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DISCUSSION PAPER SERIES

IZA DP No. 17850

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ABSTRACT

Balancing Work and Care: How Workplace Factors Can Mitigate the Gendered Impacts of Caregiving*

Parental caregiving responsibilities can disrupt paid work, contributing to persistent gender inequalities in employment and earnings. Using Australian employer-employee linked data and a dynamic difference-in-differences approach, this study examines how workplace environments shape the impacts of caregiving shocks, focusing on working parents of children diagnosed with cancer. Mothers experience large and persistent earnings losses, while fathers' outcomes remain stable. Supportive firms and occupations, defined by high female representation in senior roles and lower work hour intensity, significantly reduce mothers' earnings penalties. These findings highlight the important role of workplace conditions in reducing gendered economic costs of caregiving.

JEL Classification: J13, J16, J22

Keywords: caregiving, child health, gender gap, workplace, earnings

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1. Introduction

Balancing caregiving responsibilities with work commitments is a persistent challenge for parents, particularly mothers, whose careers are often disrupted by caregiving demands. These disruptions exacerbate gender disparities in the labour market, limiting women's career progression, pay equity, and job stability (Goldin, 2014; Bertrand, 2020). While the labour market impacts of childbirth are well-documented (e.g., Lundborg et al., 2017; Kleven et al., 2019), less is known about caregiving shocks that occur later in childhood. These shocks, often triggered by sudden and severe child health issues, can lead to significant reductions in labour supply and earnings, with potentially long-term economic and gendered consequences (Eriksen et al., 2021; Breivik & Costa-Ramón, 2024; Vaalavuo et al., 2023).

Household labour supply models suggest that caregiving roles are determined by relative skills, preferences, and opportunity costs (Becker, 1981). However, social norms often compel mothers to assume a disproportionate share of caregiving, regardless of economic considerations (Price and Wasserman, 2024). This imbalance frequently reduces mothers' work hours or leads to labour market exit, with long-term consequences for earnings and career progression. Workplace environments can significantly influence these outcomes, either enabling or constraining mothers' ability to balance caregiving with employment. Supportive workplaces, such as those offering flexible work arrangements or paid caregiving leave, help mothers maintain labour force participation during caregiving shocks (Cortes & Pan, 2018). In contrast, workplaces with rigid schedules or punitive leave policies further limit employment continuity (Blau and Kahn, 2013).

This paper investigates how workplace factors shape the magnitude of maternal employment and earnings effects following a child's cancer diagnosis, a sudden and significant caregiving shock. We focus on three workplace characteristics: the gender wage gap, long working hours, and female representation at senior, middle and low levels. These factors are well-documented in the literature as shaping women's ability to balance work

and caregiving demands (Goldin, 2014; Goldin and Katz, 2016; Kleven et al., 2019). To capture both immediate workplace dynamics and broader occupational norms, our analysis considers these factors at the firm, occupation, and industry levels. This multi-level framework allows us to assess whether localized workplace conditions or broader occupational contexts have a stronger impact on maternal labour outcomes following caregiving shocks.

Our analysis uses linked administrative data from tax, welfare, and health records, encompassing nearly the entire population of parents in Australia. A strength of this dataset is the inclusion of matched employer-employee identifiers, which allow us to construct workplace measures at the firm, occupation, and industry levels. We employ a dynamic difference-in-differences model with individual fixed effects, comparing the labour market outcomes of parents whose children are diagnosed with cancer to those of parents whose children will experience a similar diagnosis at a later time. This design isolates the causal impact of caregiving shocks, while event study estimates reveal their dynamics over time.

We find a significant drop in maternal earnings following a child's cancer diagnosis, with no comparable effect observed for fathers. Mothers' earnings decline by 15% in the year treatment begins, and this reduction persists over time, with earnings remaining almost 10% lower three years later. Notably, this persistence occurs even as caregiving intensity, measured by healthcare service use, diminishes. These findings highlight the long-term economic penalties caregiving responsibilities impose on mothers, aligning with previous evidence on the labour market impacts of caregiving shocks (Breivik & Costa-Ramón, 2024; Eriksen et al., 2021; Vaalavuo et al., 2023).

Workplace characteristics significantly moderate the magnitude of these earning effects, with work hour intensity and female representation at the firm and occupation levels emerging as key factors. Lower average work hours suggest that flexible work arrangements or reduced work intensity help mothers balance caregiving with paid work. Similarly,

female representation at senior levels indicates that diverse leadership fosters workplace environments where caregiving responsibilities are better accommodated. These factors are jointly significant at the firm and occupation levels. Firm-level factors likely reflect immediate workplace culture and policies, while occupation-level environments capture broader norms and structural characteristics, such as profession-wide agreements that secure caregiving leave or flexible scheduling.

Caregiving shocks also have smaller but notable effects on employment. Mothers are more likely to leave employment after these shocks; however, the primary driver of earnings reductions is a decrease in work hours rather than outright job exit. This aligns with theories of labour market adaptation, where mothers adjust their working patterns to accommodate caregiving demands (Goldin, 2014). Importantly, these effects are not attributable to mental health declines, as indicated by stable usage of therapy services and mental health medications. This reinforces that caregiving demands are the primary mechanism behind these outcomes.

Our findings improve understanding of the economic impacts of caregiving shocks, particularly those involving children's ill-health, which remain understudied compared to adult health shocks. Previous research has shown significant reductions in maternal earnings and employment due to caregiving responsibilities, reinforcing gender disparities in labour market outcomes (Eriksen et al., 2021; Breivik & Costa-Ramón, 2024; Vaalavuo et al., 2023). While much of this literature has examined the overall impacts of caregiving shocks and their heterogeneity by individual and family characteristics, such as age, education, and relative income, less attention has been paid to the role of firm-level conditions and broader occupation- and industry-level conditions. By focusing on these factors, our study provides insights into how workplace environments influence maternal and paternal labour market outcomes.

In addition to advancing the literature on the economic impacts of caregiving shocks, this study contributes to several broader fields. First, it adds to research on gender inequality

in the labour market by showing how unexpected caregiving demands exacerbate existing gender gaps, building on prior work documenting the persistent child penalty in women's earnings and career trajectories (see review by Cortés & Pan, 2023). Second, it connects to research on the spillover effects of health shocks, which generally focuses on adult health events and household economics (e.g., García-Gómez et al., 2013; Anand et al., 2022; Aaskoven et al., 2022; Wen & Huang, 2024). Lastly, it offers insights into the adequacy of insurance and welfare provisions during health crises and adverse events (e.g., Dobkin et al., 2018; Fadlon & Nielsen, 2021; Coile et al., 2022), suggesting that existing support mechanisms may not fully compensate for the long-term economic burden of health shocks.

2. Data

2.1. Overview of Main Data Sources

Our study uses data from the Australian Bureau of Statistics' (ABS) Person Level Integrated Data Asset (PLIDA), a longitudinal database that links administrative records from various government departments and national agencies. PLIDA covers the entire Australian resident population, allowing us to track individuals' employment, income, healthcare usage, and demographic characteristics over time. A key feature of this dataset is the inclusion of employer identifiers, which enable the construction of workplace characteristics at the firm level.

To identify caregiving shocks, we focus on parents whose children received a new cancer diagnosis, marked by the initiation of chemotherapy.[1] Chemotherapy is commonly administered immediately following a cancer diagnosis, making it a reliable, time-

[1] Treatment information is from Medicare records. Medicare is Australia's publicly-funded universal healthcare system. Medicare covers the cost of treatment as a public patient in a public hospital, and subsidises non-hospital medical services, with patients covering any charges above the schedule fee. Medicare also supports access to prescription medicines, with patients paying a capped co-payment. Out-of-pocket costs for those with high annual medical or prescription expenses are further reduced through the Medicare Safety Net scheme.

consistent marker for the onset of treatment.[2] This is especially relevant for typical childhood cancers, such as acute lymphoid leukemia, astrocytoma, and neuroblastoma. This approach means that our estimates do not represent the effects of childhood cancer not requiring chemotherapy (e.g. early-stage cancers that are successfully treated with surgery and other therapies like radiation or immunotherapy).

