Who Bears the Burden? Heterogeneous Labor Market Penalties of Child and Eldercare*

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Abstract

This paper investigates the labor market effects of family caregiving, focusing on childcare and eldercare. Using large panel data in Japan and an event-study design that accounts for staggered treatment timing, I find sizable and persistent employment penalties for females after childbirth. Mothers' employment decreases by 36 percentage points one year after childbirth and stays lower five years later by approximately 19 percentage points. These effects vary by job characteristics, contract type, and co-residence status, highlighting substantial heterogeneity. In contrast, eldercare has smaller, at most 5 percentage points, and often statistically insignificant average effects on employment. However, eldercare penalties are larger and statistically significant, reaching up to 10 percentage points, for females with certain pre-event characteristics: those in low-teleworkability jobs, those in high physical proximity jobs, those on non-regular contracts, and those employed in small firms.

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1 Introduction

In developed countries, workforces are graying, fertility rates are below the replacement level, and female labor force participation has reached record levels (Acemoglu et al., 2022; Organisation for Economic Co-operation and Development (OECD), 2024; International Labour Organization, 2018). These changes highlight two career challenges: caring for new children and caring for aging parents. Child penalties are well mapped–the atlas of Kleven et al. (2024) shows earnings losses for mothers in every country it covers using event study designs. Evidence on eldercare penalties is sparse.

This paper studies the impact of family caregiving responsibilities, specifically related to childcare and eldercare, on labor market outcomes using event study designs following Callaway and Sant'Anna (2021). This study's empirical setting is Japan, one of the most rapidly aging societies. I use data from the Japanese Panel Study of Employment Dynamics (JPSED), which tracks roughly 50,000 adults per year between 2016 and 2024, and offers a richer sample than most national longitudinal surveys by recording jobs, earnings, occupations, and family care. I supplement the JPSED data with another longitudinal dataset from the Japan Household Panel Survey (JHPS), which has longer panels (2004 to 2022) with smaller cross-sectional samples, which are about 2,000 per year. I also use data on task contents by occupation from the Japan O-NET data. These data let us follow labor-market outcomes around both care events with fine detail.

First, the arrival of a first child consistently imposes significant and persistent penalties on females' labor market outcomes, while males experience no statistically detectable effects. This is consistent with the previous literature for many countries, including Japan (Kleven et al., 2024). Female employment rates decline sharply, with the JPSED data showing a peak drop of approximately 0.36 points in year +1, and the JHPS data indicating an even larger peak decline of about 0.76 points at year +1. Females' annual earnings also fall substantially, with losses of approximately 94 (in JPY 10K units) in JPSED starting from year +1, and a larger reduction of around 140 (in JPY 10K units) in JHPS from year +1. Weekly hours worked for females decrease by approximately 5 hours in JPSED and by about 12 hours in JHPS, both reductions persisting for several years post-birth. Heterogeneous analyses reveal that this Childcare penalty is not uniform: mothers in high-teleworkability jobs and those with regular employment contracts experience a substantially reduced penalty, with non-regular workers showing markedly larger employment declines. Co-residence with parents mitigates longer-term employment loss, and larger firms may offer some initial advantages in job retention.

Second, I find that the average effects of entering elder care on employment, earnings,

and hours are close to zero for both genders. For males, employment changes remain within ± 0.03 and are never statistically significant in either dataset. Their earnings fall by 25 (JPY 250,000) at year +3 in JPSED, and peak at -30 in year +3 in JHPS, showing a small and concentrated earnings loss. Post-event female employment coefficients consistently lie between -0.03 and 0.00 in JPSED and show a small drop of 0.05 points at event years 0 and +1 in JHPS, but generally do not reach statistical significance. Most female earnings and weekly hours also show no significant effect. Heterogeneous analyses, however, indicate that the eldercare penalty on female employment is not uniform. The penalty is less pronounced or statistically insignificant for mothers in high-teleworkability jobs, those with low physical proximity requirements, and those with regular contracts. A more substantial and statistically significant penalty is observed for mothers in low-teleworkability jobs, those in high physical proximity jobs, those on non-regular contracts, and those employed in small firms.

Comparing these two caregiving responsibilities, the childcare penalty on female labor market outcomes is substantially larger and more consistently significant than the eldercare penalty. The employment declines for mothers after childbirth are several times greater (e.g., 0.37 to 0.78 points) than the maximum observed employment dip for elder care (0.05 points). Similarly, earning losses for mothers after childbirth (94 to 140 in JPY 10K units) far exceed the small earning losses observed for males in elder care (at most 30 in JPY 10K units) and the negligible effects for females in elder care.

Literature. A rich body of research documents large and persistent "child penalties"—the adverse labor market effects of having children on mothers' careers. Across many countries, females' employment and earnings trajectories diverge sharply from males' after the birth of a first child, while fathers' outcomes remain essentially unchanged. Using Danish administrative data, Kleven et al. (2019) show that mothers' earnings drop by about 20% relative to fathers and never fully recover over the subsequent decade. Swedish evidence from a within-couple event-study design finds a comparable pattern: 15 years after childbirth, mothers' annual earnings are 32% lower than their partners' on average, whereas fathers' earnings are virtually unaffected (Angelov et al., 2016). In fact, extensive cross-country evidence confirms that sharp, long-lasting female employment losses after childbirth are the norm across high-, middle-, and low-income economies (Kleven et al., 2024).

Recent studies have investigated the mechanisms behind these motherhood penalties. In particular, employer practices and career dynamics within firms can amplify the long-term gender gap. For instance, Okuyama et al. (2025) use personnel records from a large

Japanese firm to decompose the motherhood pay gap. They find that immediately after childbirth, mothers' earnings losses are driven mainly by reductions in time-based pay (e.g. lower base salary due to shorter hours), but over time a widening gap in promotion-based pay becomes the dominant factor.

This paper contributes to this literature by replicating the overall childcare penalty pattern in Japan using an event-study approach and by showing substantial heterogeneity across groups of individuals with different pre-birth characteristics (such as job task content, co-residence with parents, or employment contract type).

In contrast to the extensive research on new mothers, the labor market impacts of caring for aging parents (i.e. unpaid *eldercare*) have been less thoroughly quantified, and the evidence to date is more mixed. Notably, virtually no prior work has directly compared childcare and eldercare penalties within the same empirical framework—a gap this paper addresses by examining both types of caregiving side-by-side.

