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Job Displacement and Mental Healthcare: Treatment Responses after Mass Layoffs

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Job Displacement and Mental Healthcare: Treatment Responses after Mass Layoffs*

Abstract

We study how job displacement impacts mental healthcare use in Australia, where a universal public health insurance system subsidises psychological therapy and prescription medications. Using linked administrative data and a difference-in-differences design around mass layoffs, together with complementary national panel survey evidence, we find that displacement generates substantial and persistent earnings losses and is associated with a temporary deterioration in self-reported mental health. Mental health service use, including general practitioner mental health consultations and psychological therapy, increases around displacement and is concentrated in zero charge care, while the use of antidepressant and anxiolytic medications responds much less. Predicted service responses are substantially larger among workers with lower pre-displacement earnings and those already engaged with mental healthcare before displacement. Together, the results suggest that the mental healthcare response to job displacement is shaped by what the health system makes accessible. When mental health services are publicly subsidised and can be delivered at zero patient charge, adjustment occurs primarily through services rather than medication.

JEL classification

J63, I12, I13, I18

Keywords

job displacement, mental healthcare, mass layoffs, heterogeneous treatment effects

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Data availability: this study used the Australian Bureau of Statistics Person Level Integrated Data Asset (PLIDA) Modular Product, 2011–12 to 2018–19, accessed through the ABS DataLab. Findings are based on the use of PLIDA data. The analysis used linked taxation and payment summary records, social security payment records, Medicare Benefits Schedule records and Pharmaceutical Benefits Scheme records. Payment summary data were used to construct employer–employee links and firm-level workforce measures. The results, and any associated views or opinions, are those of the authors and do not necessarily reflect the views or opinions of the ABS or the data custodians. This study also uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, conducted by the Australian Government Department of Social Services (DSS). The findings and views reported in this paper are those of the authors and should not be attributed to the Australian Government, DSS, or any of DSS's contractors or partners, or the Melbourne Institute. DOI: 10.26193/6M1BMR.

Disclaimer: The results of this study are based, in part, on data supplied to the ABS under the Taxation Administration Act 1953, A New Tax System (Australian Business Number) Act 1999, Social Security (Administration) Act 1999, A New Tax System (Family Assistance) (Administration) Act 1999, Paid Parental Leave Act 2010 and/or the Student Assistance Act 1973. Such data may only be used for the purpose of administering the Census and Statistics Act 1905 or performance of functions of the ABS as set out in section 6 of the Australian Bureau of Statistics Act 1975. No individual information collected under the Census and Statistics Act 1905 is provided back to custodians for administrative or regulatory purposes. Any discussion of data limitations or weaknesses is in the context of using the data for statistical purposes and is not related to the ability of the data to support the Australian Taxation Office, Australian Business Register and/or Department of Social Services' core operational requirements. Legislative requirements to ensure privacy and secrecy of these data have been followed. For access to PLIDA data under Section 16A of the ABS Act 1975 or enabled by section 15 of the Census and Statistics (Information Release and Access) Determination 2018, source data are de-identified and so data about specific individuals have not been viewed in conducting this analysis. In accordance with the Census and Statistics Act 1905, results have been treated where necessary to ensure that they are not likely to enable identification of a particular person or organisation.

Conflict of interest: The authors have no conflicts of interest to declare.

1 Introduction

Mass layoffs inflict economic and psychological distress simultaneously. Workers who lose their jobs suffer large, persistent income losses, while also facing an elevated risk of mental health deterioration and increased need for care. These two consequences create a tension. Greater mental health needs increase the potential benefit of treatment, while the accompanying loss of financial resources may make that needed treatment more difficult to access or sustain, particularly when that treatment carries a patient charge. The effect of job displacement on realised mental healthcare use is therefore not obvious ex ante. It may depend on how much mental health deteriorates, beliefs about treatment effectiveness, the prices workers face at the point of care, the financial resources available to them, and their existing engagement with the healthcare system.

A large literature documents the economic costs of job displacement. Earnings losses following displacement can be substantial and persistent, reflecting lower employment, reduced wages and the loss of valuable worker-firm matches (Eliason and Storrie 2006; Jacobson, LaLonde, and Sullivan 1993; Lachowska, Mas, and Woodbury 2020; Bertheau et al. 2023, Schmieder, von Wachter and Heining 2023).

