 52 weeks. With the Social Service Act (Lov om Social Social Service, Lov nr. 454 i 1997) that came into effect in July 1998, the coverage was expanded to parents of severely sick children under the age of 18 and parents were compensated with their entire salary. Since then parents can receive benefits as long as they meet the eligibility criteria.[11] In 2011, a cap was introduced such that the maximum benefit levels corresponded to the lowest income quartile of workers (32,617 DKK or approximately 4,990 USD per month in 2021). In Section 4.2, we exploit the variation in welfare generosity due to the 1998 policy change to investigate the role that government transfers may have in either mitigating or exacerbating the impact of childhood cancer on parents' labor market outcomes.

3 Data and Empirical Strategy

3.1 Data

We use detailed register data from Denmark to collect a wide range of objective measures of child health and parental outcomes for the entire population. We focus on children born between 1987 and 2005 and use the unique person-level identifiers to link parents and children.

Outcome Variables Our primary outcome variables measure parental labor market performance. First, we combine information from the Income Statistics Register and the Income Transfer Register to create a measure of *market income* and *government transfers*. The Income Statistics Register is based on tax records collected by the Danish Tax Agency and provide information on asset holdings and liabilities of all individuals measured on the last day of the calendar year. The taxable income measure in this register is inclusive of government transfers. The Income Transfer Register comes

[11] Employees who are awarded benefits go through a review process every 52 weeks to document the child's continued need for care.

from the municipalities and contains information on the kind of benefit parents receive as well as the amount received each month. We define transfer payments as the sum of all municipality-based transfer payments received by parents. We focus on the total amount of municipality-based transfers because changes in market income may change parents' eligibility for different welfare programs. We measure market income as the difference between taxable income aggregated over all jobs and our government transfers variable.[12]

We next use the Register-Based Labour Force Statistics, a register that records the employment status of the entire Danish population (observed on January 1st) as of November of the preceding year, to define an indicator that equals one if an individual is *in the labor force* and zero otherwise. We also construct a measure of *full-time status.* Our data includes number of hours worked beginning in 2008. The data up until 2008 only includes a variable that registers full time employment, defined as a person working more than 32 hours per week on average. We therefore define a full-time employment indicator, among those who are working, equal to one for those working more than 32 hours per week on average.

We use data from several other registers to probe mechanisms. In order to explore whether childhood cancers lead to *long-run morbidity*, we use the National Patient Register, a dataset on all inpatient admissions, outpatient visits, and emergency room visits to hospitals, and calculate the number of hospital visits a child has in a given year. We investigate the role of disease severity by using information on *child survival* from the Cause of Death Register. We use the Health Insurance Register to examine effects on *parental mental health.* These data provide information on reimbursements to private-practice providers – both general practitioners and specialists – for all patient-related services covered by the national health insurance. We construct an indicator equal to one if the parent has used any services provided by psychologists or mental health related services provided by general practitioners. Finally, we use the Birth Register to measure *mother's fertility* over time.

Diagnosis of Childhood Cancers We identify childhood cancers from the National Patient Register using visits (inpatient admissions, outpatient or ER visits) that have with the following World Health Organization's International Classification of Disease (ICD) primary diagnosis codes:

[12] All monetary values are reported in 1,000 Danish Kroner (DKK) deflated to 2015 prices using the consumer price index. In that year the exchange rate was approximately DKK 7 per US $1.

ICD-8 codes starting from "140" to "209"; and ICD-10 codes starting with "DC".

Other Control Variables We use the former registers as well the National Population Register and the Education Register to define a number of variables characterizing the children and their families: child gender, birth year, birth order, number of siblings, parental age, parental education, and marital status. We detail how these variables are included in our analysis when we describe our empirical strategy.

Among children born between 1987-2005, 3279 children (in 3260 unique households) have at least one childhood cancer diagnosis. Appendix Figure A1 shows the distribution of age at cancer diagnosis. The average child is diagnosed with cancer at age 6.8 but there is a substantial amount of variation in age at diagnosis. Among these children, the most common types of cancers are non-Hodgkin lymphoma (34%), acute leukemia (16%), and ependymoblastoma (brain cancer, 15%). Appendix Table A1 compares the characteristics of (parents of) children diagnosed with cancer before age sixteen with the entire population of (parents of) children born in the same years and who do not have a cancer diagnosis. Parental characteristics are measured in the year the child is born. Children diagnosed with cancer are more likely to be male, are older, and are of slightly lower birth order than children who do not have cancer. Parental age, marital status, government transfers, and mental health care utilization are similar in both groups. Years of schooling, market income, and the likelihood of having full-time employment are lower among parents who have a child diagnosed with cancer, but while these differences are statistically significant they are negligible in magnitude. For example, the differences in market income amount to approximately 2.5% of the corresponding mean in the non-cancer population. These statistics support our claim that the occurrence of childhood cancers is unpredictable. In the next section, we describe our empirical strategy that eliminates the economically small differences observed between cancer and non-cancer households.

3.2 Empirical Strategy

In order to investigate how families react to a severe child health shock, we identify parents whose children are diagnosed with cancer (hereafter referred to as a "child cancer household") and match them to observably similar households. Specifically, for every child cancer household in our dataset, we search for all other households fitting the following criteria: (a) have a child of the same gender, born in the same year, and with the same number of siblings (in the year before diagnosis) as the child diagnosed with cancer (b) have parents that are identical to the cancer household parents in terms of mother's age and father's age at the time of birth (measured in 5-year age bins), marital status at the time of birth, and mother's and father's educational attainment at the time of birth (a dummy for having more than a high school education).

We begin with 3260 unique households with 3279 children born between 1987-2005 that had at least one childhood cancer diagnosis between 1987-2015. We drop 19 households that had more than one child with a cancer diagnosis (38 children total). We drop another 38 observations due to the inability to find exact matches based on the above criteria, leaving us with a total of 3203 matched cancer households. The median number of matched control households per cancer household is 124.

Each household i belongs to one of 3155 unique groups indexed by j, defined by the unique combination of diagnosis year and all variables involved in the matching: child gender, birth year, and sibling count, as well as mother's age category, father's age category, parental marital status, mother's education, and father's education at the time of birth.[13] In addition, each group is associated with a unique diagnosis year (the year of the child's first cancer diagnosis), which means that child cancer households with the same characteristics but different diagnosis years form distinct groups. Therefore, a control household can show up in multiple groups if they have the same characteristics as multiple cancer households with different diagnosis years. Each group j has at least one cancer and one control household. All households (both cancer and control) in a group are assigned the diagnosis year of the cancer household(s) in the group.

Appendix Table A2 shows that the characteristics of child cancer households in the year before the cancer diagnosis are almost identical to their matched controls' characteristics in that same year, with the exception of government transfers. The significantly higher transfers for cancer households likely reflects deteriorating child health prior to receiving a cancer diagnosis. We note that this difference is unlikely to be a serious issue in our setting as we demonstrate flat pre-trends in treatment-control differences in all other outcomes.

We next use an event study framework to estimate the impacts of childhood cancer diagnosis. The estimating equation is given by:

[13]The parental age categorical variables include a category for missing age.

$$Y_{ijt} = \sum_{k=-12}^{11} \left(\beta_k C_i \times D_{jt}^k + \gamma_k D_{jt}^k \right) + \alpha X_i + \mu_j + \delta_t + \epsilon_{ijt}. \quad (1)$$

where Y_{ijt} is an outcome variable measured in calendar year t for child i who belongs to group j. C_i is an indicator that takes on the value 1 for cancer households and 0 for matched control households. D_{jt}^k are dummy variables, defined for $k = -12$ to 11, such that D_{jt}^k is equal to 1 if calendar year t is k years since group j's diagnosis year. X_i controls for parental age and education, measured at the time of the child's birth: mother's and father's precise age fixed effects, and maternal and paternal educational attainment (in continuous months). Our specification also includes group (μ_j) and calendar year fixed effects (δ_t). Standard errors are clustered at the group level. We estimate a weighted regression, where cancer households each receive a weight of one, while each control household in group j receives a weight equal to the number of cancer households in group j divided by the number of control households in group j.

The main coefficients of interest are β_k, which provide the difference in outcome Y_{ijt} between cancer households and control households in each year starting from 12 years before to 11 years after the diagnosis year. In the results section, we plot these coefficients graphically in order to demonstrate how the differences between cancer and control households evolve over time. For most outcomes, we present the effects relative to the year prior to diagnosis by scaling the estimates with the outcome average in the year before diagnosis. The coefficients corresponding to pre-diagnosis years ($\beta_k = 0$ for $k < 0$) allow us to shed light on our key identification assumption. If a childhood cancer diagnosis is exogenous conditional on the observable characteristics used for matching and included in the regression, we should see no differences in the outcomes prior to the diagnosis. This is indeed what we find.