Many earlier studies using panel data found at most modest average effects of informal eldercare on employment. For example, Bolin et al. (2008) analyze adults aged 50+ in several European countries and estimate that providing care to an elderly parent is associated with only a very small reduction in the caregiver's employment probability (on the order of a few percentage points). Similarly, Oshio and Usui (2018) report that when Japanese females begin providing care to an older parent, their labor force participation drops by roughly 3% on average, with no significant change in hours worked among those who remain employed.[1]

More recent evidence suggests that eldercare responsibilities can indeed hinder females' careers under certain conditions. Using U.S. administrative data, Maestas et al. (2024) document divergent trajectories by gender around a parent-care event: when daughters start providing care to an elderly parent, their employment and earnings tend to drop only at year +1, whereas sons show little change at caregiving onset (often because sons step in only after their own careers have been interrupted for other reasons). However, emerging econometric research cautions that the estimators used in earlier studies may be biased when treatment timing is staggered and effects are heterogeneous. In particular, conventional difference-in-difference designs can produce biased estimates in such settings (Baker et al., 2022; Borusyak et al., 2024; Callaway and Sant'Anna, 2021; De Chaisemartin and d'Haultfoeuille, 2023; Roth et al., 2023).[2]

[1]For other studies using Japanese panel data on eldercare and labor outcomes, see, for example, Fukahori et al. (2015); Kikuzawa and Uemura (2021); Oshio and Usui (2017). See also Kohara and Ohtake (2011); Yamada and Shimizutani (2015).

[2]Notably, Oshio and Usui (2017) avoid this staggered-timing bias by using only two survey waves. Their IV and fixed-effects estimates of caregiving's impact on employment are statistically insignificant,

This paper's contribution is to apply an event-study design that accounts for staggered treatment timing to the context of eldercare, providing a more credible estimate of causal effects. Following Callaway and Sant'Anna (2021), I implement an event-study approach for caregiving onset and find that the average effect of an elderly parent's care need on females' employment is close to zero and often not statistically significant.[3] Importantly, this null average effect masks considerable heterogeneity: the analysis reveals that caregiving penalties vary markedly by individual and job characteristics. In particular, females in less flexible jobs (e.g., roles with low teleworkability or high physical proximity), those on non-regular contracts, those employed in smaller firms, and those not cohabiting with their parents experience significantly larger employment declines when taking on parent-care duties. By contrast, females with more flexible work arrangements or additional support show relatively negligible labor impacts. In sum, different types of family care impose different constraints on workers, underscoring the novel insight that childcare and eldercare may require distinct policy responses.

2 Data

2.1 Japanese Panel Study of Employment Dynamics

My primary data source is the Japanese Panel Study of Employment Dynamics (JPSED), an annual survey of working-age adults conducted each January. I use the 2016–2024 waves; each wave interviews about 50,000 respondents. I restrict samples of individuals aged between 20 and 69, not in schools.

JPSED records age, gender, education, marital status, annual earnings, weekly hours, employment status, employer size, and a three-digit occupation code with more than 200 categories. The large panel sharpens precision relative to most national datasets; its yearly sample is about five times the size of the U.S. Panel Study of Income Dynamics (PSID). Detailed occupation codes let me link jobs to task measures and examine heterogeneity by work content.

For childcare analysis, I use children's ages to identify the first year a respondent has a child; that year is event time zero for childbirth. For eldercare analysis, I use a question that asks whether a parent or parent-in-law received long-term-care certification in the previous year. I set event time zero for elder care in the first year, where this indicator

consistent with the present study's findings.

[3]This negligible average eldercare effect is in line with the findings of Oshio and Usui (2017), who also report no significant impact on females' employment.

equals one.

Table 1 reports weighted means for the JPSED sample in 2016 and 2024. Male employment is high—0.88 in 2016 and 0.89 in 2024—while the female rate rises from 0.68 to 0.74, shrinking but not closing the gender gap. Regular-worker shares move in parallel, increasing from 0.80 to 0.81 for males and from 0.44 to 0.45 for females, signaling a slow shift from contingent to stable contracts. College attainment climbs for both genders, from 0.34 to 0.38 among males and from 0.17 to 0.23 among females. Care events remain infrequent: roughly two percent of respondents experience a first birth each year, and new elder-care responsibilities affect two percent of males and decline from three to two percent among females. Males' average earnings and hours worked have been stable; females' earnings increase from JPY 2.14 million to JPY 2.27 million while hours slip from 32.4 to 31.8, implying that earnings gains reflect job upgrading more than longer workweeks.[4]

Table 1: Summary Statistics (JPSED)

	Males		Females	
	2016	2024	2016	2024
Employment Rate (%)	87.8	89.2	67.7	74.3
Regular Worker Share (%)	80.4	80.7	44.2	45.4
College Educated (%)	33.9	37.8	16.7	22.9
Start Childcare (%)	1.4	1.6	1.6	1.8
Start Eldercare (%)	1.9	1.8	3.4	2.4
Annual Earnings (JPY 10K)	450.5	447.9	213.6	226.9
Weekly Hours Worked	42.7	41.1	32.4	31.8
Num. of Obs.	17425	19489	16997	17836

Note: This table shows weighted means of employment status, contract type, education, caregiving indicators, annual earnings (JPY 10,000, 2020 prce), and weekly hours for respondents aged 20–69 in the JPSED data. The weight is a survey weight.

2.2 Japan Household Panel Survey

My supplementary data source is the Japan Household Panel Survey (JHPS), an annual household panel that began in 2004. I use the 2004–2022 waves; each wave interviews

[4]Annual earnings are in real terms in 2020's price, using the consumer price index for all goods. The data source is Statistics Bureau of Japan (2025).

about 7,000 households.[5] I restrict samples of individuals aged between 20 and 69, not in schools.

JHPS records age, gender, education, marital status, children's years of birth, earnings, hours, employment status, and caregiving details. The 19-year span lets me track earnings and care events over nearly two decades. Its caregiving module provides information not available in JPSED.

For childcare analysis, I use children's years of birth to set event time zero at the first year a respondent has a newborn. For eldercare analysis, I use the item "Family member needing care." I construct a dummy that equals one in the first year when any family member, other than the respondent, is newly reported as needing care; that year is event time zero for eldercare.

Table 2 provides comparable statistics for the JHPS sample. In the common year 2016, employment rates exceeded those in JPSED—0.92 vs. 0.88 for males and 0.73 vs. 0.68 for females on employment. Regular worker shares are lower than JPSED–0.68 vs. 0.80 for male regular work, and 0.24 vs. 0.44 for females. Over the longer horizon, employment for females rises from 0.60 in 2004 to 0.77 in 2022, the regular workers' share increases from 0.24 to 0.31, and college attainment rises from 0.23 to 0.40, while males' outcomes change more modestly. Annual earnings grow steadily for both genders, and weekly hours fall by roughly four hours for males and one hour for females. These trends mirror those in JPSED, confirming gradual improvements in job quality and persistent gender gaps.