A related literature shows that job loss can adversely affect health and mental health (Sullivan and von Wachter 2009; Browning and Heinesen 2012; Black, Devereux and Salvanes 2015; Schiele and Schmitz 2016), but that the resulting healthcare response is less uniform. Kuhn, Lalive, and Zweimüller (2009), for example, find relatively little change in overall medical expenditure following plant closure in Austria, alongside increases in antidepressant expenditure and mental health-related hospitalisation among men. Schaller and Stevens (2015) find that job loss worsens mental health in the United States and, among workers with chronic conditions or those who lost their employer-provided health insurance, reduces doctor visits and prescription drug use. Rocco et al. (2018) find increases in psychotropic prescribing concentrated among younger men in Italy. More recently, Tsai, Huang, and Yang (2024) document persistent increases in outpatient mental health visits and mental health expenditure following displacement in Taiwan, without further distinguishing between therapy and prescriptions. Jensen et al. (2026) find that job loss increases the incidence of mental health medication use in Denmark, whereas job finding reduces it.

Existing evidence therefore differs not only in whether healthcare use responds to displacement, but also in the treatment margin on which responses are observed. Several studies identify pharmaceutical responses, while there is comparatively little evidence distinguishing psychological services from medication following job displacement. In Australia, Abayasekara, de New, and Johnston (2025) find substantial and persistent employment and earnings losses following the shutdown of the automotive manufacturing industry, but no corresponding increase in mental healthcare use, which they suggest may partly reflect the unusually comprehensive support provided to affected workers. Together, these studies suggest that the deterioration in health following displacement does not translate automatically into greater mental healthcare use.

There is also evidence of substantial heterogeneity in the consequences of displacement. Recent work shows that earnings consequences vary substantially both across and within establishments and observable worker types (Athey et al. 2026; Gulyas and Pytka 2025), while Schiele and Schmitz (2016) find larger negative health effects at the bottom of the health distribution. There is less evidence on heterogeneity in the mental healthcare response to job displacement, including the

importance of workers' prior engagement with mental healthcare and the financial conditions under which additional treatment is obtained.

This paper examines these questions using mass layoffs in Australia and linked whole-of-population administrative data. We first estimate how displacement after a mass layoff affects government-subsidised mental health service use and antidepressant and anxiolytic medication use. We then examine heterogeneity in these effects along pre-layoff dimensions that may influence how increased need translates into care, focusing on workers' pre-displacement financial resources and prior mental healthcare use. Separately, we examine whether the additional service response is realised through bulk billed care, for which patients face no direct charge, or non-bulk billed care involving an out-of-pocket payment. Prior treatment engagement is potentially important because workers already receiving care may adjust on an intensive margin, whereas workers with no previous treatment must first enter the mental healthcare system. Financial resources may also matter differently depending on whether additional care is available at zero patient charge or requires an out-of-pocket payment.

Australia provides a useful institutional setting in which to study the composition and financial conditions of mental healthcare following displacement. Its universal public health insurance system, Medicare, subsidises medical consultations and psychological treatment through the Medicare Benefits Schedule (MBS), with access to subsidised psychological treatment generally mediated by general practitioners (GPs). The Pharmaceutical Benefits Scheme (PBS) separately subsidises listed prescription medicines. Under the MBS, providers retain discretion over the fees they charge. They may accept the Medicare rebate as full payment, leaving the patient with no out-of-pocket cost ("bulk billing"), or charge a higher fee and require the patient to pay the difference. This creates observable differences in the realised patient price of care within a publicly subsidised healthcare system, where billing status is jointly determined by provider charging decisions, patient choice and local market conditions affecting providers' pricing incentives (Pirkis et al. 2022).

We study long-tenure workers exposed to mass layoff events in 2015–16 and find displacement generates a large and persistent economic shock. Annual employment income is approximately AUD 12,000 lower, on average, in the post-displacement period, around 15 per cent relative to the pre-displacement mean. Complementary analysis using household panel survey data shows that workers experiencing redundancy or dismissal also report a deterioration in mental health, providing separate evidence of increased mental health need.

Despite the substantial earnings shock, our analysis finds mental healthcare use increases among displaced workers. MBS-subsidised mental health service use rises by around 4 per cent, with the largest increases occurring around displacement and attenuating thereafter. Importantly, the additional mental health service use response is concentrated in bulk billed care. Bulk billed mental health service contacts increase by around 12 per cent, on average, post-displacement, while we find no corresponding significant increase in non-bulk billed care. The service response includes increases in GP Mental Health Treatment Plans providing access to subsidised psychological care, GP-provided mental healthcare and psychologist services. By contrast, the average increase in antidepressant and anxiolytic medication fills is modest relative to the increase in mental health service use. These findings suggest that a deterioration in mental health following displacement generates additional treatment despite a substantial earnings shock, and that the response is concentrated in services that impose no direct patient charge.