In addition to identifying child cancer cases, Medicare data allow us to track changes in caregiving intensity over time through healthcare service use. Variations in Medicare items, such as general practitioner visits, specialist consultations, diagnostic imaging, and prescription medications, provide a proxy for the fluctuating demands of caregiving throughout the child's treatment and recovery. We also use data on parental mental health-related service use, including psychological therapy sessions, and prescriptions for mental health-related medications[3], to examine potential associations between child cancer occurrence and mental health outcomes.

Economic and employment data primarily come from Australian Taxation Office (ATO) records, which provide information on employment, business, investment, and other income sources from 2005 to 2022, for each Australian financial year (July 1 to June 30). Employment-related income, including salary, wages, commissions, and bonuses, is reported directly by employers to the ATO, minimizing errors related to self-reporting. Employment status is inferred annually based on positive earnings in a given year. Additional occupation, industry, and work hour data from the 2011 Census supplement the ATO records, enabling the construction of workplace characteristics at the occupation and industry levels.

[2] Chemotherapy medicines are those with ATC codes beginning with L01. We removed those who received methotrexate (L 01BA01). Additionally, we added immunomodulators, which have chemotherapy-like effects (09566L, 05786M, 09645P, 10387Q).

[3] Services include all mental health specific services provided by GPs, specialists (e.g. psychiatrists), and allied health professionals (e.g. psychologists). Medications include antipsychotic, anti-anxiolytic, anti-depressant, and psycho-stimulant drugs under ATC codes beginning with N05 and N06.

The final estimation sample comprises 3,258 families with children who began chemotherapy between 2012 and 2023, where parents were employed two years prior to treatment initiation. This employment restriction reflects our focus on assessing the labour market impact of caregiving shocks among working parents. Additionally, we limit our analysis to children aged 4 to 18 residing with their parents and exclude families with more than one child diagnosed with cancer during the observation period. The distribution of ages at chemotherapy initiation (Appendix Figure A1) shows an average child age of 12.98 years. Descriptive statistics (Appendix Table A1) indicate that 45% of children are female, mothers and fathers are, on average, 43.45 and 44.96 years old, respectively, and pre-diagnosis earnings average $37,639 for mothers and $79,702 for fathers.[4]

2.2. Gender-related workplace variables

To examine the influence of workplace conditions on parental labour outcomes following a caregiving shock, we focus on three key moderating variables: the gender wage gap, work hour intensity, and female representation across earnings tiers, each constructed at the firm, occupation, and industry levels.

For the gender wage gap, we use ATO earnings data to calculate the difference between average male and average female earnings at each individual's firm, occupation, and industry in their 'baseline' year, defined as two years prior to the child's chemotherapy treatment. Firms are identified by unique employer identifiers from the ATO, while occupations and industries are classified according to 3-digit codes in the Australian and New Zealand Standard Classification of Occupations (ANZSCO) and Australian and New Zealand Industry Classifications (ANZSIC), respectively, as recorded in the 2011 Census. Each firm, occupation, and industry are then categorized as having an above- or below-mean gender wage gap.

[4] The incomes reported throughout the paper are CPI adjusted to the 2012 income year based on adjustment rates available from https://www.ato.gov.au/tax-rates-and-codes/consumer-price-index

To construct work hour intensity measures, we use average weekly hours data from the 2011 Census. For firm, occupation, and industry levels, we calculate the median weekly hours worked by all employees. Parents are classified based on whether their workplace falls above or below these median values for each hierarchical level (see Appendix Table A1 for these values). We construct measures of female representation by first calculating the percentage of women within three income brackets: the bottom 50% of earners, the middle 50–80% range, and the top 20% of earners. We then create binary indicators of whether these percentages of women are greater than 50%. Earnings brackets are based on total annual earnings reported to the ATO. To ensure stable estimates, the analysis is restricted to firms with at least 10 employees.

3. Methods

We use a later-treated dynamic difference-in-differences (DiD) model to estimate the causal impact of a child cancer shock on parental labour market outcomes. The approach follows Fadlon & Nielsen (2019, 2021), and compares changes in outcomes for parents of children diagnosed with cancer (the treatment group) to those for parents of children who will experience the same diagnosis in the future (the control group). Childhood cancer is a rare event, often resulting from random genetic mutations or cellular changes with no clear environmental or behavioural causes. However, risk factors such as inherited genetic mutations or rare medical conditions may vary across families. By comparing pre- and post-shock outcomes for treated parents relative to control parents, this DiD method accounts for potential confounders influencing the likelihood of childhood cancer and associated parental outcomes.

We estimate the following equation separately for mothers and fathers:

$$Y_{it} = \sum_{r=-4}^{4} \delta_r \cdot I_{ir} + \sum_{r=-4}^{4} \theta_r I_{ir} \cdot C_i + X_{it}\beta + \gamma_t + \pi_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the outcome of interest (e.g., annual earnings or employment status) for parent i at time t. The indicator variables I_{ir} represent years relative to the child's diagnosis, with $r = 0$ corresponding to the year treatment began. These indicators interact with the treatment group variable C_i, set to one for parents whose children began chemotherapy between 2012 and 2017 (treatment group) and zero for those starting treatment between 2018 and 2023 (control group), The placebo treatment year for the control group is defined as six years before the actual treatment. The coefficients on the interaction terms θ_r capture the differential effects of caregiving shocks across time relative to diagnosis.

Control variables (X_{it}) in equation (1) include time-varying factors such as age and years since the birth of the youngest child. Year fixed effects (γ_t) control for common economic conditions and policy changes that affect all individuals in a given year. Finally, individual fixed effects (π_i) account for unobserved, time-invariant characteristics, such as inherent work preferences and caregiving tendencies.

The key assumption of our DiD framework is that, absent the caregiving shock, outcomes for the treatment and control groups would have followed parallel trends over time. By focusing on a narrowly defined and largely random health event, we aimed to minimize endogenous variation in the occurrence and timing of caregiving demands across families. To validate this assumption, Figure 1 presents estimates from regressions of pre-cancer characteristics on the treatment indicator. These estimates reveal no significant demographic, socioeconomic, or workplace differences between the treatment and control groups before diagnosis. Section 4 further validates the parallel trends assumption by analyzing pre-treatment earnings and employment estimates. These indicate no significant differences in earnings and employment changes between the treatment and control groups prior to the childhood cancer shock.

To examine heterogeneity by workplace characteristics, we use an interaction-based model. In this specification, the relative time variable is re-coded as a binary 'post' indicator, capturing the post-treatment period years 0–2, relative to the pre-treatment period (years

-4 to -2). This simplification allows for interactions with workplace characteristics without introducing an overwhelming number of interaction terms. The model is specified as:

$$Y_{it} = \beta Post_{it} \cdot C_i \; + \tau W_i \cdot Post_{it} \cdot C_i \; + \eta X_{it} + \; \gamma_t + \pi_i + \varepsilon_{it} \qquad (2)$$

Here, W_i represents workplace characteristics measured at baseline (e.g., high work hours). In this regression, $\hat{\beta}$ is the average estimated earnings effect of child cancer in years 0-2 for people without the workplace characteristic, and $\hat{\beta} + \hat{\tau}$ is the corresponding estimate for people with the workplace characteristic.

A potential concern with this heterogeneity analysis is the non-random selection into different job types. Mothers who anticipate greater caregiving responsibilities may systematically sort into more family-friendly workplaces, such as those with lower gender pay gaps, shorter work hours, or greater female representation, based on their preferences or constraints. If so, differences in post-shock labour market outcomes could partially reflect these pre-existing selection patterns rather than the causal effects of workplace environments. However, if selection were a key driver, we would expect mothers in more supportive workplaces to experience larger earnings declines following their child's cancer diagnosis, as they may have weaker labour market attachment and a greater willingness to reduce work hours or exit employment. Instead, we find the opposite pattern, suggesting that selection is unlikely to explain our findings. If anything, this expected selection pattern would likely bias our estimates toward understating the mitigating effects of supportive workplaces.