2.3 Japan O-NET

Finally, I also use Japan O-NET, an occupational information network maintained by the Ministry of Health, Labour and Welfare and the Japan Institute for Labour Policy and Training (Japan Institute for Labour Policy and Training (JILPT), 2025). The database assigns 1–5 scores to roughly 500 three-digit occupations for many task descriptors.

I focus on two: "physical proximity to others" and "face-to-face discussion." The proximity score marks jobs that require workers to stand close to coworkers or customers; Mongey et al. (2021) show that such jobs were least adaptable to social-distancing rules and suffered larger employment losses.

The face-to-face discussion score tracks the importance of in-person interaction; Dingel and Neiman (2020) use similar items to label occupations that can be done from home.

[5] Variables for eldercare are available since 2009. Thus, I use the 2009-2022 wave when I analyze the eldercare penalty.

Table 2: Summary Statistics (JHPS)

	Males			Females		
	2004	2016	2022	2004	2016	2022
Employment Rate (%)	87.0	92.0	92.0	59.7	72.7	77.0
Regular Worker Share (%)	57.2	68.4	70.4	24.1	24.4	31.3
College Educated (%)	38.6	47.3	53.6	22.9	32.3	39.8
Start Childcare (%)	3.0	0.9	0.0	2.0	0.8	0.0
Start Eldercare (%)	.	3.4	2.1	.	4.1	2.1
Annual Earnings (JPY 10K)	420.4	518.9	513.2	214.0	209.3	236.5
Weekly Hours Worked	46.4	44.3	42.0	31.8	31.2	31.1
Num. of Obs.	676.0	1088.0	1183.0	655.0	930.0	1102.0

Note: This table shows weighted means of employment status, contract type, education, caregiving indicators, annual earnings (JPY 10,000, 2020 price), and weekly hours for respondents aged 20–69 in the JHPS data. The weight is a survey weight. In 2004, the eldercare question was not asked.

Figure 1 shows the bin-scattered plot for the correlation between the proximity score and the face-to-face discussion score across occupations and their histograms. The two scores are correlated and indicate that occupations that require more physical proximity to others at work also require more face-to-face discussion.

3 Childcare Penalty

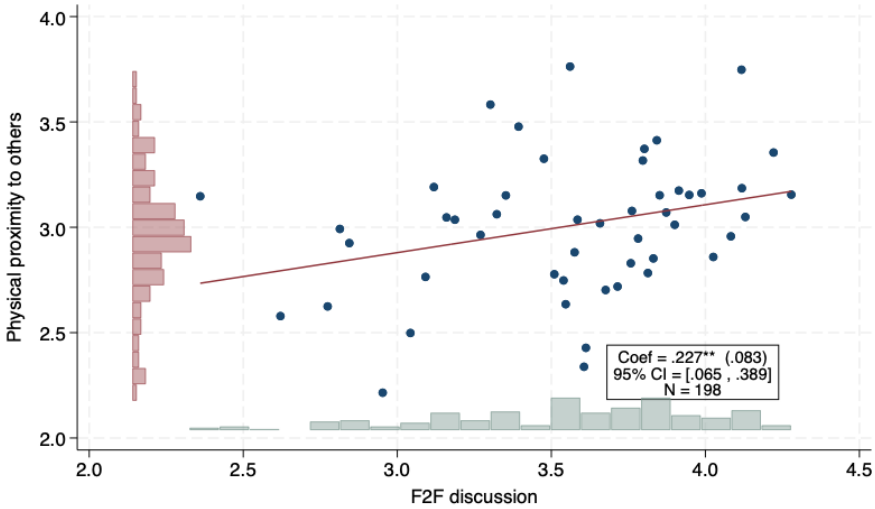
In this section, I show the average treatment effects of childcare on labor market outcomes using the event study design following Callaway and Sant'Anna (2021). I use the not-yet-treated as control groups and implement a doubly robust DiD estimator based on IPW (inverse probability weighting) and OLS. All the regressions are weighted by sample weights. As covariates, I include age, age squared, and a dummy variable of having a partner.

3.1 Childcare Main results

Figure 2 presents the event-study coefficients detailing the impact of a first child's birth on key labor market outcomes—employment, annual earnings, and weekly hours worked—for both males and females.

Panels (a) and (b) illustrate the effects on the employment rate. For males, in both JPSED (Panel a) and JHPS (Panel b), the coefficients representing the average treatment

Figure 1: Physical proximity to others and F2F Discussion



Note: This figure shows the bin-scattered plot for the correlation between the proximity score and the face-to-face discussion score across occupations and their histograms.

effect are close to zero across all observed periods, from five years before to five years after the child's birth. The 95% confidence intervals for these male coefficients consistently overlap with zero, indicating no statistically significant change in their employment rates attributable to becoming fathers.

In contrast, females experience a pronounced decline in employment. In the JPSED data (Panel a), female employment begins to drop around the event year (year 0). The reduction becomes statistically significant and substantial from year 0, falling by approximately 0.22 points. The peak effect is observed at year +1, with a reduction of about 0.36 points in the employment rate. This negative impact persists, with employment remaining approximately 0.26 points below the baseline through year +4 and still around -0.19 at year +5.

The JHPS data (Panel b) corroborates this finding, though the magnitude of the decline is larger. Female employment in JHPS shows a drop starting around year 0, reaching a peak decline of approximately 0.76 points at year +1. This effect remains statistically significant and substantial, with the employment rate still more than 0.37 points lower at year +5. The qualitative pattern of a persistent drop in female employment post-childbirth is thus identical across both datasets.

Panels (c) and (d) shift the focus to annual earnings, measured in 10,000 JPY. Similar to employment, males' earnings show no change. For females, however, the birth of a child coincides with a significant reduction in earnings. According to JPSED estimates (Panel

c), females' annual earnings start to decline around year 0, and from year +1 onwards, they experience a loss of approximately 94 (in JPY 10K units). This substantial earnings penalty persists through year +5. The JHPS data (Panel d) shows a similar, though larger, earnings decline for females, with annual earnings dropping by approximately 140 (in JPY 10K units) from year +1 to +2 and remaining around this level of reduction through year +5.

Finally, Panels (e) and (f) examine the impact on weekly hours worked. Once again, male weekly hours worked are statistically unchanged in response to childbirth in both JPSED (Panel e) and JHPS (Panel f), with coefficients hovering near zero. Conversely, females' weekly hours worked contract significantly. In the JPSED data (Panel e), females' weekly hours decrease by approximately 5 hours from year +1 onwards, but this reduction becomes statistically insignificant and not persistent through year +5. The JHPS data (Panel f) mirrors this trend, showing a reduction in female weekly hours of about 12 hours from year +3, which also remains persistent.