We also examine heterogeneity in the treatment response using the generalized random forest to estimate conditional average treatment effects (Athey, Tibshirani, and Wager 2019). Workers with larger predicted MBS, GP and psychologist service responses are substantially more likely to have used mental healthcare before displacement and tend to have lower pre-displacement income. Predicted medication responses are also larger among workers with prior mental healthcare use, but show little separation by pre-displacement income. Thus, lower income is specifically associated with larger predicted service responses rather than with larger treatment responses generally. This divergence is consistent with financial access being more consequential for services, where out-of-pocket costs vary substantially with billing arrangements, than for subsidised medicines, where patient co-payments are regulated and capped.

The paper makes three contributions. First, we add to the literature on the healthcare consequences of job displacement by providing evidence on service-based mental healthcare, a treatment margin that has received comparatively little attention in this literature. Previous work has often documented pharmaceutical responses or broader measures of healthcare utilisation, leaving much less evidence on how GP mental healthcare and psychological services respond to displacement. The Australian setting, where psychological treatment is publicly subsidised and observable alongside prescription medicines, allows us to study these service responses directly and to compare them with antidepressant and anxiolytic use. We find that displacement increases GP mental health and psychologist services, while the average medication response is comparatively modest. This implies that evidence based primarily on pharmaceutical use could miss an important part of the mental healthcare response to job loss.

Second, we add to the displacement literature by documenting the billing composition of the mental healthcare response in a universal insurance setting where providers retain discretion over whether to charge patients out of pocket. Most evidence in this literature records whether healthcare use changes after job loss, but not the patient charge status of the additional care received. We show that the increase in mental healthcare following displacement is concentrated in services delivered at zero patient charge. This is important because continued insurance coverage does not imply uniform financial conditions at the point of care, and the billing composition of realised treatment is therefore an important part of how healthcare use adjusts after a large earnings shock.

Third, we contribute to the growing literature on heterogeneity in the consequences of job displacement. Recent displacement research documents substantial heterogeneity in earnings effects both across and within observable worker groups (Athey et al. 2026). We extend this literature to mental healthcare by examining heterogeneity along two pre-displacement dimensions: workers' economic position and their prior engagement with the treatment system. We find that larger predicted service responses are associated with both lower pre-displacement income and prior mental healthcare use, while the income gradient is much weaker for medication responses. This matters because it shows that heterogeneity in healthcare responses to job loss reflects both workers' prior connection to care and their economic position, with the latter differing across treatment margins with different patient-cost structures.

The remainder of the paper is organised as follows. Section 2 describes the Australian mental healthcare and income support systems. Section 3 develops a conceptual framework in which displacement simultaneously changes mental health need and financial resources, while realised treatment may also depend on patient prices and prior treatment engagement. Section 4 describes the

data and sample construction, Section 5 presents the empirical strategy, Section 6 reports the average treatment effects and their dynamics, complementary self-reported mental health trends from national survey data and heterogeneity, Section 7 discusses and interprets the results, and Section 8 concludes.

2 Institutional background

2.1 Mental healthcare services: Medicare and Better Access

Australia's publicly subsidised mental healthcare system expanded substantially following the introduction of the *Better Access* initiative in 2006, which created subsidised pathways to mental healthcare through the Medicare Benefits Schedule (MBS) for services delivered by GPs, psychiatrists, psychologists and eligible allied mental health providers (Australian Institute of Health and Welfare 2023, Department of Health and Aged Care 2024). Under *Better Access*, access to subsidised psychological treatment generally requires a referral and Mental Health Treatment Plan from a GP. GPs therefore occupy a central position in the treatment system: they assess and manage mental health conditions, prescribe medicines where clinically appropriate, provide some direct mental healthcare, and refer patients to psychologists and other eligible providers. During our study period, patients could access up to 10 subsidised individual mental health treatment services per calendar year (Services Australia 2024a).

