I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 16005

Family Affair? Long-Term Economic and Mental Effects of Spousal Cancer

Petri Böckerman
Mika Kortelainen
Henri Salokangas
Maria Vaalavuo

MARCH 2023

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 16005

Family Affair? Long-Term Economic and Mental Effects of Spousal Cancer

Petri Böckerman
LABORE, University of Jyväskylä and IZA

Mika Kortelainen
University of Turku and VATT Institute for Economic Research

Henri Salokangas
University of Turku and Finnish Institute for Health and Welfare

Maria Vaalavuo
Finnish Institute for Health and Welfare

MARCH 2023

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Family Affair? Long-Term Economic and Mental Effects of Spousal Cancer*

Emerging strands of research have examined the family spillover effects of health shocks, usually focusing on labour market outcomes. However, the results have been inconclusive and there is only little evidence on the longer term consequences of health shocks or the mechanisms behind the spillover effects. We analyse the short- and long-term effects of cancer on the healthy spouse's labour supply and mental health by gender and relative income status within the couple (i.e., the breadwinner type). We use full population register data on all cancer patients and their cohabiting partners in Finland over the period 1995-2019. Our identification strategy is based on the quasi-random variation in the timing of the cancer diagnosis and a dynamic difference-in-differences approach. We find two main results. First, cancer increases female spouses' employment. This result is consistent with the added worker effect, although we find the magnitude of the increase in annual earnings to be negligible. By contrast, among male spouses, earnings decrease as a consequence of a spouse's cancer. Second, among women, there is heterogeneity in the effects in terms of the breadwinner status, which is especially notable in the long-term. The results show that the added worker effect is visible only among secondary earners and the effect seems to hold only when the cancer patient dies. Secondary earner women also suffer more from psychiatric symptoms during bereavement. Consequently, we argue that the breadwinner status before the health shock is a neglected factor influencing the effects of health shocks in families, and that family-level specialisation between spouses alters substantially over time in response to a health shock.

JEL Classification: I10, J12, J17, J22

Keywords: health shock, cancer, family spillover effects, employment, earnings, household division of labour, event study, difference-in-differences

Corresponding author:
Petri Böckerman
Labour Institute for Economic Research
Pitkänsillanranta 3A
FI-00530 Helsinki
Finland

E-mail: petri.bockerman@labour.fi

* This project has been financed by the Social Insurance Institution of Finland (Kela) (number: 345547) and the Academy of Finland Flagship Programme (INVEST) (number: 345547). We have no conflicts of interest to disclose.

1 Introduction

Unexpected changes in health status, such as an onset of cancer, can lead to substantial economic losses in terms of lower earnings among the directly affected individuals (*Bradley et al.*, 2005; *Jeon*, 2017; *García-Gómez et al.*, 2013; *Vaalavuo*, 2021). However, much less is known empirically about the potentially important indirect effects of severe health shocks within the family, especially in the longer run. Indirect effects concern the other family members beyond the person who falls ill. Accurately quantifying such effects, which have been hitherto largely neglected, for example, in the evaluation of cost-effectiveness of healthcare services, can provide novel insights for designing health interventions and deepen our understanding of the interconnections between health and labour market outcomes (*Böckerman and Ilmakunnas*, 2009; *Picchio and Ubaldi*, 2022).

There are many possible reasons for indirect effects to emerge. First, the health shock may cause the person falling ill to reduce her/his effective labour supply or even withdraw completely from the labour market. This can disturb the pre-existing arrangement on the joint labour supply of spouses within the household,[1] especially when the person falling ill is the main breadwinner in the family. Consequently, the unaffected spouse may react to this by increasing her/his labour supply to maintain family's income level and material well-being, in the spirit of what has been often called the "added worker hypothesis" (*Mincer*, 1962) or "added worker effect" (*Lundberg*, 1985). Heavy debt burdens, limited opportunities for credit, and high healthcare costs may significantly reinforce this effect. The second potential driver of the indirect labour market effects leads to the opposite consequences. The healthy spouse might reduce her/his labour supply due to the provision of care (known as the "caregiver effect") or concerns for the physical/mental well-being of a close family member and a desire for more shared leisure time (the so-called "family effect").[2]

While such family spillover effects have recently gained the interest of researchers, the empirical evidence on the topic is inconclusive. The diverging results of existing research are probably partly explained by differences in the institutional contexts, characteristics of the data, the empirical methods applied, and the specific health shocks examined. To further complicate the picture, we argue that existing patterns in the division of household labour supply may substantially affect the response of the unaffected spouse (see also *Riekhoff and Vaalavuo* 2021; *Vaalavuo et al.* 2022). The couple's joint pattern of labour supply prior to the health shock affects the need, opportunities, and obstacles to adjusting labour market participation. In this article, using quasi-experimental methods, we examine the effects of cancer on the unaffected spouse's employment, annual earnings, family income and mental well-being.

Our study contributes to the understanding of the wider economic impacts of cancer in two important ways. First, we add to the previous literature by integrating the theories and concepts of household division of labour and specialisation into the empirical models. More specifically, we examine the heterogeneous impacts by relative income status of the spouses prior to the cancer diagnosis. Moreover, we analyse the effects for men and women separately. While some previous studies have examined gender differences in the spillover effects, they have not considered the effect of relative income status separately (independently on gender) or focused on long-term impacts. Second, besides labour market and economic outcomes, we also study the psychological spillover effects of cancer.

[1] Throughout the paper "spouse" refers to a significant other in a marriage or cohabitation.

[2] For a nuanced discussion of the relevant terminology, see *Bobinac et al.* (2010).

It is especially important to analyse mental health outcomes separately by the survival of the spouse and how they evolve in the long run. Using the panel structure of the data over the years 1995-2019, we follow couples 5 years before and 10 years after the initial cancer diagnosis. Identifying the indirect causal effects of a spouse's cancer is generally challenging. Our identification strategy is based on quasi-random variation in the timing of the cancer diagnosis in the estimation window and dynamic difference-in-differences or event study framework (*Fadlon and Nielsen*, 2019, 2021) this allows us to evaluate the key identification assumptions of the empirical specification.

There is only a nascent body of quasi-experimental research on the indirect effects of health shocks on the spouse's labour market outcomes. Methodologically, the closest to our study is *Fadlon and Nielsen* (2021) who investigated households' labour supply responses to fatal and severe non-fatal health shocks in Denmark. While we follow their study by using a similar identification strategy, we concentrate on a different health shock (i.e., cancer) and provide evidence on the psychological well-being effects. Moreover, we analyse heterogeneity of labour supply responses by relative income position of couples and evaluate spillover effects both in the short- and long-run. Another closely related study by *Jeon and Pohl* (2017) examined the effect of different cancer diagnoses on the spouse's employment and earnings trajectories based on Canadian register data. We complement their study by analysing the role of relative income within the household and by examining a wider set of outcomes, including psychotropic drug use. We are not aware of any previous quasi-experimental studies analysing the spillover effects of a health shock on mental health. While some studies (e.g., *Bom et al.* 2019; *Stöckel and Bom* 2022) have examined mental health outcomes among spouses, they have not employed difference-in-differences or similar identification strategies.

Moreover, our study is related to concurrent work by *Arrieta and Li* (2022) that focuses on the effect of emergency department visits (i.e., acute health shocks requiring urgent care but with a potentially short duration) on intra-family adjustment of labour supply and care in the U.S. context. Overall, we contribute to the emerging literature on the topic by investigating longer-term impacts on labour supply and mental well-being as well as the potential mechanisms behind the spousal effects in more detail.

Our evidence from a comprehensive Nordic welfare state is likely to shine light on the institutional differences that might drive labour supply responses in different country contexts. The Finnish setting has a broader interest for two additional reasons. First, we can examine the effects of cancer on the total family income, including also received social transfers. The issue is highly policy-relevant also in other industrialised countries as they develop more comprehensive social safety nets for families to tackle the financial burden caused by illness. Second, Finland's cancer survival rates are among the world's highest, which highlights the importance of more deeply understanding the indirect effects of a health shock at the family level. In the near future, the indirect labour market effects of health may be especially important in ageing societies with the aim to prolong working careers.

We observed that female spouses increased their employment for some years after a severe health shock, which is consistent with the added worker effect. However, the size of the impact on annual earnings was negligible. Among men, we found the opposite: male spouses' earnings decreased once their partner fell ill. More importantly, our results shed light on labour supply responses within families based on breadwinner status. We found that the female spouses of sick main breadwinners increased their labour supply in the long run, whereas the female and male spouses of secondary earners did not change their

labour supply. Yet, this added worker effect for secondary earner women seemed to hold only when the cancer patient died. The secondary earner women also suffered more from psychiatric symptoms during bereavement. In general, negative mental health effects are considerable both among men and women both in the short and long term. These findings illustrate that the length of the follow-up, survival status of the sick spouse, and the breadwinner status within the family all matter concerning the results, and, consequently, may also clarify some inconsistencies in the existing evidence on the topic.

The article is structured as follows. Section 2 provides a concise overview of the relevant theoretical and empirical literature. Section 3 describes the data and the empirical framework that is used to identify the effects. Section 4 presents the estimation results. The last section concludes the paper.

2 Theoretical and empirical literature

It has long been recognised that individuals do not make labour supply decisions in isolation, but consider the well-being and economic prospects of the entire household (e.g., *Mincer* 1962; *Blundell and Walker* 1982; *Becker* 1991). Spouses negotiate early on in their relationship on the division of labour in the household. Traditionally, one spouse, usually the husband, has specialised in paid work outside home and the other, usually the wife, in unpaid household work at home (*Becker*, 1991; *Leira*, 1992). Such specialisation may be difficult to change at later stages of the relationship, while it also leaves different degrees of freedom to couples. For example, the main breadwinner usually has only limited opportunities for further increasing their labour supply, while a person without any work experience is likely to face difficulties entering the labour market at an older age.

While gender norms are being effaced gradually, the gender pay gap also remains considerable in the Nordic countries and affects care-taking responsibilities at home (*Cukrowska-Torzewska and Lovasz*, 2020). A severe health shock in the family arguably disturbs the existing division of labour, and participation in the labour market can be re-negotiated at such critical turning points in life, while little research on the topic exists. Recently, *Riekhoff and Vaalavuo* (2021) have argued that the combined educational level of spouses rather than just an individual's education might drive the results by affecting both the opportunities and needs in the family. It is likely that need to adjust the labour supply are smaller when the spouse affected by cancer has contributed only marginally to the total family income; while the opposite would hold when the main breadwinner is the one falling ill.

Dating back to *Woytinsky* (1940a),[3] empirical research in labour economics has studied the effect of a husband's unemployment on the labour supply of other family members to identify the magnitude of the added worker effect. In early work, using U.S. data, *Lundberg* (1985) found a small but significant added worker effect for spouses in white families but not in other racial groups. *Maloney* (1987) observed that a woman's labour supply was positively associated with the unemployment and underemployment of her husband, and the added worker effect was quite substantial. *Melvin* (2002) focused on the husbands' current employment status and analysed their wives' responses before and after job losses to examine the life-cycle labour supply trajectories. Persistent

[3]For an early discussion regarding the added worker effect, see also *Humphrey* (1940); *Woytinsky* (1940b).

post-displacement effects onthe wives' labour supply were detected in the long run. As men have traditionally been the main breadwinners in families also in the Nordic countries, added worker effects are more likely to be found for female spouses when the male spouse is affected by a decrease in labour supply.

More recent empirical literature has focused on the effects of unexpected health shocks on labour supply responses of spouses. Health shocks provide a source of plausibly exogenous variation that is helpful for identifying causal effects. *Coile* (2004) analysed health events such as heart attacks or new cancer diagnoses among older adults in the U.S. The results showed that the added worker effect was small for men and that there was no such effect for women. Using register data from Canada, *Jeon and Pohl* (2017) found strong evidence of a reduction in employment and earnings among individuals whose spouses were diagnosed with cancer. They interpret this finding as individuals reducing the effective labour supply to provide care for their sick spouses and to share joint leisure time. Recently, *Fadlon and Nielsen* (2021) found different labour supply responses depending on the severity of the health shock. Fatal events led to considerable increases in the surviving spouses' labour supply, while non-fatal health shocks had no meaningful effects on the spousal labour supply, which is consistent with the insurance coverage for individuals with reduced work capacity in the Danish context.