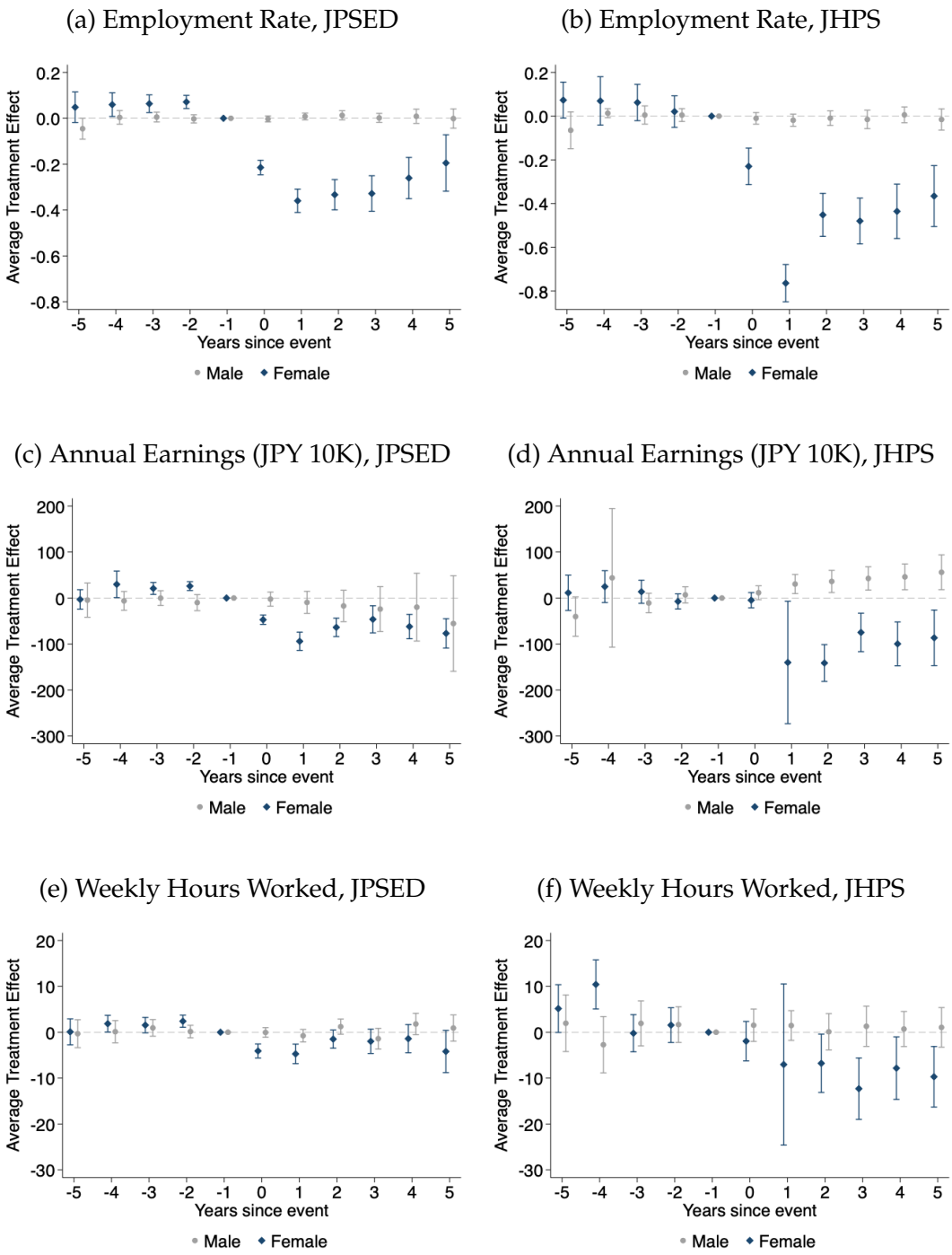
In summary, the event-study analyses from both JPSED and JHPS consistently demonstrate that the arrival of a first child imposes significant and persistent penalties on females' labor market outcomes across employment rates, annual earnings, and weekly hours worked. Males, on the other hand, experience no statistically detectable effects on these dimensions. While the precise magnitudes of these penalties vary between the two datasets, the qualitative message is unequivocal: the childcare penalty is predominantly, if not exclusively, borne by mothers in Japan.

3.2 Childcare Penalty: Heterogeneous effects

This subsection examines the heterogeneous impact of childbirth on mothers' employment rates, using the more granular occupational data available in JPSED. Individuals are pre-assigned to binary groups based on characteristics measured before the childbirth event. Specifically, I assign individuals to groups based on their modal characteristics between year -4 and year -1. These characteristics include occupation-level features such as teleworkability (computed from JPSED as the share of workers who telework), physical proximity score from the O-NET data, and face-to-face discussion score from the O-NET data, as well as individual-level factors like regular-contract status, employer firm size (300 or more employees versus smaller firms), and co-residence with parents. I then compare the event-study coefficients for the employment rate of females within each group. Figure 3 visually presents these comparisons.

Panel (a) explores how teleworkability affects mothers' employment. Post-birth, fe-

Figure 2: Childcare Penalty



Note: This figure shows event-study coefficients for employment, annual earnings (in JPY 10,000s), and weekly hours worked for males and females around the birth of their first child. The x-axis represents years since the event, with year 0 being the year of birth. Estimates are derived from JPSED and JHPS data. The estimation follows Callaway and Sant'Anna (2021), implementing a doubly robust DiD estimator based on IPW and OLS. All regressions are weighted by sample weights. The control groups are the not-yet-treated. Covariates include age, age squared, and a dummy variable for having a partner. The bars represent 95% confidence intervals.

males who were in low-teleworkability jobs before the birth see their employment fall sharply. Their employment rate drops by a peak of nearly 0.40 points in year +3. In contrast, females who were in high-teleworkability jobs before the birth face a smaller penalty. While their employment drop is around 0.15 points in year 0, their responses from year +1 onwards are not statistically significant, and the 95% confidence intervals often include zero. This suggests that teleworkability helps workers return to work after childbirth.

Panels (b) and (c) investigate the impact of occupations' task content. Panel (b) studies the importance of *face-to-face discussion* requirements. Both groups show negative employment responses, and their negative responses of about 0.30 to 0.35 points at years +2 and +3 are similar. This suggests that the importance of face-to-face discussion in an occupation might not significantly correlate with the magnitude of the childcare penalty. Panel (c) focuses on *physical proximity* requirements at work. Similar to Panel (b), the results are similar across the two groups, which indicates that the importance of physical proximity does not explain significant heterogeneity in the childcare penalty among mothers.

Panel (d) differentiates based on pre-birth *regular worker* status. Mothers who held regular contracts before childbirth experience a smaller employment exit, with a maximum drop of less than 0.23 points in year +1. In contrast, those on non-regular contracts see a larger decline, around 0.64 points in year +3 post-birth.