Another consideration is that we model earnings in dollar terms, which may not fully account for differences in baseline wage levels across job types. If mothers in less supportive workplaces have higher pre-shock earnings, as shown in Appendix Table A2, then a larger absolute earnings decline in these jobs may not necessarily reflect a greater proportional reduction in labour supply. While this distinction is important for interpreting caregiving penalties across workplace environments, we show that the significant dollar declines we report also correspond to substantial percent declines relative to pre-shock earnings.

4. Results

4.1. Main effects on parental earnings, employment and job changes

Estimates of equation (1) are presented in Figure 2, which includes six event study graphs depicting the impact of the caregiving shock on annual earnings, employment, and job changes (see corresponding estimates in Appendix Table A3). Each graph covers nine time points, from four years before to four years after the shock, with chemotherapy treatment commencing in year 0. Results are separated by parent gender, with mothers' outcomes displayed in the left column (graphs a, c, and e) and fathers' outcomes in the right column (graphs b, d, and f). The baseline comparison year is -2, at which point workplace characteristics are measured, and all parents are employed.

The caregiving shock significantly affects mothers' labour market outcomes, particularly earnings, as shown in graph (a) of Figure 2. Maternal earnings drop by $5,608 in year 0 (equivalent to 14.9% of baseline earnings), reflecting a large immediate impact of caregiving responsibilities. While earnings begin recovering 3 years post-treatment and approach baseline levels by year 4, the combined year 0 to year 3 effects represent a substantial economic cost.

Notably, the earnings reductions occur even as caregiving intensity diminishes. Appendix Figure A2 illustrates that health-related caregiving, measured by healthcare service use, peaks in year 0, declines significantly thereafter, and is back to baseline levels in year 3. The continued earnings losses could reflect negative effects on career trajectories, such as stalled promotions or foregone skill development. Alternatively, ongoing caregiving needs, even if less intense, may continue to limit mothers' ability to fully reengage in the labour market.

Appendix Figure A3 illustrates that the maternal earning effects are significantly larger for subgroups of children that require greater caregiving: younger children (aged < 12)

and children receiving more medical treatment (above median number of medical appointments). The plots indicate similar profiles to those in Figure 2, but the year 0 declines equal $9442.73 for younger children and $7825.51for children needing more treatment.[5]

Employment effects, shown in graph (c) of Figure 2, follow a similar trajectory as earnings. Employment declines by 4.9 percentage points in year 0, reflecting some mothers' exit from the labour force, and peaks two years post treatment with a decline of 5.6 percentage points. However, the overall reduction in employment levels is modest compared to the earnings losses, suggesting that the majority of mothers remained in the workforce, but reduced their hours worked or shifted to less demanding (lower wage) roles.[6]

The results in Graph (e) for job changes, measured by the likelihood of staying employed with the baseline employer, supports this interpretation. The effects are small and not statistically significant, indicating that mothers with caregiving shocks were not more likely to change jobs than their control counterparts. This lack of job mobility may reflect limited availability of flexible or accommodating roles in the labour market or constraints on mothers' ability to search for new jobs due to caregiving demands.

In stark contrast to mothers, fathers experience negligible changes in earnings, employment, and job transitions. Graphs (b), (d) and (f) reveal flat trajectories, with no statistically significant effects. These results align with theories of intra-household specialization, where fathers maintain their primary earner role during family shocks while caregiving responsibilities disproportionately fall to mothers.[7]

The consistency of pre-shock coefficients across all graphs provides strong support for the parallel trends assumption. Estimates for years -3 and -4 are small, close to zero, and not

[5] These dollar effects are equivalent to 25.82 % and 21.57 % relative to the baseline earnings of these sub-groups of mothers ($36566.73 and $36277.65).

[6] If 5 percent of mothers left the labour market, and these mothers had average earnings, then the decline in average earnings would equal $1,882 if all other mothers maintained their baseline labour supply levels. This is substantially less than the estimated $5,608 effect.

[7] Baseline average earnings equal $37,639 for mothers and $79,702 for fathers (see Appendix Table A1), demonstrating that fathers are the primary earners in the majority of our sample households.

statistically significant, indicating that treatment and control groups followed similar trajectories prior to the baseline year. Additionally, the absence of pre-trends suggests minimal anticipatory effects, aligning with the unpredictable and sudden nature of childhood cancer.

Appendix Figure A4 presents event study estimates for mothers' and fathers' use of psychological therapy services and prescription medications for mental health conditions, such as antidepressants, anxiolytics, and sedatives. Across all four graphs, the estimates are small, and statistically insignificant, indicating that the cancer shock did not lead to increased use of mental health services by either parent. These findings strengthen the interpretation that the observed reductions in mothers' earnings and employment are driven by increased caregiving responsibilities, rather than by mental health declines.

4.2. Variation in effects by workplace factors

The previous section established that childhood cancer shocks significantly affect maternal earnings. We now examine how workplace characteristics influence the magnitude of these effects, focusing on three key factors: gender pay gaps, work hour intensity, and female representation across income tiers.

4.2.1 Gender pay gap

Table 1 presents estimated effects of interactions between the cancer shock indicator variable and indicators of an above-mean gender pay gap at the firm, occupation, and industry levels (separately in columns 1–3 and jointly in column 4). These interactions test whether work environments with varying levels of gender equity mitigate or exacerbate the labour market impacts of caregiving shocks. Column (2) shows that the interaction between caregiving shocks and the gender pay gap at the occupation level is statistically significant, with a point estimate of -$2,627.[8] This result implies that mothers

[8] The gender pay gap at the occupation level equals $9,543. Therefore, the workplace indicator identifies occupations (at the 3-digit level) in which the average earnings of men are at least $9,543 more than the average earnings of women. See Appendix Table A1 for gender pay gap figures at the occupation and industry levels.

working in occupations with below-mean gender pay gaps experience lower earnings losses following a caregiving shock: $5782 versus $8409, or 16.5% versus 18.1% relative to baseline levels. In contrast, there are no significant interactions observed at the firm or industry levels. These conclusions hold true in Column 4.

One explanation for the prominence of occupational-level effects is that occupations define the day-to-day nature of work—such as job tasks, required skills, and work arrangements—that influence how feasible it is for caregiving responsibilities to be balanced with employment. Occupations that can practically incorporate part-time roles and flexible schedules are more likely to attract female employees and foster norms that accommodate caregiving, resulting in narrower gender pay gaps. At the firm level, however, such flexibility may be less consistent across roles, as firms often house a range of occupations with differing norms and arrangements. Industry-level measures, on the other hand, may be too broad to capture specific dynamics that directly impact caregiving responses.

Another, complementary explanation is that occupational-level gender pay gaps may reflect the relative power of women to shape workplace norms and policies. In female-dominated occupations, such as nursing, women often hold significant representation and influence, supported by unions and collective bargaining efforts. This representation can translate into workplace conditions that actively support caregiving, such as paid leave or flexible schedules. In contrast, at the firm or industry level, gender pay gaps may be shaped by broader structural inequities. For example, a hospital may have a pro-male pay gap at the firm level due to the dominance of male doctors and executives, despite caregiving-friendly conditions for nurses. Similarly, the healthcare industry may exhibit a pro-male pay gap because of its leadership composition, masking the more equitable dynamics within specific female-dominated occupations.

The results for fathers are presented in Appendix Table A4 and show that none of the estimates are statistically significant. This result aligns with earlier findings that caregiving shocks have little to no impact on fathers' earnings, employment, or job changes. These

results also suggest that for fathers, even those working in caregiving-friendly occupations (e.g., teaching), labour supply and earnings remain unaffected.