Anand et al. (2022) examined caregiving and labour supply responses after a spouse's work-limiting disability or health shock with a specific focus on paid leave laws in California and New Jersey. Consistent with *Jeon and Pohl* (2017), the findings in *Anand et al.* (2022) showed that the labour force participation of potential caregivers was reduced after a negative shock to the spousal health status. *Jolly and Theodoropoulos* (2023) used data from the Survey of Health, Ageing and Retirement in Europe (SHARE) to study the effects of spousal health shocks among older people. Their results revealed large reductions in the labour supply at the extensive margin as a response to the spouse's work-limiting disability. A plausible interpretation of this empirical finding is that individuals exit the labour market to either provide care or share joint leisure time with an ill spouse. This finding is also consistent with the literature on joint retirement in the U.S. (*Blau*, 1998; *Gustman and Steinmeier*, 2000) and Europe (*An et al.*, 2004; *Hospido and Zamarro*, 2014). Indeed, it is likely that the timing of the health shock matters for the spouse's labour market response, with older age, the healthy spouse is also closer to available retirement paths.

Regarding psychiatric well-being, there is much less evidence on the spillover effects of health shocks in long-term follow-ups. Survey-based evidence suggests that cancer increases the psychological distress of spouses. Increased distress can arise from the increased caregiving burden but also because the lives of spouses are linked with their ill partners in terms of emotional well-being and family responsibilities (*Northouse and McCorkle*, 2015). Recent evidence suggests that the caregiving load matters for the mental health of the spouse in a dose-response manner (*Bom et al.*, 2019; *Stöckel and Bom*, 2022). Spouses who provide more than 20 hours of weekly informal care are particularly affected, and reported consistently lower scores in mental health related composite measures relative to a less affected control group.

3 Empirical approach

3.1 Research design and identification

Our empirical strategy builds on the econometric approach used in *Fadlon and Nielsen* (2019, 2021). To mitigate the selection bias that hampers straightforward case-control comparisons, we constructed counterfactuals for couples in which one spouse was diagnosed with cancer using the couples where the spouse is diagnosed with a cancer eleven years later. This comparison is expected to provide a valid counterfactual for the treated from the families who experience the health shock later and allows us to follow the treatment group for 10 years. The identification is based on the assumption that the two groups are to a large extent similar in terms of observed and unobserved characteristics, differing only in terms of the timing of the cancer diagnosis. The key to identification is therefore the quasi-random variation in the exact timing of the health shock and is considered to be plausibly exogenous within the relatively narrow 11 year interval. We estimated a dynamic difference-in-differences model with the following structure:

$$\mathbf{Y_{i,r,t}} = \sum_{r\neq -1, r=-5}^{10} \gamma_r I_r + \sum_{r\neq -1, r=-5}^{10} \delta_r I_r C_{i,t} + \boldsymbol{X'_{i,r=-1}\beta} + \pi_t + \theta_a + \epsilon_{i,r,t}. \quad (1)$$

where the dependent variable $Y_{i,r,t}$ is the outcome of interest i (e.g., employment, earnings, income or psychotropic drug prescription purchases) observed in year t and r periods after the index cancer diagnosis year. I_r represent the indicators relative to the index diagnosis year (actual cancer diagnosis for treated and placebo diagnosis for the later-treated). In the empirical approach proposed by *Fadlon and Nielsen* (2019, 2021), this implies that the relative time for the treatment group is constructed by normalising the time relative to the year of the actual cancer diagnosis and for the control group according to the time relative to the year of actual cancer diagnosis minus 11 years.

The treatment variable is an indicator variable, C_i, which is equal to one for an individual i whose spouse is diagnosed with cancer at period $r = 0$ and zero for an individual i whose spouse is diagnosed with cancer 11 years later. The parameter of interest is δ_r which represents the differences in the labour market outcomes between the treatment and the control group relative to the difference in the year preceding the index diagnosis, $r = -1$. To interpret the income-related estimates in relative terms, we scale the absolute impact (in Euros) with the predicted outcome from the group of unaffected ($\hat{Y}_{r0}$) for each relative time period r to form the estimates for the relative effect, $\delta_r^{rel} = \frac{\delta_r}{\hat{Y}_{r0}}$, representing the percentage change in the outcome.

We also included the full set of calendar year (δ_t) and age indicators (θ_a) to account for time trends and flexible age-earnings profile. $\mathbf{X_{i,pre}}$ represent additional background characteristics such as education (measured in three levels), the number of children, the province of residence, and urban status of residence that are all measured at time $r = -1$, and cancer type.[4]

The main parameter of interest is δ_r, which captures the change in the outcome between the treated and the control group relative to the year preceding the index cancer

[4]We categorize cancers into the following groups based on International Classification of Diseases (ICD-10 codes): C00-C14 Lip & Oral cavity, C15-C26 Digestive organs, C30-C39 Respiratory system, C40-C41 Bone, C43-C44 Skin, C45-C49 Mesothelial & Soft tissue, C50 Breast, C51-C58 Female genital, C60-C63 Male genital, C64-C68 Urinary tract, C69-C72 Eye & brain, C73-C75 Thyroid & Endocrine, C76-C80 Lymphoid & Haematopoetic, C81-C96 Other cancers.

diagnosis ($r = -1$). Assuming that the control group constitutes a valid counterfactual for the treatment group, δ_r, represents the causal effect of cancer diagnosis when $r \geq 0$. Periods $-5 \leq r \leq -2$ represent pre-cancer periods for which we expect the estimated effects to be statistically not significantly different from zero ($\delta_r = 0$). For statistical inference, we cluster standard errors at the individual level.

A possible source of bias that constitutes a threat for the causal interpretation of the estimates stems from the potentially different trends in counterfactual earnings between the treated and the control group individuals. The earnings growth rates can be different between the two groups if the (unobserved) differences between the groups are considerable. These baseline differences could undermine the validity of using the control group as the counterfactual for the treatment group. This concern becomes more likely the greater the differences in background characteristics are between the two groups of individuals at period $r = -1$. For instance, differences in education between the groups may lead to substantially different (un)employment trajectories during times of economic distress. The choice of constructing counterfactuals from within the (later) affected is used to mitigate this concern.

To study the heterogeneity in terms of breadwinner status and survival of the affected spouse, we used the triple difference estimator to conduct tests on the statistical significance of heterogeneity. To make the results easier to interpret and to make subtle responses more detectable, we transformed the relative time variable into three categories. Our model for moderation, which is a heterogeneity analysis has the following structure:

$$\mathbf{Y_{i,r,t}} = \gamma_r P_r C_{i,t} + \delta_r P_r C_{i,t} M_{i,r=-1} + \boldsymbol{X'_{i,r=-1}}\boldsymbol{\beta} + \pi_t + \theta_a + \epsilon_{i,r,t}. \tag{2}$$

where variable P_r represents the categorical variable based on relative time r, taking the value 0 in years before the index diagnosis ($r < 0$), value 1 in relative periods 0 to 2 (short-term effect) and value 2 in relative periods 3-5 (medium-term effect) and value 3 in relative periods 6-10 (long-term effect). $M_{r=-1}$ stands for moderator.

Moreover, to illustrate the effect of mortality relative to the effect of a non-fatal cancer (i.e., the spouse does not die within 10 years of the index diagnosis), we conducted an additional illustrative analysis on the spouse's cancer diagnosis and outcome trajectories both after the spouse's cancer diagnosis and the death of a spouse. In this analysis, we compared three groups of individuals: i) individuals with a spouse with cancer ii) individuals with a spouse with cancer who received the diagnosis 11 years later iii) individuals with a spouse with cancer who died two years after the cancer diagnosis.

3.2 Data

Linked administrative data—Our empirical analyses are based on linked individual-level register data that cover the total population of Finland over the period 1995-2019. We linked three primary datasets: i) the Care Register for Health Care maintained by the Finnish Institute for Health and Welfare, ii) register-based information from FOLK data on income and labour market outcomes, sociodemographic characteristics, and linkages between family members by Statistics Finland, and iii) information on the dispensed psychotropic medicines reimbursable recorded by the Social Insurance Institution. Because the data are routinely collected from nationwide administrative sources, the only sources of attrition are emigration and mortality. The data has been pseudonymised and analysed using Statistics Finland's remote access system.

Study population—Information on cancer diagnosis is based on the Care Register for Health Care which includes all inpatient stays in public specialized healthcare for years 1971–2019 as well as all outpatient visits to hospitals since 1998. The standard ICD-9 and ICD-10 codes for diagnoses were used to identify individuals with cancer and the timing of the first cancer diagnosis. We used only data on inpatient care because practically all cancer diagnoses that require medical treatment lead to hospital stays, and a cancer diagnosis detected only in outpatient care is likely to be a false positive diagnosis in the Finnish context.

We limited the study population to couples where the affected person received their first cancer diagnosis between ages 28–64. We have restricted the cases to this age range to analyse labour market consequences before the statutory retirement age in Finland. Additionally, to compare our findings to earlier results, we used the same age restriction as in *Jeon and Pohl* (2017). The same restriction was used for spouses as well.

Using personal identifiers, we linked those affected with a cancer diagnosis to their cohabiting partners (i.e., non-affected spouses). We identified the spousal effects only in stable relationships. We therefore imposed a restriction of cohabitation of two years before the index cancer diagnosis. Figure S1 in the Appendix clarifies our empirical approach and the spousal sample criteria.

Observation period—We used a balanced panel in the analysis. We followed individuals 5 years before and 10 years after the initial cancer diagnosis. The diagnosed spouse may pass away during the 10-year post-diagnosis follow-up but this does not affect the sample. However, we only studied those spouses of the affected cancer patients who were present and alive in Finland for the full 16 years of follow-up. This led to a reduction of 8.2% of the men and a 4.0% reduction in women in the analytic sample which consisted only of spouses of the individuals with a cancer diagnosis.

Outcome and control variables—Register-based information on the individual-level characteristics was obtained from the FOLK data of Statistics Finland. This data were used to construct our labour market outcome variables and covariates. Our main outcomes to study spousal labour market responses were the employment status and annual earnings. We used a binary variable indicating whether the person was employed or not based on the main activity in the last week of the calendar year. We also analysed the effects on retirement, based on the same information as employment.

Information on annual earnings before taxes was obtained from state-run pension and tax registers that cover all legal employment contracts in Finland. Earnings refer to the sum of labour market income and entrepreneurial income. We imputed missing income information as zero if individuals were alive and living in Finland at the end of the calendar year. The labour market income overwhelmingly dominates the earnings measure. The share of self-employed of all employed persons is only approximately 13% in Finland.

At the household level, we used information on the total household income, which takes into account the pooling of economic resources at the household level and various social transfers provided by the Finnish welfare state. It includes all taxable income without capital income, and social transfers such as pensions, sickness allowance and unemployment benefits. Disposable household income refers to the total household income after taxes and other deductions. Equivalised household disposable income further divides the disposable household income by the number of household members taking into account economies of scale in the household. We have used the modified OECD equivalence scale for this purpose.

Finally, we used information on the dispensed psychotropic medicines, which are reimbursable under the National Health Insurance scheme. This data are provided by the Social Insurance Institution of Finland. We used an indicator for a purchase of prescribed reimbursable psychotropic drugs as an indicator for psychological well-being at the yearly level. Because all permanent residents of Finland are covered under the Finnish National Health Insurance (NHI) system and are eligible for reimbursements for the cost of medicines prescribed by a doctor or dentist, the majority of psychotropic medication prescriptions are recorded in this register. Accordingly, there is a high concordance between self-reported medication and official prescription database information on psychotropic medicine (*Haukka et al.*, 2007).[5]

We also controlled for the following variables: education, the number of children living in the household, the province of residence, age, gender and type of cancer. All these variables were all measured one year prior to the index diagnosis year. The educational level refers to the highest degree the person has achieved. The variable has three categories: 1) compulsory education only, 2) secondary education (high school or vocational education), and 3) tertiary education (polytechnics and universities). The province of residence can affect both the access to healthcare services as well as labour market opportunities, which have substantial regional variation.