Panel (e) explores differences by employer *firm size*. For the first two years post-birth, penalties are notably larger for females working in small firms, suggesting that large firms might offer better job retention, possibly due to more structured leave policies or greater resources for accommodating working mothers. However, there is no substantial heterogeneity that persists beyond year +2.

Panel (f) considers the effect of *cohabitation with parents*. While the initial employment responses are similar, females cohabiting with their parents appear to face a smaller and less statistically significant employment penalty from years +3 and +4. This suggests that intra-household childcare support from grandparents may not act as an immediate buffer against initial employment exits after childbirth, but it can be a crucial buffer against persistent labor market exit.

Collectively, these heterogeneous analyses underscore that the childcare penalty on female employment is not uniform. Specifically, pre-birth job characteristics such as high teleworkability and holding a regular employment contract appear to substantially reduce the penalty, with non-regular workers experiencing markedly larger employment declines. Furthermore, while co-residence with parents emerges as a factor mitigating longer-term employment loss and larger firms may offer some initial advantages, the spe-

cific task content of occupations, like requirements for face-to-face discussion or physical proximity, did not clearly differentiate the extent of the childcare penalty in this analysis.

4 Eldercare Penalty

In this section, I show the average treatment effects of eldercare on labor market outcomes using the event study design following Callaway and Sant'Anna (2021). I again use the not-yet-treated as control groups and implement a doubly robust DiD estimator based on IPW (inverse probability weighting) and OLS. All the regressions are weighted by sample weights. As covariates, I include age, age squared, and the dummy variable of having a partner.

In JPSED, the "event" is when a parent or parent-in-law first requires long-term care. In JHPS, it is when any family member begins needing care.[6]

4.1 Eldercare Penalty: Main results

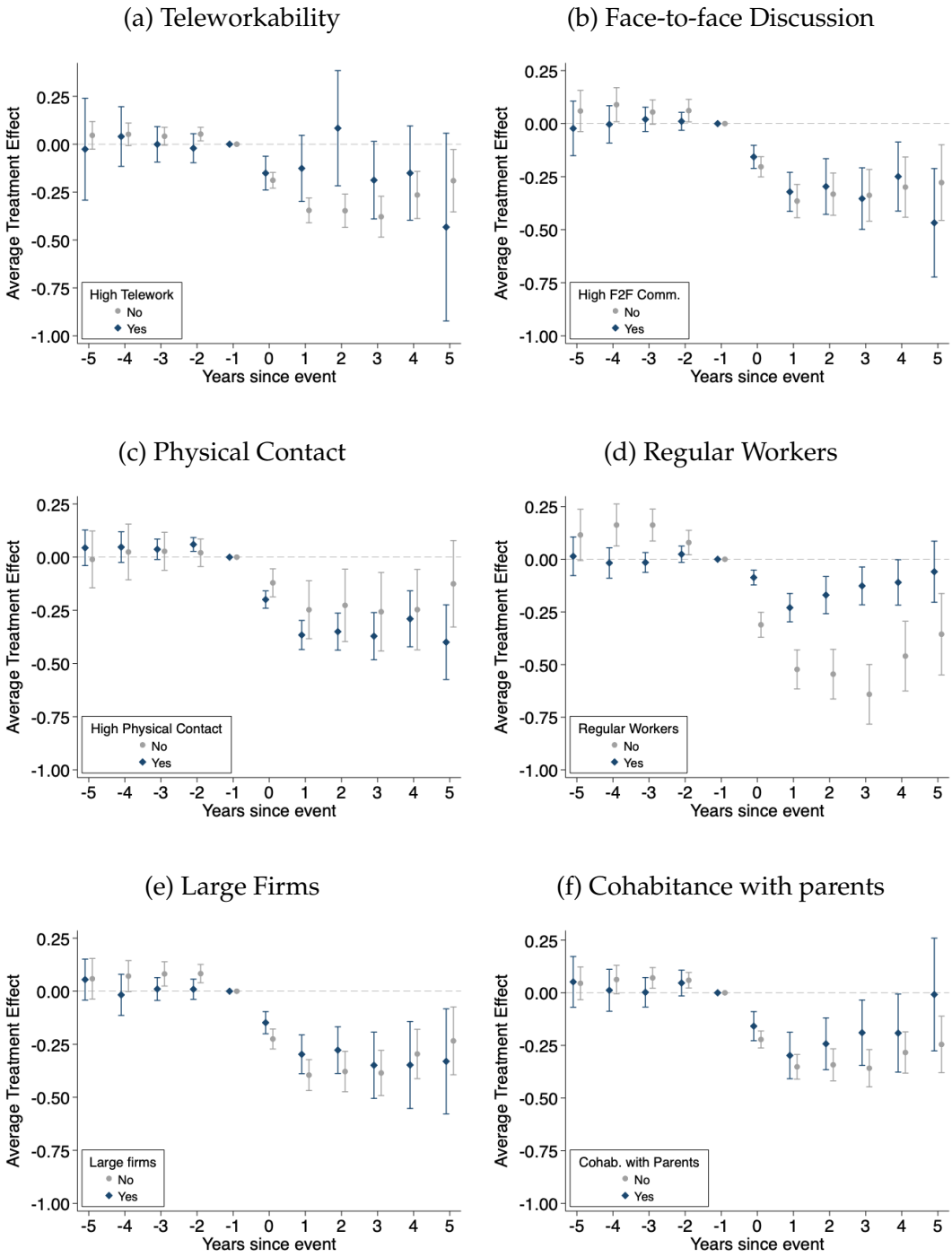
Figure 4 presents event-study coefficients for the impact of eldercare onset on employment, annual earnings, and weekly hours for both genders, using JPSED and JHPS data.

Panel (a) reports employment-rate effects in JPSED. Coefficients for males are not statistically significant, with 95% confidence intervals always overlapping zero. Post-event female coefficients similarly lie between -0.03 and +0.00, and only the coefficient at year +3 (-0.03) is statistically significant at the 5% level. Panel (b) shows JHPS estimates: males' employment changes remain within ± 0.03, never significant; females exhibit a small drop of 0.05 points at event years 0 and +1, but the point estimates at other horizons stay within ± 0.04 and are not statistically significant. Thus, the employment penalty from eldercare is at most 0.03 to 0.05 for females and indistinguishable from zero for males. They are notably smaller than the penalty from childcare, which is at most 0.4 in JPSED and 0.8 in JHPS.

Panels (c) and (d) report annual earnings effects (in 10,000 JPY). In JPSED (panel c), changes in males' earnings are not statistically significant. Female earnings coefficients also hover between -5 and +5 and never reach significance. In JHPS (panel d), the male drop peaks at -30 in year +3 (significant), while female coefficients remain within ± 10 and are not significant. Compared to the childcare penalty, which can decrease by more than 100 at their peaks, these eldercare earnings losses are smaller.