We next turn to the role of public policy in alleviating the negative consequences of child cancer shocks. To do so, we take advantage of the 1998 policy that expanded the amount and duration of compensation for lost earnings due to severely sick children, and compare households with children diagnosed in the 1993-1995 period to those with children diagnosed between 1998-2000.[14] Focusing on cohorts diagnosed with cancer within a short window around the policy change ensures that our

[14] We omit cohorts diagnosed with cancer during 1996-1997 as they are exposed to both policy regimes during the first four years following diagnosis, the period when treatment and care needs are likely to be the strongest.

comparisons are unlikely to be driven by changes in medical innovations, cancer severity, or other labor market policies.

In order to probe potential mechanisms driving our key results, we investigate heterogeneity in treatment effects across parental socioeconomic status. Given the universal health insurance coverage in our setting, differences in labor supply responses by socioeconomic status are unlikely to be due to job-lock or out of pocket costs of treatment. However, parental resource availability could still lead to treatment heterogeneity by allowing parents to cover indirect costs of care or by giving them the flexibility to take time off from work. With this motivation, we explore heterogeneity by maternal education (above or below the median years of schooling) and by pre-diagnosis market income of the household (above or below the median of the average household market income during the five years prior to diagnosis, controlling for calendar year and parental age fixed effects). We also examine treatment heterogeneity by child survival, comparing differences in responses among households in which the child dies within five years versus those in which the child survives at least five years. These results allow us to shed light on the role of disease severity. Finally, we study effects on two potential mediators: parental mental health and fertility.

4 Results

4.1 Effects on Parental Labor Market Outcomes

We begin by illustrating how a child cancer diagnosis affects the labor market outcomes of the parents. Panel A of Figure 1 displays the results for market income (taxable income minus total municipality transfers). The red line presents the main coefficient estimates for mothers while the blue line presents the effects for fathers. Cancer and non-cancer households have very similar market incomes during the 12 years before the cancer diagnosis: the coefficients corresponding to pre-diagnosis years are all very close to zero. In sharp contrast to these flat pre-trends, parents experience a significant decline in market income in the year of the cancer diagnosis (labeled year 0) and the gap widens even more in the first year after diagnosis. The income loss is large for both parents but especially for the mothers. In the first year after the cancer diagnosis, the gap between cancer and non-cancer households is approximately 25% of average mother's income in the year before diagnosis and 10% of average father's income in the year before diagnosis.[15] Market incomes of affected parents start recovering from the second year after diagnosis but recovery patterns are different for mothers and fathers. By the third year after the diagnosis, the gap between treated and control fathers is no longer significantly different from zero. Mothers, on the other hand, settle on a permanently lower market income path: by the 12th year after diagnosis, the income gap between mothers in cancer and non-cancer households is still 3% lower when compared to the average income in the year before diagnosis.

In Panel B, we examine the effects on labor force participation. We find no indication that fathers change their labor force participation but we find evidence of a decline in mothers' short-term labor force participation. Mothers whose children are diagnosed with cancer reduce their labor force participation by roughly 3% in the first year after the health shock. The participation gap between cancer and non-cancer households starts closing over time, and we cannot detect significant differences between the two groups beginning in the fifth year after the health shock (though coefficient estimates remain negative for the entire post-diagnosis period). Panel C turns to the effects on work hours, conditional on employment. We find sharp declines in the trajectories of full-time employment for both mothers and fathers. In the year of the cancer diagnosis, the gap in the likelihood of having a full-time job between cancer and non-cancer households is approximately 34% for mothers and 20% for fathers, compared to the year before the diagnosis. The gap shrinks over time for both parents but still persists 12 years after diagnosis. These results suggest that part of the observed decline in market income is driven by a reduction in work hours.

In Panel D, we turn to the critical role of income insurance against child health shocks. We document a sharp increase in total government transfers received by the household in the year of child's cancer diagnosis. By the first year after the diagnosis, the difference between transfers received by cancer and non-cancer households is 110,000 DKK, which is more than 10 times the average in the year before diagnosis.[16] Consistent with the recovery patterns in market income,

[15] Although the values are scaled by pre-diagnosis means, and even though fathers have higher income than mothers on average, we note that the magnitude of the drop in level terms is also larger for mothers than fathers.

[16] There is a small gradual uptick in transfers starting from four years prior to the cancer diagnosis, which could be because some children fall ill – serious enough for their parents to qualify for the government transfer schemes – even before receiving an official cancer diagnosis. Panel A of Appendix Figure A3 reports the main coefficients from the baseline specification using number of hospital visits as the outcome. The figure documents a small positive difference in the hospitalization risk between the cancer and non-cancer children in the year prior to diagnosis. The small magnitude of this uptick, however, suggests this is not the case for the vast majority of cancer episodes in the sample.

we find that household transfer payments decline sharply in the first four years following a child's cancer diagnosis.

In Panel E, we examine whether government transfers are able to offset the negative impacts on parent's market income by showing the evolution of total household income around a cancer diagnosis. The results suggest that government transfers almost fully make up for parent's income losses in the short-run as there is only a small statistically insignificant gap in total household incomes of treated and control families in the year of diagnosis. However, we find that families are not fully insured against child cancer shocks in the long-run. As government transfers decline, the gap in total household income between cancer and non-cancer households starts widening. The difference is statistically significant 8 years after the diagnosis, is roughly 2% of the pre-diagnosis average, and narrows only slightly by the 12th year. In Panel F, it is clear that this persistent decline is driven by mothers' rather than fathers' total income, consistent with the other labor market results. It seems that mothers' several years of lower labor supply (driven by reduced labor force participation as well as reductions in full-time employment) has persistent effects on their long-run earnings.

How do these magnitudes compare to the estimated impacts of other child health shocks found in the literature? Using data from Finland and Norway, Breivik and Costa-Ramón (2021) show that mothers with hospitalized children experience an earnings loss of 4.6-4.7% three years after the hospitalization. The short-run earnings losses are much larger for the subset of fatal child injuries: mothers experience an earnings loss of 21% three years after the death of a child. The authors do not find any effects on father's earnings, regardless of the severity of the shock. Vaalavuo et al. (2022) use data from Finland to show that in the year following a child's cancer diagnosis mothers' and fathers' earnings are reduced by 30% and 9%, respectively. Five years after diagnosis, fathers' earnings fully recover while mothers' earnings are still lower by 7%. The short-run market income losses that we document are very similar to the earnings losses found in Vaalavuo et al. (2022). Our results are also comparable to the earnings losses resulting from fatal child injuries in Breivik and Costa-Ramón (2021), consistent with the severe nature of the child cancer diagnosis. In contrast to Breivik and Costa-Ramón (2021), we also document economically large income losses for fathers.

Empirical evidence on the long-run income losses from child health shocks is provided by Gunnsteinsson and Steingrimsdottir (2021) and Eriksen et al. (2021), who use Danish data to examine the effects of having a disabled child on parental labor market outcomes. Gunnsteinsson and Steingrimsdottir (2021) focus on the effects of having a disabled child at birth and report long-run earnings losses of 13% for mothers and 3% for fathers. Eriksen et al. (2021) examine the effects of having a child with type-1 diabetes, a condition that does not qualify parents for welfare payments. They document a 4-5% decline in mothers' wage income ten years after diagnosis but they find no evidence of wage reductions for fathers. The long-run market income losses we find are closer in magnitude to those found in Eriksen et al. (2021). That temporary child health shocks may lead to long-run income losses is a novel finding. Our results suggest that the magnitudes of these shocks can actually be as large as the effects of common permanent child disabilities.

4.2 The Role of the Safety Net

In this section, we turn to the role of government transfers in mitigating or exacerbating the parental labor supply responses. We do this by leveraging the variation in welfare generosity induced by the 1998 Social Service Act. As discussed in Section 2, this law increased both the wage replacement rate and the benefit duration. Until 1998, parents of severely sick children could receive municipality transfers for a year at the maximum level of unemployment benefits. After 1998, parents were compensated for their lost earnings at the rate of their (pre-diagnosis) salary and for as long as the need for care was deemed medically necessary. We take advantage of this policy change by comparing households with children diagnosed in the 1993-1995 period to those with children diagnosed between 1998-2000. Using a short window around the introduction of the policy, we aim to hold constant changes in medical innovations, cancer severity, or other labor market policies.[17]

In Panel A of Figure 2, we confirm that the policy indeed led to much more generous transfer payments. In the year of a child cancer diagnosis, municipality transfers are 50,000 DKK higher in the affected households among the 1993-1995 cohorts while it is 90,000 DKK higher among the 1998-2000 cohorts. In the year after diagnosis, the increase in transfer payments among the 1998-2000 cohort is almost double the amount among the 1993-1995 cohorts. Panel B of Figure 2 shows that families experiencing cancer shocks during the post-policy period are fully insured against these shocks, while families who are exposed to the shocks in the pre-policy period experience

[17]We confirm that five-year survival rates are very similar among these two groups: 84% for those diagnosed in 1993-1995 and 83% for those diagnosed in 1998-2000. We also confirm that children in both groups exhibit similar trajectories of hospital visits following the cancer diagnosis (Panel B of Appendix Figure A3).

significant short-term declines in total household income. As such, it is clear that the policy change played a crucial role in smoothing total household income.