4.2.2 Work hour intensity

Panel B in Table 1 presents estimates of interactions between the cancer shock variable and indicators of above-median work hour intensity at the firm, occupation, and industry levels. These interactions test whether caregiving-related earnings penalties vary across workplace environments with differing average work hours. The results suggest that mothers in environments with below-median work hour intensity experience significantly smaller earnings penalties following caregiving shocks compared to those in higher-hour workplaces.[9] For example, the main treatment effect in Column (1) suggests that in low work hour firms, caregiving shocks result in a moderate-sized earnings loss of $3,240 (9.9% relative to baseline for low work hour firms), while mothers in high work hour firms experience a significantly larger loss of $7,159 (15.6%). Similar differences are estimated at the occupation level in Column (2), but again, the interaction effect is small and not statistically significant at the industry level. Estimates in Column (4) show that both firm and occupation level factors are jointly important, with the estimated earnings effect for mothers with a low work hours firm and occupation equaling -$2,518 compared with an effect of -$9,357 for mothers with a high work hours firm and occupation.

These results can be explained by the fact that occupations with lower work hour intensity are more likely to include part-time or task-based roles, which enable mothers to adjust their schedules without exiting the labour market. This flexibility minimizes earnings losses compared to 'greedy' occupations, which reward long or specific hours worked and penalize deviations from these norms. Similarly, firms with lower work hour intensity may foster a culture that accommodates caregiving needs by de-emphasizing long hours or rigid time commitments. The lack of significant results at the industry level suggests that broad

[9] Median work hours at the firm and occupation levels equal 37 and 40 hours, respectively. They therefore indicate whether the majority of employees are working full-time hours. These measures are positively associated with the percentage of employees that are working greater than 50 hours per week. In other words, they also partly reflect workplaces that require work to be completed during evenings and/or weekends.

industry-wide measures fail to capture these dynamics, as industries encompass a wide range of roles with varying expectations of work intensity.

Appendix Table A4 shows interaction effects for fathers. The interaction coefficient in column (1) is negative and statistically significant at the 5% level, indicating that fathers experience a decline in earnings when they work in a firm with high median hours. This pattern suggests that fathers with inflexible work schedules and/or roles that reward long hours, experience an earnings decline if they reduce hours worked in response to the additional caregiving responsibilities. However, relative to baseline earnings, the effects are substantially smaller than those observed for mothers. This suggests that while some fathers adjust their labour supply in response to a child health shock, workplace factors remain less influential in shaping their overall earnings trajectories.

4.2.3 Female representation

Table 2 presents estimates of interactions between the cancer shock indicator variable and measures of female representation across different income tiers within the firm and occupation.[10] These binary measures indicate that mothers are working in a firm, occupation or industry in which women are the majority of workers within the top 20%, middle 50–80%, and bottom 50% of earners. By examining representation across these levels, we can differentiate the effects of female leadership from broader workplace dynamics shaped by women in the core workforce (e.g. gender composition of principals in schools versus gender composition of teachers). This approach addresses a potential limitation of prior studies, which focus solely on representation in management and may overlook the importance of gender composition at lower levels of the organizational hierarchy.

Column (1) of Table 2 shows that mothers who work in a firm with a high representation of women in the top 20% of earners have a significantly smaller earnings penalty of $3,856 (8.3%) following caregiving shocks, compared to the estimated earnings penalty of $7,799

[10] Results at the industry level are shown in Appendix Table A5.

(23.4%) for other mothers. Similar estimates of $4,240 (9.2%) and $8,356 (25.0%) exist at the occupation level. This suggests that female leadership at the highest levels plays a role in mitigating caregiving-related earnings losses, potentially by fostering policies and workplace norms that accommodate caregiving needs.

Interestingly, there is no significant effect observed for representation in the middle or bottom tiers. The likely explanation for this result is that women in leadership positions are better positioned to advocate for and implement caregiving-supportive policies. By contrast, representation in lower tiers, while potentially indicative of a caregiving-friendly workforce, may lack the influence necessary to shape organizational policies.[11]

When we simultaneously include the female representation indicators from the firm and occupation levels, we find that high representation of women in the top 20% at both organizational levels is important (see Appendix Table A8). In this regression, the estimated reduction in the earnings penalty at firms with high female representation equals $2,979 and the estimated reduction at occupations with high female representation equals $4,275.

4.2.4 Combined Effects of Workplace Characteristics

While the previous subsections considered workplace factors individually, these characteristics are often correlated. As demonstrated in Appendix Table A7, high female representation in senior roles, low work hour intensity, and narrow gender pay gaps frequently co-exist. To disentangle these effects and assess their independent contributions, we estimate a combined model incorporating all firm- and occupation-level variables simultaneously.

The results, presented in Appendix Table A8, reveal that female representation in the top 20% of earners remains a significant factor in mitigating caregiving-related earnings penalties, both at the firm and occupation levels. Specifically, having high female

[11] Appendix Table A6 shows no significant interaction effects for fathers across any level of female representation.

representation among top earners reduces the negative earnings effect by approximately $2,892 at the firm level and $3,138 at the occupation level. In contrast, representation at lower earnings tiers does not significantly influence outcomes. Work hour intensity is also significant, with mothers in high-intensity occupations and firms experiencing an estimated reduction in earnings losses of $4,280 and $2,504, respectively. Notably, the gender pay gap variables lose statistical significance in this combined specification, suggesting that earlier effects may reflect the influence of correlated factors.

To illustrate the combined effect of all the workplace characteristics, we estimate event study models for women in supportive and unsupportive jobs at baseline. Supportive jobs are defined as those with high female representation in the top 20% of earners at both the firm and occupation levels, low work hour intensity at both levels, and a low gender pay gap at the occupation level (N = 2,708). Unsupportive jobs are defined as the opposite: low female representation in senior roles, high work hour intensity, and a wide gender pay gap (N = 2,339).

Figure 3 displays the event study estimates for these subsamples, highlighting considerable differences in maternal earnings trajectories following caregiving shocks (see Appendix Table A9 for corresponding estimates). In supportive jobs, mothers experience a negative earnings effect in the year 0 ($6,279), but earnings quickly recover, with no statistically significant differences from baseline observed in subsequent years. By contrast, mothers in unsupportive jobs face a much larger and more persistent earnings penalty, with an initial decline of $10,415 in period 0, widening to $10,657 in year 2 and $13,882 in year 3, before reducing in year 4.

Overall, these patterns suggest that multiple dimensions of workplace environments jointly influence the magnitude and persistence of caregiving-related earnings penalties. Supportive environments, where these factors align, can effectively insulate mothers from economic burdens, while unsupportive workplaces exacerbate the penalties.

5. Conclusion

This study investigates the gendered economic consequences of caregiving shocks, focusing on the role of workplace environments in shaping maternal labour market outcomes. Using a dynamic difference-in-differences approach with linked Australian administrative data, we analyze the impact of a child's cancer diagnosis on parental earnings and employment. Our methodological framework employs high-quality employer-employee data to explore how workplace factors – female representation, work hour intensity, and the gender pay gap – moderate these effects. We also examine whether these factors operate most strongly at the firm, occupation, or industry level, providing an understanding of the environments that matter most.

Our findings highlight that caregiving shocks result in substantial and persistent earnings losses for mothers. Mothers in workplaces characterized by high female representation in senior roles and low work hour intensity experience significantly smaller economic penalties. The gender pay gap, while initially significant, loses explanatory power when considered alongside these other workplace dimensions, underscoring the importance of considering multiple factors.

In contrast, fathers' labour market outcomes remain largely unaffected by their child's cancer treatment, regardless of firm, occupation and industry-level characteristics. This suggests that workplace conditions are unlikely to be a primary barrier to fathers adjusting their caregiving responsibilities. Instead, other factors, such as social norms or intra-household bargaining dynamics, may play a stronger role in shaping their responses.