[6] In JHPS, there is another question on the severity of care needs. However, there is no statistically significant difference in the treatment effects by severity.

Figure 3: Childcare Penalty Heterogeneity (Female Employment, JPSED)



Note: This figure shows event-study coefficients for employment rates for females around the birth of their first child. The x-axis represents years since the event, with year 0 being the year of birth. Estimates are derived from JPSED and JHPS data. The control groups are the not-yet-treated. The comparisons are within each group by pre-event characteristics. The estimation follows Callaway and Sant'Anna (2021), implementing a doubly robust DiD estimator based on IPW and OLS. All regressions are weighted by sample weights. Covariates include age, age squared, and a dummy variable for having a partner. The bars represent 95% confidence intervals.

Panels (e) and (f) show weekly hours worked. JPSED (panel e) male coefficients decrease up to 0.67 in year +4, all insignificant; female post-care estimates range from -1.7 to +0.2, only the one in year +3 being significant. Results from JHPS (panel f) show the same pattern, that only the coefficient for females in year +3 is significant. Taken together, eldercare responsibilities generate at most a 2-4 hour reduction in weekly work for females, with no precise evidence of a sustained effect for either gender.

In summary, the analyses using both JPSED and JHPS confirm that the average eldercare penalty on employment, earnings, and hours is negligible relative to the childcare penalty. Male labor market outcomes remain near zero throughout, while female employment dips by no more than 0.05 in JHPS. Earnings and hours remain mostly flat.

4.2 Eldercare Penalty: Heterogeneous effects

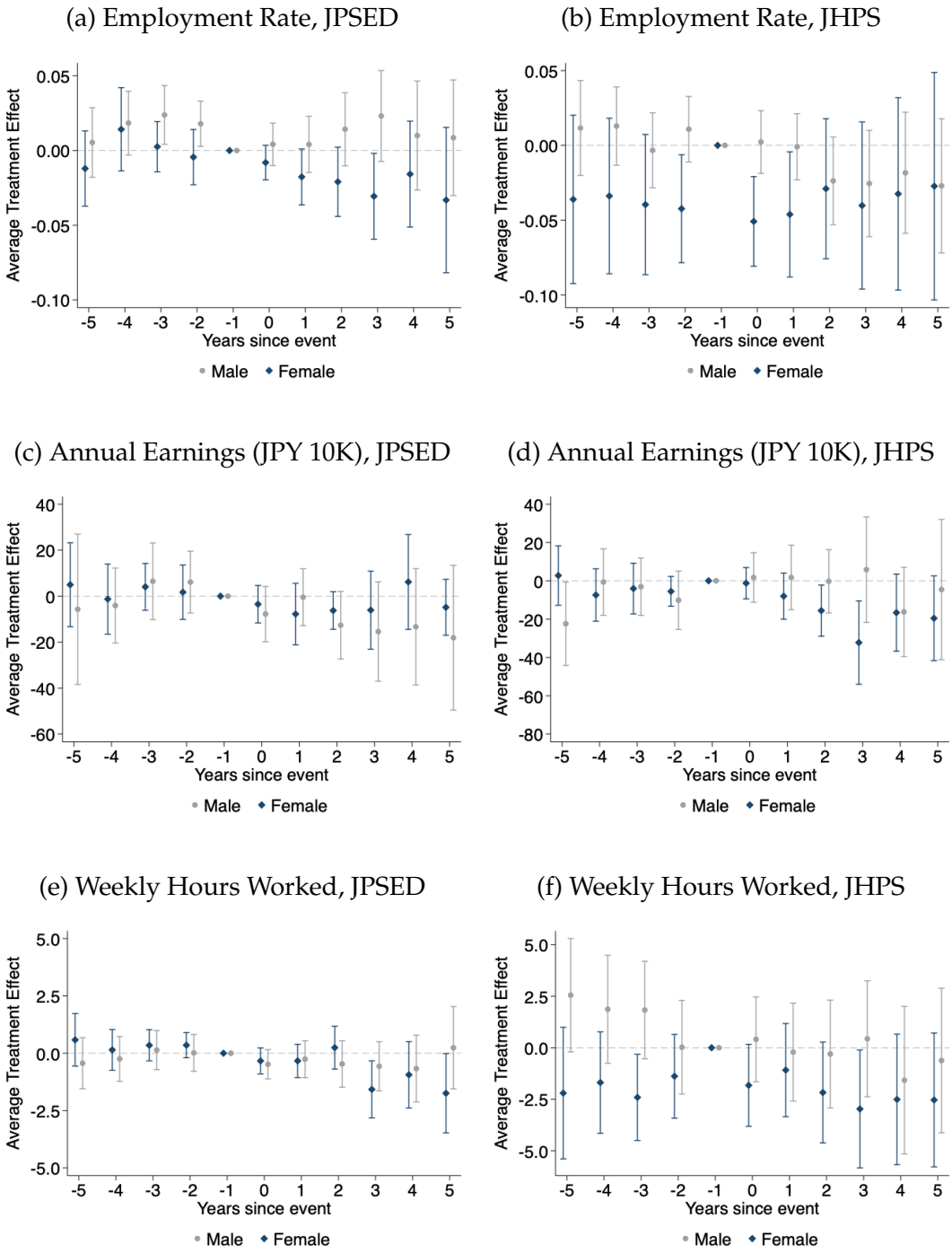
Figure 4 shows that the average effects of entering elder care on employment, earnings, and hours are close to zero, but these averages mask important heterogeneity. In the remainder of this subsection, I split the sample along the same predefined characteristics used for the childcare analysis—occupation-based task content (teleworkability, physical proximity, face-to-face discussion), contract type, firm size, and co-residence with parents—and compare treated and not-yet-treated workers within each group. Groups are fixed using pre-event information for treated individuals (their modal value before care begins), so post-event sorting cannot bias the estimates.

Figure 5 shows the results by different subgroups. Panel (a) explores how teleworkability affects mothers' employment. Post-event, females who were in low-teleworkability jobs before the birth see their employment fall sharply. Their employment rate drops by a peak of nearly 0.07 points in year +3. In contrast, females who were in high-teleworkability jobs before the birth face a smaller penalty. Their responses are not statistically significant, and the 95% confidence intervals often include zero.

Panel (b) investigates the impact of *face-to-face discussion* requirements. Both groups show negative responses, and the peaks are around 5% in years +1 and +2. There is no difference between the two groups based on the importance of face-to-face discussion in their occupations.

