Job Displacement and the Mental Health of Households: Burden Sharing Counteracts Spillover*

Yuejun Zhao†

School of Economics, University of Edinburgh, United Kingdom

Abstract

In this paper, I investigate the mental health effects of job displacement in 1-adult and 2-adult households. In a 1-adult household, if a worker loses a job unexpectedly, they can experience significant mental health deterioration. In a 2-adult household, the deterioration may be less severe for the displaced worker due to burden and risk sharing with the partner. However, in this 2-adult household, there exists the additional risk of the partner's unemployment, which could be detrimental to the worker's mental health. I compare the overall burden in 1- and 2-adult households and find no statistically significant difference, because the distress associated with the partner's displacement is offset by the lower distress upon own displacement. Regarding gender differences, I find that job displacement upsets male workers more than female workers in 2-adult households, but not in 1-adult households. These results offer fresh insights into unemployment shocks, the crucial role of partner support, and how the gender gap in mental health can be linked to household structure.

Keywords: shared burden, involuntary job loss, mental well-being, household composition, gender heterogeneity

JEL codes: I12, J12, J64

* Declarations of interest: none. Appreciation goes to the editor, Daniel Bennett, and two anonymous referees for insightful comments. I would like to thank my doctoral supervisor, Brett Inder, for advice and guidance. This work benefited tremendously from discussions with Paweł Gola. I would also like to thank Natalia Bailey, Claire de Oliveira, Denzil Fiebig, Gustav Kjellsson, Daniel D. Schnitzlein, Denni Tommasi, Farshid Vahid-Araghi, and Eugenio Zucchelli for valuable feedback and suggestions. I am grateful to Jan Marcus for making his Stata codes available online. Comments received at seminars and conferences in Melbourne, Oslo, Gothenburg, Rotterdam, and Essen are gratefully acknowledged.

† Email: yuejun.zhao1@gmail.com. This work was drafted in E853B, 21 Chancellors Walk, Clayton VIC 3800, Australia.

1 Introduction

When job displacement occurs, the distress levels of displaced workers and their partners elevate as a result.[1] Considerable research has linked job displacement—that is, workers being fired or made redundant unexpectedly, despite their willingness to work at the prevailing wage (e.g., Shapiro and Stiglitz, 1984)—to the psychological well-being of the displaced (e.g., Kuhn et al., 2009; McInerney et al., 2013; Schaller and Stevens, 2015; Schiele and Schmitz, 2016). Recent studies also reveal that the well-being of the partner is similarly affected by unemployment or job stress (Clark, 2003; Siegel et al., 2003; Fletcher, 2009; Marcus, 2013; Mendolia, 2014; Bubonya et al., 2017a; Nikolova and Ayhan, 2019; Everding and Marcus, 2020). Hence, in a 2-adult household (that is, a household with two adult partners), workers are subject to a potential mental health spillover, because their partners may encounter job displacement, and displacement blues are contagious.

At the same time, there are mental health benefits to being part of a couple when losing one's job. From a burden-sharing perspective, displaced workers can seek emotional support from their partners.[2] From a risk- and income-sharing perspective, pooling wages with partners ensure household income will not drop to zero when workers encounter unemployment shocks (Mazzocco, 2004). Working partners can increase work hours to maintain household financial security (Kohara, 2010); non-working partners may choose to (or be compelled to) become employed to compensate for the income loss (e.g., Lundberg, 1985). In a 1-adult household (that is, a household with one adult member), a worker lacks the means of sharing the mental health burden or insuring against an income shock within the household. However, the worker is also spared the additional risk of a partner's displacement.

The first research question is then the following: Is there a mental health difference in having a partner when job displacement takes place? To motivate the research question, consider a hypothetical individual who can either form a 1-adult household or be part of a 2-adult household. In a 1-adult household, the individual loses their job involuntarily and incurs a mental health cost MH_1. In a 2-adult household, when the individual becomes displaced, the mental health repercussions are likely less severe because the psychological and financial load is shared with the partner. However, the individual's partner may experience involuntary job loss, which is shown to be detrimental to the individual's mental health. The expected mental health effect for the individual in this 2-adult household, is MH_2. The research question asks, given the tradeoff between own mental health gain and partner's mental health spillover, whether MH_2 is different from MH_1.

The second research question concerns gender: Do males undergo greater mental

[1] In this paper, the term "worker" refers to the partner who potentially experiences job displacement, and "partner" is the remaining member in a couple who could also be working.

[2] See, for instance, the framework proposed by Feeney and Collins (2015).

health challenges than females when displaced? The question is fueled by a few observations. Regardless of household type, the gender pay gap (e.g., Blau and Kahn, 1996; Watson, 2010) predicts a greater loss of income for males than for females. Consequently, male workers may confront bigger financial strains and more mental health problems. In terms of gender division of labor (Baker and Jacobsen, 2007), men have long been viewed and treated as the breadwinners of the family. The provider stress and gender perception of job loss are therefore different for men and women. In 1-adult households, however, the provider stress falls upon female workers and male workers in like manner. Hence, potential gender differences can become less clear-cut when examined in 1-adult households.

To answer these two questions—how the mental health toll of job displacement differs by household composition and gender—I make use of the Health, Income and Labor Dynamics in Australia (HILDA) survey from 2007 to 2019. I estimate the impact of job displacement separately for 1-adult and 2-adult households, men and women, and workers and partners. I match non-displaced workers with displaced workers to facilitate the comparison between the two groups. For each individual, I construct the difference in mental health across survey waves to track the changes in the individual's well-being during the treatment period. The empirical approach addresses selection issues through matching on observable characteristics, and it accounts for time-invariant unobservable characteristics through differencing. It does not, however, deal with selection on unobservable time-varying traits, nor does it address similarities across types of households and gender. These remain the limitations of the current empirical strategy.

The results indicate that there is no difference in the overall mental health cost of displacement between 1-adult and 2-adult households (p-value = 0.30 for males and 0.47 for females), notwithstanding the statistically significant spillover effects. This is largely owing to the fact that by having partners, displaced workers enjoy a discount on the emotional burden, and the discount is of similar size to any mental health spillover from the partners' potential unemployment. In fact, if one factors in the differences in the prevalence of job loss, a worker will likely benefit from being in a 2-adult household. Furthermore, on average, displaced male workers bear a greater psychological burden than displaced female workers from 2-adult households (p-value = 0.01). When I examine 1-adult households, however, the difference becomes negligible. I conjecture that the interplay of (relative) financial contribution to the household and gendered perception of job loss is accountable for the gender heterogeneity in 2-adult households. For men, job displacement appears to be linked to high distress independent of earnings or their relative contributions to household income.

The remainder of the paper is organized as follows. Section 2 surveys related literature. Section 3 introduces the data and variables and describes the methodology. Section 4 presents the summary statistics and conveys the key results. Section 5 discusses further

results. Section 6 concludes the paper.

2 Related literature

Much of this work's focus is devoted to the distinction, or lack thereof, between 1-adult and 2-adult households: Does household composition affect an individual's expected mental health after an unemployment shock? Regarding household composition and well-being, prior research offers two prominent views that appear contradictory. Studies such as Clark (2003) and Bünnings et al. (2017) advance understanding of the spillover burdens within households. In the meantime, the literature on risk-sharing directs attention towards how household members provide insurance against health shocks (Dercon and Krishnan, 2000) and wage shocks (Blundell et al., 2016). The current work reconciles the two views and examines whether the burdens of mental health spillover are counteracted by the benefits of partnership at the household level.

In the study of unemployment and mental health, one common specification involves the use of marital status as a conditioning variable (e.g., Theodossiou, 1998; Salm, 2009; Clark et al., 2010; McInerney et al., 2013; Wang et al., 2018). Helpful as this formulation can be, it does not account for the additional risk of partners' unemployment and the spillover distress that follows. Another set of specifications deals primarily with the spillover within the household, and for that reason, offers no comparisons between different partnership statuses. A typical example is Marcus (2013), a close cousin of the current study. The author concentrates on cohabiting spouses in the German Socio-Economic Panel Study and finds that unemployment is almost as detrimental to spouses as it is to workers. The current work draws inspirations from the conditioning of marital status in previous work, builds on Marcus' specifications, and expands the analysis in a methodologically important direction, by allowing a counterfactual analysis of 1-adult versus 2-adult household structures that takes into account both displacement-related distress and distress spillover.

Because of this unique counterfactual setup that bridges different types of households, there appear to be no directly comparable studies in the literature. Nevertheless, there are recent studies in labor economics appealing to 1-adult or 2-adult households separately. For 1-adult households with children, research typically concerns work search (Avram et al., 2018) and time investment (Mencarini et al., 2019) of the working adult. For 2-adult households, Winkelmann (2005) elaborates on the role of unemployment on parents' and children's subjective well-being, modeled as a joint distribution;[3] Booth and Van Ours (2009) map partners' employment type to family well-being; Mariotti et al. (2016) assess

[3] Winkelmann (2005) specifies a hierarchical ordered probit model with random effects for both individuals and households. Using the German Socio-Economic Panel data spanning 1984 and 1997, the author discovers that unemployment strongly predicts low household well-being.

job insecurity and risk sharing between couples.

With respect to general health, economists have also provided separate evidence for 1-adult and 2-adult households. To begin with, spousal bereavement is a stimulus of cognitive impairment (e.g., Zhao et al., 2021). Similarly, divorce underlies adverse changes in physical and mental health (Zulkarnain and Korenman, 2019). Meanwhile, Davillas and Pudney (2017) observe that there exists a concordance between partners' health states. In addition, chronic illness (Holmes and Deb, 2003), disability (Braakmann, 2014), and drug dependency (Noori et al., 2015) can induce spillover effects on the mental health of partners.

Taken together, these separate findings enrich the discussion of household heterogeneity. Another dimension examined in this paper, gender heterogeneity in unemployment distress, has been extensively observed in the literature (e.g., Theodossiou, 1998; Clark, 2003; Llena-Nozal et al., 2004; Cygan-Rehm et al., 2017). How this heterogeneity varies by household composition is the novel question that the current research seeks to answer.

3 Data and Method

3.1 Data

The analysis is based on data from the Household, Income, and Labor Dynamics in Australia (HILDA, v19) survey from 2007 to 2019. Respondents of the survey are chosen to form a representative sample of households living in private dwellings in Australia (Wilkins et al., 2021). To date, over 43,700 individuals have participated in the survey at least once.

The HILDA survey offers several advantages. First, for couple families, partners of the respondents also form part of the survey; they respond to survey modules and are linked to respondents from the same household. Second, the longitudinal nature of the survey allows users to track the changes in workers' and partners' mental health across survey waves. Third, in addition to labor dynamics and mental health, the survey encompasses a wide range of topics that include demographics, socio-economic conditions, physical health, and household characteristics.

What necessitates the use of observational data is the fact that for obvious ethical reasons, one cannot randomly assign job displacement to study mental health impacts. In HILDA, researchers have access to data on experiences of job displacement and the timing of displacement onset. The labor dynamics module also provides information on employment history, labor earnings, and job characteristics. Together with other individual and household characteristics, these variables ensure the proper accounting of various observable reasons for entry into unemployment (e.g., Clark et al., 2001).

3.2 Outcome measure

For the analysis, changes in the standardized Kessler Psychological Distress Scale or SK10 constitute the outcome variable. In the HILDA survey, the mental health module is centered on the (non-standardized) Kessler Psychological Distress Scale. The scale was designed as a short screening tool to monitor the prevalence and trends in psychological distress in surveys (Kessler et al., 2002).[4] It has well-established internal consistency, reliability, and validity (e.g., Hides et al., 2007; Searle et al., 2015). The scale has been widely adopted by health economists in related studies (e.g., Chatterji et al., 2007; Johnston et al., 2013; Nguyen and Connelly, 2018).

Since 2007, the scale has been incorporated into the HILDA survey as a biennial measure. In the survey, it reflects current mental status, since respondents are asked to report psychological symptoms in the four weeks immediately preceding the interview. The scale, on its own, serves as a non-specific measure of mental well-being. The 10 items under the scale provide a more detailed insight into different domains of well-being (e.g., depressed mood or anxiety). Appendix C presents the item inventory and delves into these domains of well-being.

For the regression analysis, I create SK10 by standardizing the scores to have a mean of 50 and a standard deviation (SD) of 10. I then construct the changes in SK10 scores between survey waves as the outcome of interest. Both workers and partners are modeled on changes in their reported SK10 scores.

3.3 Treatment and control groups

The treatment period is defined over two years—the interval at which the SK10 is surveyed in HILDA. I focus on households that provide valid SK10 scores both before $(t-2)$ and after (t) the treatment. Overall, the analysis pools six treatment periods from 2007 to 2019. The main specification estimates the *average* mental health effects of being displaced, with displacement onset at any possible point (0 to 24 months) over the pooled treatment period.

Workers report their treatment status in answer to the question "Did any of these happen to you in the past 12 months? Fired or made redundant by an employer." Respondents who experienced at least one such employment transition in the treatment period are considered treated. Due to low incidence, I do not analyze multiple displacement episodes as separate treatment categories. Before the treatment, workers are required to be in the labor force, employed, and aged between 18 and 65. For 1-adult households, I additionally require the adults have no partners. In 2-adult households, only partners who have been interviewed are included in the sample. After the treatment, workers

[4] In the sample, the correlation between the standardized scale (SK10) and life satisfaction is 0.42, and the correlation between SK10 and health satisfaction is 0.39.