In sharp contrast, the evolution of parental labor market outcomes around child's cancer diagnosis (presented in Figure 3) is strikingly similar under the different welfare schemes. If anything, the results on labor force participation in Panel C suggest that the removal of time-limits on compensation eligibility may have allowed mothers to remain in the labor force by allowing their employers to cover their salaries when mothers needed to take extended periods of leave. The absence of a labor supply response to the change in welfare generosity is a novel finding in the literature.[18]

In order to gauge the cost-effectiveness of the new policy, we compare the implied differences in total transfer payments under the two welfare regimes with the differences in the resulting market income losses for mothers. Comparing the sum of the coefficients from year 0 to year 11 for the two cohorts (panel A of Figure 2), we find that the new policy results in 86,000 DKK higher transfer payments to cancer households. Conducting the same exercise for mothers' market income losses (panel A of Figure 3), we find that reductions in earnings is 115,000 DKK lower under the new policy. Thus, our back-of-the envelope calculation suggests that the new policy was largely self-funding.

In the remainder of the paper, we aim to shed light on the underlying economic mechanisms behind these results. While the register data are not well-suited to uncover the precise mechanism behind our findings, the richness of the data allows us to document patterns suggestive of one potential channel: parents' strong preference to care for their children in the immediate aftermath of the cancer diagnosis. We now turn to describing these patterns.

4.3 Heterogeneous Effects

We first explore how estimated effects vary by socioeconomic status. We use two proxies to examine heterogeneity in the effects: mothers' completed schooling and household market income. Figure 4 displays effects by median years of schooling of the mother (13 years), while Appendix Figure A2 presents results separately by the median pre-diagnosis household market income (from two years before diagnosis and residualized after controlling for calendar year fixed effects).[19] Panel A of each

[18]For an overview of the economic research documenting the work disincentive effects of safety net programs, see Moffitt (2016).

[19]The main advantage of using mother's education is that it is one of our matching variables and therefore guarantees that we have suitable matches within each SES subgroup. When we split the sample by the median household market income, there are some cancer households who are matched to control households that do not fall

figure documents effects on government transfers. Across both proxies, we find that the difference between transfers received by cancer and non-cancer households is larger in the higher SES group, reflecting the fact that for most of the years in our study period transfer amounts are determined by pre-diagnosis income levels.

The remaining panels in each figure, on the other hand, show little evidence of heterogeneity. For brevity, we combine mother's and father's outcomes where applicable and present effects at the household level. In particular, we use the sum of mother's and father's total income and market income, an indicator for both parents being in the labor force and an indicator for both parents having a full-time job. Across all of these outcomes, patterns are similar across low-SES and high-SES groups. Having more resources does not appear to buffer the negative labor market responses to a child cancer diagnosis: parents who can afford to hire help to reduce the demands on their own time are still reducing labor supply to a similar degree as lower-SES families. This is consistent with the idea that parents have a strong preference to care for their child after a cancer diagnosis.

We next turn to treatment heterogeneity by child survival. In our sample, approximately 20% of children who are diagnosed with cancer die within 5 years of diagnosis. Survival largely depends on disease etiology and is unrelated to child traits or socioeconomic characteristics of the household. Hence, child survival can be seen as a proxy for cancer severity that affects families idiosyncratically.[20] Figure 5 presents results separately by child survival status. While parental labor supply responses are economically large in both samples, effects are generally larger and more persistent among households in which the child does not survive. This suggests that the long-run labor supply responses we document are not driven by survivors' persistent health problems.

4.4 Additional Outcomes

In this section, we explore two additional outcomes that may act as mediators: parental mental health and fertility. We first examine the effects on parents' mental health, proxied by use of

into the same income category (above or below median) because residualized income is not used in the matching procedure. In these cases, we drop non-matching control households from the regressions. Results (available upon request) are almost identical if we use father's education.

[20] Appendix Table A3 confirms that the observable characteristics are broadly similar among households in which the child dies within five years and those in which the child survives at least five years. Panel C of Appendix Figure A3 documents that non-survivors experience larger increases in hospital visits from the onset of diagnosis until their death, consistent with them having higher disease severity.

psychotherapy through psychologists in private clinics and licensed primary care physicians.[21] The results in Panel A of Figure 6 show that following a child's cancer diagnosis parents' mental health care utilization substantially increases: the share of parents who receive psychotherapy almost doubles in the first two years after diagnosis for both mothers and fathers.[22] Panel B of Figure 6 shows that these responses are much larger and more persistent among households in which the child dies within five years.

Motivated by the extensive literature in economics linking family size and parental labor supply decisions, we next investigate whether child cancer shocks impact household fertility decisions. The results in Panel C of Figure 6 indicate a gradual but steady increase in the fertility gap between cancer and non-cancer households, starting in the second year after diagnosis. In particular, mothers' total fertility increases by about five percent ten years after their child's cancer diagnosis. Panel D of Figure 6 shows that the fertility responses are entirely driven by households where the child dies, consistent with prior studies documenting a replacement fertility response (Ben-Porath, 1976; Rosenzweig and Schultz, 1983; Schultz, 1978; Wolpin, 1984). These results imply that the large, immediate reductions in income and labor supply are not driven by changes in fertility (which were gradual and only present among survivor households).

How do these effects on intermediate outcomes impact the overall parental labor supply responses? In order to assess this, in Figure A4, we re-estimate our baseline model controlling for mental health care utilization (red line) or total fertility (blue line). In both cases, we find patterns that are nearly identical to our baseline estimates, suggesting that changes in parental mental health or fertility do not drive our key findings.

[21] Adults in Denmark can receive mental health care through four different providers. Primary care physicians are responsible for the initial diagnostic consultation as well as for administering psychometric tests. Mild cases which require only psychotherapy are handled by private practice psychologists and specially certified primary care physicians. If their condition is not severe patients can receive pharmaceutical treatment from primary care physicians and private practice psychiatrists. Medical guidelines recommend that severe cases are referred to psychiatric hospitals. Costs of all mental health care services, except psychotherapy through private practice psychologists, are covered by the public health insurance system. While private psychologist fees are generally paid out-of-pocket, since 1992, closest family members of individuals who suffer from a severe somatic disease (including cancer) are eligible for referral to a specialist for subsidized psychological counseling. According to Serena (2021), in 2020, one counselling session with a psychologist cost 860 DKK (approximately 132 USD). The Danish public health insurance covers 60 percent of the cost of up to 12 counseling sessions for families of children with cancer.

[22] We note that mothers are more likely to have mental health visits on average and that mothers' increase in mental health care utilization is also larger in level terms.

5 Conclusion

Significant numbers of families are affected by severe health shocks to children every year. Despite this, there is limited population-level evidence on the impact of child health shocks on parental labor supply and even less knowledge on the role of the safety net in mitigating these detrimental effects. This paper uses linked administrative data from Denmark to document the consequences of childhood cancers – a severe and largely unpredictable disease – on parents' labor market outcomes. We find that parents' market income declines substantially following a cancer diagnosis for their child. While fathers' market income recovers over time, the effects on mothers' market income persist for more than a decade, reaching a steady-state that is 3 percent lower than controls. We document that the safety net is able to make up for parents' income losses in the short-run, but families are not fully insured against child cancer shocks in the long-run.

In order to shed light on the role of welfare generosity in parental labor supply responses, we exploit a 1998 policy change that substantially increased transfer payments and duration to parents of severely sick children. Comparing cohorts diagnosed with cancer in the years just before and just after the policy change, we show that the policy was successful in smoothing total household income. Importantly, we find no evidence that the more generous policy was associated with higher work disincentives. If anything, our results suggest that women were less likely to leave the labor force when the policy was more generous. Our back-of-the envelope calculations indicate that the increase in transfers after the policy change was compensated by the reduction in the earnings loss, making it cost-effective.

We next examine heterogeneity in treatment effects by household socioeconomic status and by disease severity. We find no evidence of heterogeneity by socioeconomic status (as proxied by maternal education or pre-diagnosis household income) but we show that the effects are most pronounced for the 20 percent of families in which the cancer results in the child's death. Finally, we investigate effects on two other outcomes that could be driving some of our labor market results: parental mental health and fertility. We find evidence of increased parental mental health care utilization in the years after a child's cancer diagnosis as well as a steady rise in fertility. However, conditioning on these outcomes does not impact the documented parental supply responses. We cautiously interpret these data patterns as suggestive of parental preferences as the mechanism behind our main findings.