Heterogeneity analysis by breadwinner status.—To identify the role of the household division of labour and specialisation, we examine the heterogeneity of the indirect effects on the spouse in terms of gender and the household income share of the individual, i.e., the breadwinner status. We constructed a binary variable that takes the value of 0 if the individual's income contribution share was below 50 percent (the secondary earner) one year prior the index diagnosis and 1 if the share was above 50 percent (the main breadwinner).

Table 1 describes the study sample and compares our treatment and control groups in the period preceding the index diagnosis. The index diagnosis refers to the year of the cancer diagnosis for the treated individuals and placebo diagnosis year for control group. The placebo diagnosis year takes place 11 years prior to actual diagnosis year of the control group. Men (husbands of the affected) were over-represented in the breadwinner category (69%), whereas women (wives of the affected) were clearly under-represented in the breadwinner category (28%). There are notable differences between the treatment and control groups in terms of age distribution and retirement probability. These variables are included in the event study regressions.

Cancer-related mortality reduced the household size by one in 34% of families during the follow-up period (in the treatment group). Men who got cancer were considerably more likely to die (44%) compared to women (26%) during the 10-year post-cancer follow-up period.

4 Results

4.1 Main effects of spousal cancer

We start our empirical analysis by presenting the overall results based on equation 1. The results from this specification along with the corresponding 95% confidence intervals are

[5]The NHI reimbursements cover only outpatient medication. Medication administered in public hospitals is not reimbursable.

Table 1: Descriptive statistics of analytical sample

Variable	**Men (Wife has cancer)**		**Women (Husband has cancer)**	
	Control group	Treatment group	Control group	Treatment group
Birth year	1952.7	1951.5	1952.5	1951.3
Year of spousal cancer	2014.9	2004.5	2014.9	2004.7
Age 28-44 (%)	25.6	17.0	21.5	15.4
Age 45-54 (%)	38.5	38.8	43.5	37.3
Age 55-64 (%)	35.9	44.2	35.0	47.3
Number of children living in household	0.991	0.851	0.858	0.666
Education: Primary (%)	27.8	28.8	28.5	30.5
Education: Secondary (%)	53.4	51.4	58.9	56.8
Education: Tertiary (%)	18.8	19.7	12.6	12.7
Breadwinner (%)	69.8	67.9	27.9	28.4
Earnings	36833.4	36604.1	22899.1	22334
HH earnings	65021.4	65012.1	60606.4	57979.8
Eq. disposable income	31065	32480.1	30748.2	32093.4
Employed (%)	78.5	76.3	75.3	71.3
Psychotropic medication (%)	7.5	8.4	12.6	14.6
Retired (%)	12.8	14.9	11.1	15.3
Married (%)	85.6	87.2	87.6	88.2
Spouse dies within 10y (%)	0	25.5	0	43.7
N	34484	23298	35849	20264

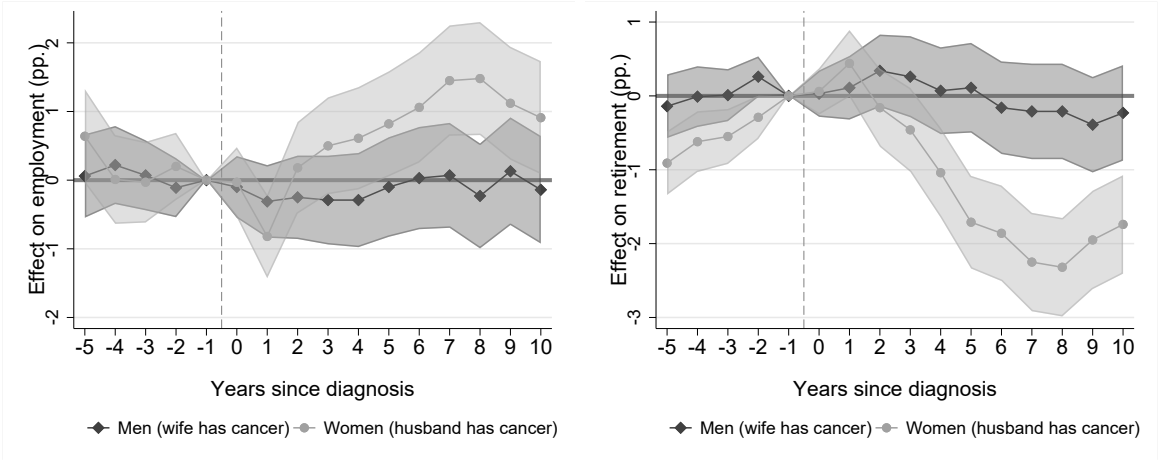
Notes: Sample means with standard deviations at year preceding the index diagnosis. The sample consists of adults aged 28-64 whose spouse was diagnosed with cancer in Finland between 2000–2008 (treatment group) and 2011–2019 (control group).

presented graphically in Figure 1 and the parameter coefficients are reported in Tables S1 and S2. The figures plot the change in the outcomes of interest relative to the year before spousal cancer diagnosis in the treatment group. Crucially, the figures do not reveal clear pre-trends, which supports the key identification assumption of our empirical specification.

We find support for the added worker effect among women in the longer run: employment among women increased after an initial reduction as a consequence of their spouse's cancer diagnosis (Panel A of Figure 1). In contrast, among male spouses, the effect was not statistically significant and the effect size was close to zero. The increase in employment for women was also reflected in the reduction of the probability of retiring from the labour market (Panel B). Consistent with the employment effects, the effect on the probability of retiring was substantially larger for women compared to men. These results support the conclusion that the labour supply adjusts more to severe health shocks for women than men. However, when it comes to annual earnings (Panel C), the size of the effect was negligible for women. Moreover, for male spouses, their earnings decreased after their spouse fell ill. This result is consistent with the caregiver effect, although the effect was modest with less than a 2 percent reduction in earnings.

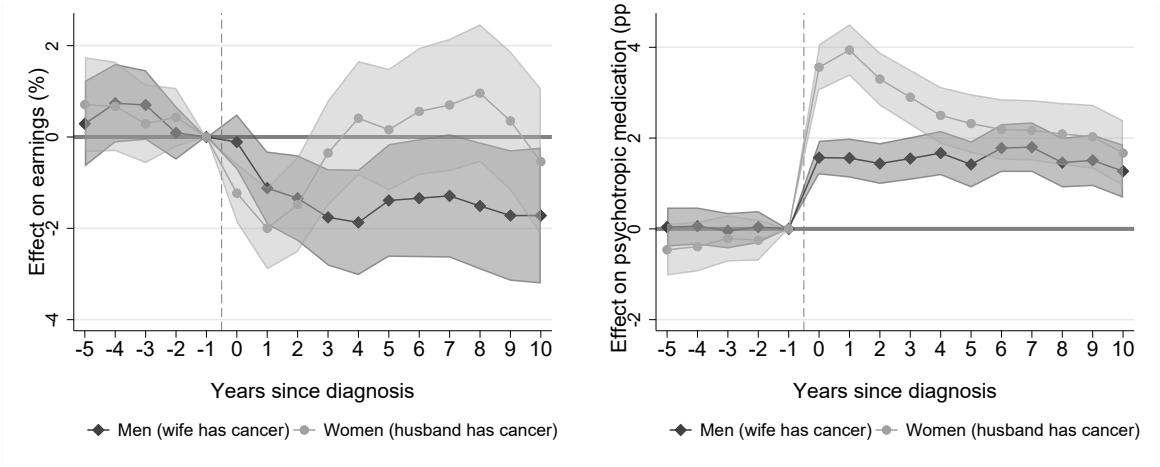
Importantly, cancer also affected the spouse's mental well-being. According to Panel D of Figure 1, the probability of using psychotropic medication increased initially by approximately 4 percentage points (pp.) for women and about 2 pp. for men and the impacts stabilized at around 1.5-2 pp. for both sexes. Relative to the baseline probability of psychotropic medication use, the relative increase in psychotropic medication was 13.8% for men and 13.9% on average during the full follow-up period.

Figure 1: Effect of spousal cancer on labour supply, income and psychotropic drug use



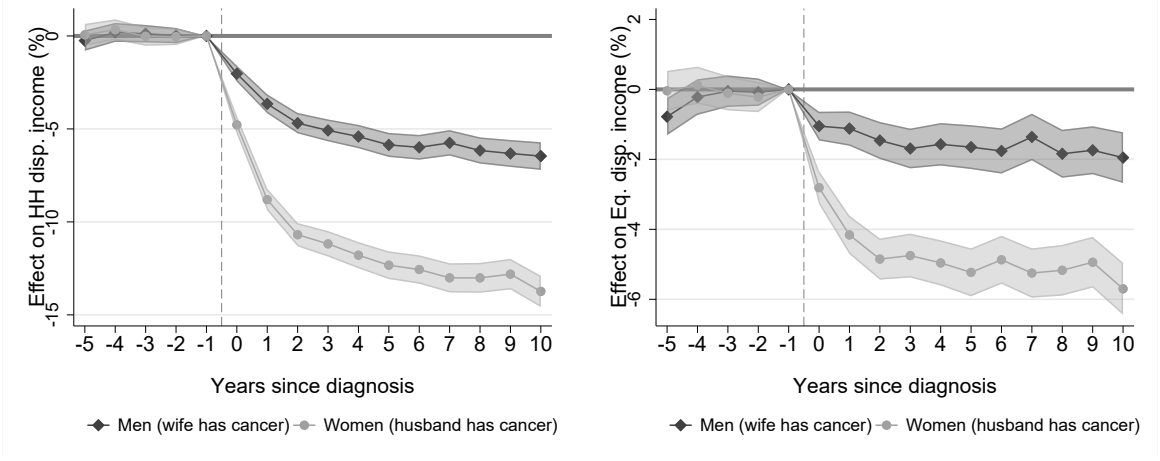
(A) Employment

(B) Retirement



(C) Earnings

(D) Psychotropic drug use



(E) HH disposable income

(F) Eq. HH disposable income

Note: These figures plot the coefficient estimates from event study regressions. The point estimates (with the shaded areas representing the 95% confidence intervals) refer to the differences in outcome vs. control group relative to year preceding the index cancer diagnosis. The control group consists of individuals diagnosed with cancer 11 years later relative to the treatment group. The vertical line at time $r = -0.5$ depicts the moment of the cancer diagnosis. "HH" refers to household and "Eq" to equivalised, respectively. Standard errors are clustered at the individual level. Tables S1 and S2 report the corresponding event study estimates in table format.

The estimates regarding a household's disposable income (Panel E) (as well as a household's total income shown in Table S1 and S2) show an important decrease, from 10 to 15 percent in the medium to long run among female spouses and around 5 percent among the male spouses. However, once the household disposable income is adjusted by using OECD modified equivalence scale (Panel F), the income deficit becomes smaller, settling at less than 2 percent for male spouses and around 5 percent among female spouses. This reveals that a female spouse's increase in earnings does not compensate for the loss of the sick spouse's income in the household. Financial difficulties following a spouse's death tend to be harsher for women which might be explain the reason cancer leads to a larger decrease in owner-occupancy in housing among women but not among men (Table S1 and S2).

A potential concern for the validity of the estimates is the endogenous character of cancer. The event study specification ensures that the comparisons are conducted for individuals of the same sex, age, cancer type of the spouse, and education level but with the timing difference of the spouse's cancer diagnosis of 11 years. The main concern therefore is related to the timing of the diagnosis. The timing difference can potentially reveal differences between household living conditions and health behaviors. Hence, as a robustness check, we re-estimated the effects of spousal cancer using only a subset of cancer diagnoses that are less related to health behaviors. This subset of cancers includes (ICD-10 category in parentheses): 1) Gallbladder cancer (C23), 2) Breast cancer (C50), 3) Ovarian cancer (C56), Prostate cancer (C61), Testicular cancer (C62), Thyroid cancer (C73), Myeloma (C90), Non-Hodgkin lymphoma (C82-85,C96), Leukaemia (C91-C95), and Brain and other central nervous system cancers (C70-72). The selection of cancers was based on the British (*Brown et al.*, 2018) and Australian (*Wilson et al.*, 2018) estimates of the fraction of cancers that are preventable within each cancer diagnosis category. In our analysis, we took a conservative attitude and included only cancer types that were estimated to be preventable by up to 30%. Encouragingly, the results based on this subsample (Tables S3 and S4) are by and large very similar to the baseline results presented in Figure 1.