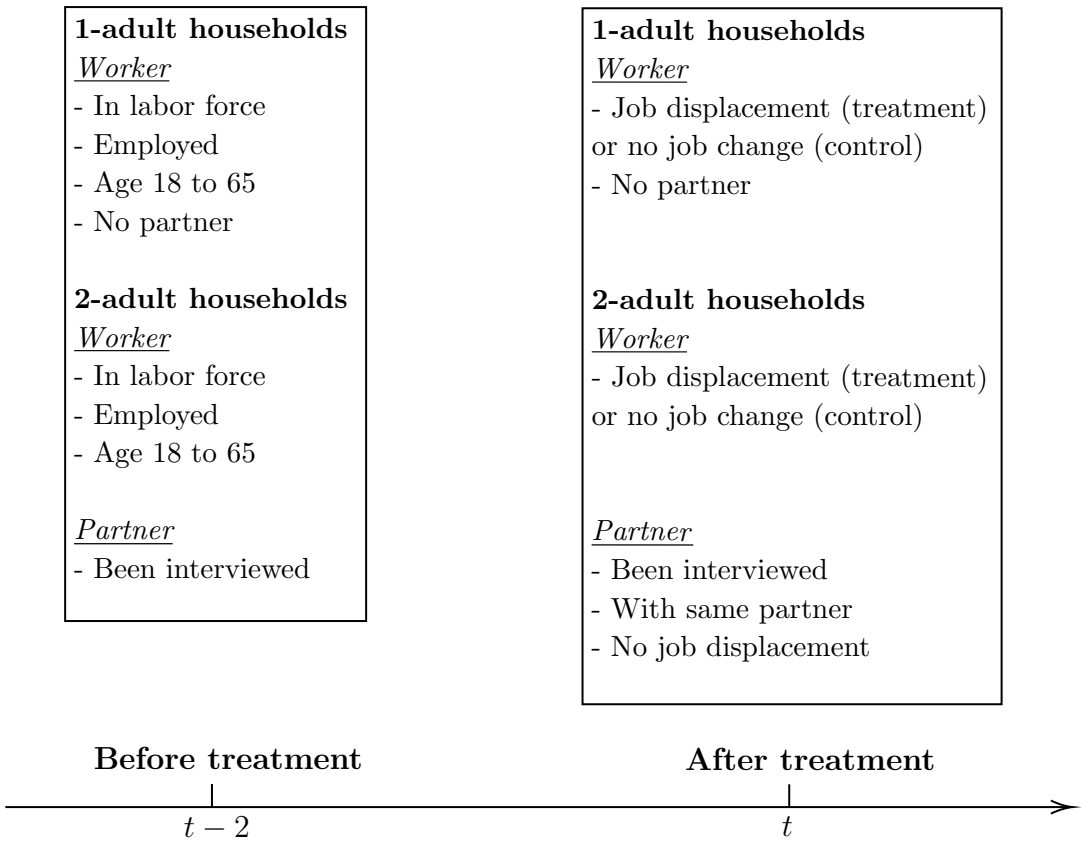

Figure 1: Inclusion criteria for the treatment and control groups. Different criteria apply to 1-adult and 2-adult households. The criteria also differ between time $t-2$ (before treatment) and time t (after treatment). Unless specified, the treatment and control groups share the same criteria.

who underwent job displacement should remain unemployed but have not exited the labor force. Meanwhile, the control group comprises workers who have not changed jobs between $t-2$ and t. I exclude partners who missed interviews, changed partners, or experienced job displacement themselves during the treatment period.

The final sample for analysis comprises 8191 households with one adult and 20058 households with two adults. The treatment group consists of 434 (530) households with one adult (two adults), in 222 (326) of which the displaced worker is male. I do not consider same-sex couples as there are only five pairs in the treatment group for the main specification, and only one pair for one alternative specification. In other words, I am unable to study these couples as a separate treatment group because of small sample size. I do include individuals with same-sex identity for 1-adult households, and bisexual or other identity for both types of households.

The definition of treatment and control groups inevitably points to a highly selective sample. As we shall see later, other types of employment transitions can also have an impact on mental health. The restrictions on job change and employment status thus ensure that the pure effects of job displacement can be more closely captured. The same

argument applies to a change in relationship status, namely, becoming single, becoming part of a couple, or changing partners in the current context. In other words, in order to partial out the effects of job displacement on the mental health of households, I restrict attention to a subset of the survey participants at the expense that they no longer constitute a representative sample of all households in Australia. Lastly, despite the fact that I pool job displacement across different types of employment, occupations, and industries to make it less sensitive to the definition, the risk of bias due to non-random assignment persists and remains a limitation of the paper, in common with virtually any study of a life event (such as labor market or health shocks) that cannot be the subject of a controlled experiment.

3.4 Covariates

The analysis includes a list of pre-treatment covariates, which can be classified as individual characteristics or household characteristics. The choice of variables parallels Marcus (2013) with additions and modifications due to differences in survey and study designs.

Individual characteristics comprise demographics (age, gender, non-English speaker status, and sexual identities), health (physical health and general health), education (secondary schooling, university degree, and vocational training), and labor market (earnings, never unemployed, years in paid work, company size, job security, occupation, industry, employment type, casual worker, and income share in household).

Household characteristics consist of dependent children, regional profile and locality (unemployment rate, neighborhood coherence, remoteness area, state, or territory), well-being (ranks on socio-economic status, economic resource, and education and career), life events, and cohabitation status. Table A.1 in Appendix A defines the covariates and specifies the subsets designated for different household compositions (one adult or two adults) and household roles (worker or partner).

3.5 Empirical approach

To estimate the effects of job displacement on the mental health of households, I execute a two-step procedure that involves first matching the control group with the treatment group to generate weights, and then running weighted least squares regressions. I estimate average treatment effect on the treated (ATT), where the mental health effects pertain to those who, or whose partner, actually experienced job displacement (Marcus, 2013).

In the first step, I match non-displaced households with displaced households using pre-treatment circumstances; see the covariates listed in Section 3.4. This ensures that the treatment and matched control groups are comparable in terms of observable characteristics. I divide the sample by household type and gender, creating four strata (1-adult male households, 1-adult female households, 2-adult households where the displaced worker is

male, 2-adult households where the displaced worker is female). Matching is performed for each stratum separately to reduce variability within groups and potentially improve the precision of matching.

To implement matching, I use entropy balancing developed by Hainmueller (2012).[5] It is a reweighting scheme that caters to large sets of conditions, produces smooth weights that are information-preserving, and reduces model dependence on selected covariates. It can balance multiple sample moments and has been shown to be doubly-robust (Zhao and Percival, 2017). For the current work, the first two sample moments are balanced, meaning for each covariate, the mean and variance of the matched control group equal those of the treatment group. The result of the matching step is a weight matrix with off-diagonal elements 0 and diagonal elements satisfying the aforementioned balancing constraints. Workers in the treatment group share a base weight of 1.

In the second step, I regress changes in SK10 on the treatment indicator and pre-treatment characteristics, applying the weights obtained from the matching step. The specification is given by

$$\widehat{\mathbf{W}}^{1/2}\Delta\mathbf{y} = \alpha\widehat{\mathbf{W}}^{1/2}\boldsymbol{\iota} + \gamma\widehat{\mathbf{W}}^{1/2}\mathbf{d} + \widehat{\mathbf{W}}^{1/2}\mathbf{X}\boldsymbol{\beta} + \widehat{\mathbf{W}}^{1/2}\boldsymbol{\varepsilon}, \tag{1}$$

where $\widehat{\mathbf{W}}^{1/2}$ is the square root of the weight matrix from entropy balancing, $\Delta\mathbf{y} = \mathbf{y}_t - \mathbf{y}_{t-2}$ is the change in SK10 score, $\boldsymbol{\iota}$ is a vector of 1s, $\mathbf{d}$ is the treatment indicator with $d_i = 1$ if worker i is displaced and 0 otherwise, $\mathbf{X}$ is the matrix of covariates that is used both for matching and conditioning, $\mathbf{W}^{1/2}\boldsymbol{\varepsilon}$ is the weighted error term. I estimate Equation (1) using (weighted) least squares and obtain $\widehat{\boldsymbol{\theta}} = \left(\widetilde{\mathbf{X}}'\widehat{\mathbf{W}}\widetilde{\mathbf{X}}\right)^{-1}\widetilde{\mathbf{X}}'\widehat{\mathbf{W}}\Delta\mathbf{y}$, where $\boldsymbol{\theta} = (\alpha, \gamma, \boldsymbol{\beta}')'$ and $\widetilde{\mathbf{X}} = [\boldsymbol{\iota}\ \mathbf{d}\ \mathbf{X}]$. The ATT parameter is given by γ.

The specification has two merits. First, the matching process reduces the bias in ATT that arise from covariate imbalance between the displaced and non-displaced. Second, by constructing the differences in SK10 before and after the treatment, I control for unobservable, time-invariant heterogeneity, imperfect examples being partner preferences and risk profile, in a manner similar to first differencing in the panel data literature.

The specification also has drawbacks. First, as a result of sample size constraints, it is not feasible to undertake panel data analysis on within-individual variations in mental health. Second, even though matching addresses selection on observables and differencing addresses selection on unobservables, selection issues likely persist because job displacement is a non-random assignment. More specifically, matching does not provide a perfect solution to selection on observables, especially between different types of households.[6]

[5] Entropy balancing weights are generated using the `ebalance` program (Hainmueller and Xu, 2013) in Stata 16.0.

[6] One example kindly given by the editor is that 1-adult households without children may, in a few years, become 2-adult households with children. While the separate matching strategy enhances comparability within the two individual groups, it does not deal with the similarities between the two groups over time. One solution is again panel data analysis, where one observes enough individuals who are treated both in 1-adult households without children and in 2-adult households with children.

Furthermore, unobservable time-varying traits such as ability, employability, and perception have not been accounted for. Workers may become less employable or perceive themselves to be less employable after job displacement, and in turn, suffer from poorer mental health.

4 Results

4.1 Descriptive statistics

Table 1 reports the descriptive statistics of selected covariates conditional on treatment and matching status. Sample means for covariates in the treatment group, unmatched control group, and matched control group are presented. I further quantify and test the difference between the treated and unmatched controls. Significant differences necessitate the matching step, as they reflect marked contrast between the treated and controls in terms of mean characteristics. Statistics are presented separately by household type (1-adult or 2-adult households), gender (male or female), and household role (worker or partner).

In 1-adult households, compared to the control group, male workers from the treatment group report lower average job security (by 1.7 points on a 20-point scale) and work more often on a casual basis (by 16.6 percentage points). Female workers in the treatment group are less likely to have a university degree (21.2% versus 30.6%) and earn, on average, 8000 AUD less per year than their non-displaced counterparts before the treatment.

For workers from 2-adult households, these differences are also observed to different extents. In addition, workers with partners in the treatment group are generally more advanced in age (by 2 to 2.2 years) and have on average 0.2 to 0.3 fewer dependent children (included as dummy variables) than their counterparts in the control group. Partners of displaced male workers are more likely to be unemployed before the treatment than partners of non-displaced male workers (34.4% versus 22.6%). Even though males and females are not directly compared in the table, one observes that regardless of treatment status, no more than 35% of female partners are employed, while over 70% of male partners are employed prior to the treatment.

The "treated" column, together with the "matched controls" column, demonstrates that for all covariates displayed here, exact matching of the first sample moment has been achieved through entropy balancing. The same was achieved for the remaining covariates that are not displayed. Put differently, after matching, the means of all covariates are identical between the treatment and control groups. Note that for these covariates, the matching algorithm also balances the second sample moment, which is not reported here.

Table 1: Descriptive statistics for selected pre-treatment covariates.

	Male displacement				Female displacement			
Pre-treatment variable	Treated	Unmatched controls	Matched controls	Difference	Treated	Unmatched controls	Matched controls	Difference
1-adult households, workers								
Age (in years)	40.1	38.8	40.1	1.3	42.4	42.0	42.4	0.4
Non-English†	7.2	7.0	7.2	0.2	8.0	8.6	8.0	-0.6
University degree†	15.8	17.8	15.8	-2.0	21.2	30.6	21.2	-9.4***
Labor earnings (in 10000 AUD)	4.3	4.5	4.3	-0.2	3.1	3.9	3.1	-0.8***
Job security (0-20)	13.3	15.0	13.3	-1.7***	12.9	15.3	12.9	-2.4***
Casual worker†	36.9	20.3	36.9	16.6***	38.7	21.9	38.7	16.8***
Number of dependent children[a]	0.1	0.1	0.1	-0.0	0.3	0.3	0.3	-0.0
N	222	3673	3673	—	212	4084	4084	—
2-adult households, workers								
Age (in years)	46.1	43.9	46.1	2.2***	45.3	43.3	45.3	2.0***
Non-English†	12.9	9.7	12.9	3.2*	9.8	10.4	9.8	-0.6
University degree†	25.8	31.6	25.8	-5.8**	31.4	40.3	31.4	-8.9***
Labor earnings (in 10000 AUD)	7.4	6.4	7.4	1.0***	3.8	4.0	3.8	-0.2
Job security (0-20)	13.1	15.5	13.1	-2.4***	12.1	15.6	12.1	-3.5***
Casual worker†	20.9	7.5	20.9	13.4***	24.0	16.7	24.0	7.3***
Number of dependent children[a]	0.7	0.9	0.7	-0.2***	0.5	0.8	0.5	-0.3***
Household income share	0.6	0.6	0.6	0.0	0.4	0.4	0.4	-0.0
2-adult households, partners								
Age (in years)	44.1	42.3	44.1	1.8***	47.1	45.4	47.1	1.7**
Non-English†	15.0	11.1	15.0	3.9**	8.8	8.9	8.8	-0.1
Labor earnings (in 10000 AUD)	2.7	3.1	2.7	-0.4**	6.3	5.7	6.3	0.6
Unemployed†	34.4	22.6	34.4	11.8***	10.8	8.1	10.8	2.7
Employed full-time†	31.9	35.0	31.9	-3.1	71.6	76.2	71.6	-4.6
N	326	10535	10535	—	204	8993	8993	—

Notes: Descriptive statistics conditional on treatment and matching status for selected covariates. [a] Number of dependent children is included in the specification as dummy variables: no dependent child, one dependent child, two dependent children, three dependent children, and more than three dependent children. I perform separate matching for 1-adult households and 2-adult households, and males and females. "Treated," "unmatched controls," and "matched controls" present the means of covariates for the displaced, non-displaced, and non-displaced after matching, respectively. "Difference" tests the difference in means between the treatment and unmatched control groups for each covariate. A † indicates percentage mean. * p<0.10. ** p<0.05. *** p<0.01.

4.2 Main results on mental distress

Table 2 presents the main results for the displacement effects on the mental health of workers and partners. I pool respondents from all treatment periods and perform separate regression analysis based on household type (1-adult households and 2-adult households). I further slice the sample by gender, obtaining estimates specific to male and female unemployment, respectively. For 2-adult households, I distinguish between workers' well-being and partners' well-being.

In addition, for selected groups of estimates, I test the differences in mental health costs using seemingly unrelated regressions and report the p-values ("p-value of difference"). "Direct difference" tests, for a displaced worker, whether being in a 2-adult household provides better mental health buffers than being in a 1-adult household, setting aside for a moment the additional risk of the partner's displacement in a 2-adult household. "Household difference" contrasts the potential outcomes of hypothetical individuals who choose whether to form 1-adult households or be part of 2-adult households. First, it calculates, for a worker with a partner, the sum of mental health effects of own displacement and their partner's potential displacement, weighted by sample prevalence. It then tests whether the weighted sum—that is, the expected mental health loss if the worker has a partner—is different from the expected loss if the worker has no partner.[7] "Gender difference" compares across individuals. It tests whether displaced male workers are afflicted with greater emotional burden than displaced female workers. "Role difference" tests whether an individual from a 2-adult household is upset by job displacement to a lesser extent as a partner than as a worker.

Specification (1), "mean difference on $\mathbf{y}$," estimates $\mathbf{y} = \alpha\boldsymbol{\iota} + \gamma\mathbf{d} + \boldsymbol{\varepsilon}$, where $\mathbf{y}$ is the (non-differenced) mental health score after the treatment and the rest of the notations are as defined in Section 3.5. In words, it is the simple difference in average mental health impacts between the treated and the controls. The results in this column show that on average, displaced workers indeed experience higher levels of distress. This is especially true among female workers from 1-adult households (6.72 points or 67.2% of one SD), though no statistically significant gender difference is detected for either type of household (p-value = 0.96 for 1-adult households and 0.55 for 2-adult households). Meanwhile, I find significant mental health spillover in 2-adult households, with 2.36 points spillover for male displacement and 1.96 points spillover for female displacement.