This study contributes to the literature on caregiving and labour market outcomes by providing an exploration of how workplace factors influence gendered economic penalties. By integrating industry, occupation and firm level characteristics into the analysis, it extends existing research beyond household-level dynamics and highlights potential mechanisms through which workplace environments interact with caregiving responsibilities. These findings add to broader debates on gender inequality and workplace

norms, demonstrating how different workplace contexts can shape women's economic resilience.

While this study does not establish causal relationships between specific workplace policies and caregiving penalties, it demonstrates that certain workplace environments are associated with better outcomes for mothers. A potential concern in interpreting these effects is non-random selection into job types: mothers who anticipate higher caregiving demands may sort into workplaces with greater flexibility or family-friendly policies. If selection were a key driver, we would expect mothers in more supportive workplaces to experience larger earnings declines post-shock due to weaker labour market attachment. However, we find the opposite pattern, suggesting that selection is unlikely to explain our findings and, if anything, may imply that the true earnings penalties in unsupportive workplaces are even larger than observed. Future work should explore how supportive environments can be developed efficiently and effectively.

These findings also highlight that reducing the economic penalties borne by mothers requires addressing societal and workplace norms that discourage fathers from taking on caregiving responsibilities. While policies such as equitable parental leave and flexible work arrangements are important, they should be paired with efforts to normalize caregiving for fathers and ensure they can prioritize family needs without career repercussions.

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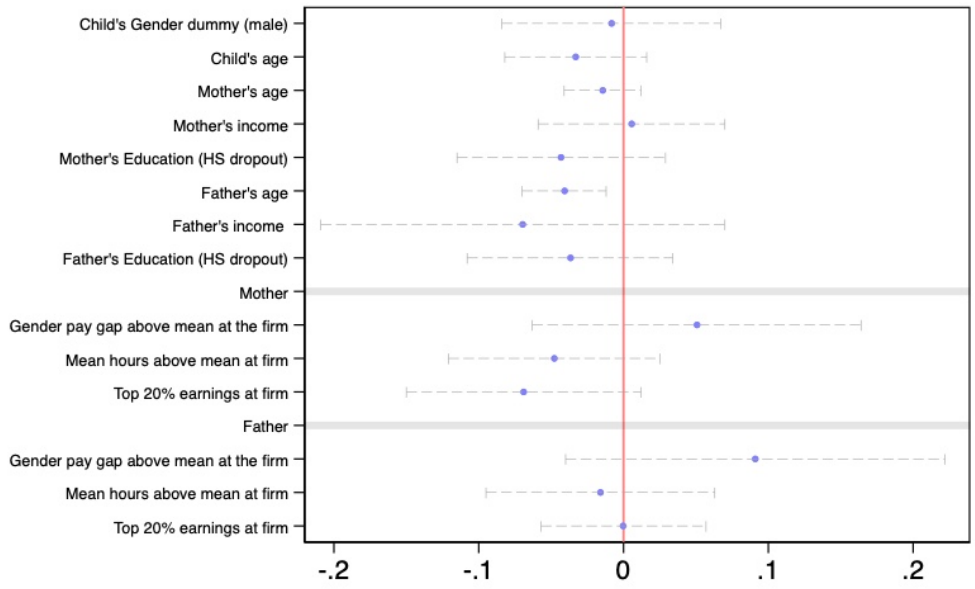
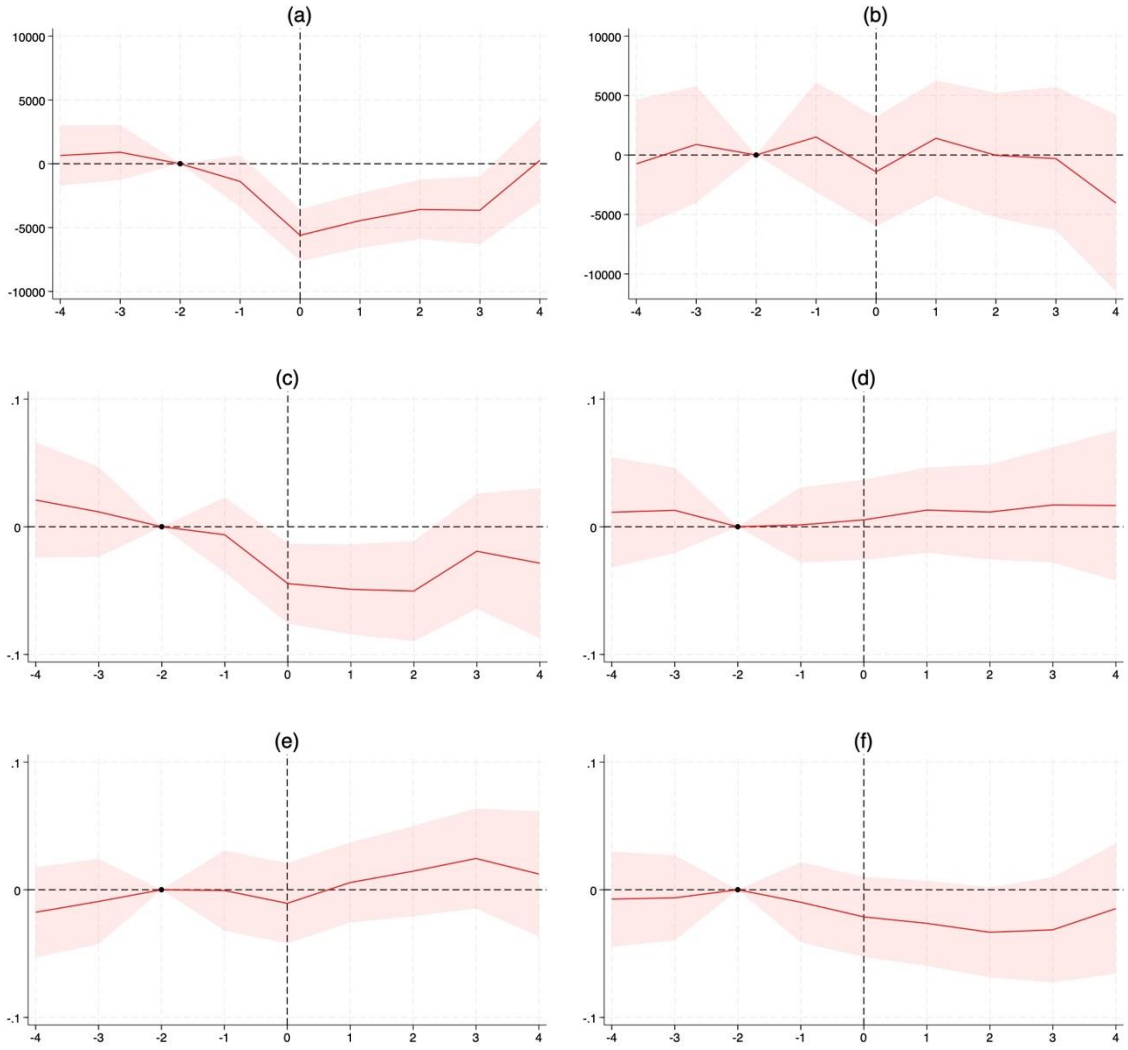
Main Tables and Figures

Figure 1. Estimated Differences in Characteristics between Treated and Control Groups



Note: Plot points represent estimates from regressions of pre-cancer characteristics (measured at year -2) on the treatment indicator.

Figure 2. Estimated Effects for Mothers' and Fathers' Earnings, Employment and Job Change



Note: Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -2. Vertical access is income in dollars. Figure (a) indicates the impact of initiation of childhood cancer treatment on mothers' earnings. Figure (b) indicates the impact of initiation of childhood cancer treatment on fathers' earnings. Figure (c) shows the impact of initiation of childhood cancer treatment on mothers' likelihood of employment. Figure (d) shows the impact of initiation of childhood cancer treatment on fathers' likelihood of employment. Figure (e) shows the impact of initiation of childhood cancer treatment on mothers' likelihood of remaining in a same job as baseline. Figure (f) shows the impact of initiation of childhood cancer treatment on fathers' likelihood of remaining in a same job as baseline.