Overall, our results suggest that even in a high-income context with a robust public safety net such as Denmark, child health shocks can have pronounced and long-lasting effects on parental labor outcomes. Importantly, these shocks may have a disproportionate effect on mothers. Our findings also underline the importance of the safety net programs in mitigating these detrimental effects. Consistent with recent studies highlighting the benefits of safety net programs on children (Aizer et al., 2022), our findings underscore the importance of assisting families experiencing severe health shocks.

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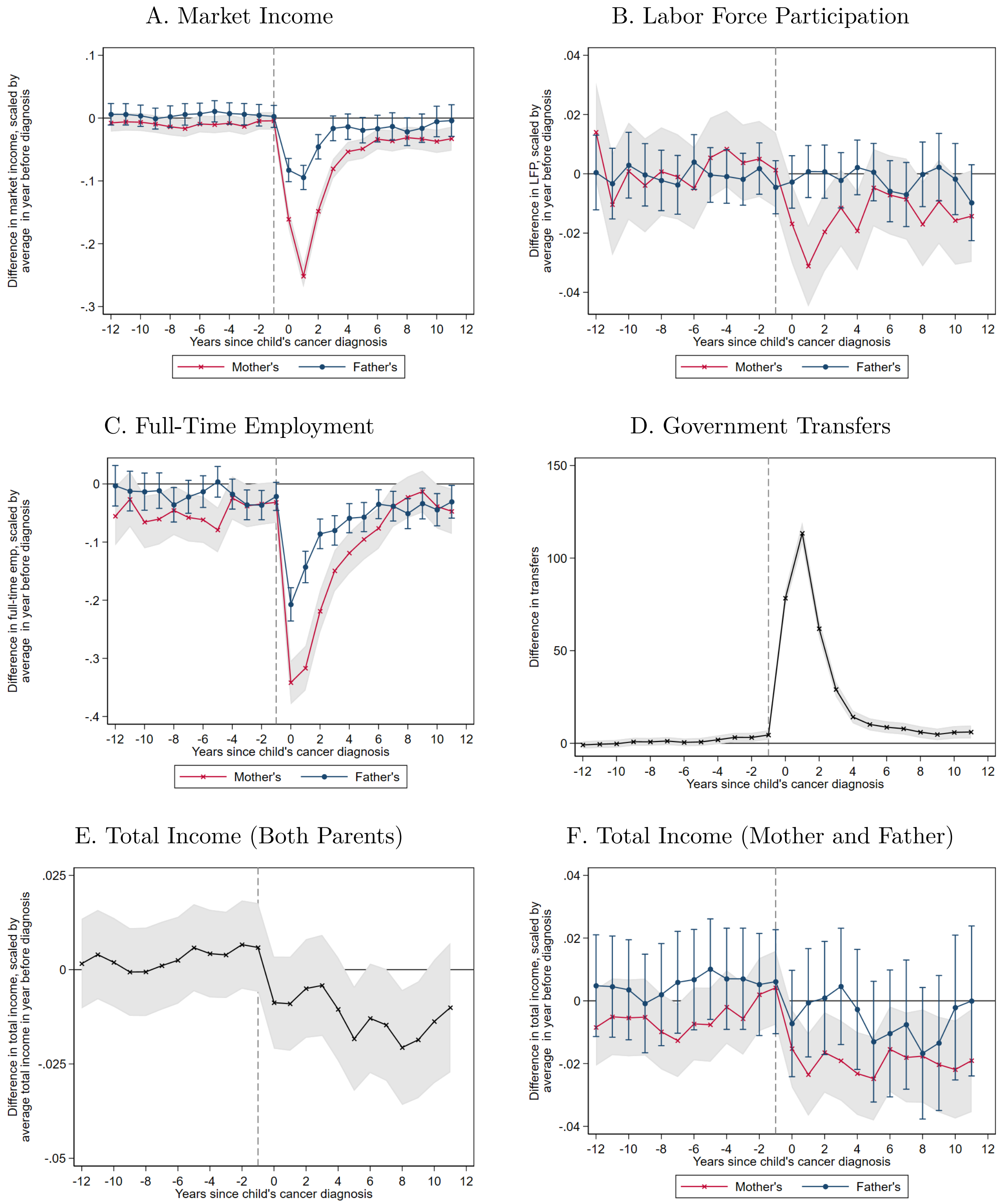
Figure 1: Parental Labor Market Responses to Child Cancer Shocks

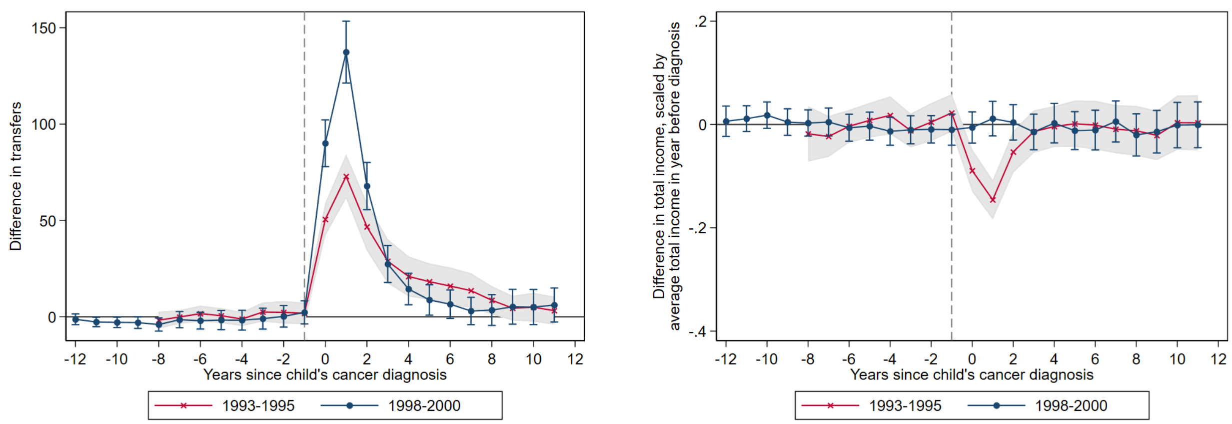


Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (scaled by the outcome average in the year before diagnosis in all panels except D).