[7] Consider the case of male displacement. Men choosing to form 1-adult households will experience, on average, $\hat{\gamma}_2$ elevation in distress. Assuming the prevalence of displacement is the same for workers with or without partners (this assumption is relaxed in Appendix B), we have that the prevalence of male displacement for 1-adult households is ρ_4—using ρ_2 will yield the same result. The weighted mental health effect is then $\widehat{\text{MH}}_1 = \hat{\gamma}_4\rho_2$. If these men were to choose to be part of 2-adult households, the average distress is $\hat{\gamma}_4$ if they were to become displaced, and $\hat{\gamma}_7$ if their partners were to become displaced. The prevalence of own displacement is ρ_4 and that of partner's displacement is ρ_7. The weighted mental health effects for males from 2-adult households, is then $\widehat{\text{MH}}_2 = \rho_4\hat{\gamma}_4 + \rho_7\hat{\gamma}_7$. To test whether having a partner carries any mental health implications, I test $H_1 : \text{MH}_1 \neq \text{MH}_2$.

Table 2: The effect of job displacement on mental health—main results.

Outcome	Mean difference on $\mathbf{y}$ (1)	Mean difference on $\Delta\mathbf{y}$ (2)	Adjusted difference on $\Delta\mathbf{y}$ (3)	Matched difference on $\Delta\mathbf{y}$ (4)	Main specification (5)
All households					
All displacement for workers (γ_1)	5.07***	1.76***	2.21***	2.32***	2.31***
	(0.40)	(0.34)	(0.35)	(0.37)	(0.35)
1-adult households					
Male displacement for workers (γ_2)	4.44***	3.03***	3.45***	3.76**	3.76***
	(0.83)	(0.88)	(0.86)	(1.60)	(1.28)
Female displacement for workers (γ_3)	6.72***	2.37***	2.71***	3.02**	3.02***
	(0.96)	(0.78)	(0.83)	(1.26)	(1.09)
2-adult households					
Male displacement for workers (γ_4)	3.80***	1.50***	1.79***	1.88***	1.88***
	(0.59)	(0.47)	(0.48)	(0.43)	(0.38)
Male displacement for partners (γ_5)	2.36***	0.98**	1.06**	1.00**	1.00***
	(0.60)	(0.47)	(0.46)	(0.43)	(0.37)
Female displacement for workers (γ_6)	3.93***	0.04	0.83	0.74*	0.74**
	(0.76)	(0.62)	(0.65)	(0.44)	(0.36)
Female displacement for partners (γ_7)	1.96***	0.68	0.62	0.64	0.64**
	(0.69)	(0.60)	(0.58)	(0.40)	(0.32)
p-value of difference					
Direct difference					
Males, $H_1 : \gamma_2 > \gamma_4$	0.26	0.06	0.05	0.13	0.08
Females, $H_1 : \gamma_3 > \gamma_6$	0.01	0.01	0.04	0.04	0.02
Household difference					
Males, $H_1 : \rho_4\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.47	0.35	0.26	0.40	0.30
Females, $H_1 : \rho_6\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.79	0.39	0.71	0.53	0.47
Gender difference					
1-adult households, $H_1 : \gamma_2 > \gamma_3$	0.96	0.29	0.27	0.36	0.33
2-adult households, $H_1 : \gamma_4 > \gamma_6$	0.55	0.03	0.12	0.03	0.01
Role difference					
Males, $H_1 : \gamma_4 > \gamma_7$	0.02	0.14	0.06	0.02	0.01
Females, $H_1 : \gamma_6 > \gamma_5$	0.05	0.88	0.61	0.67	0.69

Notes: The effect of job displacement on mental health. Pooled estimates as well as separate estimates for 1-adult and 2-adult households, males and females, and workers and partners are reported. Furthermore, the table presents p-values for Wald tests. "Direct difference" tests whether a displaced worker reports more distress in a 1-adult household than in a 2-adult household. "Household difference" tests whether being in a 1-adult household carries different mental health implications from being part of a 2-adult household when displacement occurs. "Gender difference" tests whether displaced male workers are more disturbed than displaced female workers. "Role difference" tests whether being a worker imposes higher mental health costs than being a partner. I use $\gamma_j, j = 1, \ldots, 7$ to denote the estimated coefficients and $\rho_j, j = 1, \ldots, 7$ to denote sample prevalence. Here, $\rho_1 = 0.034, \rho_2 = 0.057, \rho_3 = 0.049, \rho_4 = \rho_5 = 0.030$, and $\rho_6 = \rho_7 = 0.022$. The treatment group consists of 434 households with one adult and 530 households with two adults, 222 and 326 of which the displaced worker is male. The control group comprises 7757 households with one adult and 19528 households with two adults, 3673 and 10535 of which involve male workers who experienced no job change. The first four columns compare estimates for the mean difference in mental health, mean difference in changes in mental health, mean difference in changes in mental health with covariates, and matched difference in changes in mental health. The last column reports coefficients of Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Robust standard errors clustered on household IDs are in parentheses. * p<0.10. ** p<0.05. *** p<0.01.

Specification (2),"mean difference on $\Delta\mathbf{y}$," estimates $\Delta\mathbf{y} = \alpha\boldsymbol{\iota} + \gamma\mathbf{d} + \boldsymbol{\varepsilon}$. The departure from specification (1) is that I now model changes in mental health on the left-hand side of the equation. Under this specification, workers who are displaced face a less pronounced increase in mental distress than in specification (1). I conduct Wald tests on cross-equation differences (that is, for each estimate j under specification A, I find the corresponding estimate under specification B, and test whether $\gamma_j^A = \gamma_j^B, j = 1, \ldots, 7$).

Six out of the seven pairs report significant difference in ATT estimates, and the remaining pair concerns male workers from 1-adult households. Nevertheless, the effects under specification (2) remain positive and significant for all workers without partners, as well as male workers with partners. In 2-adult households, male displacement has a more substantial impact on mental health than female displacement; the difference between the two genders becomes statistically significant at the 5% level (p-value = 0.03).

Specification (3), "adjusted difference on $\Delta\mathbf{y}$," estimates $\Delta\mathbf{y} = \alpha\boldsymbol{\iota} + \gamma\mathbf{d} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$. It augments the previous specification by adding covariates as control variables. It appraises how job displacement affects changes in mental health, holding observable characteristics constant. The majority of the ATT estimates have become more sizeable compared to specification (2), with significant cross-equation difference detected for all displacement, male workers from 2-adult households, and female workers from 2-adult households. In the case of female workers from 2-adult households, the effect jumped from 0.4% to 8.3% of one SD. Direct difference between female workers from 1- and 2-adult households records a p-value of 0.04, which implies that under this specification, a female worker may be better off with a partner in terms of mental health outcomes, if one considers own displacement effects only.

Specification (4), "matched difference on $\Delta\mathbf{y}$," estimates $\widehat{\mathbf{W}}^{1/2}\Delta\mathbf{y} = \alpha\widehat{\mathbf{W}}^{1/2}\boldsymbol{\iota} + \gamma\widehat{\mathbf{W}}^{1/2}\mathbf{d} + \widehat{\mathbf{W}}^{1/2}\boldsymbol{\varepsilon}$. Put another way, I estimate weighted least squares where covariates are used to generate the weights but are not yet included as control variables. Most of the estimates have again increased in size in comparison with specification (3). The estimates under specification (4), however, cannot be directly compared to those under specification (3) using Wald tests because of the inclusion of regression weights. For female workers from 2-adult households, the ATT estimate has shrunk in magnitude (from 0.83 points to 0.74 points) but is more precisely estimated with a smaller standard error (0.44 as opposed to 0.65).

Finally, specification (5), "main specification," estimates Equation (1), which, compared to the previous column, contains the additional component $\widehat{\mathbf{W}}^{1/2}\mathbf{X}\boldsymbol{\beta}$. In words, I have included the covariates as control variables in addition to using them for matching. I have done so because while the ATT estimates are mean-independent of the covariates after matching, they are not variance-independent. Put differently, variations in the covariates can further help explain variations in the outcome variable, namely, changes in mental health. As expected, for the household- and gender-specific equations, the point estimates under specification (5) are identical to those under specification (4). The standard errors of the estimates, on the other hand, are smaller, suggesting that the ATT estimates with covariates are more precise with covariates than without covariates.

Under specification (5), job displacement exacerbates mental distress for all workers by 2.31 points or 23.1% of one SD on average. The impacts for males, females, workers, and partners from either type of household are all statistically significant, although the

impacts vary in size. Compared to the control group, male workers from the treatment group are expected to experience an average of 3.76 points increase in distress if they were from 1-adult households, and half of the increase in distress (1.88 points) if they were from 2-adult households. However, the difference is not statistically significant at the 5% level (p-value = 0.08). For female workers, the ratio is four (3.02/0.74), meaning the ATT is four times greater for workers without partners than for those with partners, and the difference is statistically significant (p-value = 0.02). If I pool male and female workers for each type of household (not reported), the mental health costs are more considerable for 1-adult households with a p-value of direct difference of 0.04. These findings are consistent with the view that when displacement occurs, a worker is less vulnerable as part of a 2-adult household, likely because of burden and risk sharing.

The tradeoff for workers from 2-adult households is that they have partners who can experience unemployment. For a male worker, even though his own metal health cost is 1.88 points, there exists the potential spillover of his partner's displacement distress, which comes to 0.64 points. For a female worker, the own mental health cost is 0.74 points, while the spillover is 1 point. Hence, for workers from 2-adult households, I weigh the two sources of mental health penalties using prevalence of displacement to find the average penalty. I then compare this to the average penalty for 1-adult households, assuming workers face the same likelihood of displacement regardless of household type. The comparison depicts a hypothetical person's mental health in one of the two potential states: as part of a 1-adult household or as a member of a 2-adult household. I find that for both male workers (p-value = 0.30) and female workers (p-value = 0.47), being part of a 2-adult household does not result in any difference in mental health, even with the tradeoff in place.

The gender comparison is more straightforward. I compare the average effects between male workers and female workers. Interestingly, I find that the two groups are similarly affected if they were from 1-adult households (p-value = 0.33). In contrast, in 2-adult households, displaced male workers, on average, experience a stronger detrimental effect than displaced female workers (p-value = 0.01). Gender differences are further highlighted by role comparisons. More specifically, in 2-adult households, whether the individual is a worker or a partner matters for males but not for females. For males, being a partner is less stressful than being a worker (p-value = 0.01), while for females, there is no such distinction (p-value = 0.69). These results imply that displaced male workers from 2-adult households value their role in the household as well as the earnings they bring in. I infer from the results in Appendix D that different perceptions of job loss between men and women could indeed contribute to the gender heterogeneity.

Taken together, the results in Table 2 suggest that unemployment distress affects all households. In particular, the psychological effects of involuntary job loss are (at least as sizeable as) more sizeable if a (male) female worker is from a 1-adult household. Then,

notwithstanding the risk of a mental health spillover from the partner's unemployment, a worker experiences similar distress in a 2-adult household as in a 1-adult household. This follows because in a 2-adult household, the discount from burden and risk sharing upon own displacement is comparable in size to the spillover of partner's potential displacement, and hence the two opposing effects cancel out. Moreover, in 1-adult households, male unemployment and female unemployment have a similar impact on mental health. In 2-adult households, there is a mental health disparity, as male workers are on average more troubled than female workers. Lastly, the main specification (specification 5) is superior to the other specifications, since it produces ATT estimates that are more precise and less sensitive to observable characteristics and unobservable time-invariant characteristics.

So far, I have concentrated on the implications of having a partner (burden and risk sharing versus mental health spillover). However, it is not the only distinction between 1-adult and 2-adult households. The two types of households also differ in the prevalence of job displacement.[8] For male workers from 1-adult households, the prevalence of displacement is 0.06, while for their counterparts from 2-adult households, it is 0.03. For female workers, the prevalence of displacement is 0.05 if they are from 1-adult households, and 0.02 if they are from 2-adult households.[9] Hence, is there a welfare gain to having a partner, considering that the two effects—the burden- and risk-sharing effect, and the prevalence effect—are both desirable? In Appendix B, I modify the household difference test to include the prevalence effect.[10] I observe that the p-value of (two-sided) difference is 0.05 for males and 0.07 for females. I then decompose the overall effect to find that for males, 29% of the difference arises from burden and risk sharing and 71% from the difference in prevalence; for females, 20% comes from burden and risk sharing and 80% from the difference in prevalence. I conclude that overall, workers from 2-adult households might be better off on average, largely because their likelihood of getting displaced is approximately halved when they have partners.

For hypothesis tests, I choose the significance threshold at 5% following common practice. The conclusions might change had I chosen a more conservative significance threshold such as 1% or a more lenient threshold such as 10%. Nevertheless, across specifications, I have consistent evidence showing that workers with and without partners bear similar mental health burden in the context of displacement blues and spillover.

[8] I would like to thank one referee for pointing out that the prevalence of job displacement might be different across types of households.

[9] The difference in prevalence is not driven by the fact that I exclude 2-adult households where both adults are displaced. If I were to include them, the prevalence would become 0.031 (versus 0.030) for male displacement and 0.024 (versus 0.022) for female displacement.

[10] This is achieved with invaluable help from Paweł Gola.

5 Further Results

5.1 Sensitivity analyses

Table 3 sets out assessing the sensitivity of the main results. Specifications (6) to (8) are all to be compared with specification (5), the main specification. The p-values of cross-equation differences, when not reported, are available from the author. Under specification (6), the placebo treatment is set to transpire two years earlier than the actual treatment. For this setup, I lag the outcomes and pre-treatment covariates by two years so that they precede the placebo job loss. I then match on the placebo treatment using lagged covariates to generate the weight matrix. The results show that the placebo displacement has no significant impact on mental well-being. This is reassuring as it suggests there is little difference in mental health trends between the treated and matched controls prior to the treatment.[11] For most pairs of estimates between the main specification and the placebo regression, I can reject the null of equality at 5% level of significance; see column "p-value of difference between (5) and (6)." This means that the placebo estimates are significantly different from the main estimates. The two exceptions are with male workers in 2-adult households, where the cross-equation differences are not striking, but the placebo estimates are close to zero nonetheless.

Specification (7) estimates the ATT using propensity score weighting. As discussed in Section 3.5, entropy balancing is implemented to simultaneously match the first two sample moments. Propensity score weighting, on the other hand, only corrects for mean differences. Consequently, I additionally include squares of cardinal covariates for comparability. In general, propensity score weighting yields similar results to entropy balancing. In fact, I am unable to reject the null of equality for any pair of estimates between specifications (5) and (7). Both the significance and magnitude of the estimates follow the main results closely. I reach the same conclusions for tests on direct, household, gender, and role differences.