Table 1. Estimated Moderating Effects of Gender Wage Gap and Work hours

	(1)	(2)	(3)	(4)
Panel A. Gender pay gap				
Main effect	-5071.5***	-5782.2***	-4648.2***	-5093.7***
	(983.6)	(897.1)	(805.8)	(1103.8)
Interaction effects				
High gap at firm level	-365.8			146.8
	(1197.7)			(1239.2)
High gap at occupation level		-2627.7**		-3038.9**
		(1302.9)		(1374.2)
High gap at industry level			876.8	1276.7
			(1185.6)	(1225.3)
Number of observations	13037	13432	13432	13013
Panel B. Work hours				
Main effect	-3240.3***	-3157.0***	-5043.4***	-2518.9*
	(978.8)	(943.8)	(1210.5)	(1372.9)
Interaction effects				
High hours at firm level	-3919.3***			-2946.8**
	(1196.9)			(1248.8)
High hours at occupation level		-4221.5***		-3893.5***
		(1176.6)		(1289.6)
High hours at industry level			-433.5	1087.6
			(1328.3)	(1406.7)
Number of observations	12862	13191	13208	12756

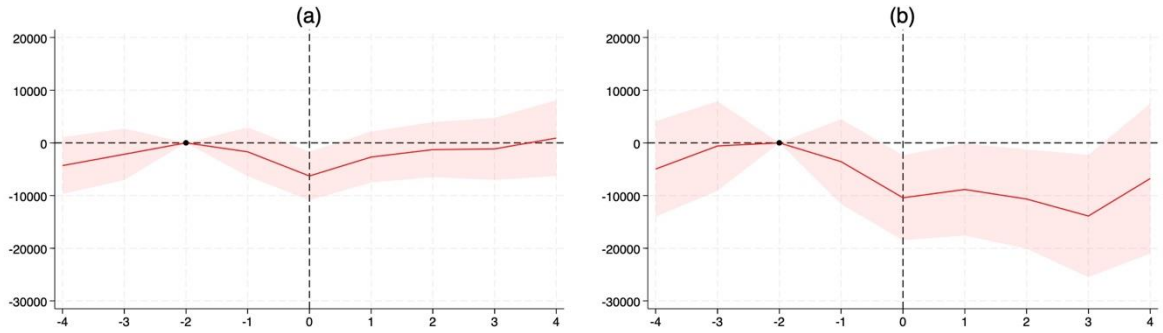
Note: Panel A refers to moderating impacts of Gender pay gap. The 'high gap' rows represent estimated interactions between treatment indicator and indicators of above-mean gender pay gap in mothers' firm, occupation and industry, measured in the base year (t=-2). Panel B refers to moderating impact of work hours. The 'high hours' rows represent estimated interactions between treatment indicator and indicators of above-mean work hours in mothers' firm, occupation and industry, measured in the base year (t=-2). Outcome variable is income in dollars. The estimates are based on equation 2.

Table 2. Estimated Moderating Effects of Female Representation

	(1)	(2)	(3)	(4)
Panel A. Firm level factors				
Main effect	-7799.1***	-5195.5**	-6029.9***	-6619.9***
	(931.2)	(2239.8)	(1576.5)	(2267.3)
Interaction effects				
Female majority in top 20%	3943.1***			4564.2***
	(1140.1)			(1671.9)
Female majority in 50-80%		-162.8		-2558.7
		(2327.6)		(3237.5)
Female majority below 50%			816.6	1344.1
			(1645.7)	(2786.7)
Number of observations	13384	13384	13384	13384
Panel B. Occupation level factors				
Main effect	-8356.5***	-8418.2***	-7122.2***	-7780.8***
	(1073.8)	(1632.5)	(1680.4)	(1730.1)
Interaction effects				
Female majority in top 20%	4116.9***			4504.2***
	(1215.9)			(1441.6)
Female majority in 50-80%		3157.3*		1505.4
		(1694.2)		(2950.6)
Female majority below 50%			1993.5	-2075.5
			(1742.9)	(2869.6)
Number of observations	13432	13432	13432	13432

Note: Panels A and B refer to moderating impacts of gender composition across income levels in firm and occupation respectively. The explanatory variables indicated are the interaction of a binary variable equal to 1 if percentage of female is above 50% at levels indicated at mother's workplace at the base year (t=-2) with the treatment effect. Outcome variable is income in dollars. The estimates are based on equation 2.

Figure 3. Estimated Effects for Mothers' Earnings in Supportive and Unsupportive Jobs



Note: Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -2. Vertical access is income in dollars. Figure (a) shows the impacts of childhood cancer treatment on income of mothers if they work in a supportive job. Supportive job is defined as lower-than-average work hours, high percentage of female at top 20% at workplace and occupation, and low gender wage gap at occupation level. Figure (b) shows this impact for mothers working in unsupportive jobs defined low female representation in the top 20% of earners at both the firm and occupation levels, high work hour intensity at both levels, and a wider gender pay gap at the occupation level.

Appendix

Supplementary Figures

Figure A1. Distribution of Child Age at start of Chemotherapy in our sample.

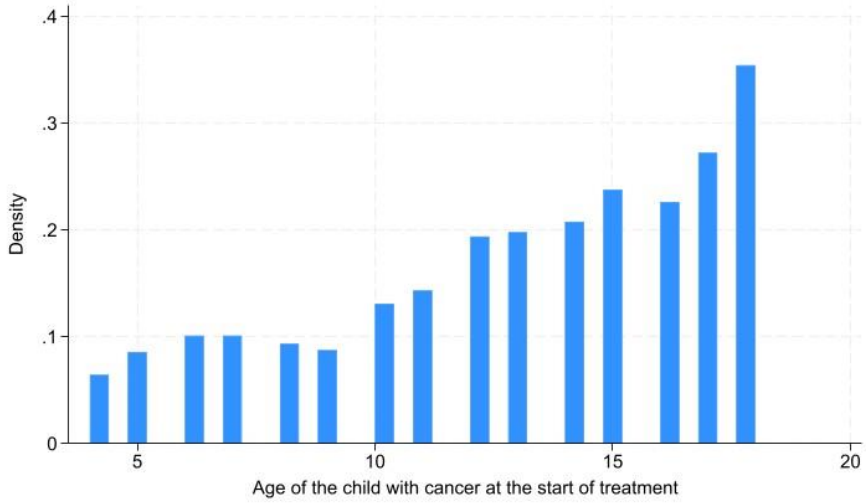
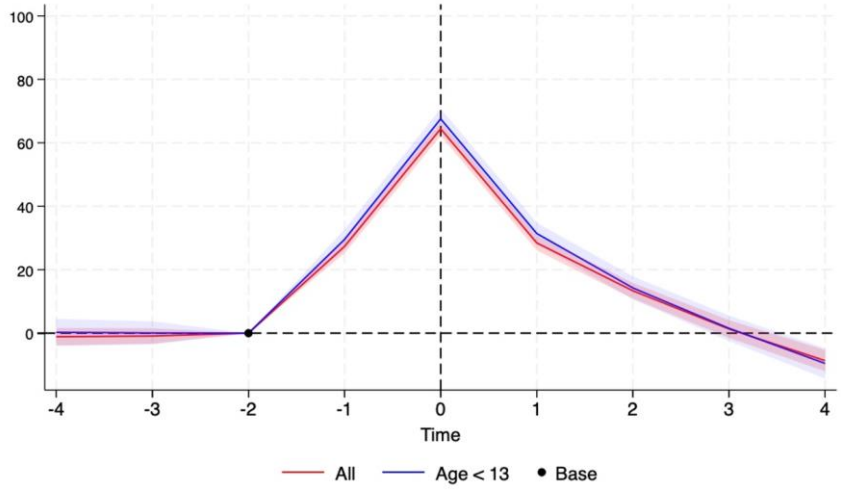
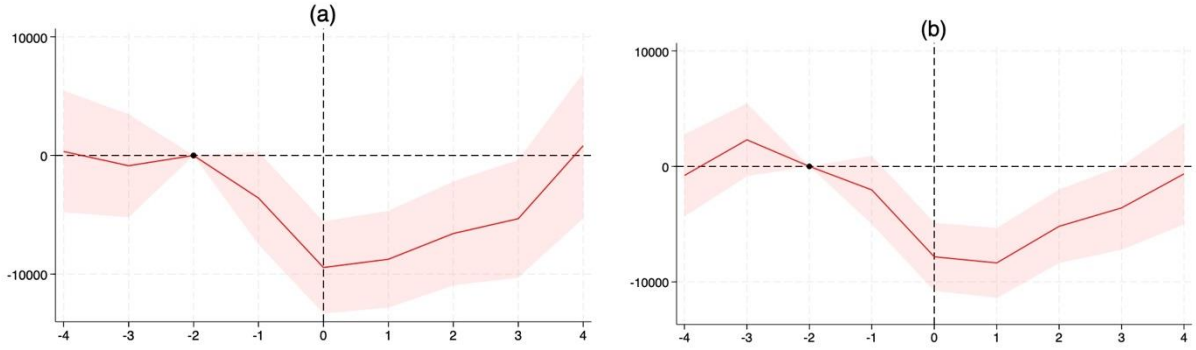