4.2 Heterogeneity by breadwinner status

We proceed to examine whether the pre-cancer relative income status within couples moderates the impacts of spousal cancer. We estimated the breadwinner heterogeneity of the effects for female and male spouses separately using equation 2 on earnings, employment, and psychotropic drug use in the short-, medium- and long-term. These results are shown in Table 2. Impact estimates for employment and psychotropic drug use are provided in percentage points and in percent relative to the baseline. The pre-cancer adjusted mean of the outcome within the breadwinner status is reported in the rightmost column.

In the short term, we do not detect statistically significant differences in the relative income status in labour market outcomes nor in psychotropic medication use. Instead, in the long term, we find different labour supply responses for women. A spouse's cancer increased the long-term income by 1.1 percent and the probability of being employed by 1.7 percentage points for secondary earners. These effects are statistically significantly different relative to breadwinner women, for whom both earnings and employment point estimates were negative. The secondary earners also showed a higher increase in the probability of psychiatric symptoms in the medium and the long term. For men, no

Table 2: Effects of spousal cancer by breadwinner status

	Breadwinner status	Short-term		Medium-term		Long-term		Adj. mean
		est.	%	est.	%	est.	%	
a. Women (Husband has cancer)								
Earnings (%)	Breadwinner	-1.4 [0.6]		-0.7 [0.9]		-1.7 [1.1]	-0.3	26618
	Secondary earner	-2.8 [0.6]		-0.8 [0.7]		1.1 [0.9]*	2.8	16880
Employment (pp.)	Breadwinner	-0.2 [0.4]	-0.2	0.1 [0.5]	0.2	-0.2 [0.5]	-0.3	71.5
	Secondary earner	-0.8 [0.3]	-1.3	0.5 [0.4]	0.8	1.7 [0.4]**	2.9	58.3
Psychotropic	Breadwinner	3.6 [0.4]	25.3	2.2 [0.4]	15.6	1.5 [0.5]	10.6	14.1
drug use (pp.)	Secondary earner	4.2 [0.3]	26.2	3.3 [0.3]*	21.1	2.6 [0.3]†	16.1	15.8
b. Men (Wife has cancer)								
Earnings (%)	Breadwinner	-0.7 [0.4]		-1.8 [0.6]		-2.3 [0.7]		35485
	Secondary earner	-1.6 [1.1]		-2.5 [1.2]		-1.2 [1.4]		16845
Employment (pp.)	Breadwinner	-0.3 [0.3]	-0.5	-0.4 [0.3]	-0.5	0 [0.3]	0.0	70.3
	Secondary earner	0.1 [0.5]	0.2	0.1 [0.6]	0.2	0.1 [0.6]	0.3	51.5
Psychotropic	Breadwinner	1.6 [0.2]	17.9	1.4 [0.2]	15.3	1.5 [0.3]	16.1	9
drug use (pp.)	Secondary earner	1.3 [0.3]	11.2	1.6 [0.4]	14.3	1.5 [0.4]	12.9	11.5

Notes: Short-, medium- and long-term impacts of spousal cancer on earnings (scaled), employment and psychotropic drug use by different breadwinner status. Standard errors (clustered at individual level) are reported beside the point estimates in parentheses. Short-term refers to DD-estimates using post-event periods 0–2, medium-term to periods 3-5 and long-term to periods 6–10. Symbols †, * and ** refer to statistical significance 10%, 5% and 1% of the point estimates relative to the reference group (Breadwinner). All estimates are based on the triple-difference models presented in equation 2.

statistically significant differences between breadwinners and secondary earners were detected.

All in all, we find that the relative income status within the couple affected the results and their interpretation, but only for women. Our findings imply that the added worker effect is concentrated on those women who contributed a smaller fraction of the total family income during the pre-cancer period. The heterogeneous effects by breadwinner status also explain why a spouse's cancer might have a negligible impact on earnings, but a significant impact on employment as is the case in our main estimates for men. The pre-cancer division of labour market participation might also explain the gender differences in the labour market responses as women are typically the secondary or equal earners and men tend to hold the main breadwinner status.

4.3 Heterogeneity by survival status

As previously stated, the cancer survival rates differed notably by gender. 44% of men and 26% of women died during the 10-year follow-up (Table 1), while there were some differences in the timing. Among men, 53% of the deaths took place within 2 years of the diagnosis, whereas the corresponding figure for women was higher at 63%. This could cause potential differences in the spousal labour supply responses between genders. Therefore, we estimated the effects for female and male spouses separately based on a spousal sample where the affected individuals in the treatment group survived cancer for the full post-diagnosis follow-up period and separately for those families where the affected individual died at some point during the follow-up period. No such restrictions

were imposed on the control group and no restrictions were imposed on the timing of spousal death.

Table 3: Effects of spousal cancer by survival status

	Survival	Short-term		Medium-term		Long-term		Adj. mean
		est.	%	est.	%	est.	%	
a. Women (Husband has cancer)								
Earnings (%)	Survives	-1.9 [0.5]		-1.8 [0.7]		-2.5 [0.8]		19822
	Dies	-2.4 [0.6]		0.6 [0.7]**		3.2 [0.9]**		19676
Employment (pp.)	Survives	-0.8 [0.3]	-1.2	-0.3 [0.4]	-0.4	-0.1 [0.4]	-0.2	61.6
	Dies	-0.5 [0.3]	-0.7	1 [0.4]*	1.6	2.4 [0.5]**	3.9	62.1
Psychotropic	Survives	1.3 [0.3]	7.3	0.9 [0.3]	5.4	1.1 [0.3]	5.5	17.2
drug use (pp.)	Dies	7.5 [0.3]**	45.2	5.6 [0.3]**	33.2	3.7 [0.4]**	20.5	16.7
b. Men (Wife has cancer)								
Earnings (%)	Survives	-0.6 [0.4]		-1.6 [0.6]		-2.1 [0.7]		30186
	Dies	-2.2 [0.7]†		-3.1 [0.9]		-1.2 [1]		29909
Employment (pp.)	Survives	-0.2 [0.2]	-0.3	-0.3 [0.3]	-0.5	-0.2 [0.3]	-0.3	65.5
	Dies	-0.5 [0.4]	-0.7	-0.4 [0.5]	-0.6	0.3 [0.5]	0.4	65.2
Psychotropic	Survives	0.7 [0.2]	6.4	0.6 [0.2]	5.1	0.7 [0.2]	6.1	10.3
drug use (pp.)	Dies	4.1 [0.3]**	40.6	4.2 [0.3]**	39.1	3.8 [0.4]**	32.8	10.1

Notes: Short-, medium- and long-term impacts of spousal cancer on employment and psychotropic drug use by different survival status. Standard errors (clustered at individual level) are reported beside the point estimates in parentheses. Short-term refers to DD-estimates using post-event periods 0–2, medium-term to periods 3–5 and long-term to periods 6–10. Symbols †, * and ** refer to statistical significance 10%, 5% and 1% of the point estimates relative to the reference group (Breadwinner) separately for men and by survival of spouse. All estimates are based on the triple-difference models presented in equation 2.

We found statistically significant differences in the labour market effects by survival status in the long term for women (Table 3). Women whose spouses died during the follow-up, earned 3.2% more and were 2.4 pp. more likely to be employed in the long term. The estimates are statistically significant relative to women whose spouses survived cancer in the medium and long term. For men, there were no detectable differences in the labour market impacts of spousal cancer with respect to survival status.

The psychological toll due to the fatal cancer of a spouse is considerable. Both women and men are affected by spousal cancer regardless of survival status. However, in fatal cancer cases the magnitudes were considerably larger and statistically different from the surviving cases. The probability of suffering from psychiatric symptoms increased by 7.5 pp. for women and 4.1 pp. for men in the short term in fatal cases translating to 45.2% and 40.6% increases with respect to the baseline probability of using psychotropic drugs. The magnitudes were large also in the long term for both women (3.7 pp.) and men (3.9 pp.) for fatal cancer cases.

A potential limitation of this analysis is that we did not distinguish the exact timing of death during the follow-up. While most of the deaths during the follow-up occurred in the short term (61%), some of the bereavement effects took place only in the medium (20%) and long term (19%) after cancer diagnosis. Consequently, treating all cancer-related deaths lumped together may not reveal the dynamics of the cancer spillover fully. An

auxiliary analysis explicitly setting the time of death of a spouse at $r = 2$ shows that women were more responsive to spousal death in terms of the labour market and psychiatric outcomes (Appendix Figure S2).

4.4 Heterogeneity by breadwinner status in non-fatal and fatal cancers

Finally, we study whether the impact of a cancer diagnosis that resulted in a death within the 10-year follow-up is different by breadwinner status with respect to the survival status. We estimated the effects separately in terms of gender and survival status using the triple differences estimator with breadwinner status as a moderator. These results are reported in Table 4.

Table 4: Effects of fatal spousal cancer by breadwinner status

	Breadwinner status	Short-term		Medium-term		Long-term	
		Dies	Survives	Dies	Survives	Dies	Survives
a. Women (Husband has cancer)							
Earnings (%)	Breadwinner	-2.2 [0.8]	-0.7 [0.8]	-0.5 [1.1]	-1.0 [1.1]	-0.6 [1.3]	-3.1 [1.4]
	Secondary earner	-2.5 [0.7]	-2.8 [0.7]†	-2.1 [1.0]†	-2.9 [1.0]	6.7 [1.2]**	-3.1 [1.0]
Employment (pp.)	Breadwinner	-0.3 [0.6]	0.0 [0.5]	0.5 [0.6]	-0.2 [0.6]	0.0 [0.7]	-0.5 [0.7]
	Secondary earner	-0.3 [0.4]	-1.1 [0.4]†	1.7 [0.5]	-0.3 [0.4]	4.3 [0.6]**	-0.2 [0.5]
Psychotropic	Breadwinner	6.6 [0.5]	0.7 [0.5]	4.3 [0.6]	0.2 [0.5]	2.6 [0.6]	0.4 [0.6]
drug use (pp.)	Secondary earner	7.9 [0.4]†	1.5 [0.3]	6.3 [0.4]**	1.3 [0.3]†	4.3 [0.5]*	1.3 [0.4]
b. Men (Wife has cancer)							
Earnings (%)	Breadwinner	-2.1 [0.7]	-0.2 [0.3]	-3.4 [0.9]	-1.0 [0.6]	-2.7 [1.1]	-1.9 [0.8]
	Secondary earner	-1.7 [1.8]	-0.1 [0.5]	-1.2 [1.9]	-2.8 [1.3]	2.7 [2.2]*	-2.3 [1.5]
Employment (pp.)	Breadwinner	-0.7 [0.5]	-0.2 [0.3]	-0.6 [0.5]	-0.3 [0.3]	0.3 [0.6]	-0.1 [0.4]
	Secondary earner	0.7 [0.9]	-0.1 [0.5]	0.4 [0.9]	0.0 [0.6]	1.1 [1.1]	-0.2 [0.7]
Psychotropic	Breadwinner	4.4 [0.4]	0.7 [0.2]	4.0 [0.4]	0.5 [0.2]	3.8 [0.5]	0.6 [0.3]
drug use (pp.)	Secondary earner	3.3 [0.6]	0.6 [0.3]	4.7 [0.7]	0.6 [0.4]	3.5 [0.8]	0.8 [0.5]

Notes: Short-, medium- and long-term impacts of spousal cancer on employment and psychotropic drug use by different survival status. Standard errors (clustered at individual level) are reported beside the point estimates in parentheses. Short-term refers to DD-estimates using post-event periods 0–2, medium-term to periods 3–5 and long-term to periods 6–10. Symbols †, * and ** refer to statistical significance 10%, 5% and 1% of the point estimates relative to the reference group (control group). All estimates are based on the triple-difference models presented in equation 2.

We found that fatal spousal cancer increased the labour supply particularly for the secondary earner women in the long term. Earnings increased by 6.7% and employment by 4.3 pp. in the long term. These responses were statistically significant for breadwinner women, for whom we found no detectable effect in the medium nor long term. The psychological impacts, measured based on psychotropic drug use, appeared also to be more notable for the secondary earners relative to the breadwinner women.