Specification (8) includes all households that experienced job displacement irrespective of subsequent employment status of the displaced. That is to say, workers who become employed after the displacement are also deemed treated. The number of treated individuals has increased sharply. Meanwhile, the effects are smaller compared to the main specification (specification 5) by a fair amount. For instance, in 2-adult households, job displacement is now associated with an average deterioration of 0.82 points rather than 1.88 points in male workers' mental health (p-value of cross-equation difference = 0.02), and -0.29 points instead of 0.64 points in female workers' mental health (p-value of cross-equation difference = 0.01). This signals that the distress experienced by displaced workers can be ascribed in part to the state of being unemployed. In addition,

[11] Yet, it is still possible that workers with poor mental health self-select into unemployment. See Schmitz (2011) for a causal examination.

Table 3: The effect of job displacement on mental health—sensitivity analyses.

	Main specification (5)	Placebo regression (6)	p-value of diff. b/t (5) and (6)	Propensity score weighting (7)	Re-employed & unemployed (8)
All households					
All displacement for workers (γ_1)	2.31***	-0.41	0.00	2.08***	1.17***
	(0.35)	(0.42)		(0.34)	(0.21)
$N_{Treated}$	964	652		964	2337
1-adult households					
Male displacement for workers (γ_2)	3.76***	-1.96	0.01	3.44***	1.64**
	(1.28)	(1.75)		(1.27)	(0.74)
$N_{Treated}$	222	133		222	442
Female displacement for workers (γ_3)	3.02***	-0.72	0.03	2.74**	2.54***
	(1.09)	(1.36)		(1.08)	(0.61)
$N_{Treated}$	212	135		212	422
2-adult households					
Male displacement for workers (γ_4)	1.88***	0.75	0.08	1.83***	0.82***
	(0.38)	(0.50)		(0.38)	(0.29)
Male displacement for partners (γ_5)	1.00***	0.61	0.56	1.06***	0.42
	(0.37)	(0.55)		(0.35)	(0.30)
$N_{Treated}$	326	255		326	987
Female displacement for workers (γ_6)	0.74**	-0.68	0.02	0.47	0.27
	(0.36)	(0.48)		(0.37)	(0.24)
Female displacement for partners (γ_7)	0.64**	-0.26	0.04	0.65*	-0.29
	(0.32)	(0.30)		(0.34)	(0.21)
$N_{Treated}$	204	160		204	486
p-value of difference					
Direct difference					
Males, $H_1 : \gamma_2 > \gamma_4$	0.08	0.93		0.11	0.15
Females, $H_1 : \gamma_3 > \gamma_6$	0.02	0.51		0.02	0.00
Household difference					
Males, $H_1 : \rho_4\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.30	0.17		0.40	0.22
Females, $H_1 : \rho_6\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.47	0.60		0.50	0.06
Gender difference					
1-adult households, $H_1 : \gamma_2 > \gamma_3$	0.33	0.71		0.34	0.82
2-adult households, $H_1 : \gamma_4 > \gamma_6$	0.01	0.02		0.01	0.07
Role difference					
Males, $H_1 : \gamma_4 > \gamma_7$	0.01	0.04		0.01	0.00
Females, $H_1 : \gamma_6 > \gamma_5$	0.69	0.96		0.88	0.66

Notes: The effect of job displacement on mental health using alternative definitions and procedures as robustness checks. Pooled estimates as well as separate estimates for 1-adult and 2-adult households, males and females, and workers and partners are reported. The number of treated units for each specification is displayed next to $N_{Treated}$. All specifications estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Furthermore, the table presents p-values for Wald tests. "Direct difference" tests whether a displaced worker reports more distress in a 1-adult household than in a 2-adult household. "Household difference" tests whether being in a 1-adult household carries different mental health implications from being part of a 2-adult household when displacement occurs. "Gender difference" tests whether displaced male workers are more disturbed than displaced female workers. "Role difference" tests whether being a worker imposes higher mental health costs than being a partner. I use $\gamma_j, j = 1, \ldots, 7$ to denote the estimated coefficients and $\rho_j, j = 1, \ldots, 7$ to denote sample prevalence, where $\rho_4 = \rho_5$ and $\rho_6 = \rho_7$. Specification (5) reports the main results as in Table 2. Specification (6) assumes the displacement takes place two years earlier. Specification (7) weighs the observations using $1/(1 - \text{PS}(\widetilde{\mathbf{X}}))$, where $\text{PS}(\widetilde{\mathbf{X}})$ is the propensity score. Specification (8) includes all households that experienced job displacement irrespective of subsequent employment status of the displaced. Robust standard errors clustered on household IDs are in parentheses. * p<0.10. ** p<0.05. *** p<0.01.

the household difference becomes more pronounced for female workers. This suggests that various labor market conditions, examples being the prevalence of displacement (explored in Section 4.2) and the likelihood of re-employment, may well have an impact on the mental health of displaced individuals. The absence or presence of a partner is not

the sole distinction between 1-adult and 2-adult households.

Another point to note is that the estimates for female workers and their partners from 2-adult households are not statistically significant at the 5% level under alternative specifications (specifications 6 to 8). In Table 2, specifications (2) to (4) also produce insignificant estimates for these individuals. Therefore, while specification (5) suggests that job displacement has a significant impact on 2-adult households where the female worker is displaced, the significance should be interpreted with caution.

5.2 Types of employment transitions

Table 4 investigates several types of employment transitions and how they weigh on the mental health of workers and partners. The investigation is prompted by the question: Had the displacement or transition been anticipated or voluntary, would there remain an impact on mental health? I compare the estimates to the "main specification" (specification 5), where the displacement is unanticipated. Again, the p-values for cross-equation difference tests, when not presented, are available from the author.

Specification (9) zooms in on anticipated displacement, where treated workers are currently unemployed, but were neither displaced unexpectedly nor out of work voluntarily. In 2-adult households, partners of displaced males do not report any elevation in distress when the displacement is anticipated, unlike the case with unanticipated displacement (p-value of cross-equation difference = 0.00). However, displaced male workers from these households find anticipated displacement to be more influential than unanticipated displacement (p-value of cross-equation difference = 0.00). This makes intuitive sense, since job insecurity (controlled for in the current study) can be burdensome to workers (Bünnings et al., 2017). Household difference becomes statistically significant at the 5% level for males (p-value = 0.04) and females (p-value = 0.01), meaning the mental health difference between the two household structures is more distinct under anticipated displacement. Together, the results show that the *shock* factor of being fired or made redundant explains individuals' mental affliction to some extent. Another part of the impact stems from *the experience of* being displaced irrespective of prior knowledge of the displacement.

Voluntary unemployment (specification 10), in contrast to other unemployment events, inflicts little damage on the mental well-being of workers and partners. Cross-equation differences between unanticipated displacement (specification 5) and voluntary unemployment all produce a p-value of 0.00, except for female workers from 2-adult households (p-value = 0.30). Moreover, the majority of the ATT estimates are not statistically significant from zero. This further implies that a core feature of job displacement is its involuntariness—if individuals enter unemployment by choice, they may experience little or no distress. This concurs with the literature on early retirement (excluded from the

Table 4: The effect of employment transitions on mental health—types of employment transitions.

Outcome	Main specification (5)	Anticipated displacement (9)	Voluntary unemployment (10)	All unemployment (11)	Job change (12)
All households					
All displacement for workers (γ_1)	2.31***	1.49***	-0.05	1.61***	-0.54***
	(0.35)	(0.32)	(0.33)	(0.22)	(0.14)
$N_{Treated}$	964	1344	777	3085	4942
1-adult households					
Male displacement for workers (γ_2)	3.76***	1.90**	-2.01*	1.49*	-0.72**
	(1.28)	(0.77)	(1.06)	(0.84)	(0.35)
$N_{Treated}$	222	195	165	582	748
Female displacement for workers (γ_3)	3.02***	3.38***	0.40	3.16***	-0.86**
	(1.09)	(1.02)	(1.10)	(0.83)	(0.43)
$N_{Treated}$	212	268	217	697	1221
2-adult households					
Male displacement for workers (γ_4)	1.88***	4.01***	0.42	2.06***	-0.42**
	(0.38)	(0.20)	(0.29)	(0.20)	(0.20)
Male displacement for partners (γ_5)	1.00***	0.27	0.43	0.83***	-0.50**
	(0.37)	(0.19)	(0.27)	(0.18)	(0.20)
$N_{Treated}$	326	153	180	659	1591
Female displacement for workers (γ_6)	0.74**	0.16	0.57	0.48	-0.32
	(0.36)	(0.55)	(0.40)	(0.33)	(0.21)
Female displacement for partners (γ_7)	0.64**	0.57	-0.34	0.37	0.19
	(0.32)	(0.47)	(0.31)	(0.28)	(0.18)
$N_{Treated}$	204	728	215	1147	1382
p-value of difference					
Direct difference					
Males, $H_1 : \gamma_2 > \gamma_4$	0.08	1.00	0.99	0.75	0.78
Females, $H_1 : \gamma_3 > \gamma_6$	0.02	0.00	0.56	0.00	0.87
Household difference					
Males, $H_1 : \rho_4\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.30	0.04	0.09	0.20	0.26
Females, $H_1 : \rho_6\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.47	0.01	0.68	0.01	0.94
Gender difference					
1-adult households, $H_1 : \gamma_2 > \gamma_3$	0.33	0.88	0.94	0.92	0.41
2-adult households, $H_1 : \gamma_4 > \gamma_6$	0.01	0.00	0.62	0.00	0.64
Role difference					
Males, $H_1 : \gamma_4 > \gamma_7$	0.01	0.00	0.04	0.00	0.99
Females, $H_1 : \gamma_6 > \gamma_5$	0.69	0.58	0.39	0.82	0.26

Notes: The effect of different types of employment transitions on the mental health of households. Pooled estimates as well as separate estimates for 1-adult and 2-adult households, males and females, and workers and partners are reported. The number of treated units for each specification is displayed next to $N_{Treated}$. All specifications estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Furthermore, the table presents p-values for Wald tests. "Direct difference" tests whether a displaced worker reports more distress in a 1-adult household than in a 2-adult household. "Household difference" tests whether being in a 1-adult household carries different mental health implications from being part of a 2-adult household when displacement occurs. "Gender difference" tests whether displaced male workers are more disturbed than displaced female workers. "Role difference" tests whether being a worker imposes higher mental health costs than being a partner. I use $\gamma_j, j = 1, \ldots, 7$ to denote the estimated coefficients and $\rho_j, j = 1, \ldots, 7$ to denote sample prevalence, where $\rho_4 = \rho_5$ and $\rho_6 = \rho_7$. Specification (5) reports the main results (unanticipated displacement) as seen in Table 2. Specifications (9) to (12) display the results for anticipated displacement (the treated workers are not displaced unexpectedly or unemployed voluntarily), voluntary unemployment (voluntarily inactive, studying, traveling, or working in an unpaid voluntary job), all unemployment (unanticipated displacement, anticipated displacement, and voluntary unemployment aggregated), and voluntary job change, respectively. Robust standard errors clustered on household IDs are in parentheses. * p<0.10. ** p<0.05. *** p<0.01.

sample) and health benefits (Hallberg et al., 2015). Specification (11) combines unanticipated displacement, anticipated displacement, and voluntary unemployment. With few exceptions, the inclusion of anticipated displacement and voluntary unemployment

renders the effects smaller but significant nonetheless. For female workers and their partners from 2-adult households, the effects remain negligible across specifications, meaning these treated individuals are, on average, not influenced by other types of employment transitions.

A job change (specification 12) does not have a bearing on the mental well-being of female workers and their partners from 2-adult households. In fact, it is associated with enhanced mental health among all workers from 1-adult households, as well as male workers and their partners from 2-adult households. I do not reject the null hypothesis for direct, household, gender, or role difference tests. All cross-equation differences between specifications (5) and (12) are statistically significant with p-values < 0.02, which could be ascribed to one of two factors: the nature of the job change being voluntary once again, or workers remaining employed after a job change but not following a job loss.

Overall, the results in Table 4 indicate that the definition of job displacement is reasonable, since a relaxed definition (that is, all unemployment) delivers similar results. Workers more likely self-select into other forms of unemployment than unanticipated displacement. At the same time, most of the estimates for other forms of unemployment are no larger than estimates for unanticipated displacement. Together, these suggest that selection into job displacement would lead to underestimated rather than overestimated ATTs. Moreover, the shock of displacement together with its involuntariness lie at the heart of workers' and partners' distress. Meanwhile, being prepared for unemployment and staying employed after a job change can ease the distress to varying extents.

5.3 Other considerations

In Appendix C, I dissect the mental health index and study how specific domains of well-being—depressed mood, motor agitation, fatigue, worthless guilt and anxiety—respond to job displacement. The results recognize that depressed mood is present for all workers and partners, while the other domains affect household members differently. In 1-adult households, worthless guilt affects men and women to similar degrees; in 2-adult households, male workers experience greater worthless guilt than female workers. This lends credence to the interpretation that if female workers are part of 2-adult households in Australia, it is somewhat acceptable, on a mental health level, for them to not work.

In Appendix D, I explore the mechanisms through which displacement blues transpire. I find that attaining more education helps male workers and male partners in 2-adult households cope with job loss, and residing in major cities tend to provide mental health benefits to male partners in 2-adult households. Furthermore, pre-treatment earnings matter not only in comparison with other workers, but also in relation to the partners' financial contribution to the household. Men suffer mental distress regardless of how much they contribute to household income, whereas women experience displacement blues only

if they earn less than 25% or between 50 and 75% of the household income. These findings suggest that gender heterogeneity is driven by a combination of men earning more on average, the provider stress, and a gendered perception of job loss.[12]

6 Conclusion

This paper establishes how job displacement influences the mental well-being of households in varying ways and to varying degrees. It relies on longitudinal data from the Household, Income and Labor Dynamics in Australia (HILDA) survey between 2007 and 2019. It engages entropy balancing to enhance the comparability of households experiencing displacement and those experiencing no job change. Crucially, it analyzes 1-adult and 2-adult households, males and females, and workers and partners, offering a compelling account of the differences that arise from household composition and gender.

The results uniquely highlight the benefit of burden and risk sharing in 2-adult households. First, I establish that when a worker becomes unemployed involuntarily, psychological consequences are present regardless of household composition. Then, I present evidence that in a 2-adult household, there exists a mental health spillover if the worker's partner loses a job. Finally, I take a critical step to demonstrate that even with the added risk of the partner's displacement and distress spillover, the worker's well-being would not be significantly different if they were part of a 2-adult household or a 1-adult household. This arises because even though the additional mental health risk exists in a 2-adult household, it is counteracted by the discount on distress coming from burden sharing and risk sharing with the partner when the worker gets displaced.