Although these services are publicly subsidised, the MBS does not generally determine the price ultimately paid by the patient. Providers retain discretion over the fees they charge. A provider may accept the Medicare rebate as full payment, in which case the service is "bulk billed" and the patient faces no out-of-pocket charge, or charge a higher fee and require the patient to pay the difference. Bulk billing is therefore a provider choice rather than an entitlement attached to Medicare coverage. During our study period, GPs could receive additional incentive payments when they bulk billed eligible concession card holders, making zero-price care more financially attractive to the provider, but the decision to bulk bill nevertheless remained at the provider's discretion (Productivity Commission 2020). More broadly, Australian evidence shows that providers exercise substantial discretion over fees and may vary charging decisions according to patient characteristics, including indicators of ability to pay (Johar et al. 2017).

This institutional feature is important for interpreting displacement-induced changes in concession status. A worker who becomes eligible for a Health Care Card does not automatically receive free MBS mental healthcare, but concession status may increase the likelihood that a GP chooses to bulk bill. By contrast, concession status directly reduces the regulated patient co-payment for PBS-subsidised medicines. Thus, concession eligibility operates differently across the service and pharmaceutical margins.

Out-of-pocket payments were common for Better Access treatment services during our study period. In 2018, 52.7 per cent of treatment services involved a consumer co-payment (Pirkis et al., 2022). Billing practices also differ substantially across mental health provider types. GP mental health services are much more commonly bulk billed than psychological treatment. In 2018, 95.9 per cent of GP mental health-related consultations were bulk billed, compared with 39.8 per cent of psychological therapy services delivered by clinical psychologists and 49.1 per cent of focussed psychological strategy services delivered by other psychologists (Pirkis et al. 2022). For services that are not bulk billed, patient charges can be substantial. In 2019, the median co-payment was AUD 75

for clinical psychologist psychological therapy services and AUD 74 for psychologist focussed psychological strategy services, compared with AUD 41 for GP mental health treatment consultations and AUD 59 for GP focussed psychological strategy services (Pirkis et al. 2022).

Medicare Safety Net arrangements can reduce some out-of-pocket expenditure after annual thresholds are reached, but patients must first accumulate sufficient eligible expenditure before receiving higher benefits (Department of Health Disability and Ageing 2016, Services Australia 2024b). Consequently, public subsidies do not remove variation in the effective patient price of mental healthcare. The coexistence of bulk billed and non-bulk billed services allows us to distinguish treatment delivered at zero patient charge from treatment for which the patient incurs an out-of-pocket cost.

Non-price barriers may also affect access to psychological care. Evidence from the Australian Psychological Society indicates that waiting lists were common even before the COVID-19 pandemic, although around 80 per cent of psychologists reported being able to see a new client within two months (Australian Psychological Society 2021).

Full MBS mental health-related service item numbers are reported in Appendix Section 2.

2.2 Mental health prescriptions: Pharmaceutical Benefits Scheme

The Pharmaceutical Benefits Scheme (PBS) subsidises listed prescription medications, including medications commonly used to treat mental health conditions (Pharmaceutical Benefits Scheme 2016). In this paper, we focus on antidepressants and anxiolytics. We identify antidepressants using Anatomical Therapeutic Chemical code N06A and anxiolytics using code N05B, consistent with the World Health Organization Anatomical Therapeutic Chemical classification system (WHO 2024a, 2024b).

The prescription pathway differs from psychological therapy in its cost structure. In 2016, the maximum Pharmaceutical Benefits Scheme co-payment was AUD 38.30 for general patients and AUD 6.20 for concession card holders (Pharmaceutical Benefits Scheme 2016). Health Care Card holders, including people receiving unemployment-related income support, are entitled to cheaper prescription medicines under the PBS (Services Australia 2024c). As a result, displaced workers who become eligible for a Health Care Card may face a lower capped concession payment rate for subsidised medicines than they did before displacement. No equivalent Health Care Card concession directly reduces potential outpatient mental health services co-payments under Better Access.

2.3 Income support for displaced workers

During our study period, displaced workers who met means-tested eligibility requirements and met active job search participation requirements may have received Newstart Allowance (Services Australia 2016). In 2016, the base rate for a single adult was around AUD 527 per fortnight, placing Australian unemployment benefits toward the lower end of replacement rates among comparable high-income countries (OECD 2016).

Australia also provides some employer-funded redundancy entitlements through the National Employment Standards. Redundancy pay is not universal. Eligibility and payment amounts depend on tenure, employer size, employment status and other exclusions (Fair Work Ombudsman 2026a, 2026b). Workers who receive redundancy, termination or leave payments may face delays before

income support payments commence. In particular, lump sum payments can trigger an income maintenance period, during which payments such as redundancy pay, leave payments or termination payments are treated as income for social security purposes. Some applicants may also face a liquid assets waiting period depending on their available savings and circumstances (Services Australia 2016). Workers who qualified for Newstart were generally eligible for a Health Care Card, which reduced the capped patient co-payment for subsidised prescription medicines.