The breadwinner heterogeneity was markedly different when a spouse survived cancer. Women who were secondary earners reduced their labour supply in the short term while breadwinner's labour market outcomes remained unaffected. The breadwinner interaction term was statistically significant in the short term but in the medium term and long term the responses are similar between the two groups. Negative mental health effects seemed

to be larger among secondary earner women also in the case of non-fatal cancer of the spouse, while statistically significant only in the medium term.

For men, we found no statistically significant differences by the breadwinner status for the most part, but the coefficients pointed to a modest increase in employment among male secondary earners when the spouse died of cancer. However, only in the long term earnings was the response statistically significantly different by the breadwinner status if the spouse died. No differences in mental health effects could be detected by breadwinner status.

These pieces of evidence suggest that that the relative income status is not a major determinant of the labour supply responses or psychological well-being in non-fatal spousal health shocks. However, losing a breadwinner spouse appears to play an important role in the decision to participate in the labour market, especially among women. Women who earn less than their deceased spouse increase their labour supply in long term and are more likely suffer from psychological symptoms, while among men the consequences seem to limit to labour supply decisions.

5 Discussion

Cancer is a life event causing considerable sorrow and strife. It affects millions of people worldwide annually. Its effects are not solely limited to the individual receiving the diagnosis. Quite the opposite, cancer, its long-lasting treatment and possible death have substantial additional economic and non-economic effects at the family level. Much of the empirical literature has focused only on the labour market consequences (i.e., employment and earnings trajectories) of the affected individual, thereby ignoring the broader indirect effects within the family. However, there is emerging literature that has aimed at identifying such effects (e.g., *Jeon and Pohl* 2017; *Fadlon and Nielsen* 2021; *Breivik and Costa-Ramón* 2022; *Vaalavuo et al.* 2022). Understanding these broader effects is important for policy designs and interventions that aim to compensate for the lost earnings due to an abrupt change in health status.

In this article, using linked nationwide register-based data on cancer diagnoses and a comprehensive set of income, employment and mental health measures, we provided new evidence on the relationship between spouses' cancer and its effects on the healthy spouse in the short and long term. This study significantly contributes to the literature by applying the theories and concepts of the household division of labour (*Leira*, 1992) to better understand how individuals react to a sudden decrease in their spouse's earning capacity. Consequently, we focused on estimating the effects by gender and breadwinner type. This study design arguably clarifies some contradictions in the prior research on the topic. Our data covers all cancer patients and their cohabiting partners in Finland over the extensive period of 1995–2019 allowing a nuanced analysis of the broader effects at the family level. Our identification strategy was based on quasi-random variation in the timing of the cancer diagnosis and a dynamic difference-in-differences framework earlier proposed and used by *Fadlon and Nielsen* (2019, 2021).

Our empirical analysis reveals three main findings. First, for female spouses, we observed an increase in the likelihood of being employed and a reduction in the likelihood of being retired. This observation is consistent with the added worker effect, according to which the spouse increases her labour supply in order to maintain the previous income level of the household and stabilise the family's financial situation. Notably, this finding

only applied to women. This is not unlikely as the affected husbands' participation in the labour market decreased substantially and men are more often the main breadwinners in the family. In general, women are more likely to have opportunities to increase their labour supply from an initially lower level both at the extensive and intensive margin (i.e., hours of work conditional of being employed). Indeed, the findings regarding earnings show that the earnings of men rather decrease after a spouse's cancer with little or no effect on employment or retirement.

Second, we observed considerable heterogeneity in the effects that have not been documented in earlier studies. An increase in earnings and employment after a spouse's cancer was driven by female secondary earners, which was indeed expected. Moreover, the effect was only visible in the long term, 6 to 10 years after the initial cancer diagnosis. This makes sense: in the short term, caregiving needs and emotional shock are likely to prevail, and it takes some time to find employment opportunities and increase the labour supply meaningfully. A closer look at the data suggests that this finding is strongly connected to the spouse's death. When the male spouse died, the widow's labour supply increased, but not when the spouse survived. Again, this applied to secondary earner women, but not to breadwinner women. Additionally, secondary earner men appeared to increase their labour market participation after their spouse died, but this effect was not statistically significant except for earnings in the long term.

Third, the negative mental health effects of a spouse's cancer on the other spouse were considerable in both short and long term and for both genders. These effects were mainly driven by the spouse's death. Interestingly, in the case of fatal cancer, secondary earner women were more negatively affected than breadwinner women, while no such difference was detected among surviving male spouses. The stronger effect among secondary earner women could plausibly be linked to greater economic difficulties.

Our findings demonstrate that it is important to consider the effects by gender, breadwinner status, and the survival of the spouse to more deeply understand the mechanisms that remain unclear when only average effects are analysed. The results regarding secondary earners revealed that both opportunities to increase the labour supply as well as the need to do so when the spouse died affected the reactions of spouses. The heterogeneity based on pre-cancer breadwinner status and survival of the spouse is likely to partly explain the above-mentioned gender differences in the results. Importantly, our results also shed light on the inconclusive evidence of earlier research on the topic. Women who are secondary earners are the most responsive persons in families. After the initial shock, they reduce their labour supply, but in the long term their labour supply increases. These findings highlight that the household division of labour creates opportunities, obstacles, and needs for labour market adjustments in a situation where the family faces a severe health shock even in a comprehensive welfare state setting with universal access to healthcare services, such as Finland. While such a division of labour and specialisation between spouses is usually negotiated early on in the relationship (*Baker and Jacobsen*, 2007), our results show that sudden events can interrupt the arrangement and cause economically meaningful labour market responses. We expect that such effects are even greater in countries with weaker social safety nets, but also in countries where survival rates from cancer are poorer than in Finland.

The results suggest that spousal responses to cancer exhibit dynamics where short-term follow-ups may reveal only part of the full picture. Our analysis suggests that initially after the cancer diagnosis, spouses may reduce their labour supply in order to take care of their spouse or to increase joint leisure time suggesting caregiver/family effect

in the short term. However, when a spouse dies after a cancer diagnosis, the surviving secondary earner responds by postponing the retirement and remaining employed for longer. This result is consistent with *Fadlon and Nielsen* (2021) the interpretation of self-insurance as a central mechanism for the family labour supply responses with respect to health shocks.

Notably, we find that the increased labour supply among secondary earners as opposed to breadwinners in families in which a spouse suffers a fatal cancer, coincides with larger psychological symptoms. This raises the question whether the increased labour supply due to financial concerns exacerbates the psychological distress. An alternative interpretation of the finding is that the effect is driven by the individual's need to broaden their social contacts from the family environment to the work environment during an unexpected stressful life event that is also particularly stressful from the financial perspective.

Our empirical approach has two limitations. First, the socioeconomic status may cause substantial differences in the severity of cancer and the consequent survival probability differences potentially complicate the interpretation of the indirect economic effects at the family level. Second, using nationwide register data, we infer the importance of the caregiver role indirectly based on the spouse's labour market participation. However, it is possible that at the onset of the health shock in the family some spouses increase both their labour supply due to the reduction in family income, and also provide more care to the sick spouse by cutting down their own personal leisure time. This may lead to substantial stress and mental health problems in the long run that could themselves be potentially interesting outcomes in subsequent empirical work.

To conclude, our findings highlight that future research on health shocks in the family context should pay much more attention to the heterogeneity of the effects by the breadwinner status and consider the role of household division of labour more deeply. This information would be helpful in order to target policy measures such as social income transfers and related public interventions to those who are most in need.

References

An, M. Y., B. J. Christensen, and N. D. Gupta (2004), Multivariate mixed proportional hazard modelling of the joint retirement of married couples, *Journal of Applied Econometrics*, *19*(6), 687–704, doi:https://doi.org/10.1002/jae.783.

Anand, P., L. Dague, and K. L. Wagner (2022), The role of paid family leave in labor supply responses to a spouse's disability or health shock, *Journal of Health Economics*, *83*, 102,621, doi:10.1016/J.JHEALECO.2022.102621.

Arrieta, G. R., and G. Li (2022), Caring to work or working to care: The intra-family dynamics of health shocks, *American Journal of Health Economics*, doi:10.1086/722588, doi: 10.1086/722588.

Baker, M. J., and J. P. Jacobsen (2007), Marriage, specialization, and the gender division of labor, *Journal of Labor Economics*, *25*, 763–793, doi:10.1086/522907, doi: 10.1086/522907.

Becker, G. S. (1991), *A Treatise on the Family: Enlarged edition*, Harvard University Press.

Blau, D. M. (1998), Labor force dynamics of older married couples, *Journal of Labor Economics*, *16*, 595–629, doi:10.1086/209900, doi: 10.1086/209900.

Blundell, R., and I. Walker (1982), Modelling the joint determination of household labour supplies and commodity demands, *The Economic Journal*, *92*(366), 351–364, doi:10.1093/acprof:oso/9780198749806.003.0004.

Bobinac, A., N. J. A. van Exel, F. F. H. Rutten, and W. B. F. Brouwer (2010), Caring for and caring about: Disentangling the caregiver effect and the family effect, *Journal of Health Economics*, *29*, 549–556, doi:https://doi.org/10.1016/j.jhealeco.2010.05.003.

Bom, J., P. Bakx, F. Schut, and E. van Doorslaer (2019), Health effects of caring for and about parents and spouses, *The Journal of the Economics of Ageing*, *14*, 100,196, doi:https://doi.org/10.1016/j.jeoa.2019.100196.

Bradley, C. J., D. Neumark, H. L. Bednarek, and M. Schenk (2005), Short-term effects of breast cancer on labor market attachment: results from a longitudinal study, *Journal of Health Economics*, *24*, 137–160, doi:https://doi.org/10.1016/j.jhealeco.2004.07.003.

Breivik, A.-L., and A. Costa-Ramón (2022), The career costs of children's health shocks, *University of Zurich, Department of Economics, Working Paper*.

Brown, K. F., et al. (2018), The fraction of cancer attributable to modifiable risk factors in england, wales, scotland, northern ireland, and the united kingdom in 2015, *British Journal of Cancer*, *118*, 1130–1141, doi:10.1038/s41416-018-0029-6.

Böckerman, P., and P. Ilmakunnas (2009), Unemployment and self-assessed health: evidence from panel data, *Health Economics*, *18*, 161–179, doi:https://doi.org/10.1002/hec.1361, https://doi.org/10.1002/hec.1361.

Coile, C. C. (2004), Health shocks and couples' labor supply decisions, *National Bureau of Economic Research Working Paper Series*, *No. 10810*, doi:10.3386/w10810.

Cukrowska-Torzewska, E., and A. Lovasz (2020), The role of parenthood in shaping the gender wage gap – a comparative analysis of 26 european countries, *Social Science Research*, *85*, 102,355, doi:https://doi.org/10.1016/j.ssresearch.2019.102355.

Fadlon, I., and T. H. Nielsen (2019), Family Health Behaviors, *American Economic Review*, *109*(9), 3162–91, doi:10.1257/aer.20171993.

Fadlon, I., and T. H. Nielsen (2021), Family labor supply responses to severe health shocks: Evidence from danish administrative records, *American Economic Journal: Applied Economics*, *13*, 1–30, doi:10.1257/app.20170604.

García-Gómez, P., H. Van Kippersluis, O. O'Donnell, and E. Van Doorslaer (2013), Long-term and spillover effects of health shocks on employment and income, *Journal of Human Resources*, *48*(4), 873–909, doi:10.3368/jhr.48.4.873.

Gustman, A. L., and T. L. Steinmeier (2000), Retirement in dual-career families: A structural model, *Journal of Labor Economics*, *18*, 503–545, doi:10.1086/209968, doi: 10.1086/209968.

Haukka, J., J. Suvisaari, A. Tuulio-Henriksson, and J. Lönnqvist (2007), High concordance between self-reported medication and official prescription database information, *European Journal of Clinical Pharmacology*, *63*, 1069–1074, doi:10.1007/s00228-007-0349-6.

Hospido, L., and G. Zamarro (2014), Retirement patterns of couples in europe, *IZA Journal of European Labor Studies*, *3*, 12, doi:10.1186/2193-9012-3-12.