Figure 2: Effects of the 1998 Social Service Act on Welfare Generosity

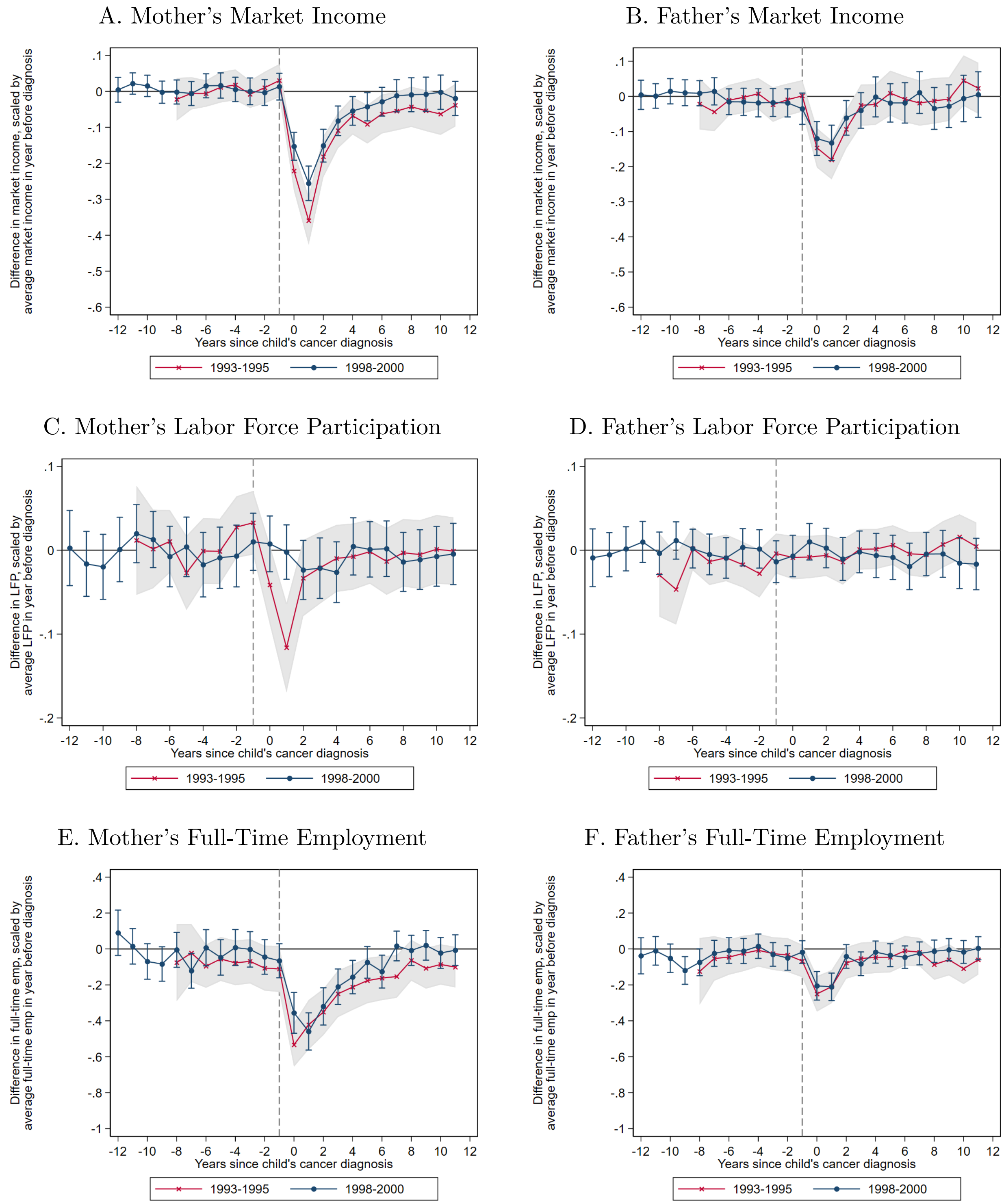
A. Government Transfers

B. Total Parental Income



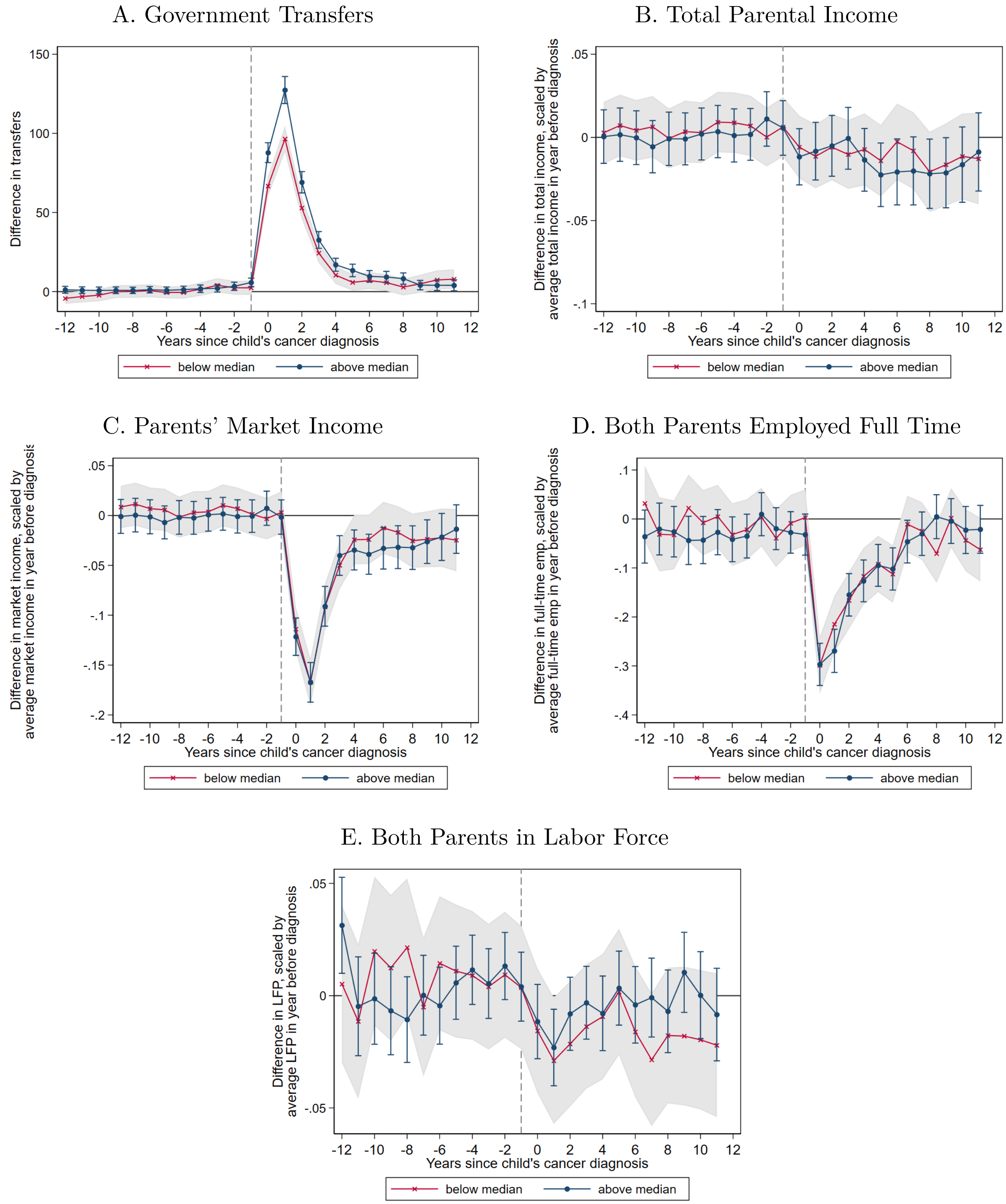
Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (in panel B, scaled by the sub-sample outcome average in the year before diagnosis).

Figure 3: Welfare Generosity and Parental Labor Market Responses to Child Cancer Shocks



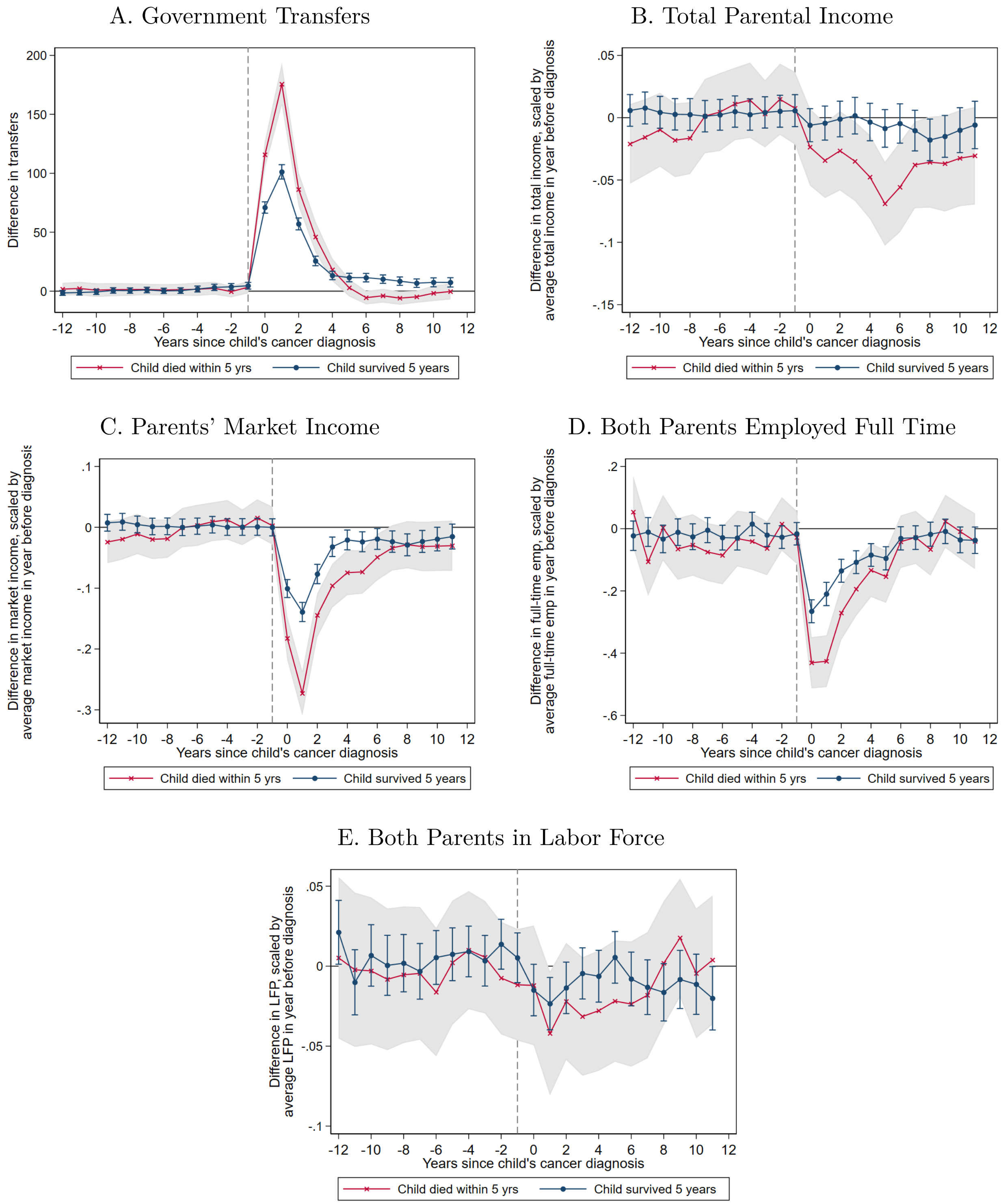
Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (scaled by the sub-sample outcome average in the year before diagnosis).