Panel (c) focuses on *physical proximity* requirements at work. High physical contact jobs are associated with larger employment declines for mothers. Females in jobs with low physical proximity requirements experience a smaller penalty, which is not statistically distinguishable from zero. This indicates that the importance of physical contact is significant in the eldercare effect on employment.

Figure 4: Eldercare Penalty



Note: This figure shows event-study coefficients for employment, annual earnings (in JPY 10,000s), and weekly hours worked for males and females around the onset of caregiving needs. The x-axis represents years since the event, with year 0 being the year of the onset. Estimates are derived from JPSED and JHPS data. The estimation follows Callaway and Sant'Anna (2021), implementing a doubly robust DiD estimator based on IPW and OLS. All regressions are weighted by sample weights. The control groups are the not-yet-treated. Covariates include age, age squared, and a dummy variable for having a partner. The bars represent 95% confidence intervals.

Panel (d) differentiates based on pre-birth *regular worker* status. Mothers who held regular contracts before childbirth experience a statistically insignificant employment exit. Those on non-regular contracts see a larger decline, around 0.03 to 0.10 points in the initial years post-event.

Panel (e) explores differences by employer *firm size*. Penalties are notably larger for females working in small firms. Their employment rate drops by a significant 0.03 points from year +1 and persists at this level. For females in large firms ("Large firms - Yes", meaning $\geq$ 300 employees), the employment reduction is smaller, around 0.10 to 0.12 points, and in some post-event years, the effect is not statistically significant or is marginally so. This suggests that large firms might offer better job retention, possibly due to more structured leave policies or greater resources for accommodating working mothers.

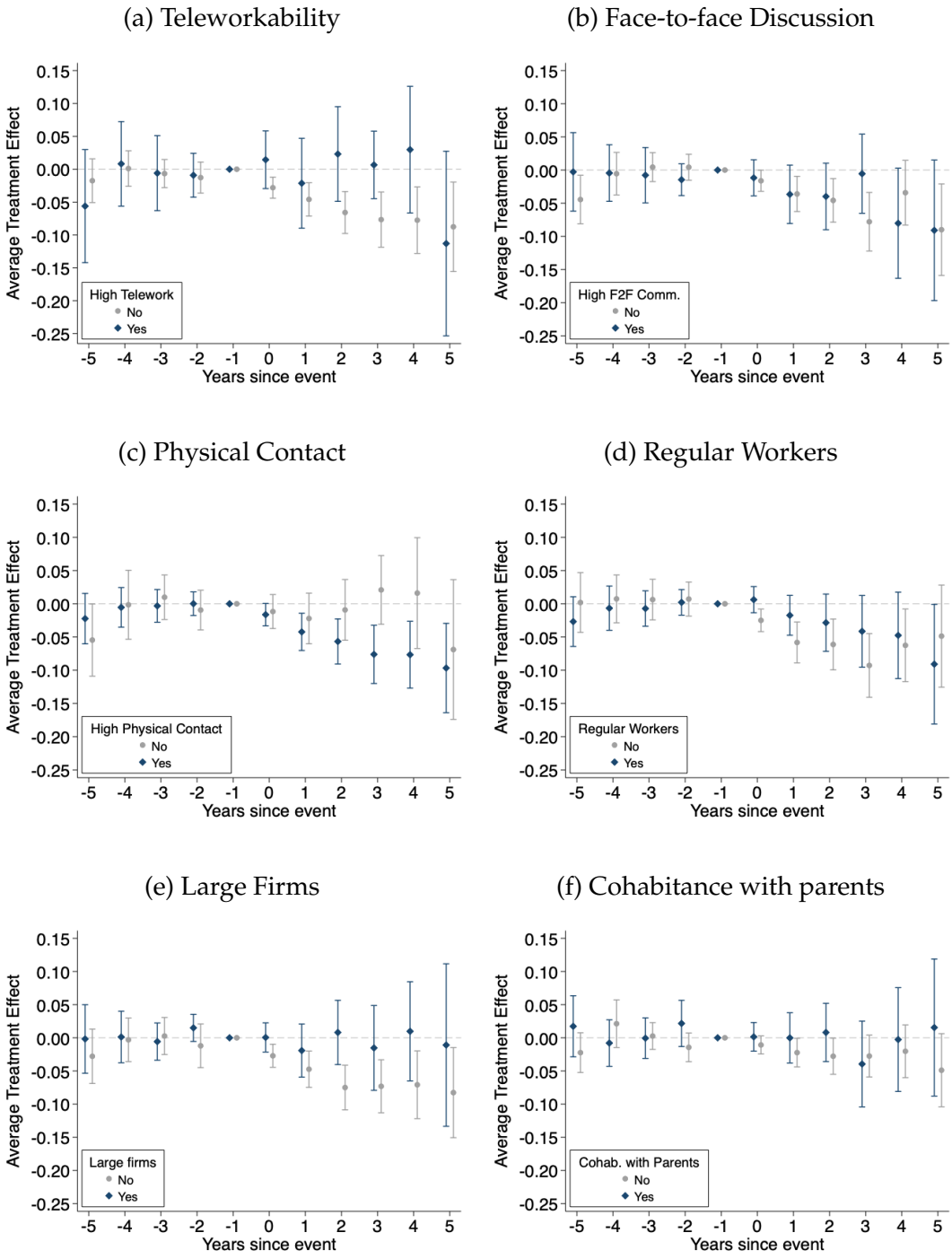
Panel (f) considers the effect of *cohabitation with parents*. Females cohabiting with their parents appear to face a smaller and less statistically significant employment penalty. While there is a slight dip, the point estimates are generally smaller (around -0.05 to -0.08) and often not statistically different from zero. In contrast, mothers not living with their parents experience a more substantial and statistically significant drop in employment, averaging around -0.15 to -0.18 points between year +1 and year +5.

Collectively, these heterogeneous analyses underscore that the eldercare penalty on female employment is not uniform. The effects observed vary across different subgroups of mothers. Specifically, the penalty is less pronounced or statistically insignificant for mothers in high-teleworkability jobs, those with low physical proximity requirements, those with regular contracts, and those cohabiting with parents. Conversely, a more substantial and statistically significant penalty is observed for mothers in low-teleworkability jobs, those in high physical proximity jobs, those on non-regular contracts, mothers employed in small firms, and those not cohabiting with parents. These findings indicate that specific job characteristics, contract types, firm environments, and household structures are associated with differing magnitudes of the eldercare penalty on female employment.