Humphrey, D. D. (1940), Alleged "additional workers" in the measurement of unemployment, *Journal of Political Economy*, *48*, 412–419, doi:10.1086/255563, doi: 10.1086/255563.

Jeon, S.-H. (2017), The long-term effects of cancer on employment and earnings, *Health Economics*, *26*, 671–684, doi:https://doi.org/10.1002/hec.3342, https://doi.org/10.1002/hec.3342.

Jeon, S. H., and R. V. Pohl (2017), Health and work in the family: Evidence from spouses' cancer diagnoses, *Journal of Health Economics*, *52*, 1–18, doi:10.1016/J.JHEALECO.2016.12.008.

Jolly, N. A., and N. Theodoropoulos (2023), Health shocks and spousal labor supply: an international perspective, *Journal of Population Economics*, *36*, 973–1004, doi:10.1007/s00148-022-00929-7.

Leira, A. (1992), *Welfare states and working mothers: the Scandinavian experience*, Cambridge University Press, bibl.: p. 185-196.

Lundberg, S. (1985), The added worker effect, *Journal of Labor Economics*, *3*, 11–37, doi:10.1086/298069, doi: 10.1086/298069.

Maloney, T. (1987), Employment constraints and the labor supply of married women: A reexamination of the added worker effect, *Journal of Human Resources*, *22*, 51–61.

Melvin, J. S. (2002), Worker displacement and the added worker effect, *Journal of Labor Economics*, *20*, 504–537, doi:10.1086/339615, doi: 10.1086/339615.

Mincer, J. (1962), *Labor force participation of married women: A study of labor supply*, 63-105 pp., Princeton University Press.

Northouse, L. L., and R. McCorkle (2015), Spouse Caregivers of Cancer Patients, in *Psycho-Oncology*, Oxford University Press, doi:10.1093/med/9780199363315.003.0075.

Picchio, M., and M. Ubaldi (2022), Unemployment and health: a meta-analysis, IZA Discussion Paper No. 15433.

Riekhoff, A. J., and M. Vaalavuo (2021), Health shocks and couples' labor market participation: A turning point or stuck in the trajectory?, *Social Science & Medicine*, *276*, 113,843, doi:10.1016/J.SOCSCIMED.2021.113843.

Stöckel, J., and J. Bom (2022), Revisiting longer-term health effects of informal caregiving: Evidence from the uk, *The Journal of the Economics of Ageing*, *21*, 100,343, doi:https://doi.org/10.1016/j.jeoa.2021.100343.

Vaalavuo, M. (2021), The unequal impact of ill health: Earnings, employment, and mental health among breast cancer survivors in finland, *Labour Economics*, *69*, 101,967, doi:10.1016/J.LABECO.2021.101967.

Vaalavuo, M., H. Salokangas, and O. Tahvonen (2022), Gender inequality reinforced: the impact of a child's health shock on parents' labor market trajectories, *SocArXiv*, doi:10.31235/osf.io/wx83z.

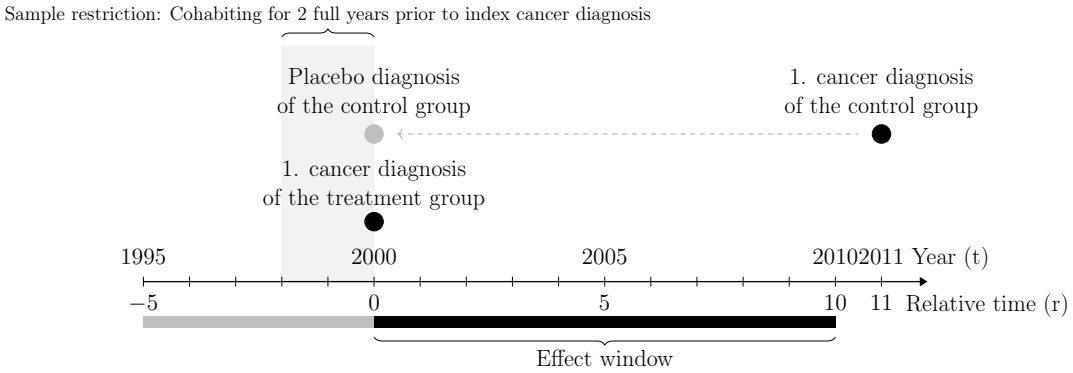
Wilson, L. F., et al. (2018), How many cancer cases and deaths are potentially preventable? estimates for australia in 2013, *International Journal of Cancer*, *142*, 691–701, doi:https://doi.org/10.1002/ijc.31088, https://doi.org/10.1002/ijc.31088.

Woytinsky, W. S. (1940a), Additional workers on the labor market in depressions: A reply to mr. humphrey, *Journal of Political Economy*, *48*, 735–739.

Woytinsky, W. S. (1940b), Additional workers on the labor market in depressions: A reply to mr. humphrey, *Journal of Political Economy*, *48*, 735–739, doi:10.1086/255613, doi:10.1086/255613.

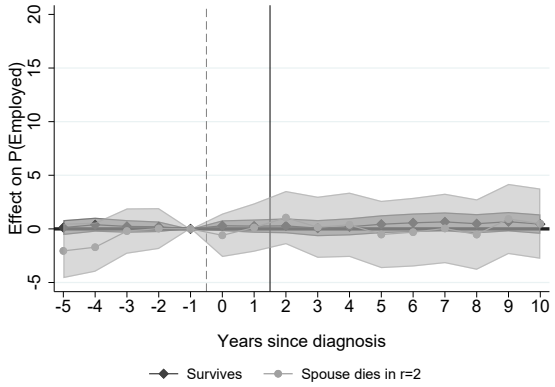
Appendix

Figure S1: Data construction and sample inclusion criteria

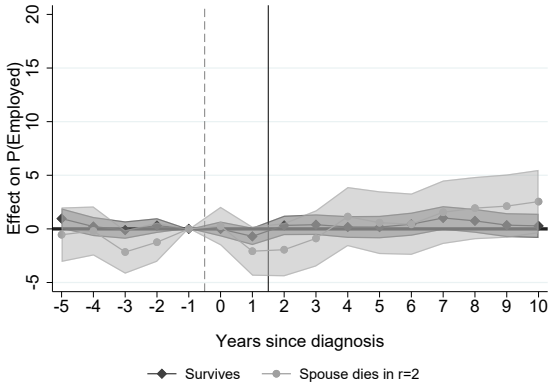


S1 Dynamic effects of non-fatal and fatal health shocks on labour supply and psychotropic drug use

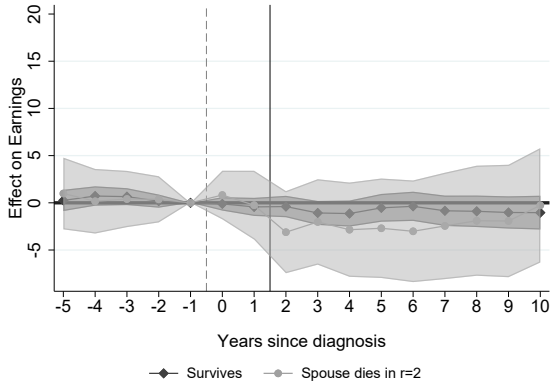
Figure S2: Visualisation of outcomes by survival when death of a spouse occurs at period r=2



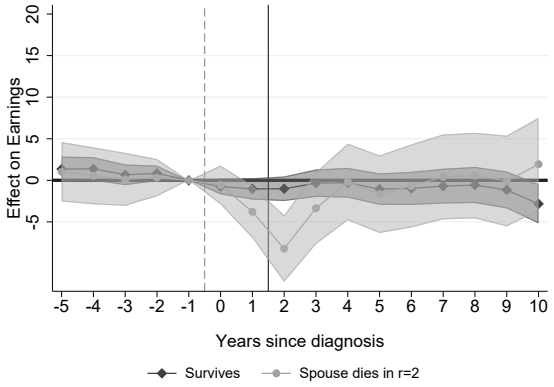
(A) Men's employment



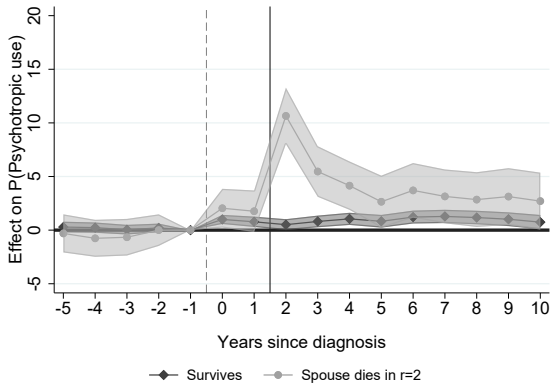
(B) Women's employment



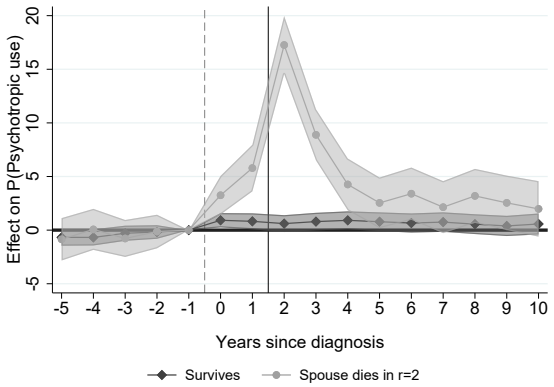
(C) Men's earnings



(D) Women's earnings



(E) Men's psychotropic drug use



(F) Women's psychotropic drug use

Note: These figures show dynamics with surrounding two health events of the spouse: cancer diagnosis and death. This event study analysis is conducted use the main event study specification separately for those whose spouse survives cancer (alive in 10 years in the post-diagnosis follow-up) and for those whose spouse dies exactly two years after the initial cancer diagnosis. Control group stays the same in both group analyses.