Figure 4: Heterogeneous Effects by Mother's Education



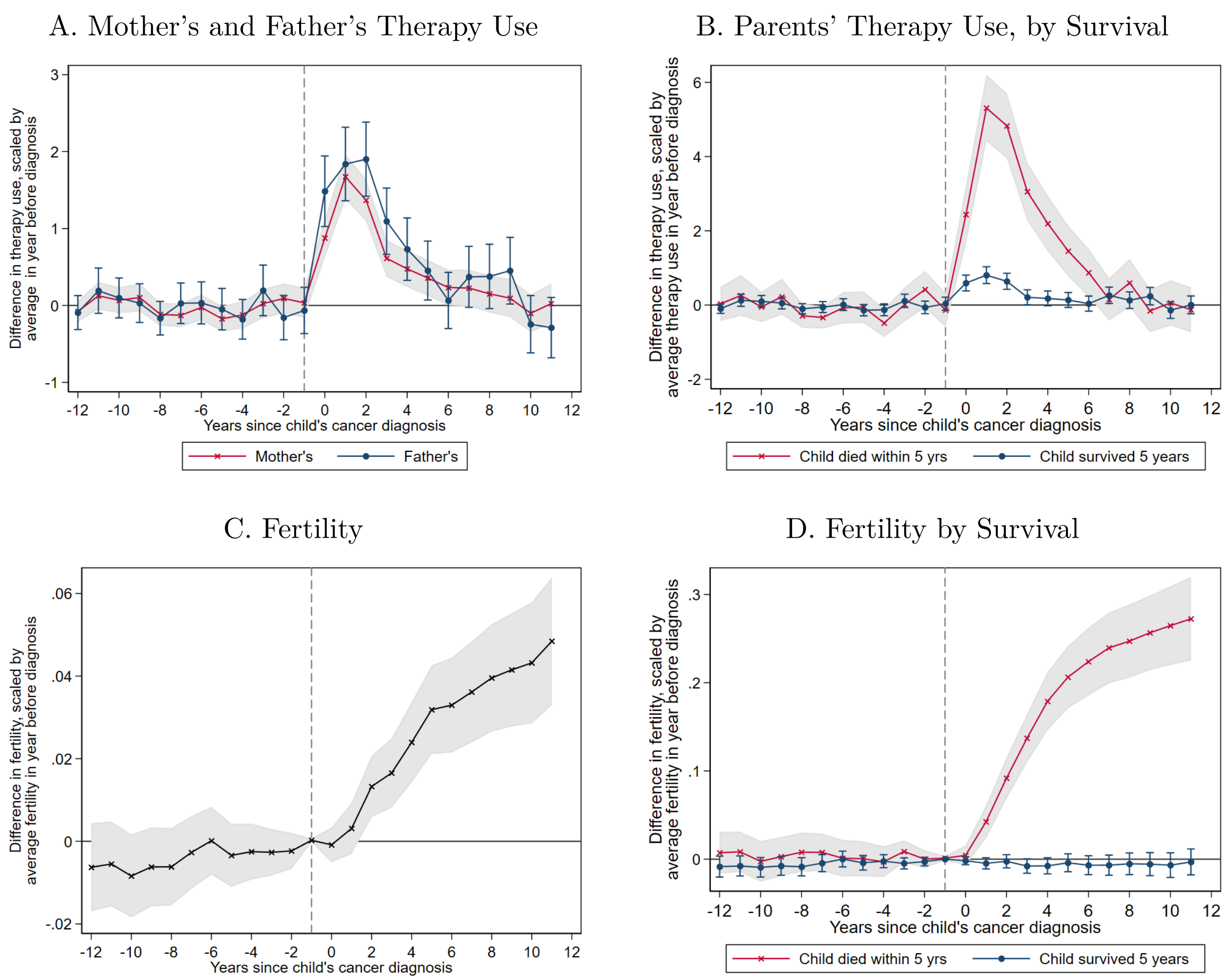
Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (scaled by the sub-sample outcome average in the year before diagnosis in all panels except A).

Figure 5: Heterogeneous Effects by Child Survival



Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (scaled by the sub-sample outcome average in the year before diagnosis in all panels except A).

Figure 6: Other Outcomes



Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households, scaled by the (sub-sample) outcome average in the year before diagnosis. In panel A, the outcome variables are an indicator equal to 1 if the mother or father had any therapy use in the year. In panel B, the outcome variable is an indicator equal to 1 if either parent had any therapy use in the year.

A Online Appendix

Table A1: Summary Statistics for Cancer and Non-Cancer Households, Full Population

	(1) Cancer	(2) Non-Cancer	(3) Difference
Child Characteristics			
Female	0.46	0.49	-0.03***
	(0.50)	(0.50)	(0.01)
Birth Order	1.52	1.58	-0.06***
	(0.72)	(0.76)	(0.01)
Birth Year	1994.54	1995.70	-1.16***
	(5.50)	(5.66)	(0.10)
Family Characteristics in Year of Birth			
Age of Mother	29.56	29.64	-0.08
	(4.98)	(4.96)	(0.09)
Age of Father	32.24	32.36	-0.12
	(5.82)	(5.63)	(0.11)
Parents Married	0.50	0.51	-0.01
	(0.50)	(0.50)	(0.01)
Years of Schooling (Mother)	12.38	12.48	-0.10**
	(2.32)	(2.39)	(0.04)
Years of Schooling (Father)	12.64	12.72	-0.08*
	(2.52)	(2.49)	(0.04)
Market Income (Mother)	232.49	238.53	-6.04***
	(112.92)	(116.09)	(1.97)
Market Income (Father)	336.70	345.08	-8.39***
	(183.32)	(195.81)	(3.21)
Full-Time Employment (Mother)	0.42	0.46	-0.04***
	(0.49)	(0.50)	(0.01)
Full-Time Employment (Father)	0.56	0.60	-0.03***
	(0.50)	(0.49)	(0.01)
Total Income (Combined)	590.09	604.23	-14.14***
	(226.28)	(240.91)	(3.96)
Government Transfers (Combined)	20.78	20.23	0.54
	(57.95)	(60.60)	(1.01)
Mental Health Contact (Mother)	0.02	0.02	-0.00
	(0.13)	(0.13)	(0.00)
Mental Health Contact (Father)	0.01	0.01	0.00
	(0.09)	(0.09)	(0.00)
Observations	3279	1153342	1156621

Notes: * p< 0.1 ** p< 0.05 *** p< 0.01. Standard deviations (in columns 1 and 2) and standard errors (in column 3) in parentheses. Sample includes all children born between 1987-2005. All monetary values are in 1,000 DKK, deflated by CPI to year 2015.

Table A2: Summary Statistics for Cancer and Non-Cancer Households, Matched Sample

	(1)	(2)	(3)
	Cancer	Non-Cancer	Difference
Child Characteristics			
Female	0.46	0.46	-0.00
	(0.50)	(0.50)	(0.01)
Birth Order	1.52	1.52	-0.00
	(0.71)	(0.71)	(0.01)
Birth Year	1994.56	1994.56	0.00
	(5.51)	(5.51)	(0.10)
Parental Characteristics in Year of Birth			
Age of Mother	29.49	29.50	-0.00
	(4.85)	(4.83)	(0.09)
Age of Father	32.08	32.10	-0.02
	(5.46)	(5.46)	(0.11)
Parents Married	0.50	0.50	0.00
	(0.50)	(0.50)	(0.01)
Years of Schooling (Mother)	12.38	12.41	-0.03
	(2.32)	(2.37)	(0.04)
Years of Schooling (Father)	12.65	12.65	-0.01
	(2.50)	(2.50)	(0.05)
Parental Characteristics in Year before Cancer Diagnosis			
Number of Children (Mother)	1.82	1.82	-0.00
	(0.94)	(0.94)	(0.02)
Market Income (Mother)	282.26	283.86	-1.60
	(140.63)	(139.04)	(2.53)
Market Income (Father)	391.88	391.11	0.77
	(237.72)	(239.40)	(4.30)
Full-Time Employment (Mother)	0.57	0.57	-0.00
	(0.50)	(0.49)	(0.01)
Full-Time Employment (Father)	0.72	0.72	-0.00
	(0.45)	(0.45)	(0.01)
Total Income (Combined)	697.08	693.38	3.70
	(295.82)	(300.68)	(5.33)
Government Transfers (Combined)	25.32	20.77	4.55***
	(76.17)	(68.44)	(1.37)
Mental Health Contact (Mother)	0.05	0.05	0.00
	(0.21)	(0.21)	(0.00)
Mental Health Contact (Father)	0.02	0.02	-0.00
	(0.14)	(0.14)	(0.00)
Observations	3203	662527	