5 Conclusion

In conclusion, I find that motherhood imposes a substantial and persistent *childcare penalty* on females' employment in Japan. This employment loss after childbirth is large on average and heterogeneous across individual and job characteristics, indicating that some females face much steeper career costs of motherhood than others. By contrast, the labor market consequence of family eldercare, an *eldercare penalty*, is much smaller. My estimates suggest that, on average, the impact of an elderly parent's care needs on a female's

Figure 5: Eldercare Penalty, Heterogeneity (Female Employment, JPSED)



Note: This figure shows event-study coefficients for employment rates for females around the onset of caregiving needs. The x-axis represents years since the event, with year 0 being the year of the onset. Estimates are derived from JPSED and JHPS data. The control groups are the not-yet-treated. The comparisons are within each group by pre-event characteristics. The estimation follows Callaway and Sant'Anna (2021), implementing a doubly robust DiD estimator based on IPW and OLS. All regressions are weighted by sample weights. Covariates include age, age squared, and a dummy variable for having a partner. The bars represent 95% confidence intervals.

employment is close to zero and often not statistically significant. However, this modest average masks considerable heterogeneity: certain subgroups of females experience non-trivial employment declines when taking on caregiving responsibilities for elderly family members. Importantly, my event-study approach—accounting for the staggered timing of caregiving onset—was crucial in detecting these nuanced effects and avoiding biases that could arise with conventional estimators.

Looking ahead, my findings open two avenues for further research and policy analysis. First, the absence of a large average employment effect for eldercare should not be interpreted as zero welfare cost. Many females likely continue working while caregiving by increasing effort or sacrificing leisure and well-being, implying hidden burdens not captured by employment rates. Developing a structural model of females' labor supply and caregiving choices would help quantify these welfare implications, illuminating how caregiving affects utility, productivity, or health even when employment is maintained.

Second, my results have implications for the design of social policies to support working caregivers. Prior evidence shows that formal long-term care support can mitigate the burden of informal caregiving on labor supply. For instance, Fu et al. (2017) find that the introduction of Japan's public Long-Term Care Insurance in 2000 significantly increased labor force participation among family caregivers. Similarly, Mikoshiba (2025) uses a structural model to demonstrate that a generous universal LTC insurance program can enhance caregiver welfare while sustaining labor supply. Building on these insights, future work should explore how targeted policies, such as improved caregiver leave provisions, flexible work arrangements, and expanded access to formal care services, could reduce the remaining labor market penalties of child-rearing and eldercare in Japan.

References

Acemoglu, D., Mühlbach, N. S., and Scott, A. J. (2022). The rise of age-friendly jobs. *The Journal of the Economics of Ageing*, 23:100416.

Angelov, N., Johansson, P., and Lindahl, E. (2016). Parenthood and the gender gap in pay. *Journal of Labor Economics*, 34(3):545–579.

Baker, A. C., Larcker, D. F., and Wang, C. C. (2022). How much should we trust staggered difference-in-differences estimates? *Journal of Financial Economics*, 144(2):370–395.

Bolin, K., Lindgren, B., and Lundborg, P. (2008). Your next of kin or your own career? caring and working among the 50+ of europe. *Journal of Health Economics*, 27(3):718–738.

Borusyak, K., Jaravel, X., and Spiess, J. (2024). Revisiting event-study designs: robust and efficient estimation. *Review of Economic Studies*, 91(6):3253–3285.

Callaway, B. and Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225(2):200–230.

De Chaisemartin, C. and d'Haultfoeuille, X. (2023). Two-way fixed effects and differences-in-differences with heterogeneous treatment effects: A survey. *The Econometrics Journal*, 26(3):C1–C30.

Dingel, J. I. and Neiman, B. (2020). How many jobs can be done at home? *Journal of Public Economics*, 189:104235.

Fu, R., Noguchi, H., Kawamura, A., Takahashi, H., and Tamiya, N. (2017). Spillover effect of japanese long-term care insurance as an employment promotion policy for family caregivers. *Journal of Health Economics*, 56:103–112.

Fukahori, R., Sakai, T., and Sato, K. (2015). The effects of incidence of care needs in households on employment, subjective health, and life satisfaction among middle-aged family members. *Scottish Journal of Political Economy*, 62(5):518–545.

International Labour Organization (2018). Ilo labour force estimates and projections (lfep) 2018: Key trends. Statistical brief, International Labour Organization (ILO). Accessed: 2025-06-07.

Japan Institute for Labour Policy and Training (JILPT) (2025). Occupational information database: Simple numerical download data, version 3.0. Downloaded from the Job Tag website on 3 June 2025 and processed by the author. URL: https://shigoto.mhlw.go.jp/User/download.

Kikuzawa, S. and Uemura, R. (2021). Parental caregiving and employment among midlife women in japan. *Research on Aging*, 43(2):107–118.

Kleven, H., Landais, C., and Leite-Mariante, G. (2024). The child penalty atlas. *Review of Economic Studies*, page rdae104.

Kleven, H., Landais, C., and Søgaard, J. E. (2019). Children and gender inequality: Evidence from denmark. *American Economic Journal: Applied Economics*, 11(4):181–209.

Kohara, M. and Ohtake, F. (2011). Altruism and the care of elderly parents: evidence from japanese families. *Japanese Economy*, 38(2):3–18.

Maestas, N., Messel, M., and Truskinovsky, Y. (2024). Caregiving and labor supply: New evidence from administrative data. *Journal of Labor Economics*, 42(S1):S183–S217.

Mikoshiba, M. (2025). Universal insurance with in-kind transfers: The welfare effects of long-term care insurance in japan. Discussion Paper 25-E-030, Research Institute of Economy, Trade and Industry (RIETI). March 2025.

Mongey, S., Pilossoph, L., and Weinberg, A. (2021). Which workers bear the burden of social distancing policies? *Journal of Economic Inequality*, 19(3):509–526.

Okuyama, Y., Murooka, T., and Yamaguchi, S. (2025). Unpacking the child penalty using personnel data: How promotion practices widen the gender pay gap. *IZA Discussion Paper*, (17673).

Organisation for Economic Co-operation and Development (OECD) (2024). *Society at a Glance 2024: OECD Social Indicators*. OECD Publishing, Paris, 10th edition. Published 20 June 2024.

Oshio, T. and Usui, E. (2017). Informal parental care and female labour supply in japan. *Applied Economics Letters*, 24(9):635–638.

Oshio, T. and Usui, E. (2018). How does informal caregiving affect daughters' employment and mental health in japan? *Journal of the Japanese and International Economies*, 49:1–7.

Roth, J., Sant'Anna, P. H., Bilinski, A., and Poe, J. (2023). What's trending in difference-in-differences? a synthesis of the recent econometrics literature. *Journal of Econometrics*, 235(2):2218–2244.

Statistics Bureau of Japan (2025). Consumer price index for all goods. https://www.e-stat.go.jp/dbview?sid=0003427113. e-Stat database; Accessed: June 12, 2025.

Yamada, H. and Shimizutani, S. (2015). Labor market outcomes of informal care provision in japan. *The Journal of the Economics of ageing*, 6:79–88.