Table S1: Effects of spousal cancer: Men

Years since diagnosis	Earnings	HH Annual income	HH Disposable income	Eq. disposable income	P(employed)	P(pension)	P(Psychotropic drug use)	P(Antidepressant drug use)	P(Owner-occupier)
-5	0.0029	-0.0006	-0.0025	-0.0078	0.0006	-0.0014	0.0004	-0.0016	0.0034
	[0.0048]	[0.0027]	[0.0028]	[0.0027]	[0.0031]	[0.0022]	[0.0022]	[0.0018]	[0.0025]
-4	0.0074	0.0026	0.0019	-0.0022	0.0022	-0.0001	0.0006	0.0001	0.0055
	[0.0044]	[0.0024]	[0.0026]	[0.0026]	[0.0029]	[0.0021]	[0.0021]	[0.0017]	[0.0023]
-3	0.0070	0.0014	0.0012	-0.0005	0.0007	0.0001	-0.0004	-0.0006	0.0023
	[0.0039]	[0.0021]	[0.0024]	[0.0023]	[0.0026]	[0.0018]	[0.0020]	[0.0016]	[0.0019]
-2	0.0009	0.0014	0.0002	-0.0008	-0.0011	0.0026	0.0004	-0.0003	0.0024
	[0.0030]	[0.0017]	[0.0021]	[0.0020]	[0.0022]	[0.0014]	[0.0018]	[0.0014]	[0.0015]
-1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]
0	-0.0011	-0.0232	-0.0203	-0.0105	-0.0010	0.0003	0.0157	0.0085	-0.0034
	[0.0031]	[0.0019]	[0.0022]	[0.0021]	[0.0023]	[0.0016]	[0.0019]	[0.0015]	[0.0015]
1	-0.0112	-0.0443	-0.0365	-0.0112	-0.0031	0.0011	0.0156	0.0098	-0.0038
	[0.0041]	[0.0023]	[0.0026]	[0.0025]	[0.0027]	[0.0022]	[0.0022]	[0.0018]	[0.0018]
2	-0.0134	-0.0513	-0.0469	-0.0146	-0.0025	0.0034	0.0144	0.0064	-0.0069
	[0.0048]	[0.0026]	[0.0028]	[0.0027]	[0.0031]	[0.0025]	[0.0023]	[0.0019]	[0.0021]
3	-0.0176	-0.0537	-0.0508	-0.0169	-0.0029	0.0026	0.0155	0.0075	-0.0065
	[0.0054]	[0.0029]	[0.0030]	[0.0029]	[0.0033]	[0.0028]	[0.0024]	[0.0020]	[0.0023]
4	-0.0187	-0.0577	-0.0541	-0.0157	-0.0029	0.0007	0.0167	0.0091	-0.0076
	[0.0059]	[0.0030]	[0.0032]	[0.0031]	[0.0035]	[0.0030]	[0.0025]	[0.0020]	[0.0024]
5	-0.0139	-0.0591	-0.0586	-0.0165	-0.0010	0.0011	0.0142	0.0058	-0.0080
	[0.0063]	[0.0032]	[0.0033]	[0.0032]	[0.0037]	[0.0031]	[0.0026]	[0.0021]	[0.0025]
6	-0.0134	-0.0598	-0.0599	-0.0176	0.0003	-0.0016	0.0178	0.0079	-0.0082
	[0.0066]	[0.0033]	[0.0034]	[0.0033]	[0.0038]	[0.0032]	[0.0027]	[0.0021]	[0.0026]
7	-0.0129	-0.0581	-0.0575	-0.0136	0.0007	-0.0021	0.0180	0.0064	-0.0094
	[0.0069]	[0.0034]	[0.0035]	[0.0034]	[0.0039]	[0.0033]	[0.0028]	[0.0022]	[0.0027]
8	-0.0151	-0.0598	-0.0616	-0.0184	-0.0023	-0.0021	0.0146	0.0082	-0.0096
	[0.0071]	[0.0035]	[0.0036]	[0.0035]	[0.0039]	[0.0033]	[0.0028]	[0.0022]	[0.0027]
9	-0.0172	-0.0599	-0.0632	-0.0174	0.0013	-0.0039	0.0151	0.0087	-0.0097
	[0.0073]	[0.0036]	[0.0037]	[0.0035]	[0.0040]	[0.0033]	[0.0029]	[0.0022]	[0.0028]
10	-0.0172	-0.0613	-0.0646	-0.0195	-0.0014	-0.0023	0.0127	0.0059	-0.0118
	[0.0076]	[0.0037]	[0.0038]	[0.0037]	[0.0040]	[0.0033]	[0.0030]	[0.0023]	[0.0029]
Observations	923248	920798	920798	920798	923248	923248	923248	923248	923248
N	57703	57703	57703	57703	57703	57703	57703	57703	57703
DD-estimate	-0.018	-0.0535	-0.0521	-0.0124	-0.0017	0.000	0.0122	0.0065	-0.0078
	[0.0048]	[0.0024]	[0.0023]	[0.0023]	[0.002]	[0.002]	[0.002]	[0.001]	[0.002]
Pre-shock period joint test	0.1456	0.4607	0.2811	0.0097	0.7702	0.1074	0.9793	0.7778	0.0991
DD (short)	-0.0098	-0.0347	-0.0285	-0.0085	-0.0028	0.0009	0.0154	0.0096	-0.0059
	[0.0038]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.002]
DD (medium)	-0.0196	-0.0564	-0.0527	-0.0136	-0.0032	0.0022	0.0148	0.0077	-0.0093
	[0.0051]	[0.0026]	[0.0025]	[0.0024]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]
DD (long)	-0.0187	-0.0607	-0.0615	-0.0149	-0.0009	-0.0022	0.015	0.0078	-0.0111
	[0.0063]	[0.003]	[0.003]	[0.0029]	[0.003]	[0.003]	[0.002]	[0.002]	[0.002]
Pre-trend est	-0.0012	0.000	0.0003	0.0017	-0.0005	0.0006	-0.0001	0.0003	-0.001
	[0.0012]	[0.0007]	[0.0007]	[0.0007]	[0.001]	[0.001]	[0.001]	[0]	[0.001]
Control mean	30032	71241	58242	31398	0.6631	0.2657	0.0876	0.0465	0.8929
Treated mean	29898	70958	58130	31312	0.6601	0.2675	0.0882	0.0479	0.8935

Notes: Impact of spousal cancer on husband's outcomes. Regression specification is based on Equation 1. Income variables are scaled by the predicted level of control group. Standard errors are clustered at the individual level.

Table S2: Effects of spousal cancer: Women

Years since diagnosis	Earnings	HH Annual income	HH Disposable income	Eq. disposable income	P(employed)	P(pension)	P(Psychotropic drug use)	P(Antidepressant drug use)	P(Owner-occupier)
-5	0.0071	0.0033	0.0006	-0.0004	0.0064	-0.0091	-0.0046	-0.0032	0.0001
	[0.0053]	[0.0029]	[0.0030]	[0.0029]	[0.0035]	[0.0022]	[0.0029]	[0.0024]	[0.0025]
-4	0.0067	0.0014	0.0034	0.0012	0.0001	-0.0062	-0.0039	-0.0005	0.0006
	[0.0050]	[0.0026]	[0.0028]	[0.0027]	[0.0033]	[0.0021]	[0.0028]	[0.0023]	[0.0022]
-3	0.0029	-0.0008	-0.0002	-0.0011	-0.0003	-0.0055	-0.0021	-0.0018	0.0011
	[0.0044]	[0.0023]	[0.0026]	[0.0025]	[0.0030]	[0.0019]	[0.0026]	[0.0022]	[0.0019]
-2	0.0043	0.0016	-0.0004	-0.0022	0.0020	-0.0029	-0.0025	-0.0005	0.0014
	[0.0033]	[0.0019]	[0.0023]	[0.0022]	[0.0025]	[0.0015]	[0.0023]	[0.0019]	[0.0015]
-1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]
0	-0.0123	-0.0553	-0.0478	-0.0281	-0.0003	0.0006	0.0356	0.0175	-0.0084
	[0.0033]	[0.0023]	[0.0025]	[0.0024]	[0.0026]	[0.0016]	[0.0026]	[0.0021]	[0.0016]
1	-0.0200	-0.0961	-0.0880	-0.0416	-0.0082	0.0044	0.0394	0.0271	-0.0172
	[0.0046]	[0.0028]	[0.0030]	[0.0028]	[0.0031]	[0.0023]	[0.0029]	[0.0024]	[0.0021]
2	-0.0148	-0.1125	-0.1069	-0.0485	0.0018	-0.0016	0.0330	0.0228	-0.0222
	[0.0053]	[0.0031]	[0.0032]	[0.0030]	[0.0034]	[0.0027]	[0.0030]	[0.0025]	[0.0023]
3	-0.0035	-0.1166	-0.1118	-0.0475	0.0050	-0.0046	0.0290	0.0167	-0.0272
	[0.0059]	[0.0033]	[0.0035]	[0.0032]	[0.0036]	[0.0029]	[0.0031]	[0.0026]	[0.0025]
4	0.0041	-0.1166	-0.1179	-0.0496	0.0061	-0.0104	0.0250	0.0139	-0.0268
	[0.0064]	[0.0035]	[0.0036]	[0.0033]	[0.0038]	[0.0031]	[0.0032]	[0.0027]	[0.0027]
5	0.0016	-0.1188	-0.1233	-0.0523	0.0082	-0.0171	0.0232	0.0115	-0.0274
	[0.0068]	[0.0036]	[0.0038]	[0.0035]	[0.0039]	[0.0032]	[0.0033]	[0.0027]	[0.0028]
6	0.0056	-0.1215	-0.1256	-0.0487	0.0106	-0.0186	0.0219	0.0112	-0.0307
	[0.0071]	[0.0037]	[0.0039]	[0.0035]	[0.0041]	[0.0033]	[0.0034]	[0.0027]	[0.0029]
7	0.0070	-0.1214	-0.1301	-0.0525	0.0145	-0.0225	0.0217	0.0107	-0.0320
	[0.0074]	[0.0038]	[0.0040]	[0.0036]	[0.0041]	[0.0034]	[0.0034]	[0.0028]	[0.0029]
8	0.0096	-0.1193	-0.1301	-0.0517	0.0148	-0.0232	0.0209	0.0090	-0.0345
	[0.0077]	[0.0039]	[0.0041]	[0.0037]	[0.0042]	[0.0034]	[0.0035]	[0.0028]	[0.0030]
9	0.0035	-0.1171	-0.1281	-0.0494	0.0112	-0.0195	0.0203	0.0111	-0.0354
	[0.0078]	[0.0040]	[0.0042]	[0.0037]	[0.0042]	[0.0034]	[0.0036]	[0.0029]	[0.0031]
10	-0.0054	-0.1220	-0.1374	-0.0570	0.0091	-0.0174	0.0167	0.0106	-0.0339
	[0.0082]	[0.0041]	[0.0043]	[0.0038]	[0.0042]	[0.0034]	[0.0037]	[0.0030]	[0.0032]
Observations	896384	894862	894862	894862	896384	896384	896384	896384	896384
N	56024	56023	56023	56023	56024	56024	56024	56024	56024
DD-estimate	-0.0032	-0.1082	-0.1126	-0.0448	0.0051	-0.008	0.0206	0.0124	-0.0254
	[0.0052]	[0.0027]	[0.0027]	[0.0024]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]
Pre-shock period joint test	0.4624	0.3582	0.4796	0.6185	0.1188	0.0009	0.5642	0.4929	0.8935
DD (short)	-0.0205	-0.0767	-0.0686	-0.0343	-0.0064	0.0077	0.0400	0.0235	-0.0129
	[0.0042]	[0.0023]	[0.0023]	[0.0022]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]
DD (medium)	-0.0075	-0.1172	-0.1157	-0.0489	0.003	-0.0029	0.0300	0.0174	-0.0257
	[0.0056]	[0.003]	[0.0029]	[0.0026]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]
DD (long)	-0.0002	-0.1214	-0.1310	-0.0512	0.0096	-0.0147	0.0221	0.0114	-0.0325
	[0.0068]	[0.0034]	[0.0034]	[0.003]	[0.003]	[0.003]	[0.003]	[0.002]	[0.003]
Pre-trend est	-0.0017	-0.0006	-0.0005	-0.0003	-0.0011	0.0021	0.001	0.0006	0.0001
	[0.0014]	[0.0007]	[0.0007]	[0.0007]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Control mean	19618	68785	56323	30975	0.635	0.259	0.140	0.078	0.881
Treated mean	19521	68331	56173	30949	0.622	0.271	0.147	0.082	0.882

Notes: Impact of spousal cancer on wife's outcomes. Regression specification is based on Equation 1. Income variables are scaled by the predicted level of control group. Standard errors are clustered at the individual level.