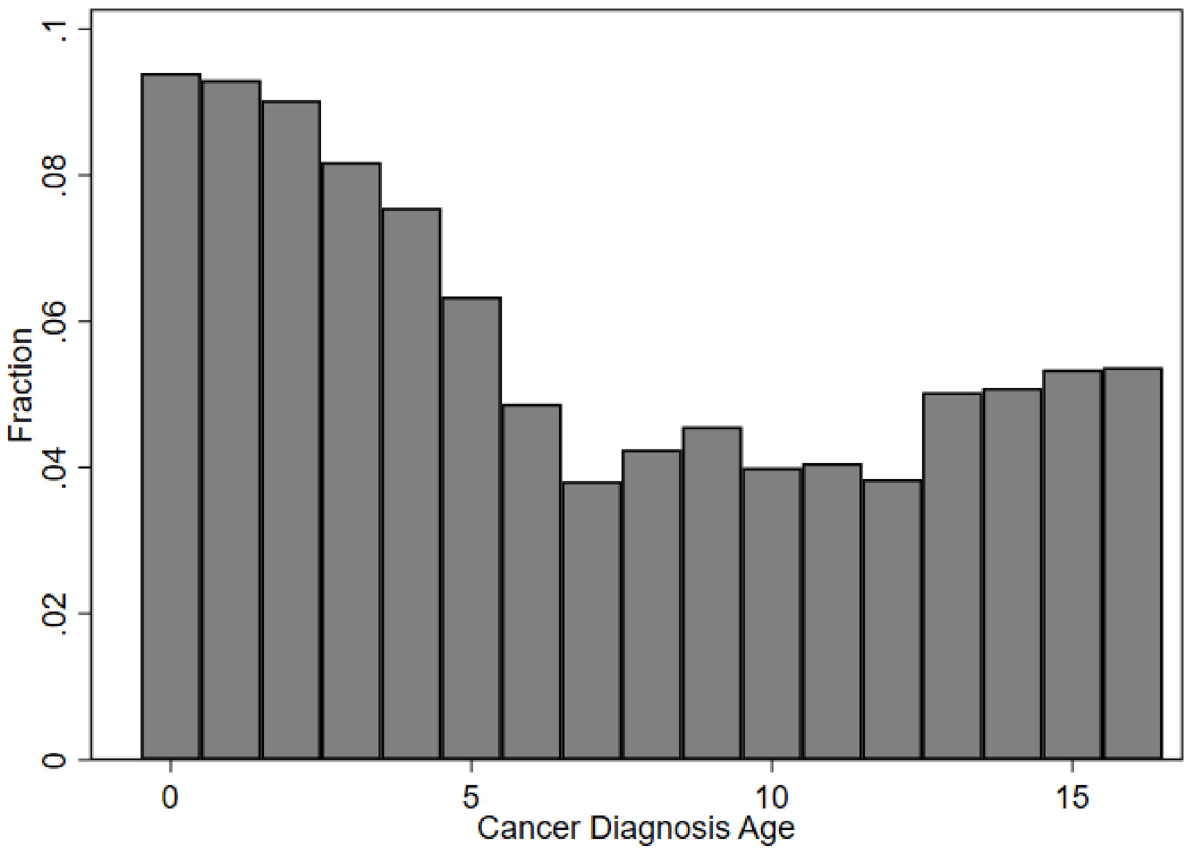
Notes: * p< 0.1 ** p< 0.05 *** p< 0.01. Standard deviations (in columns 1 and 2) and standard errors (in column 3) in parentheses. Sample includes all cancer children and matched controls in our final sample. "Difference" in column 3 is obtained from a weighted regression of the covariate of interest on a child cancer indicator, where cancer households each receive a weight of one, while each control household receives a weight equal to the number of cancer households divided by the number of control households in their group. All monetary values are in 1,000 DKK, deflated by CPI to year 2015.

Table A3: Summary Statistics for Cancer Households, by Child Survival

	(1) Survived	(2) Died	(3) Difference
Child Characteristics			
Age at Diagnosis	6.89	6.20	0.69***
	(5.22)	(4.87)	(0.24)
Female	0.46	0.48	-0.02
	(0.50)	(0.50)	(0.02)
Birth Order	1.52	1.50	0.02
	(0.72)	(0.71)	(0.03)
Birth Year	1994.70	1993.87	0.83***
	(5.50)	(5.55)	(0.26)
Parental Characteristics in Year of Birth			
Age of Mother	29.51	29.43	0.07
	(4.84)	(4.92)	(0.23)
Age of Father	32.06	32.21	-0.15
	(5.45)	(5.53)	(0.28)
Parents Married	0.49	0.54	-0.05*
	(0.50)	(0.50)	(0.02)
Years of Schooling (Mother)	12.38	12.37	0.01
	(2.34)	(2.22)	(0.11)
Years of Schooling (Father)	12.63	12.71	-0.08
	(2.48)	(2.61)	(0.12)
Parental Characteristics in Year before Cancer Diagnosis			
Number of Children (Mother)	1.82	1.82	0.01
	(0.96)	(0.86)	(0.04)
Market Income (Mother)	283.44	276.19	7.26
	(140.86)	(139.42)	(6.68)
Market Income (Father)	392.43	389.06	3.37
	(239.48)	(228.74)	(11.05)
Full-Time Employment (Mother)	0.57	0.58	-0.01
	(0.50)	(0.49)	(0.03)
Full-Time Employment (Father)	0.73	0.69	0.04
	(0.44)	(0.46)	(0.03)
Total Income (Combined)	699.34	685.45	13.90
	(297.48)	(287.16)	(13.81)
Government Transfers (Combined)	25.60	23.92	1.68
	(78.26)	(64.43)	(3.20)
Mental Health Contact (Mother)	0.05	0.03	0.02*
	(0.22)	(0.18)	(0.01)
Mental Health Contact (Father)	0.02	0.02	0.00
	(0.14)	(0.13)	(0.01)
Observations	2680	523	3203

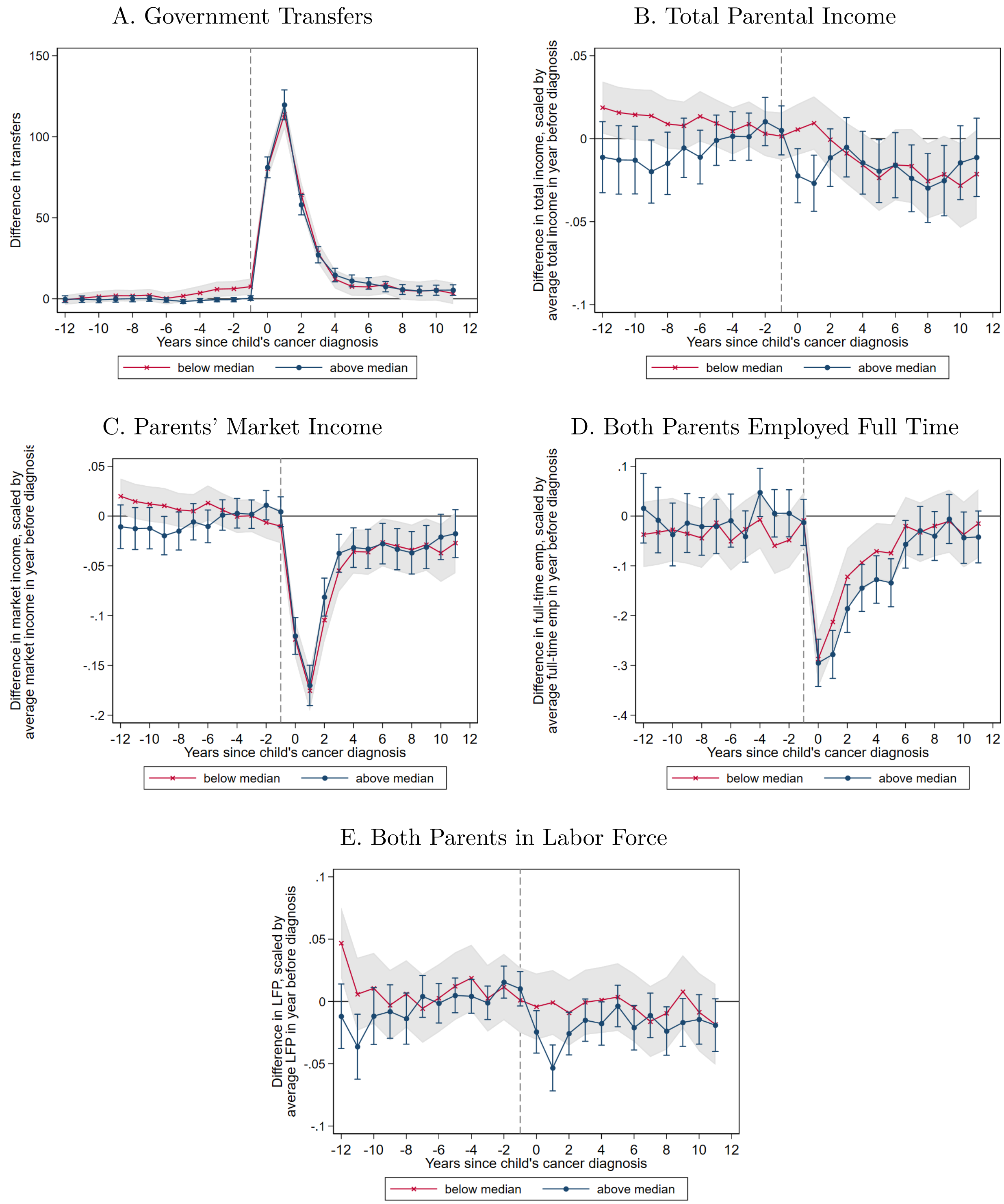
Notes: * $p< 0.1$ ** $p< 0.05$ *** $p< 0.01$. Standard deviations (in columns 1 and 2) and standard errors (in column 3) in parentheses. Sample includes all cancer children in our final sample.Regressions restrict to children of mothers with a registered partner in the year before diagnosis. All monetary values are in 1,000 DKK, deflated by CPI to year 2015.