Beyond burden sharing and risk sharing, there are a few more ways a partner could contribute to the mental health experience after job displacement. First, partners can offer social support on top of emotional support. The loss of collegial contact (Stauder, 2019) may affect workers without partners more than it does workers with partners.[13] Second, partners can offer tips on job search and help the displaced access hidden job opportunities in their networks (Topa, 2011), thereby enhancing the (perceived or actual) job prospects of the displaced. Third, displaced workers from 2-adult households can switch roles with their partners; they can devote more attention to household production (Gimenez-Nadal and Molina, 2014) and possibly benefit from the preoccupation. Lastly, having a partner is associated with reduced risk of job loss in the sample, and once I take this into account, displaced workers appear to be faring better in 2-adult households than in 1-adult households.

[12] I would like to thank one referee for pointing out that gender differences may be due to gender or aspects correlated with gender such as earnings.

[13] A whole other set of conditions could come into play, namely, the non-spousal social support that workers receive. Future work can thus bring an array of focus to the broader concept of social support.

With respect to gender heterogeneity, the results demonstrate that in 1-adult households, displaced male workers face a greater mental health sting than displaced female workers, but the difference is not statistically significant. In 2-adult households, however, male workers are significantly more distressed than female workers upon involuntary job loss. Gender differences in pay, division of labor, and the perception of job loss could all contribute to the mental health gap in 2-adult households. In addition, there is evidence unpacking the unfavorable impact of female employment on male partners' mental health (e.g., Kessler and McRae, 1982). More generally, men and women have different susceptibility to mental distress (Kessler, 2004); significant life events such as an unemployment shock may trigger more distress in men than in women. Together, current results and existing literature demonstrate that the gender dimension should be examined in conjunction with the household dimension for a full understanding of psychological distress following involuntary job losses.

The findings of this paper should be regarded in light of a few limitations. First, the estimates likely suffer from downward biases due to sample attrition from workers suffering severe unemployment distress (Barnay, 2016; Classen and Dunn, 2012), selection on unobservables, and the exclusion of 2-adult households where both partners are displaced. Second, the research design dictates that the results pertain to the short-run impact (up to two years) of job displacement on mental well-being. The complex long-run psychological implications of an unemployment shock therefore remain to be addressed. Third, even though the covariates are carefully chosen, the specification does not preclude confounding effects or omitted variable bias. Related to the point is the incomplete set of pre-treatment conditions, from which variables such as tenure status and mortgage payment are missing due to limited data availability. As a result, a worker's propensity to be displaced may not have been fully captured.

In looking closely at related work, it quickly becomes clear that current results pose unanswered questions regarding potential cross-country differences. In Marcus (2013), both male and female unemployment adversely impact the mental health of workers and cohabiting spouses in Germany. The present study finds that, in Australia, displaced workers from 1-adult households are burdened with distress regardless of gender. In 2-adult households, however, female displacement tends to have a weaker influence on workers and their partners than male displacement.[14] Future work on displacement spillover could also branch into unemployment spells, income protection schemes, multiple displacement events, variations in treatment timing, and their impact on other aspects of

[14] This could be attributed to the fact that between countries, female labor force participation and family composition generally vary, and thus displacement-related mental health spillover through these predictors may also vary. In particular, Australia spends 0.60% of its GDP in public unemployment compensation, whereas in Germany, 0.86% of GDP is spent on public unemployment (Organisation for Economic Co-operation and Development (OECD), 2018b). Furthermore, the average size of households is 2.56 for Australia and 2.00 for Germany (Organisation for Economic Co-operation and Development (OECD), 2018a).

health such as body weight and substance use. It might also be instructive to examine the endogenous anticipation of unemployment and its effects on the psychological adjustment of workers, their families, or individuals in the same network.

In summary, the work offers novel perspectives on job displacement and psychological well-being. It demonstrates that the extent to which job displacement impinges on individuals' mental health depends critically on household type, gender, the role in the household, and the type of unemployment. From an empirical standpoint, the research challenges existing views on mental health spillover and identifies the phenomena of burden sharing and risk sharing within 2-adult households. It offers practical implications on the importance of partnership in mediating the unemployment experience. It also broadens understanding about gender heterogeneity in psychological resilience when workers confront adverse labor market experiences.

Data availability statement

The data that support the findings of this study are funded by the Australian Government Department of Social Services (DSS). Restrictions apply to the availability of these unit record data, which were used under license for this study. Data are available at `https://dataverse.ada.edu.au/dataverse/hilda` with the permission of the Melbourne Institute of Applied Economic and Social Research. This paper represents the opinions of the author and is not intended to represent the views of either the DSS or the Melbourne Institute.

References

American Psychiatric Association, 1987. Diagnostic and statistical manual of mental disorders, revised third edition (DSM-III-R). Washington, DC.

Australian Bureau of Statistics, 2001a. Census of population and housing: Socio-economic indexes for areas. Information paper, ABS cat. no. 2039.0.

Australian Bureau of Statistics, 2001b. Information paper: Use of the Kessler Psychological Distress Scale in ABS health surveys. ABS cat. no. 4817.0.55.001.

Australian Bureau of Statistics, 2006a. Australian and New Zealand Standard Classification of Occupations (ANZSCO). First edition, ABS cat. no. 1220.0.

Australian Bureau of Statistics, 2006b. Australian and New Zealand Standard Industrial Classification (ANZSIC). Revision 2.0, ABS cat. no. 1292.0.

Australian Bureau of Statistics, 2011. Australian Statistical Geography Standard (ASGS). ABS cat. no. 1270.0.55.001.

Australian Bureau of Statistics, 2020. Labour force, Australia, detailed. ABS cat. no. 6291.0.55.001.

Avram, S., Brewer, M., Salvatori, A., 2018. Can't work or won't work: Quasi-experimental evidence on work search requirements for single parents. Labour Econ. 51, 63–85. doi:10.1016/j.labeco.2017.10.002.

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

Barnay, T., 2016. Health, work and working conditions: A review of the European economic literature. Eur. J. Health Econ. 17, 693–709. doi:10.1007/s10198-015-0715-8.

Belloni, M., Carrino, L., Meschi, E., 2022. The impact of working conditions on mental health: Novel evidence from the UK. Labour Econ. 76, 102176. doi:10.1016/j.labeco.2022.102176.

van den Berg, G.J., Deeg, D.J.H., Lindeboom, M., Portrait, F., 2010. The role of early-life conditions in the cognitive decline due to adverse events later in life. Econ J 120, F411–F428. doi:10.1111/j.1468-0297.2010.02396.x.

Blau, F.D., Kahn, L.M., 1996. Wage structure and gender earnings differentials: An international comparison. Economica 63, S29–S62. doi:10.2307/2554808.

Blundell, R., Pistaferri, L., Saporta-Eksten, I., 2016. Consumption inequality and family labor supply. Am. Econ. Rev. 106, 387–435. doi:10.1257/aer.20121549.

Booth, A.L., Van Ours, J.C., 2009. Hours of work and gender identity: Does part-time work make the family happier? Economica 76, 176–196. doi:10.1111/j.1468-0335.2007.00670.x.

Braakmann, N., 2014. The consequences of own and spousal disability on labor market outcomes and subjective well-being: Evidence from Germany. Rev. Econ. Househ. 12, 717–736. doi:10.1007/s11150-012-9164-7.

Bubonya, M., Cobb-Clark, D.A., Wooden, M., 2017a. Job loss and the mental health of spouses and adolescent children. IZA J. Labor Econ. 6, 6. doi:10.1186/s40172-017-0056-1.

Bubonya, M., Cobb-Clark, D.A., Wooden, M., 2017b. Mental health and productivity at work: Does what you do matter? Labour Econ. 46, 150–165. doi:10.1016/j.labeco.2017.05.001.

Bünnings, C., Kleibrink, J., Weßling, J., 2017. Fear of unemployment and its effect on the mental health of spouses. Health Econ. 26, 104–117. doi:10.1002/hec.3279.

Chatterji, P., Alegría, M., Lu, M., Takeuchi, D., 2007. Psychiatric disorders and labor market outcomes: Evidence from the National Latino and Asian American Study. Health Econ. 16, 1069–1090. doi:10.1002/hec.1210.

Clark, A.E., 2003. Unemployment as a social norm: Psychological evidence from panel data. J. Labor Econ. 21, 323–351. doi:10.1086/345560.

Clark, A.E., Georgellis, Y., Sanfey, P., 2001. Scarring: The psychological impact of past unemployment. Economica 68, 221–241. doi:10.1111/1468-0335.00243.

Clark, A.E., Knabe, A., Rätzel, S., 2010. Boon or bane? Others' unemployment, well-being and job insecurity. Labour Econ. 17, 52–61. doi:10.1016/j.labeco.2009.05.007.

Classen, T.J., Dunn, R.A., 2012. The effect of job loss and unemployment duration on suicide risk in the United States: A new look using mass-layoffs and unemployment duration. Health Econ. 21, 338–350. doi:10.1002/hec.1719.

Cygan-Rehm, K., Kuehnle, D., Oberfichtner, M., 2017. Bounding the causal effect of unemployment on mental health: Nonparametric evidence from four countries. Health Econ. 26, 1844–1861. doi:10.1002/hec.3510.

Davillas, A., Pudney, S., 2017. Concordance of health states in couples: Analysis of self-reported, nurse administered and blood-based biomarker data in the UK understanding society panel. J. Health Econ. 56, 87–102. doi:10.1016/j.jhealeco.2017.09.010.

Dercon, S., Krishnan, P., 2000. In sickness and in health: Risk sharing within households in rural Ethiopia. J. Polit. Econ. 108, 688–727. doi:10.1086/316098.

Everding, J., Marcus, J., 2020. The effect of unemployment on the smoking behavior of couples. Health Econ. 29, 154–170. doi:10.1002/hec.3961.

Feeney, B.C., Collins, N.L., 2015. A new look at social support: A theoretical perspective on thriving through relationships. Pers. Soc. Psychol. Rev. 19, 113–147. doi:10.1177/1088868314544222.

Fletcher, J., 2009. All in the family: Mental health spillover effects between working spouses. B. E. J. Econom. Anal. Policy 9, 1. doi:10.2202/1935-1682.1967.

Gimenez-Nadal, J.I., Molina, J.A., 2014. Regional unemployment, gender, and time allocation of the unemployed. Rev. Econ. Househ. 12, 105–127. doi:10.1007/s11150-013-9186-9.

Gola, P., 2022. On the importance of social status for occupational sorting URL: https://www.pawelgola.com/wp-content/uploads/2020/10/StatusOccupationalSortingGolawebsite.pdf. accessed: 2020-11-19.

Green, F., 2011. Unpacking the misery multiplier: How employability modifies the impacts of unemployment and job insecurity on life satisfaction and mental health. J. Health Econ. 30, 265–276. doi:10.1016/j.jhealeco.2010.12.005.

Hainmueller, J., 2012. Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. Polit. Anal. 20, 25–46. doi:10.1093/pan/mpr025.

Hainmueller, J., Xu, Y., 2013. ebalance: A Stata package for entropy balancing. J. Stat. Softw. 54, 1–18. doi:10.18637/jss.v054.i07.

Hallberg, D., Johansson, P., Josephson, M., 2015. Is an early retirement offer good for your health? Quasi-experimental evidence from the army. J. Health Econ. 44, 274–285. doi:10.1016/j.jhealeco.2015.09.006.

Hides, L., Lubman, D.I., Devlin, H., Cotton, S., Aitken, C., Gibbie, T., Hellard, M., 2007. Reliability and validity of the Kessler 10 and Patient Health Questionnaire among injecting drug users. Aust. N. Z. J. Psychiatry 41, 166–168. doi:10.1080/00048670601109949.

Holmes, A.M., Deb, P., 2003. The effect of chronic illness on the psychological health of family members. J. Ment. Health Policy Econ. 6, 13–22.

Holmes, T.H., Rahe, R.H., 1967. The Social Readjustment Rating Scale. J. Psychosom. Res. 11, 213–218. doi:10.1016/0022-3999(67)90010-4.

Jann, B., 2014. Plotting regression coefficients and other estimates. Stata J. 14, 708–737. doi:10.1177/1536867X1401400402.

Johnston, D.W., Schurer, S., Shields, M.A., 2013. Exploring the intergenerational persistence of mental health: Evidence from three generations. J. Health Econ. 32, 1077–1089. doi:10.1016/j.jhealeco.2013.09.001.

Kalenkoski, C.M., Foster, G., 2008. The quality of time spent with children in Australian households. Rev. Econ. Househ. 6, 243–266. doi:10.1007/s11150-008-9036-3.

Kessler, R.C., 2004. Gender differences in mental disorders in the U.S. National Comorbidity Survey, in: The Economics of Gender and Mental Illness. Emerald Group Publishing Limited. volume 39, p. 88. doi:10.1016/S0194-3960(04)15002-6.

Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., Normand, S.L.T., Walters, E.E., Zaslavsky, A.M., 2002. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol. Med. 32, 959–976. doi:10.1017/s0033291702006074.

Kessler, R.C., McRae, Jr, J.A., 1982. The effect of wives' employment on the mental health of married men and women. Am. Sociol. Rev. 47, 216–227. doi:10.2307/2094964.

Kohara, M., 2010. The response of Japanese wives' labor supply to husbands' job loss. J. Popul. Econ. 23, 1133–1149. doi:10.1007/s00148-009-0247-6.

Kuhn, A., Lalive, R., Zweimüller, J., 2009. The public health costs of job loss. J. Health Econ. 28, 1099–1115. doi:10.1016/j.jhealeco.2009.09.004.

Lindeboom, M., Portrait, F., van den Berg, G.J., 2002. An econometric analysis of the mental-health effects of major events in the life of older individuals. Health Econ. 11, 505–520. doi:10.1002/hec.746.

Llena-Nozal, A., Lindeboom, M., Portrait, F., 2004. The effect of work on mental health: Does occupation matter? Health Econ. 13, 1045–1062. doi:10.1002/hec.929.

Lundberg, S., 1985. The added worker effect. J. Labor Econ. 3, 11–37. doi:10.1086/298069.

Marcus, J., 2013. The effect of unemployment on the mental health of spouses - evidence from plant closures in Germany. J. Health Econ. 32, 546–558. doi:10.1016/j.jhealeco.2013.02.004.

Mariotti, F., Dickson, M., Mumford, K., Pena-Boquete, Y., 2016. Job insecurity within the household: Are Australian householders caring when it comes to risk sharing? Aust. J. Labour Econ. 19, 77–90.

Mazzocco, M., 2004. Saving, risk sharing, and preferences for risk. Am. Econ. Rev. 94, 1169–1182. doi:10.1257/0002828042002516.

McInerney, M., Mellor, J.M., Nicholas, L.H., 2013. Recession depression: Mental health effects of the 2008 stock market crash. J. Health Econ. 32, 1090–1104. doi:10.1016/j.jhealeco.2013.09.002.

Mencarini, L., Pasqua, S., Romiti, A., 2019. Single-mother families and the gender gap in children's time investment and non-cognitive skills. Rev. Econ. Househ. 17, 149–176. doi:10.1007/s11150-017-9385-x.