3 Conceptual framework: need, financial access and treatment

Job displacement can affect mental healthcare use through two simultaneous shocks. First, displacement may create 'financial shock' by reducing labour income and the financial resources available for purchasing healthcare and other consumption. Second, displacement may create a 'mental health shock' by deteriorating baseline mental wellbeing and raising the need for care.

The first mechanism may reduce demand for health and healthcare if health is a normal good, while the second mechanism, through a deterioration in mental health, may increase the potential benefit of healthcare as an input into restoring mental health (Grossman 1972). The overall effect of displacement on mental healthcare use is therefore ambiguous and depends on the relative strength of the financial resource and need effects, together with the effective patient price and accessibility of mental healthcare.

We formalise this intuition using a simple health production framework. Individual i derives utility from non-health consumption, c_i, and mental health, h_i. Mental health is produced from baseline mental health, N_i, and a vector of mental healthcare inputs, X_{ij}, where j indexes treatment pathways such as GP-based mental healthcare, psychological services and medications:

$$h_i = N_i + F(X_{i1}, \dots, X_{ij}),$$

with $F_j > 0$ and diminishing marginal products. The individual chooses consumption and treatment subject to

$$c_i + \sum_j p_{ij} X_{ij} \leq B_i,$$

where B_i denotes financial resources available to individuals, and p_{ij} is the effective patient price faced by individual i for treatment j. Financial resources comprise labour income, W_i, and other available resources, Y_i:

$$B_i = W_i + Y_i.$$

A displacement event generates two simultaneous shocks. Labour income falls, $dW_i < 0$, reducing B_i, while baseline mental health deteriorates, $dN_i < 0$. Let desired final mental health be $h_i^*(B_i, N_i)$ and define the amount of mental health the individual seeks to produce through treatment as

$$q_i^* = h_i^*(B_i, N_i) - N_i.$$

Following displacement,

$$dq_i^* = \frac{\partial h_i^*}{\partial B_i} dB_i + \left(\frac{\partial h_i^*}{\partial N_i} - 1 \right) dN_i.$$

The first term captures the resource effect. If health is a normal good,

$$\frac{\partial h_i^*}{\partial B_i} > 0,$$

so the fall in resources reduces desired final health and, all else equal, reduces mental healthcare treatment demand. The second term captures the response to worsening baseline mental health. If individuals do not allow the deterioration in baseline mental health to translate one-for-one into lower final mental health, such that

$$\frac{\partial h_i^*}{\partial N_i} < 1,$$

then a fall in N_i increases the amount of health individuals seek to restore through increased mental healthcare treatment.

The net effect on treatment demand is therefore ambiguous. If the increase in treatment need dominates the negative income effect, displacement may increase mental healthcare use despite reducing earnings.

3.1 Financial resources and the effective patient price of care

Financial circumstances may affect utilisation not only through the overall budget constraint but also through the effective price faced by the patient. Let use of mental healthcare treatment j be represented as

$$X_{ij} = D_j\left(q_i^*, p_{ij}, A_{ij}, Z_{i0}\right),$$

where A_{ij} captures the accessibility or availability of treatment j for individual i, and Z_{i0} denotes the individual's pre-displacement mental healthcare treatment state. We assume that treatment use increases with treatment need and accessibility and falls with the patient price:

$$D_{j,q} > 0, \qquad D_{j,p} < 0, \qquad D_{j,A} > 0.$$

The distinction between financial resources and patient price is important. A fall in income may reduce demand for care, but the magnitude of this response depends on the price actually faced at the point of use. Gertler, Locay and Sanderson (1987) develop a healthcare demand model in which price elasticity and income are explicitly interrelated. A central implication is that, if health is a normal good, lower income individuals are more responsive to changes in the price of care.

Denoting the price elasticity of demand for treatment j by

$$\varepsilon_{p,j}(B_i) = \frac{\partial \ln X_{ij}}{\partial \ln p_{ij}} < 0,$$

their framework implies that the absolute price elasticity falls as resources increase:

$$\frac{\partial \left|\varepsilon_{p,j}(B_i)\right|}{\partial B_i} < 0.$$

A given out-of-pocket charge for mental healthcare treatment may therefore suppress care more strongly among lower resource individuals. Conversely, access to services delivered at zero patient charge—whether because providers bulk bill or patients select into bulk-billed care—may make it easier for increased need to translate into mental healthcare utilisation among lower-resource individuals. More recent evidence similarly shows that healthcare consumption responds to liquidity

and patient cost sharing, and that financial assistance can increase utilisation among lower resource patients (Gross, Layton and Prinz 2022; Adams et al., 2022).