Figure A1: Distribution of Age at Cancer Diagnosis



Notes: Histogram shows the distribution of age at cancer diagnosis among children born between 1987-2005 (N = 3279 children in 3260 unique households).

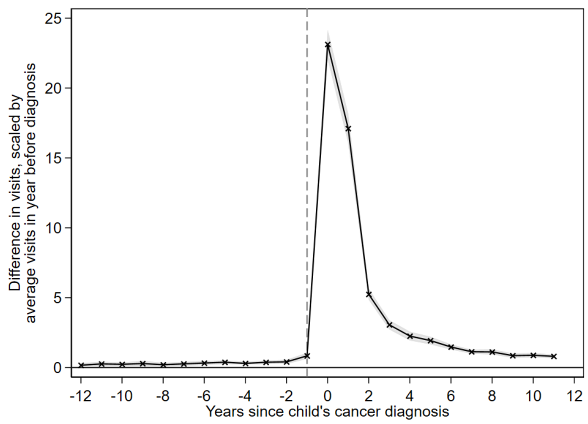
Figure A2: Heterogenous Effects by Pre-Diagnosis Market Income



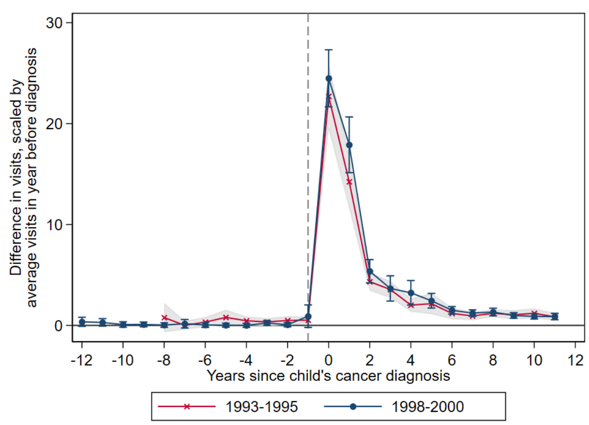
Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households (scaled by the sub-sample outcome average in the year before diagnosis in all panels except A). These regressions split the sample at the median of total market income (residualized after controlling for calendar year fixed effects, and taken from two years before diagnosis). We drop control households that do not fall into the same income category as their matched cancer households.

Figure A3: Child Hospital Visits, by Survival and Diagnosis Year

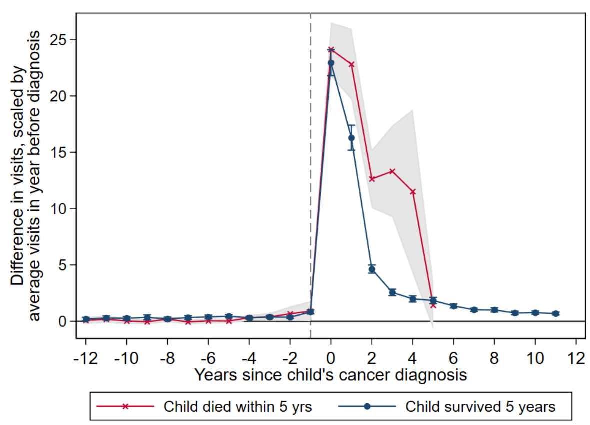
A. Overall



B. By Diagnosis Year

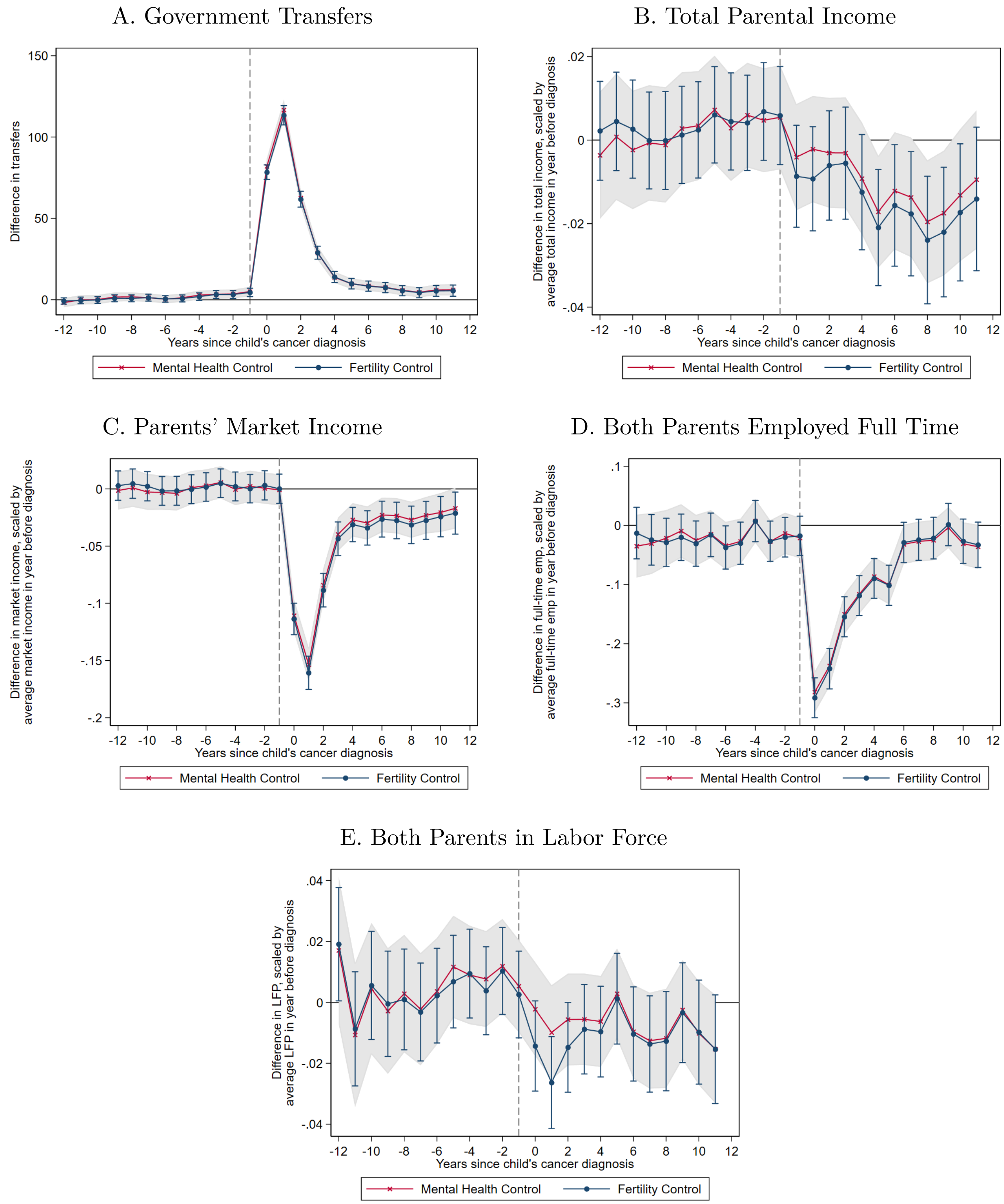


C. By Survival



Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients from specification (1), which represent the difference between cancer and non-cancer households, scaled by the (sub-sample) outcome average in the year before diagnosis. Visits are set to missing after a child dies.

Figure A4: Parental Labor Market Responses, Alternative Specifications



Notes: Graphs plot estimates and 95% confidence intervals for the β_k coefficients – from two versions of specification (1) – which represent the difference between cancer and non-cancer households (scaled by the outcome average in the year before diagnosis in all panels except panel D). The "Mental Health Control" series reports results from including a control for mental health (the average of both parents' therapy use indicators). The "Fertility Control" series reports results from controlling for mother's fertility.