Mendolia, S., 2014. The impact of husband's job loss on partners' mental health. Rev. Econ. Househ. 12, 277–294. doi:10.1007/s11150-012-9149-6.

Nguyen, H.T., Connelly, L.B., 2018. Out of sight but not out of mind: Home countries' macroeconomic volatilities and immigrants' mental health. Health Econ. 27, 189–208. doi:10.1002/hec.3532.

Nikolova, M., Ayhan, S.H., 2019. Your spouse is fired! How much do you care? J. Popul. Econ. 32, 799–844. doi:10.1007/s00148-018-0693-0.

Noori, R., Jafari, F., Moazen, B., Khoddami Vishteh, H.R., Farhoudian, A., Narenjiha, H., Rafiey, H., 2015. Evaluation of anxiety and depression among female spouses of Iranian male drug dependents. Int J High Risk Behav Addict 4, e21624. doi:10.5812/ijhrba.21624.

Organisation for Economic Co-operation and Development (OECD), 2018a. OECD family database URL: http://www.oecd.org/social/family/database.htm. accessed: 2020-3-10.

Organisation for Economic Co-operation and Development (OECD), 2018b. Social protection - public unemployment spending - OECD data URL: https://data.oecd.org/socialexp/public-unemployment-spending.htm. accessed: 2020-3-10.

Roman, J.G., Cortina, C., 2016. Family time of couples with children: Shortening gender differences in parenting? Rev. Econ. Househ. 14, 921–940. doi:10.1007/s11150-015-9315-8.

Salm, M., 2009. Does job loss cause ill health? Health Econ. 18, 1075–1089. doi:10.1002/hec.1537.

Schaller, J., Stevens, A.H., 2015. Short-run effects of job loss on health conditions, health insurance, and health care utilization. J. Health Econ. 43, 190–203. doi:10.1016/j.jhealeco.2015.07.003.

Schiele, V., Schmitz, H., 2016. Quantile treatment effects of job loss on health. J. Health Econ. 49, 59–69. doi:10.1016/j.jhealeco.2016.06.005.

Schmitz, H., 2011. Why are the unemployed in worse health? The causal effect of unemployment on health. Labour Econ. 18, 71–78. doi:10.1016/j.labeco.2010.08.005.

Searle, A.K., Van Hooff, M., McFarlane, A.C., Davies, C.E., Fairweather-Schmidt, A.K., Hodson, S.E., Benassi, H., Steele, N., 2015. The validity of military screening for mental health problems: Diagnostic accuracy of the PCL, K10 and AUDIT scales in an entire military population. Int. J. Methods Psychiatr. Res. 24, 32–45. doi:10.1002/mpr.1460.

Shapiro, C., Stiglitz, J.E., 1984. Equilibrium unemployment as a worker discipline device. Am. Econ. Rev. 74, 433–444.

Siegel, M., Bradley, E.H., Gallo, W.T., Kasl, S.V., 2003. Impact of husbands' involuntary job loss on wives' mental health, among older adults. J. Gerontol. B Psychol. Sci. Soc. Sci. 58, S30–7. doi:10.1093/geronb/58.1.s30.

Stauder, J., 2019. Unemployment, unemployment duration, and health: Selection or causation? Eur. J. Health Econ. 20, 59–73. doi:10.1007/s10198-018-0982-2.

Stephens, Jr., Melvin, 2002. Worker displacement and the added worker effect. J. Labor Econ. 20, 504–537. doi:10.1086/339615.

Stöhr, T., 2015. The returns to occupational foreign language use: Evidence from Germany. Labour Econ. 32, 86–98. doi:10.1016/j.labeco.2015.01.004.

Theodossiou, I., 1998. The effects of low-pay and unemployment on psychological well-being: A logistic regression approach. J. Health Econ. 17, 85–104. doi:10.1016/s0167-6296(97)00018-0.

Topa, G., 2011. Labor markets and referrals, in: Handbook of Social Economics. Elsevier. volume 1, pp. 1193–1221. doi:10.1016/B978-0-444-53707-2.00005-0.

Wang, H., Wang, C., Halliday, T.J., 2018. Health and health inequality during the great recession: Evidence from the PSID. Econ. Hum. Biol. 29, 17–30. doi:10.1016/j.ehb.2018.01.001.

Ware, Jr, J.E., 2000. SF-36 Health Survey update. Spine 25, 3130–3139. doi:10.1097/00007632-200012150-00008.

Watson, I., 2010. Decomposing the gender pay gap in the Australian managerial labour market. Aust. J. Labour Econ. 13, 49.

Wilkins, R., Vera-Toscano, E., Botha, F., Dahmann, S.C., 2021. The Household, Income and Labour Dynamics in Australia Survey: Selected findings from waves 1 to 19. Melbourne Institute of Applied Economic and Social Research, University of Melbourne.

Winkelmann, R., 2005. Subjective well-being and the family: Results from an ordered probit model with multiple random effects. Empir. Econ. 30, 749–761. doi:10.1007/s00181-005-0255-7.

Zhao, Q., Percival, D., 2017. Entropy balancing is doubly robust. J. Causal Inference 5, 962. doi:10.1515/jci-2016-0010.

Zhao, Y., Inder, B., Kim, J.S., 2021. Spousal bereavement and the cognitive health of older adults in the US: New insights on channels, single items, and subjective evidence. Econ. Hum. Biol. 43, 101055. doi:10.1016/j.ehb.2021.101055.

Zulkarnain, A., Korenman, S., 2019. Divorce and health in middle and older ages. Rev. Econ. Househ. 17, 1081–1106. doi:10.1007/s11150-018-9435-z.

Appendix A Definition of covariates

Table A.1: Covariates inventory for 1-adult and 2-adult households.

Pre-treatment variable	Definition	1-adult W	2-adult W	2-adult P
Individual information				
Demographics				
Age	In years	✓	✓	✓
Female†	= 1 if female	✓	✓	
Non-English at home†	= 1 if speaks language other than English at home	✓	✓	✓
Same-sex identity†	= 1 if identifies as lesbian or gay	✓		
Bisexual or other identity†	= 1 if identifies as bisexual, other, or unsure	✓	✓	✓
Health				
Bodily pain	2 items (0–100) based on SF36	✓	✓	✓
General health	5 items (0–100) based on SF36	✓	✓	✓
Physical functioning	10 items (0–100) based on SF36	✓	✓	✓
Role-emotional	3 items (0–100) based on SF36	✓	✓	✓
Role-physical	4 items (0–100) based on SF36	✓	✓	✓
Social functioning	2 items (0–100) based on SF36	✓	✓	✓
Vitality	4 items (0–100) based on SF36	✓	✓	✓
Education				
Secondary schooling†	= 1 if has diploma or certificate from technical school	✓	✓	✓
University†	= 1 if has university degree	✓	✓	✓
Vocational training†	= 1 if has vocational training	✓	✓	✓
Labor market				
Labor earnings	Financial year nominal earnings in 10000 AUD, CPI-adjusted to 2012 price levels	✓	✓	✓
Never unemployed†	= 1 if never unemployed	✓	✓	✓
Years in paid work	Years worked for previous employer	✓	✓	
Company size	7 categories ($\leq$ 20, 20–99, 100–499, 500–999, 1000–4999, 5000–19,999, $\geq$ 20,000 employees)	✓	✓	
Job security	Scale from totally dissatisfied to totally satisfied (0-20)	✓	✓	
Occupation	8 categories based on Australian and New Zealand Standard Classification of Occupations (ABS, 2006a)	✓	✓	
Industry sector	19 categories based on Australian and New Zealand Standard Industrial Classification (ABS, 2006b)	✓	✓	
Employment type	4 categories (employer, employee, own account worker, contributing family worker)	✓	✓	
Casual worker†	= 1 if employed on a casual basis (i.e., no paid leave)	✓	✓	
Income share	Individual earnings divided by household income		✓	
Work status	4 categories (unemployed, casual, part time, full time)			✓
Household information				
Dependent children	5 categories (0, 1, 2, 3, > 3 dependent children)	✓	✓	✓
Regional unemployment	Unemployment rate (ABS, 2020) in statistical region	✓	✓	✓
Remoteness area	7 categories based on Australian Statistical Geography Standard remoteness area (ABS, 2011)	✓	✓	✓
State or territory	8 categories (NSW, VIC, QLD, SA, WA, TAS, NT, ACT)	✓	✓	✓
Life event index	Weighted sum of 17 life events (0–100) (See Table A.2)	✓	✓	✓
Neighborhood coherence	Sum of area satisfaction and sense of belonging (0–100)	✓	✓	✓
Socio-economic status rank	Socio-Economic Indexes for Areas (SEIFA) decile of index of relative socio-economic disadvantage (ABS, 2001a)	✓	✓	✓
Economic resource rank	SEIFA decile of index of economic resources	✓	✓	✓
Education and career rank	SEIFA decile of index of education and occupation	✓	✓	✓
Cohabitation†	= 1 if cohabiting with partner		✓	✓
Survey year	6 categories (2009, 2011, 2013, 2015, 2017, 2019)	✓	✓	✓

Notes: An overview of covariates adopted for the analysis. The covariates are first used for matching and then included as control variables in regressions. Different subsets of covariates are selected for 1-adult households, 2-adult households, workers ("W"), and partners ("P"). A † indicates a dummy variable that equals zero if the stated condition is not met. All covariates are measured before the treatment.

Table A.1 describes the pre-treatment covariates used for matching and conditioning. Individual information involves demographics, health, education, and labor market characteristics. Household information pertains to composition, locality, rankings, well-being, and relationship type.

Physical health measures are collected from the short-form health survey (Ware, 2000). Role-emotional refers to issues with work or other daily activities ascribable to emotional problems, and role-physical refers to the same issues ascribable to physical problems. The remaining health measures are self-explanatory.

To disentangle the income effect from the gender effect, I consider income share, which entails how much a worker contributes to the household income before the treatment. Since a worker can hold a low-skill position in a high-skill industry or vice versa (e.g., Gola, 2022), I control for both occupation and industry sectors by using 27 dummy variables, 8 for various occupations and 19 for different industry sectors; these measures also partially account for the effects that job conditions have on mental health (Bubonya et al., 2017b; Belloni et al., 2022). I include the partner's demographic characteristics, health conditions, and educational background to partially adjust for assortative mating in the mental health dimension.

To address the potential impact of significant life events on mental well-being, I introduce a life event index. The notion is long endorsed by economists studying labor market stress and strain (e.g., Lindeboom et al., 2002; van den Berg et al., 2010). Table A.2 details the construction of the index. It summarizes the impact of various life events prior to the treatment. Each event is dichotomized, with 1 indicating the occurrence of the event and 0 otherwise. The raw index is then constructed as a weighted sum of the events. Weights are determined by impact scores described in Holmes and Rahe (1967).

In the construction of the index, I exclude events that define the treatment or control group: being fired or made redundant, changing jobs, and being promoted at work. Being fired or made redundant, the treatment in this study, has an impact score of 47 out of 100. It ranks number eight out of the 43 life events listed in Holmes and Rahe (1967) in terms of severity. Job change, on the other hand, entails either changing the line of work, the responsibilities at work, or work hours and conditions. The impact scores are 36, 29, and 20, respectively. Being promoted at work also has no exact mapping to any event in Holmes and Rahe (1967) but shares the set of approximations with job change. Retirement from the workforce (impact score = 45) is excluded because retirees do not enter either the treatment or the control group. Separated from the spouse and got back together with the spouse have no occurrence in the sample owing to the partnership requirements imposed on the treatment and control groups.

Bounding the raw index between 0 and 100, one derives the standardized index, which is subsequently used in the matching and regression steps. The sample mean is 5.4 points with a standard deviation of 7.8. In the sample, the most common event is serious injury

Table A.2: Summary statistics for life events and impact scores.

Life event	Impact score	N_1	Mean (%)	SD
Got married	50	509	1.9	0.14
Pregnancy	40	1746	6.4	0.24
Birth/adoption of new child	39	1248	4.6	0.21
Serious personal injury/illness	53	1985	7.3	0.26
Serious injury/illness to family member	44	3713	13.6	0.34
Death of close relative/family member	63	3088	11.3	0.32
Death of a close friend	37	2249	8.2	0.27
Victim of physical violence	53	232	0.8	0.09
Victim of a property crime	44	810	3.0	0.17
Detained in jail	63	27	0.1	0.03
Close family member detained in jail	50	333	1.2	0.11
Major improvement in finances	38	808	3.0	0.17
Major worsening in finances	58	665	2.4	0.15
Changed residence	20	3351	12.2	0.33
	Min	Max	Mean	SD
Standardized index	0	100	5.4	7.81

Notes: All life events are dichotomous with 1 indicating the occurrence of the event and 0 otherwise. Hence, the means represent percentage shares in the top panel. Life events are randomly ordered in the table. The impact scores are defined in Holmes and Rahe (1967). The impact scores for victim of physical violence, victim of a property crime, and close family member detained in jail are extrapolated based on event severity. Being fired, changed jobs, retired from the workforce, promoted at work, separated from the spouse, got back together with the spouse, and the death of a spouse or a child are excluded from the calculation of the life event index. For each event, the number of incidents is reported under N_1. The total number of matched observations is 28249 for the main specification. For the matching and regression steps, the life event index is standardized to a 0–100 scale.

or illness to a family member, followed by changing residence and the death of a close relative or family member. The least common events are being detained in jail, being a victim of physical violence, and having a close family member who is detained in jail.

Appendix B Decomposing the overall household difference

In Table 2, I test for household differences in burden and risk sharing. Noticing that the prevalence of displacement is also different across types of households, I modify the test to additionally include the prevalence effect. The results of the main specification and the p-values of the new tests are presented in Table B.1. The difference between the two tests, "household difference in burden and risk sharing" and "overall household difference including prevalence," is that the former employs a counterfactual prevalence for 1-adult workers whereas the latter employs the real prevalence for these workers.