This mechanism is particularly relevant in the Australian Medicare setting because the effective patient price of an MBS service varies according to billing arrangements. Let $b_{ij} = 1$ if treatment j received by person i is bulk billed. The patient price can be represented as

$$p_{ij} = (1 - b_{ij})\tilde{p}_{ij},$$

where $\tilde{p}_{ij} > 0$ is the out-of-pocket price when the service is not bulk billed. When $b_{ij} = 1$, the patient faces no out-of-pocket charge for that service.

Within the Australian healthcare system, providers decide whether to accept the government-funded Medicare benefit as full payment and, where they do not bulk bill, what fee to charge to patients. Accordingly, the patient price observed in the data is not exogenously assigned. It may reflect provider responses to patient circumstances, patient sorting across providers and local competitive conditions that shape providers' incentives and ability to charge above the Medicare rebate. We therefore treat billing status as an endogenous feature of realised care rather than as a source of exogenous price variation. Australian evidence suggests that provider fees can vary systematically with patient financial circumstances through price discrimination (Johar et al. 2017). The effective price faced by a patient may therefore partly reflect this 'informal buffer' via an interaction between patient resources and provider billing behaviour.

3.2 Pre-existing mental healthcare treatment and the margin of adjustment

The treatment response to displacement may also depend on where displaced workers were already using the mental healthcare system before the shock. We capture this through the baseline treatment state, Z_{i0}, which may distinguish, for example,

$$Z_{i0} \in \{\text{no treatment},\ \text{medication only},\ \text{services only},\ \text{combined medication and services}\}.$$

Workers already engaged with mental healthcare differ from those not engaged in several potentially important respects. Prior mental healthcare treatment may indicate greater pre-existing underlying mental health need or vulnerability. Existing users may also have established relationships with GPs, prescribers or mental health providers, and may therefore have crossed some of the informational, referral and provider search barriers associated with initiating treatment.

For workers without prior treatment, displacement may therefore operate primarily on the extensive margin of entering mental healthcare. For workers already using treatment, the more relevant margin may instead be treatment intensification. A deterioration in mental health following displacement may therefore increase the intensity or breadth of treatment among existing users.

The role of financial resources and patient price may also differ according to baseline treatment state. In general,

$$\frac{\partial X_{ij}}{\partial B_i} = g_B(Z_{i0}), \qquad \frac{\partial X_{ij}}{\partial p_{ij}} = g_p(Z_{i0}),$$

so there is no requirement that the income gradient or price responsiveness of treatment be constant across prior-treatment groups. Among workers with no prior mental healthcare, resources and patient prices may be especially important for whether treatment is initiated. Among workers already

engaged with care, the post-displacement response may depend more strongly on worsening need, existing provider relationships, and the costs of stepping up treatment.

3.3 A reduced form decomposition of the utilisation response

The framework can be summarised using a first-order approximation to the post-displacement change in treatment use. For treatment pathway j,

$$dX_{ij} \approx \left[D_{j,q}\, dq_i^* + D_{j,p}\, dp_{ij} + D_{j,A}\, dA_{ij}\right]_{Z=Z_{i0}}$$

The marginal response coefficients are evaluated at pre-displacement values, conditional on baseline treatment state, Z_{i0}. Because baseline treatment history is fixed, $dZ_{i0} = 0$, heterogeneity arises because the responses to changes in desired health improvement, patient price and accessibility may differ across baseline treatment states.

The expression highlights three conceptually distinct channels. First, displacement changes desired treatment intensity through the combined need and resource shock, dq_i^*. Second, realised use depends on the effective patient price, p_{ij}, including whether a service is bulk billed or not. Third, use depends on treatment accessibility, A_{ij}, including provider availability, waiting times and continuity with an existing provider. Fixed baseline treatment state (Z_{i0}) may shift the importance of these channels by determining whether the relevant margin is treatment initiation, continuation or intensification.

This formulation communicates that the total mental healthcare response observed across displaced workers may reflect not only the direct financial resource effect, but also differences in treatment need, effective prices, access and prior engagement with care.