Table S3: Indirect effects of cancer on male spouse: Selected cancer diagnoses

Years since diagnosis	Earnings	HH Annual income	HH Disposable income	Eq. disposable income	P(employed)	P(pension)	P(Psychotropic drug use)	P(Antidepressant drug use)	P(Owner-occupier)
-5	0.0092	0.0014	-0.0005	-0.0088	0.0061	-0.0051	0.0029	0.0001	0.0065
	[0.0058]	[0.0034]	[0.0035]	[0.0035]	[0.0039]	[0.0026]	[0.0028]	[0.0022]	[0.0033]
-4	0.0134	0.0046	0.0033	-0.0017	0.0061	-0.0043	0.0026	0.0021	0.0086
	[0.0053]	[0.0031]	[0.0033]	[0.0033]	[0.0036]	[0.0024]	[0.0026]	[0.0022]	[0.0029]
-3	0.0074	0.0013	0.0008	-0.0009	0.0035	-0.0025	0.0007	0.0004	0.0042
	[0.0046]	[0.0026]	[0.0030]	[0.0029]	[0.0033]	[0.0021]	[0.0025]	[0.0020]	[0.0025]
-2	0.0026	0.0015	0.0019	0.0002	-0.0016	0.0018	0.0016	-0.0001	0.0023
	[0.0035]	[0.0022]	[0.0026]	[0.0026]	[0.0027]	[0.0017]	[0.0022]	[0.0018]	[0.0019]
-1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]
0	-0.0003	-0.0201	-0.0173	-0.0118	0.0003	-0.0024	0.0134	0.0076	-0.0034
	[0.0037]	[0.0023]	[0.0027]	[0.0026]	[0.0028]	[0.0019]	[0.0024]	[0.0019]	[0.0018]
1	-0.0068	-0.0350	-0.0281	-0.0127	-0.0023	0.0009	0.0115	0.0085	-0.0009
	[0.0049]	[0.0029]	[0.0031]	[0.0031]	[0.0034]	[0.0026]	[0.0027]	[0.0022]	[0.0023]
2	-0.0073	-0.0391	-0.0350	-0.0118	-0.0002	0.0034	0.0128	0.0044	-0.0037
	[0.0058]	[0.0032]	[0.0034]	[0.0034]	[0.0038]	[0.0030]	[0.0029]	[0.0024]	[0.0027]
3	-0.0102	-0.0424	-0.0395	-0.0150	-0.0005	0.0034	0.0182	0.0086	-0.0038
	[0.0065]	[0.0036]	[0.0037]	[0.0037]	[0.0041]	[0.0034]	[0.0031]	[0.0025]	[0.0029]
4	-0.0118	-0.0456	-0.0440	-0.0155	-0.0017	0.0022	0.0181	0.0100	-0.0050
	[0.0070]	[0.0038]	[0.0039]	[0.0039]	[0.0044]	[0.0036]	[0.0032]	[0.0026]	[0.0031]
5	-0.0068	-0.0472	-0.0469	-0.0154	-0.0004	0.0019	0.0167	0.0067	-0.0052
	[0.0075]	[0.0039]	[0.0041]	[0.0041]	[0.0046]	[0.0038]	[0.0033]	[0.0027]	[0.0032]
6	-0.0046	-0.0486	-0.0496	-0.0179	0.0019	-0.0023	0.0189	0.0100	-0.0038
	[0.0079]	[0.0041]	[0.0043]	[0.0042]	[0.0048]	[0.0040]	[0.0034]	[0.0027]	[0.0033]
7	-0.0068	-0.0491	-0.0496	-0.0154	0.0016	-0.0022	0.0179	0.0074	-0.0063
	[0.0083]	[0.0043]	[0.0044]	[0.0043]	[0.0049]	[0.0041]	[0.0035]	[0.0027]	[0.0034]
8	-0.0076	-0.0520	-0.0526	-0.0182	0.0005	-0.0038	0.0149	0.0088	-0.0061
	[0.0086]	[0.0044]	[0.0045]	[0.0045]	[0.0050]	[0.0041]	[0.0036]	[0.0028]	[0.0035]
9	-0.0098	-0.0515	-0.0551	-0.0193	0.0042	-0.0040	0.0150	0.0120	-0.0063
	[0.0088]	[0.0045]	[0.0047]	[0.0046]	[0.0050]	[0.0042]	[0.0036]	[0.0029]	[0.0036]
10	-0.0093	-0.0521	-0.0574	-0.0210	0.0014	-0.0035	0.0121	0.0080	-0.0081
	[0.0093]	[0.0047]	[0.0049]	[0.0047]	[0.0051]	[0.0042]	[0.0038]	[0.0029]	[0.0037]
Observations	557232	555802	555802	555802	557232	557232	557232	557232	557232
N	34827	34827	34827	34827	34827	34827	34827	34827	34827
DD-estimate	-0.0136	-0.0443	-0.0438	-0.0121	-0.0017	0.0021	0.0113	0.0065	-0.0057
	[0.0058]	[0.003]	[0.0029]	[0.0029]	[0.0031]	[0.0025]	[0.0021]	[0.0017]	[0.0025]
Pre-shock period joint test	0.1109	0.4213	0.5364	0.0185	0.1706	0.0268	0.7845	0.7346	0.0603
DD (short)	-0.0102	-0.0293	-0.0238	-0.0099	-0.004	0.0016	0.0108	0.0075	-0.006
	[0.0046]	[0.0025]	[0.0025]	[0.0025]	[0.0028]	[0.0022]	[0.002]	[0.0017]	[0.0022]
DD (medium)	-0.0157	-0.0453	-0.0424	-0.012	-0.0037	0.0051	0.0146	0.0068	-0.008
	[0.0061]	[0.0032]	[0.0031]	[0.0031]	[0.0034]	[0.0029]	[0.0024]	[0.0019]	[0.0027]
DD (long)	-0.0141	-0.0524	-0.054	-0.0159	-0.0008	-0.0008	0.0136	0.0085	-0.0089
	[0.0076]	[0.0039]	[0.0038]	[0.0038]	[0.0039]	[0.0033]	[0.0028]	[0.0021]	[0.0032]
Pre-trend est	-0.0029	-0.0006	0.000	0.0019	-0.002	0.0016	-0.0007	-0.0002	-0.0019
	[0.0015]	[0.0008]	[0.0009]	[0.0009]	[0.001]	[0.0007]	[0.0007]	[0.0006]	[0.0008]
Control mean	32328	73982	60173	32084	0.7001	0.2323	0.0833	0.0461	0.898
Treated mean	31948	73803	60341	32091	0.6927	0.2378	0.0837	0.0472	0.8994

Notes: Event study estimates of the effects of spousal cancer in selected diagnoses of more "exogenous" nature. These cancers include 1) Gallbladder (C23), 2) Breast (C50), 3) Ovary (C56), Prostate (C61), Testis (C62), Thyroid (C73), Myeloma (C90), Non-Hodgkin (C82-85,C96), Leukaemia (C91-C95), Brain & other CNS (C70-72). Breast and prostate cancer form about 75% of these cancers.

Table S4: Indirect effects of cancer on female spouse: Selected cancer diagnoses

Years since diagnosis	Earnings	HH Annual income	HH Disposable income	Eq. disposable income	P(employed)	P(pension)	P(Psychotropic drug use)	P(Antidepressant drug use)	P(Owner-occupier)
-5	0.0252	0.0062	0.0009	0.0042	0.0175	-0.0152	-0.0064	-0.0069	-0.0011
	[0.0084]	[0.0046]	[0.0047]	[0.0046]	[0.0056]	[0.0035]	[0.0046]	[0.0039]	[0.0040]
-4	0.0189	0.0028	0.0041	0.0060	0.0063	-0.0101	-0.0066	-0.0063	-0.0004
	[0.0078]	[0.0042]	[0.0045]	[0.0044]	[0.0053]	[0.0033]	[0.0044]	[0.0037]	[0.0035]
-3	0.0093	0.0007	0.0042	0.0059	0.0009	-0.0082	-0.0025	-0.0036	-0.0004
	[0.0068]	[0.0035]	[0.0040]	[0.0040]	[0.0048]	[0.0030]	[0.0042]	[0.0035]	[0.0030]
-2	0.0068	0.0037	0.0008	-0.0003	0.0026	-0.0043	0.0029	0.0005	-0.0010
	[0.0051]	[0.0029]	[0.0036]	[0.0035]	[0.0040]	[0.0024]	[0.0038]	[0.0030]	[0.0024]
-1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]	[.]
0	-0.0108	-0.0292	-0.0207	-0.0133	0.0033	0.0007	0.0203	0.0087	-0.0034
	[0.0053]	[0.0033]	[0.0038]	[0.0037]	[0.0041]	[0.0026]	[0.0040]	[0.0032]	[0.0024]
1	-0.0161	-0.0647	-0.0536	-0.0295	-0.0002	0.0020	0.0237	0.0145	-0.0117
	[0.0071]	[0.0041]	[0.0045]	[0.0043]	[0.0049]	[0.0036]	[0.0045]	[0.0037]	[0.0031]
2	-0.0127	-0.0789	-0.0692	-0.0384	0.0046	-0.0002	0.0240	0.0138	-0.0132
	[0.0082]	[0.0047]	[0.0050]	[0.0047]	[0.0054]	[0.0043]	[0.0048]	[0.0040]	[0.0035]
3	-0.0025	-0.0839	-0.0764	-0.0406	0.0059	-0.0005	0.0246	0.0102	-0.0181
	[0.0092]	[0.0050]	[0.0053]	[0.0050]	[0.0057]	[0.0047]	[0.0049]	[0.0041]	[0.0038]
4	0.0046	-0.0821	-0.0826	-0.0431	0.0141	-0.0075	0.0243	0.0086	-0.0135
	[0.0099]	[0.0053]	[0.0056]	[0.0053]	[0.0061]	[0.0050]	[0.0051]	[0.0042]	[0.0040]
5	0.0084	-0.0823	-0.0848	-0.0425	0.0127	-0.0141	0.0237	0.0111	-0.0167
	[0.0105]	[0.0056]	[0.0059]	[0.0055]	[0.0063]	[0.0051]	[0.0053]	[0.0043]	[0.0042]
6	0.0113	-0.0849	-0.0871	-0.0402	0.0155	-0.0185	0.0241	0.0126	-0.0189
	[0.0110]	[0.0058]	[0.0061]	[0.0057]	[0.0065]	[0.0053]	[0.0054]	[0.0044]	[0.0044]
7	0.0198	-0.0850	-0.0912	-0.0437	0.0237	-0.0229	0.0212	0.0084	-0.0232
	[0.0116]	[0.0060]	[0.0063]	[0.0057]	[0.0066]	[0.0054]	[0.0055]	[0.0045]	[0.0045]
8	0.0255	-0.0831	-0.0898	-0.0435	0.0266	-0.0263	0.0216	0.0048	-0.0234
	[0.0120]	[0.0062]	[0.0065]	[0.0059]	[0.0067]	[0.0055]	[0.0056]	[0.0046]	[0.0046]
9	0.0192	-0.0848	-0.0883	-0.0399	0.0250	-0.0245	0.0213	0.0085	-0.0272
	[0.0123]	[0.0063]	[0.0067]	[0.0060]	[0.0067]	[0.0054]	[0.0058]	[0.0047]	[0.0048]
10	0.0091	-0.0923	-0.0996	-0.0498	0.0222	-0.0197	0.0172	0.0106	-0.0221
	[0.0129]	[0.0065]	[0.0068]	[0.0061]	[0.0068]	[0.0055]	[0.0060]	[0.0048]	[0.0050]
Observations	339584	339056	339056	339056	339584	339584	339584	339584	339584
N	21224	21223	21223	21223	21224	21224	21224	21224	21224
DD-estimate	-0.0033	-0.0796	-0.0804	-0.0414	0.0087	-0.0058	0.02	0.0109	-0.0153
	[0.0083]	[0.0042]	[0.0041]	[0.0038]	[0.0042]	[0.0033]	[0.0033]	[0.0027]	[0.0033]
Pre-shock period joint test	0.0427	0.3700	0.7152	0.3853	0.0071	0.0003	0.1937	0.2419	0.9902
DD (short)	-0.0258	-0.0496	-0.0391	-0.0245	-0.0043	0.0093	0.0244	0.0148	-0.0066
	[0.0067]	[0.0034]	[0.0035]	[0.0034]	[0.004]	[0.0031]	[0.0034]	[0.0029]	[0.0028]
DD (medium)	-0.0133	-0.0845	-0.0802	-0.0442	0.0033	0.0027	0.0263	0.014	-0.0141
	[0.0088]	[0.0045]	[0.0044]	[0.0041]	[0.0048]	[0.0039]	[0.0037]	[0.003]	[0.0035]
DD (long)	0.004	-0.0886	-0.0932	-0.0463	0.0164	-0.014	0.0224	0.0117	-0.0209
	[0.0108]	[0.0054]	[0.0054]	[0.0048]	[0.0053]	[0.0042]	[0.0043]	[0.0035]	[0.0042]
Pre-trend est	-0.0062	-0.0012	-0.0005	-0.0015	-0.0039	0.0036	0.0022	0.0020	0.0002
	[0.0021]	[0.0012]	[0.0012]	[0.0011]	[0.0014]	[0.0009]	[0.0011]	[0.0009]	[0.001]
Control mean	20419	72402	59214	32277	0.659	0.2409	0.1379	0.0771	0.8969
Treated mean	20283	72909	59976	32697	0.6376	0.2572	0.1469	0.0843	0.9055

Notes: Event study estimates of the effects of spousal cancer in selected diagnoses of more "exogenous" nature. These cancers include 1) Gallbladder (C23), 2) Breast (C50), 3) Ovary (C56), Prostate (C61), Testis (C62), Thyroid (C73), Myeloma (C90), Non-Hodgkin (C82-85,C96), Leukaemia (C91-C95), Brain & other CNS (C70-72). Breast and prostate cancer form about 75% of these cancers.