Using the real prevalence for 1-adult workers, I find that the overall household difference has a (two-sided) p-value of 0.05 for males and a 0.07 for females. To distinguish the prevalence effect from the burden- and risk-sharing effect, I perform the following decomposition for males:

$$\begin{aligned} & \rho_2\hat{\gamma}_2 - \rho_4\hat{\gamma}_4 - \rho_7\hat{\gamma}_7 \\ = & \underbrace{(\rho_2\hat{\gamma}_2 - \rho_4\hat{\gamma}_2)}_{\text{prevalence effect}} + \underbrace{(\rho_4\hat{\gamma}_2 - \rho_4\hat{\gamma}_4 - \rho_7\hat{\gamma}_7)}_{\text{burden- and risk-sharing effect}} \\ = & 70.6\% + 29.4\%. \end{aligned}$$

In words, I compute the prevalence effect by holding the mental health burden ($\hat{\gamma}_2$) constant and updating the prevalence (ρ_2 to ρ_4). To compute the burden- and risk-sharing effect, I hold the prevalence (ρ_4) constant for workers, update the mental health burden ($\hat{\gamma}_2$ to $\hat{\gamma}_4$), and subtract the spillover of partner's potential displacement ($\rho_7\hat{\gamma}_7$). Using the same argument, I have, for females,

$$\begin{aligned} & \rho_3\hat{\gamma}_3 - \rho_6\hat{\gamma}_6 - \rho_5\hat{\gamma}_5 \\ = & \underbrace{(\rho_3\hat{\gamma}_3 - \rho_6\hat{\gamma}_3)}_{\text{prevalence effect}} + \underbrace{(\rho_6\hat{\gamma}_3 - \rho_6\hat{\gamma}_6 - \rho_5\hat{\gamma}_5)}_{\text{burden- and risk-sharing effect}} \\ = & 80.1\% + 19.9\%. \end{aligned}$$

In Section 4.2, I establish that burden and risk sharing alone are not associated with any mental health gain or loss for workers from 2-adult households. According to the current exercise, individuals from 2-adult households are better off on average (if one-sided hypotheses were specified a priori). This comes partly from burden and risk sharing with partners ("burden- and risk-sharing effect") and largely from the fact the workers are less likely displaced as part of couples ("prevalence effect").

It is difficult to determine whether the difference in prevalence is the result of having a partner or selection. It could be that employers are more reluctant to fire employees who have partners. It could also be that workers who are less likely to be displaced are more

Table B.1: Overall household difference in the main specification.

Outcome	Main specification (5)
All households	
All displacement for workers (γ_1)	2.31***
	(0.35)
1-adult households	
Male displacement for workers (γ_2)	3.76***
	(1.28)
Female displacement for workers (γ_3)	3.02***
	(1.09)
2-adult households	
Male displacement for workers (γ_4)	1.88***
	(0.38)
Male displacement for partners (γ_5)	1.00***
	(0.37)
Female displacement for workers (γ_6)	0.74**
	(0.36)
Female displacement for partners (γ_7)	0.64**
	(0.32)
***p*-value of difference**	
Household difference in burden and risk sharing	
Males, $H_1 : \rho_4\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.30
Females, $H_1 : \rho_6\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.47
Overall household difference including prevalence	
Males, $H_1 : \rho_2\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.05
Females, $H_1 : \rho_3\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.07

Notes: The effect of job displacement on mental health. Pooled estimates as well as separate estimates for 1-adult and 2-adult households, males and females, and workers and partners are reported. Furthermore, the table presents p-values for Wald tests. "Household difference in burden and risk sharing" tests whether being in a 1-adult household carries different *mental health* implications from being part of a 2-adult household when displacement occurs. "Overall household difference including prevalence" tests whether being in a 1-adult household carries different *welfare* implications to being part of a 2-adult household when displacement occurs. I use $\gamma_j, j = 1, \ldots, 7$ to denote the estimated coefficients and $\rho_j, j = 1, \ldots, 7$ to denote sample prevalence. Here, $\rho_1 = 0.034, \rho_2 = 0.057, \rho_3 = 0.049, \rho_4 = \rho_5 = 0.030$, and $\rho_6 = \rho_7 = 0.022$. The treatment group consists of 434 households with one adult and 530 households with two adults, 222 and 326 of which the displaced worker is male. The control group comprises 7757 households with one adult and 19528 households with two adults, 3673 and 10535 of which involve male workers who experienced no job change. "Main specification" reports coefficients of Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Robust standard errors clustered on household IDs are in parentheses. * p<0.10. ** p<0.05. *** p<0.01.

inclined to partner up. For that reason, in the main body of the paper, I place emphasis on the burden- and risk-sharing effect, which yields the most conservative estimate of tradeoff a particular worker could experience from coupling up.

Appendix C Domains of Well-Being

Developed by Kessler et al. (2002), the Kessler Psychological Distress Scale (SK10) serves as a generic measure of mental well-being in surveys. The scale consists of 10 items, listed in Table C.1. After reversal, each item invites a response to one of the five categories: 1 = "none of the time," 2 = "a little of the time," 3 = "some of the time," 4 = "most of the time," and 5 = "all of the time." In the Household, Income, and Labor Dynamics in Australia (HILDA) survey, respondents indicate their response to each item, and I derive SK10 by summing up the responses to the items, which were given equal weights. By construction, the higher the total score, the higher the distress. In the present study, the scale is standardized to have mean 50 and standard deviation 10.

Table C.1: Kessler Psychological Distress Scale item inventory and domains of well-being.

Item no.	Item	Domain
1	Depressed	Depressed mood
2	Everything was an effort	Fatigue
3	So nervous that nothing could calm you down	Anxiety
4	So restless that you could not sit still	Motor agitation
5	Hopeless	Depressed mood
6	Nervous	Anxiety
7	Restless or fidgety	Motor agitation
8	So sad that nothing could cheer you up	Depressed mood
9	Tired out for no good reasons	Fatigue
10	Worthless	Worthless guilt

Notes: For each item, the reversed answer categories range from 1 (*none of the time*) to 5 (*all of the time*). The standardized Kessler Psychological Distress Scale or SK10 is equal to the unweighted sum of the responses to each item, standardized to have mean 50 and standard deviation 10 for the current study. I then construct the changes in SK10 scores across survey waves as the outcome of interest. Kessler et al. (2002) register the well-being domains to which the items under the scale belong. See also Australian Bureau of Statistics (2001b) for the adoption of the scale in Australian surveys.

Kessler et al. (2002) further sort items under the scale into domains listed in the DSM–III–R (American Psychiatric Association, 1987).[15] The final item pool reflects five domains: depressed mood (3 items), motor agitation (2 items), fatigue (2 items), worthless guilt (1 item), and anxiety (2 items). For each domain, the unweighted sum of item scores is again standardized to have mean 50 and standard deviation 10. Item to domain mapping is also presented in Table C.1.

I examine these mental health domains in Figure C.1 accordingly. "Main specification" corresponds to the results shown in Table 2, specification (5), which regresses variables on changes in SK10. "Depressed mood" attacks both workers and partners regardless of household type or gender. The p-values of direct, household, and role differences (not

[15] This was with the exception of positive affect, which was later eliminated from the final pool. See Kessler et al. (2002).

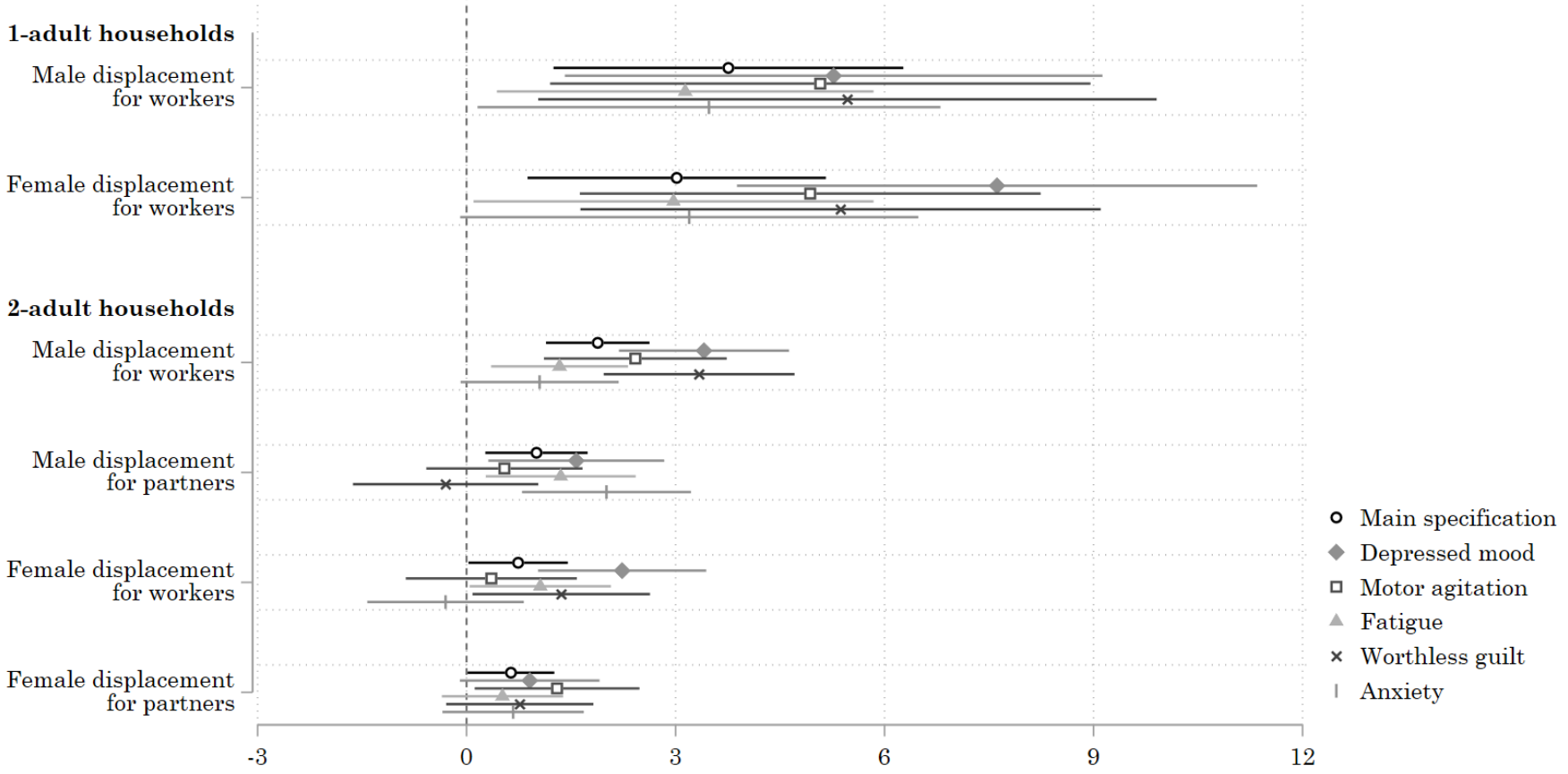

Figure C.1: The effect of job displacement on mental health and in various domains of well-being. Separate estimates are illustrated for 1-adult and 2-adult households, males and females, and workers and partners. The domains are as registered in Kessler et al. (2002). All specifications estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Robust standard errors clustered on household IDs are used to calculate the confidence intervals. The markers pinpoint the estimated coefficients and the horizontal whiskers represent the 95 percent confidence intervals. The dashed vertical gray line marks the significance cutoff of 0. The graph is created using Stata's `coefplot` command (Jann, 2014).

shown) lead us to the same conclusions as the p-values under the main specification (see Table 2). This suggests that the significant findings under the main specification, which measures the changes in generic distress, may be largely driven by the onset of depressed mood.

"Motor agitation" is present among all workers from 1-adult households and male workers or partners from 2-adult households. For these individuals, being restless, fidgety, or unable to sit still also contribute to the general distress after job displacement. In contrast, female workers or partners from 2-adult households are spared "motor agitation" symptoms but report a significant increase in "fatigue." For female partners, this could be attributable to the added worker effect (e.g., Lundberg, 1985; Stephens et al., 2002).

"Worthless guilt" strikes male and female workers in like manner in 1-adult households (p-value of gender difference = 0.49), while in 2-adult households, male workers are more susceptible to worthless guilt than female workers (p-value of gender difference = 0.02). This implies that when displaced female workers have partners, the feeling of worthlessness subsides. In addition, "anxiety" is prominent among partners of displaced male workers in 2-adult households. Female workers from these households, however, do not appear to exhibit any anxiety symptoms. In fact, the coefficient has a negative sign. Put differently, in 2-adult households, females are in general more anxious about their partners' job loss than their own job loss (p-value of role difference = 0.00).

Appendix D Possible mechanisms

Table D.1: The effect of job displacement on mental health—education and urbanicity.

	High school or below	Diploma or above	Major cities	Regional and remote areas
Outcome	(13)	(14)	(15)	(16)
All households				
All displacement for workers (γ_1)	2.84***	1.98***	2.25***	2.23***
	(0.57)	(0.42)	(0.39)	(0.66)
$N_{Treated}$	379	585	700	264
1-adult households				
Male displacement for workers (γ_2)	3.53**	2.39***	3.31**	3.52*
	(1.58)	(0.62)	(1.33)	(2.05)
$N_{Treated}$	116	106	155	67
Female displacement for workers (γ_3)	2.99**	2.46***	2.94***	1.79
	(1.42)	(0.60)	(1.13)	(2.56)
$N_{Treated}$	97	115	145	67
2-adult households				
Male displacement for workers (γ_4)	2.75***	1.30***	1.92***	2.14***
	(0.51)	(0.43)	(0.44)	(0.42)
Male displacement for partners (γ_5)	1.58***	0.65	0.99**	1.22**
	(0.55)	(0.41)	(0.41)	(0.53)
$N_{Treated}$	86	240	246	80
Female displacement for workers (γ_6)	0.62	1.46***	1.02**	-0.31
	(0.50)	(0.42)	(0.40)	(0.44)
Female displacement for partners (γ_7)	1.73***	0.33	0.50	2.50***
	(0.39)	(0.36)	(0.36)	(0.33)
$N_{Treated}$	80	124	154	50
***p*-value of difference**				
Direct difference				
Males, $H_1 : \gamma_2 > \gamma_4$	0.32	0.02	0.16	0.25
Females, $H_1 : \gamma_3 > \gamma_6$	0.06	0.02	0.05	0.21
Household difference				
Males, $H_1 : \rho_4\gamma_2 \neq \rho_4\gamma_4 + \rho_7\gamma_7$	0.77	0.15	0.47	0.83
Females, $H_1 : \rho_6\gamma_3 \neq \rho_6\gamma_6 + \rho_5\gamma_5$	0.89	0.87	0.66	0.87
Gender difference				
1-adult households, $H_1 : \gamma_2 > \gamma_3$	0.40	0.59	0.42	0.30
2-adult households, $H_1 : \gamma_4 > \gamma_6$	0.00	0.71	0.06	0.00
Role difference				
Males, $H_1 : \gamma_4 > \gamma_7$	0.06	0.04	0.01	0.75
Females, $H_1 : \gamma_6 > \gamma_5$	0.90	0.08	0.48	0.99

Notes: The effect of job displacement on mental health with separate estimates for education and urbanicity. Pooled estimates as well as separate estimates for 1-adult and 2-adult households, males and females, and workers and partners are reported with the number of treated units shown under $N_{Treated}$. All specifications estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Furthermore, the table presents *p*-values for Wald tests. "Direct difference" tests whether a displaced worker reports more distress in a 1-adult household than in a 2-adult household. "Household difference" tests whether being in a 1-adult household carries different mental health implications from being part of a 2-adult household when displacement occurs. "Gender difference" tests whether displaced male workers are more disturbed than displaced female workers. "Role difference" tests whether being a worker imposes higher mental health costs than being a partner. I use $\gamma_j, j = 1, \ldots, 7$ to denote the estimated coefficients and $\rho_j, j = 1, \ldots, 7$ to denote sample prevalence, where $\rho_4 = \rho_5$ and $\rho_6 = \rho_7$. Specification (13) is intended for households where the workers have a high school degree or lower, while specification (14) is aimed at households where workers have a diploma or above (a Bachelor's, graduate diploma, or postgraduate degree). Specification (15) represents households living in major cities in Australia, and specification (16) follows households living in inner regional, outer regional, remote, and very remote Australia. Remoteness is identified by Australian Bureau of Statistics (2011). Robust standard errors clustered on household IDs are in parentheses. * p<0.10. ** p<0.05. *** p<0.01.