4 Data and sample construction

4.1 Administrative data source

Our primary data source was the Person Level Integrated Data Asset (PLIDA), a secure person-level linked administrative data asset held by the Australian Bureau of Statistics (ABS). PLIDA combines information on healthcare, government payments, income and taxation, employment and population characteristics over time (Australian Bureau of Statistics 2025a; 2025b). For this study, we used person-level income taxation records, including employer payment summary data from the Australian Taxation Office (ATO), linked to an individual's receipt of government social security and welfare payments, their use of Medicare-subsidised services on the Medicare Benefits Schedule (MBS), and their fills of subsidised prescription medicines on the Pharmaceutical Benefits Scheme (PBS).

4.1.1 Firm-level employment

ATO Payment summary records also identify workers' employers and were used to construct employer-level workforce measures. We defined each worker's 'primary employer' as the employer from which they received the largest amount of employment income in a financial year. These employer–employee links in the payment summary data were used to construct firm headcounts in each financial year, identify mass layoff events, and follow workers' employment and earnings over

time. The construction of the mass layoff measure and treatment and control samples is further described in Section 4.2.1.

4.1.2 Study period

We restricted the analysis period to 2011–12 through 2018–19 and selected 2015–16 as the focal displacement ('event') year. This timing makes best use of the available pre-pandemic linked data, with MBS and PBS information available from 2011–12, while providing a substantial and approximately balanced observation window around displacement: four pre-displacement years (2011–12 to 2014–15), the displacement year, and three subsequent years (2016–17 to 2018–19). In the event study analysis, 2014–15 therefore serves as the final pre-displacement reference year.

This window is particularly useful for the empirical design because the four pre-displacement years allow us to examine the evolution of outcomes before job loss and assess the plausibility of the identifying parallel trends assumption, while retaining several years of post-displacement follow-up within a consistently observed pre-pandemic period. Consistent with this, the event study estimates show little evidence of differential trends between treatment and comparison groups before displacement.

We ended the study period in 2018–19 to ensure that all outcome years preceded the coronavirus (COVID-19) pandemic. This was particularly important given our focus on mental health and mental healthcare use, both of which were substantially affected by the pandemic and associated policy responses (Australian Institute of Health and Welfare 2021). Including later years could therefore confound post-displacement changes in treatment with pandemic-related changes in mental health need, service availability, policy settings and patterns of healthcare utilization.

4.1.3 Income and government welfare payments

We constructed economic outcomes at the person-year level. Employment income was measured as gross individual non-business labour earnings from employer-linked taxation records. Unemployment-related payments were identified from Centrelink social security records and used to measure reliance on income support following displacement. We also constructed an annual indicator for concession status, defined as holding a Health Care Card, Pensioner Concession Card or Commonwealth Seniors Health Card through any relevant Centrelink scheme during the financial year.

Together, these measures capture three distinct dimensions of the economic consequences of displacement: changes in labour earnings; receipt of unemployment-related income support; and entry into concession arrangements that may affect the financial conditions under which healthcare is accessed.

All monetary values are expressed in 2018–19 Australian dollars (AUD). Employment income was adjusted using total hourly rates of pay excluding bonuses for Australia, across private and public sectors and all industries. Unemployment-related payments were adjusted using the all-groups Consumer Price Index for Australia.

4.1.4 Mental health service use (MBS)

Mental health service outcomes were constructed from MBS utilisation records containing service dates, MBS item numbers and provider information. We identified mental health-related services using mental health-specific MBS items, following the Australian Institute of Health and Welfare classification of Medicare-subsidised mental health-related services (Australian Institute of Health and Welfare 2024). The full list of included MBS items is reported in Section 9.2. These services included care delivered by GPs, psychiatrists, clinical psychologists, other registered psychologists and eligible allied mental health providers.

Our main measure of service utilisation was the annual number of mental health-related MBS services. We separately constructed annual counts of bulk billed and non-bulk billed mental health services, allowing us to distinguish services delivered at zero patient charge from those for which patients incurred an out-of-pocket payment. We also constructed an indicator for any mental health service use during the financial year.

More disaggregated outcomes were constructed to identify which components of care contributed to the overall service response. These included annual counts of GP mental health services (including GP Mental Health Treatment Plans and mental health treatment delivered directly by GPs), psychiatrist services, psychologist services (including clinical psychologist services and other psychologist services) and allied mental health services. The main results focus on total service use, billing status and key provider groups, with more detailed service outcomes reported where informative.