Figure A2. Number of medical services used by children with cancer



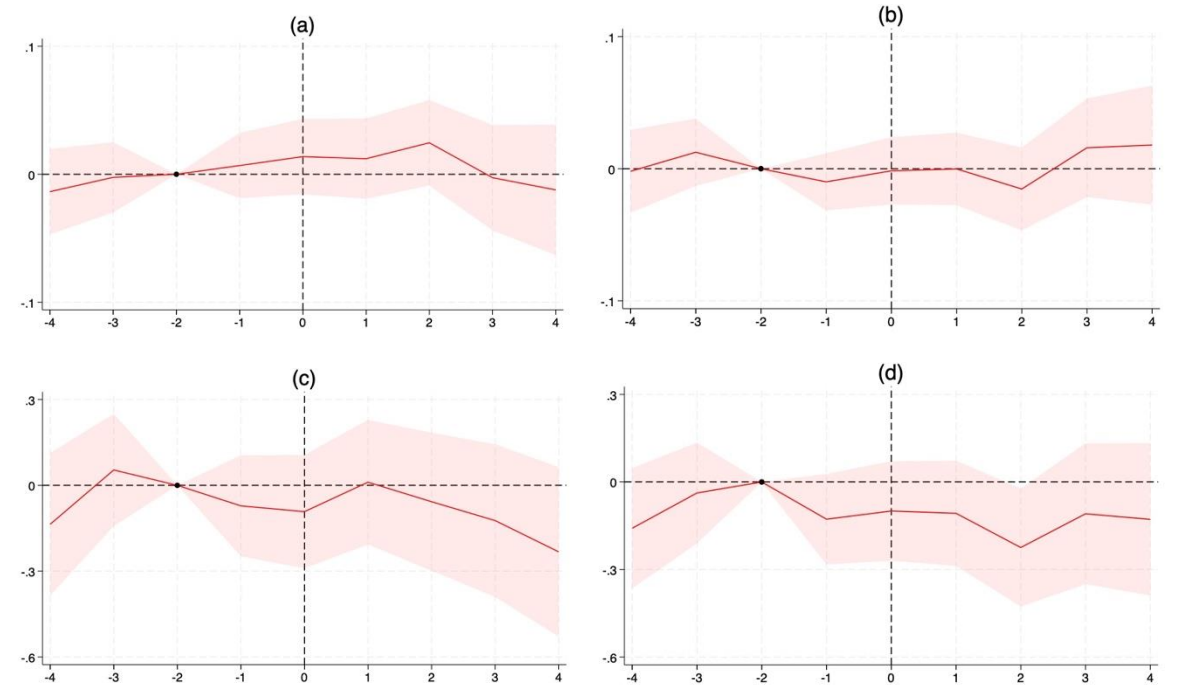
Note: Number of medical services per annuum for children commencing chemotherapy treatment at time 0. Horizontal line depicts time/year from initiation of treatment. The medical services include all out of hospital services offered by Medicare, which includes GP and specialists' consultations, pathology and imaging, as well as therapeutic services.

Figure A3. Estimated Effects for Mothers' Earnings



Note: Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -2. Vertical access is income in dollars. Figure (a) shows the impacts of childhood cancer treatment on income of mothers when child is 11 or younger. Figure (b) shows this impact on mothers' income for children with higher-than-average prescription drug use in the year following their treatment initiation.

Figure A4. Impact on parents' mental health prescription and services use.



Note: Horizontal access shows time (year) relative to year of initiation of cancer treatment. Baseline is at year -2. Vertical access is likelihood of use of mental health prescription drugs - figures (a) and (b) for mothers and father respectively; and mental health services use – figures (c) and (d) for mother and father respectively.

Supplementary Tables

Table A1. Summary statistics

Variable	Mean or proportion
Family characteristics	
Child age at diagnosis	12.98
Child female	45%
Mother's age	43.45
Father's age	44.96
Mother's income	37638
Father's income	79701
Mother's education: bachelor or higher	36%
Mother's education: other post-school qual	16%
Mother's education: high school graduate	23%
Mother's education: high school dropout	25%
Father's education: bachelor or higher	30%
Father's education: other post-school qual	34%
Father's education: high school graduate	15%
Father's education: high school dropout	21%
Mother's workplace characteristics	
Gender pay gap at firm	10554
Gender pay gap at occupation	9543
Gender pay gap at industry	9839
Hours at firm	32.00
Hours at occupation	34.48
Hours at industry	36.65
Percent female in top 20% at firm	46%
Percent female in 50-80% at firm	67%
Percent female in bottom 50% at firm	69%
Percent female in top 20% at occupation	48%
Percent female in 50-80% at occupation	63%
Percent female in bottom 50% at occupation	64%
Percent female in top 20% at industry	40%
Percent female in 50-80% at industry	59%
Percent female in bottom 50% at industry	61%

Table A2. Average earned income of mothers at baseline for different subsamples

Sample	Mean income ($)
All mothers	37,638
Child is younger (age < 12)	36,566
Child has high healthcare needs	36,277
Subsamples based on baseline job characteristic	
All at firm level	
Gender pay gap high	49,670
Gender pay gap low	35,106
Work hours high	46,003
Work hours low	32,857
Representation in top 20% of earnings is high	46,223
Representation in top 20% of earnings is low	33,315
Works in a supportive job	32,549
Works in an unsupportive job	50,492

Note: Average income is shown at baseline, year -2 for all mothers that fall in the categories indicated.

Table A3. Estimates corresponding with Figure 2

	Income		Employment		Job change	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
	(1)	(2)	(3)	(4)	(5)	(6)
Year -4	645.349	-743.987	0.021	0.011	-0.018	-0.007
	(1204.603)	(2755.384)	(0.023)	(0.022)	(0.018)	(0.019)
Year -3	896.709	887.072	0.012	0.013	-0.009	-0.006
	(1096.032)	(2500.531)	(0.018)	(0.017)	(0.017)	(0.017)
Year -2	-	-	-	-	-	-
Year -1	-1383.808	1513.843	-0.006	0.001	-0.001	-0.010
	(1037.546)	(2350.949)	(0.015)	(0.015)	(0.016)	(0.016)
Year 0	-5608.140***	-1405.509	-0.045***	0.005	-0.011	-0.021
	(1033.819)	(2340.932)	(0.016)	(0.016)	(0.016)	(0.016)
Year 1	-4455.039***	1408.252	-0.049***	0.013	0.006	-0.026
	(1093.233)	(2474.621)	(0.018)	(0.017)	(0.016)	(0.017)
Year 2	-3583.197***	-27.778	-0.050**	0.012	0.015	-0.033*
	(1186.827)	(2680.784)	(0.020)	(0.019)	(0.018)	(0.018)
Year 3	-3644.509***	-300.231	-0.019	0.017	0.025	-0.031
	(1354.670)	(3075.660)	(0.023)	(0.023)	(0.020)	(0.021)
Year 4	260.783	-4029.116	-0.029	0.017	0.012	-0.015
	(1664.706)	(3795.067)	(0.030)	(0.030)	(0.025)	(0.026)
Observations	22820	21032	22820	21032	22820	21032

Note: Year -2 is baseline. Employment is proxied by presences or lack of income in a financial year. Job change is a dummy variable that is equal to one when an individual moves between employers in two consecutive financial year.