Table D.1 examines whether education attainment and urbanicity are potential mechanisms behind the displacement-distress link. Specification (13) focuses on households

where the workers' highest education attainment does not exceed high school completion. Specification (14) is designated for households where the workers have a higher education than a high school degree. This includes certificates, diplomas, a Bachelor's degree, graduate diplomas, a Master's degree, or a PhD. One observes that households report higher distress when the workers have an educational background capped at high school. For example, among the male workers from 2-adult households, the increase in distress is 2.75 points for those with a high school degree or below, and only 1.30 points for those with a diploma or above (p-value of cross-equation difference = 0.05). The argument in Green (2011), which states that employability could modify unemployment-related mental ill-health, lends support to this finding. One notable exception is with female workers from 2-adult households, where the workers are more distressed when they have a higher degree (1.46 points versus 0.62 points), though the difference between the two estimates is not statistically significant (p-value of cross-equation difference = 0.24). Direct differences are more evident when workers have diplomas or above; gender differences are more striking for 2-adult households where workers have a high school degree or below.

Specification (11) studies households residing in major cities, while specification (12) considers households residing in other parts of Australia, including inner regional, outer regional, remote, and very remote Australia. When residents are the partners of displaced females, they suffer a less severe mental health penalty than non-major city residents (p-value of cross-equation difference = 0.00). Female workers from these households, on the other hand, face a greater mental health challenge if they reside in major cities (p-value of cross-equation difference = 0.02). The p-values of household and role differences are more stark among major-city dwellers, whereas gender differences are more noticeable among non-city dwellers from two-adult households.

These results suggest that attaining more education generally alleviates mental distress upon job loss, and significantly so for men in 2-adult households. Meanwhile, residing in major cities tend to benefit mental health after job displacement, particularly for partners of female workers in 2-adult households. Limiting job opportunities associated with low education levels and living remotely may be the explanation behind both mechanisms. Female workers from 2-adult households do not conform to the pattern; they are more concerned if they reside in major cities or have a diploma or above. These exceptions could be due to job expectations that come with higher degrees and greater competition in major cities.

Figure D.1 explores the relationship between pre-treatment earnings and psychological well-being, and how the relationship differs by gender. Earnings are CPI-adjusted to 2012 price levels. The figure shows that male workers from 1-adult households (panel a) are charged greater psychological penalties when they are in the top half of the earnings rank (Q3 and Q4). For instance, the p-value of cross-equation difference between the ATT estimates for Q2 and Q3 is 0.04. The ATTs are estimated in comparison to workers who

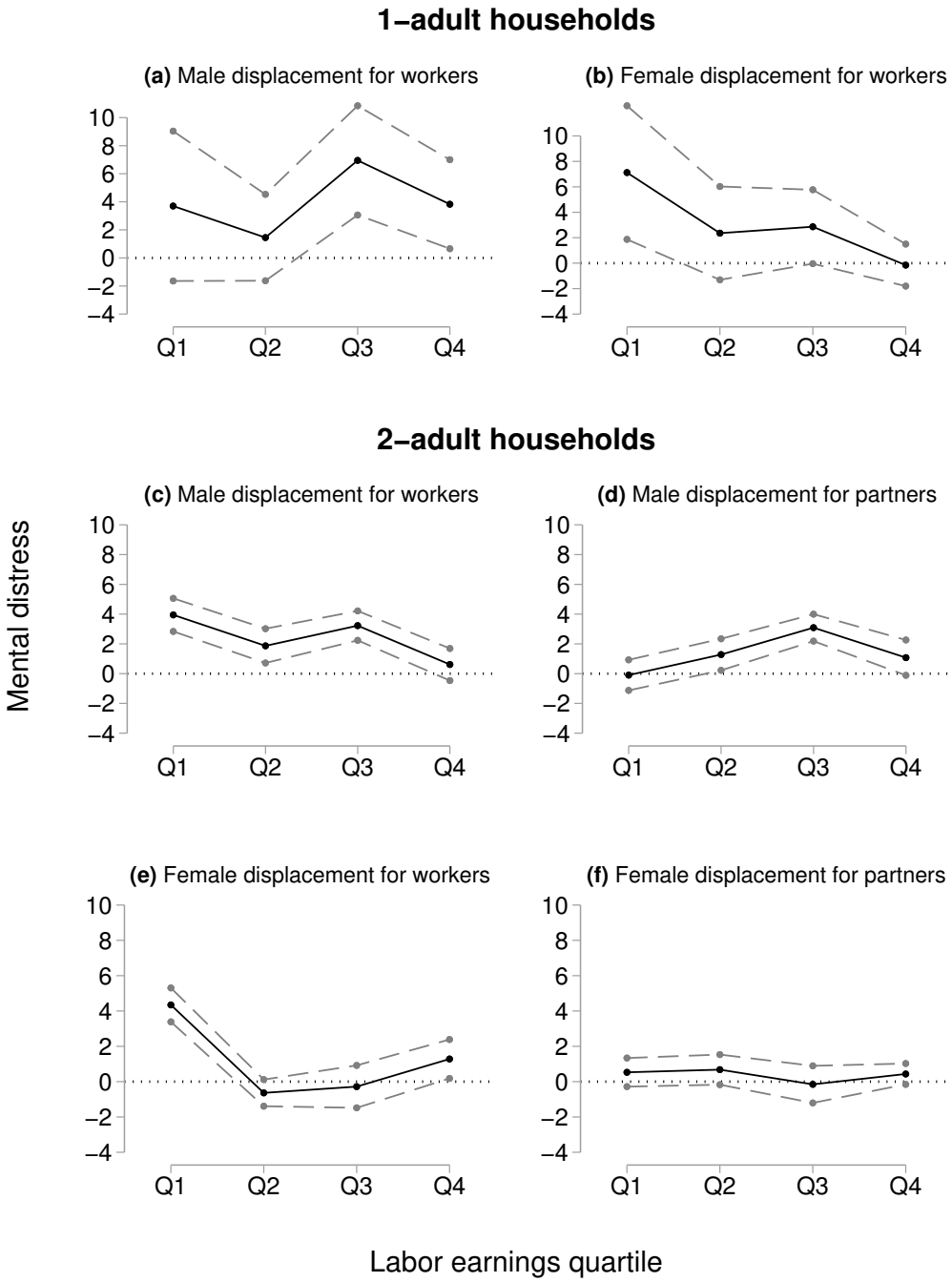

Figure D.1: Pre-treatment earnings and mental health effects. Each panel divides the treatment group into four earnings quartiles, with Q1 being the lowest-earning group and Q4 the highest-earning group. I estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Robust standard errors clustered on household IDs are used to calculate the confidence intervals. The solid black line traces the estimate for each group. The dashed gray lines mark the 95 percent confidence intervals. The dotted horizontal line denotes the significance cutoff at 0. Panels are created using Stata's `coefplot` command (Jann, 2014).

had not changed jobs and who were also ranked in the third or fourth quartile before the treatment period. This result follows intuitively, since one would expect the greater loss

of earnings, the more likely a worker suffers psychologically after displacement, since more income needs to be recovered. On the other hand, female workers from 1-adult households (panel b) exhibit the opposite pattern: The group reporting the highest influence is those earning in the bottom quartile (Q1). For example, the p-value of cross-equation difference between the Q1 and Q4 estimates is 0.01. This seemingly unexpected result could be attributed, among other things, to the financial strain of low-earning female workers, their prior saving behavior, and low job expectations. Standard errors of estimates are larger for 1-adult households than for 2-adult households due to fewer treated cases in the former group.

In 2-adult households, male displacement (panel c) is linked to higher distress for workers in the first and third earnings quartile. (Statistically significant cross-equation differences are found between Q1 and Q2, Q1 and Q4, and Q3 and Q4.) The partners of these displaced males (panel d) experience greater emotional turmoil when the displaced workers were in the third earnings quartile, the estimate for which is significantly different from those for the other quartiles. Surprisingly, for male workers and their partners, loss of high earnings (Q4) is not the most detrimental to mental health. This could be owing to high savings associated with high earnings.

Female displacement in 2-adult households (panel e) is once again the most damaging to workers in the lowest earnings quartile (Q1), with p-values 0.00 for all cross-equation differences. This pattern is similarly observed among females from 1-adult households. Whether being a female is the common factor, one can only speculate. However, I am able to conclude that pre-treatment earning is one possible dimension that underlies the gender differences observed in the main specification.

Figure D.2 studies the effect of relative earnings in households. I construct the percentage earned in the household ("income share") before the treatment, and group individuals into quartiles accordingly. In 1-adult households, individuals earn close to 100%, meaning there are insufficient variations to rank individuals. Hence, in this exercise, I consider 2-adult households only.

Displaced male workers (panel a) who were earning 0 to 25% of household income (Q1) were the most stressed compared to their non-displaced counterparts. The other contribution groups also report an increase in mental distress, particularly workers earning between 50 and 75% of the household income, but none of the cross-equation differences are statistically significant. For partners of male workers (panel b), there is a clear upward trend: The more a male worker contributed to household income, the more stressed the partner became when the worker is displaced. These results signal that in the case of male displacement in 2-adult households, income loss is a greater concern for partners, whereas gender role and perception of unemployment may be more relevant for workers.

According to panel (c), female workers who contribute less than 25% or between 50 and 75% are more vulnerable after displacement. (The estimates for Q1 and Q3, as

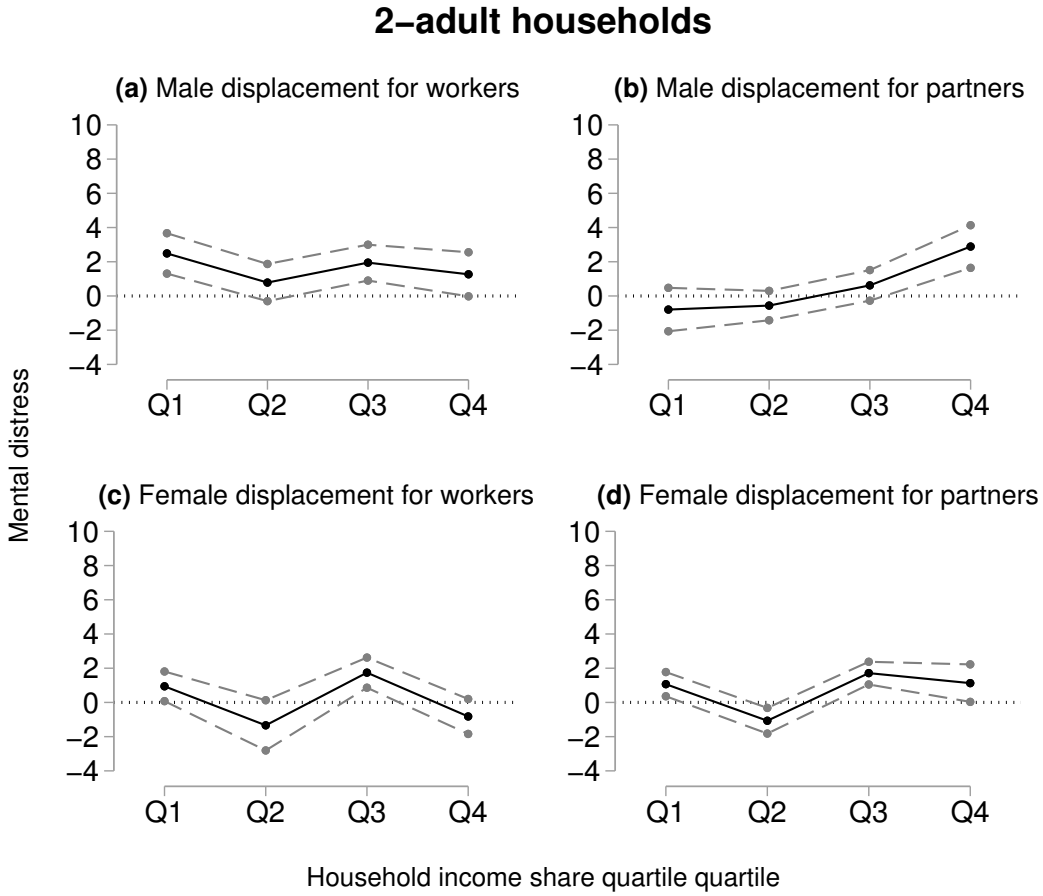

Figure D.2: Pre-treatment household income share and mental health effects in 2-adult households. Each panel divides the treatment group into four earnings quartiles, with Q1 being the lowest-earning group and Q4 the highest-earning group. I estimate the ATT using Equation (1), namely, matched difference in changes in mental health with covariates. Covariates are detailed in Appendix A. Robust standard errors clustered on household IDs are used to calculate the confidence intervals. The solid black line traces the estimate for each group. The dashed gray lines mark the 95 percent confidence intervals. The dotted horizontal line denotes the significance cutoff at 0. Panels are created using Stata's `coefplot` command (Jann, 2014).

well as Q2 and Q4, are similar, while the other pairs are significantly different.) The partner's distress pattern (panel d) closely resembles the worker's. An exception is when the displaced female workers contributed 75 to 100% of the household income. There, the partners report high average distress but the workers do not. Comparing panel (d) in Figure D.2 with panel (f) in Figure D.1, it becomes apparent that partners of displaced female workers are more concerned with the loss of relative income than the loss of absolute income.

Overall, Figure D.2 argues that gender differences are not driven solely by earnings. If such were the case, we would have observed a strict upward trend in panel (c) as well as panel (b). In the case of male workers, no matter the contribution proportion, there exists relatively high distress. For female workers, losing 75 to 100% of household income does not appear to affect their mental well-being.

One potential mechanism that has not been investigated is having dependent children. This is because in the analytic sample, only 21 male workers without partners have dependent children. Consequently, it is not feasible to estimate the ATT for the stratum for further comparisons. Nevertheless, with dependent children, gender differences can arise from the quality of family time (Kalenkoski and Foster, 2008) or role demands on the displaced (Roman and Cortina, 2016). Being a non-English speaker at home is another potential mechanism that has been overlooked because of the small size of the treatment group. On the one hand, being an immigrant (as proxied by language spoken at home) could reduce employability. On the other hand, recent evidence shows that occupational foreign language skills could benefit workers in certain occupations (e.g., Stöhr, 2015).