Table A4. Estimated moderating effects of gender wage gap and work hours on father's earnings

	(1)	(2)	(3)	(4)
		Panel A Gender pay gap		
Main treatment effect	-241.366	424.884	-57.263	1017.334
	(2270.597)	(2170.667)	(2199.587)	(2755.664)
High gap at firm level	-625.257			-308.185
	(2724.495)			(2896.616)
High gap at occupation level		-1106.239		-490.140
		(2682.646)		(2924.406)
High gap at industry level			-2071.818	-2346.186
			(2701.042)	(2779.839)
R-squared	0.01	0.01	0.01	0.01
Number of observations	12016	12197	12197	11989
		Panel B Work hours		
Main treatment effect	2723.960	766.012	1851.124	4032.734
	(2194.573)	(2344.327)	(2251.776)	(2704.111)
High hours at firm level	-5383.384**			-5731.319*
	(2627.073)			(2933.172)
High hours at occupation level		-4643.138*		-2307.598
		(2622.808)		(3034.612)
High hours at industry level			-2572.297	-905.309
			(2707.880)	(3015.867)
R-squared	0.01	0.01	0.01	0.01
Number of observations	13318	13402	13769	12894

Note: Panel A refers to moderating impacts of gender pay gap. The 'high gap' rows represent estimated interactions between treatment indicator and indicators of above-mean gender pay gap in fathers' firm, occupation and industry, measured in the base year (t=-2). Panel B refers to moderating impact of work hours. The 'high hours' rows represent estimated interactions between treatment indicator and indicators of above-mean work hours in mothers' firm, occupation and industry, measured in the base year (t=-2).

Table A5. Estimated moderating effects of female representation at industry level for mothers

	(1)	(2)	(3)	(4)
Main effect	-5467.255***	-5318.274***	-4959.046**	-4962.545**
	(796.447)	(828.815)	(2317.560)	(2317.735)
Female majority in top 20%	322.813			1603.687
	(1346.159)			(2405.822)
Female majority in 50-80%		-199.919		-1387.371
		(1242.518)		(2233.566)
Female majority below 50%			-455.734	-396.470
			(2358.653)	(2401.757)
R-squared	0.04	0.04	0.04	0.04
Number of observations	13432	13432	13432	13432

Note: This table refers to moderating impacts of gender composition across income levels in industry level. The explanatory variables are binary variables equal to 1 if percentage of female is above 50% at levels indicated during the base year (t=-2), interacted with the main treatment effect. Outcome variable is income in dollars. The estimates are based on equation 2.

Table A6. Estimated moderating effects of female representation at firm level for fathers

	(1)	(2)	(3)	(4)
Main effect	158.281	-1766.231	-2455.853	-2541.480
	(1737.377)	(1893.263)	(1983.350)	(1987.981)
Female majority in top 20%	-5781.962			-10646.999
	(3841.726)			-9654.46
Female majority in 50-80%		3402.662		3982.331
		(2855.445)		(4659.116)
Female majority below 50%			4841.385	5908.129
			(2729.405)	(4227.874)
R-squared	0.01	0.01	0.01	0.01
Number of observations	12192	12192	12187	12187

Note: This table refers to moderating impacts of gender composition across income levels in firm level for fathers. The explanatory variables indicated are the interaction of a binary variable equal to 1 if percentage of female is above 50% at levels indicated at father's workplace at the base year (t=-2) with the treatment effect. Outcome variable is income in dollars. The estimates are based on equation 2.

Table A7. Pairwise variables across Firm and Occupation characteristics

	Female top 20%	Female 50-80%	Female 0-50%	Female top 20%	Female 50-80%	Female 0-50%	Hours occ	Hours firm	Gender pay gap firm	Gender pay gap occ
Female top 20%	1									
Female 50-80%	0.6512	1								
Female below 50%	0.6168	0.8965	1							
Female top 20%	0.8998	0.7607	0.72	1						
Female 50-80%	0.9052	0.8659	0.8348	0.9233	1					
Female below 50%	0.6645	0.9007	0.8784	0.7763	0.9215	1				
Hours at occupation	0.3211	0.3582	0.3849	0.2395	0.3885	0.3608	1			
Hours at firm	0.3102	0.3911	0.4301	0.2853	0.4505	0.43	0.7505	1		
Gender pay gap at firm	0.2752	0.3987	0.4879	0.3158	0.4422	0.4544	0.6861	0.6699	1	
Gender pay gap at occ	0.1652	0.2478	0.2895	0.0597	0.2768	0.2969	0.6167	0.5652	0.5541	1

Note: Pairwise correlations are shown for the workplace variables, calculated using main mother sample.

Table A8. Moderating impacts of workplace characteristics

	(1)	(2)
Main effect	-6706.898***	-1919.747
	(2481.042)	(2602.128)
Interaction effects		
Female at top 20% Firm	2979.864**	2892.273**
	(1367.045)	(1443.054)
Female at 50-80% Firm	-3447.706	-2930.904
	(2488.417)	(2652.702)
Female at below 50% Firm	811.107	-363.839
	(2341.797)	(2454.956)
Female at top 20% Occ	4275.051***	3138.146*
	(1658.162)	(1857.481)
Female at 50-80% Occ	855.578	-1352.048
	(3010.421)	(3255.668)
Female at below 50% Occ	775.501	-499.785
	(3279.927)	(3564.553)
Hours at occupation		-4280.543***
		(1468.750)
Hours at Firm		-2504.830*
		(1337.374)
Gender Pay Gap at Firm		1852.508
		(1404.662)
Gender Pay Gap at Occ		507.316
		(1687.995)
R-squared	0.04	0.04
Number of observations	13384	12497

Note: Outcome variable is income in dollars. The estimates are based on equation 2.

Table A9. Event study earnings estimates for supportive and unsupportive workplaces

	Supportive jobs	Unsupportive jobs
	(1)	(2)
Year -4	-4309.923	-4962.006
	(2747.560)	(4626.554)
Year -3	-2165.123	-587.130
	(2484.736)	(4325.461)
Year -2	-	-
Year -1	-1697.833	-3566.895
	(2352.889)	(4112.515)
Year 0	-6279.830***	-10415.912**
	(2347.174)	(4115.383)
Year 1	-2691.561	-8846.652**
	(2462.412)	(4456.344)
Year 2	-1278.940	-10657.692**
	(2660.006)	(4805.745)
Year 3	-1146.661	-13882.131**
	(3004.002)	(5915.592)
Year 4	912.167	-6764.930
	(3671.760)	(7263.173)
Observations	2708	2339

Note: Table shows event study estimates of income for two sub-samples defined based on job characteristics for mothers. Year -2 is baseline. Outcome variable is income in dollars. Supportive jobs are defined as those with high female representation in the top 20% of earners at both the firm and occupation levels, low work hour intensity at both levels, and a low gender pay gap at the occupation level (N = 2,708). Unsupportive jobs are defined as the opposite: low female representation in senior roles, high work hour intensity, and a wide gender pay gap (N = 2,339).