Importantly, these measures capture Medicare-subsidised mental healthcare but exclude services provided outside the MBS. However, Medicare represents the dominant funding channel for psychologist care in Australia. Pirkis et al. (2022), estimate annual expenditure of around AUD 720 million on psychologist services through Better Access, compared with approximately AUD 125 million through other sources for private psychologist services.

4.1.5 Pharmaceutical dispensing (PBS)

Mental health-related prescription medicine outcomes were constructed from PBS dispensing records containing the dispensing date and medicine classification. We focused on medicines commonly used to treat mental health conditions, specifically antidepressants and anxiolytics. Antidepressants were identified using Anatomical Therapeutic Chemical (ATC) code N06A and anxiolytics using code N05B, consistent with the World Health Organization ATC classification system (WHO 2024a, 2024b).

Our main pharmaceutical utilisation outcome was the annual number of mental health medicine fills. We also constructed an indicator for any mental health medicine use during the financial year and separately examined antidepressant and anxiolytic fills. Additional outcomes distinguished prescriptions according to prescriber type, including GPs and psychiatrists, and were used to examine the source of any overall pharmaceutical response.

We also constructed combined treatment measures distinguishing the use of mental health services and medicines within a financial year, including MBS service use only, PBS medication use only and use of both services and medicines. These measures were used to characterise the composition of mental healthcare and prior treatment engagement.

4.2 Sample construction

4.2.1 Mass layoff definition

We identified mass layoff events occurring between 2014–15 and 2015–16. For each firm, we first identified workers for whom that firm was their primary employer in 2014–15 (i.e. the employer from whom they received the majority of their annual earnings). Workers classified as having already 'left' the firm during 2014–15 were excluded when constructing the firm's 2014–15 workforce. Among the remaining workers, we then identified those who left the firm during 2015–16. Firms with fewer than 20 workers in 2014–15 were excluded. A firm was classified as experiencing a mass layoff when the number of workers leaving during 2015–16 was at least 30 per cent of its 2014–15 workforce. This definition also captured complete firm closures, for which the corresponding workforce reduction was 100 per cent.

An individual was classified as leaving their 2014–15 primary employer during 2015–16 if either of two conditions was met. First, where the firm remained the individual's primary employer in 2015–16, a worker was classified as leaving in 2015-16 if one of these conditions held: i) the worker received a termination payment from that firm in 2015–16; ii) the worker experienced a fall of at least 50 per cent in wage payments from the firm between 2014–15 and 2015–16; iii) the worker received no wage payment from the firm in 2016–17, so that the last payment from the firm must have happened in 2015-16. Second, a worker was classified as leaving in 2015-16 if their 2014–15 primary employer became a secondary employer in 2015–16. This definition accommodated the fact that annual administrative earnings records may contain partial year wages or termination payments around the time of separation.

The analysis window covered 2011–12 to 2018–19. We treated 2011–12 to 2014–15 as the pre-displacement period and 2015–16 to 2018–19 as the event and post-displacement period, with 2015–16 capturing the displacement ('event') year. In the event study specification, 2014–15 was the omitted reference year.

4.2.2 Treatment, control and matched analysis sample

The treatment group comprised workers classified as leaving a firm that experienced a mass layoff event in 2015–16. To focus on workers for whom displacement represented a substantial break from a stable employment relationship, we required treated workers to have had the same primary employer in each pre-displacement year, from 2011–12 to 2014–15. This restriction is consistent with displacement designs that focus on workers with strong prior attachment to the affected employer (Hoefer Marti et al. 2023). Of the 809,011 workers initially identified as leaving a mass layoff firm in 2015–16, 203,219 satisfied this stable employment requirement. After requiring linkage to the relevant government payment, MBS and PBS records, excluding individuals recorded as having died by 2018–19, restricting the sample to individuals aged 20–65 throughout the analysis period, and requiring complete matching covariates, 138,964 treated workers remained before matching.

The control pool comprised workers employed by firms that did not experience a mass layoff event in 2015–16. We applied the same requirement of stable attachment to a single primary employer from 2011–12 to 2014–15, together with the same linkage, mortality, age and covariate restrictions. This resulted in a control pool of 2,130,484 workers before matching.

We then used propensity score matching to improve comparability between displaced workers and workers in the control pool. Propensity scores were estimated using a logit model that included workers' gender, age in January 2015, gross employment income in 2013–14 and 2014–15, indicators for any mental health service use and any mental health prescription use in both 2013–14 and 2014–15; as well as the 2014-15 primary employer's state, industry, and headcount in 2013–14 and 2014–15. The male indicator was interacted with the remaining covariates in the propensity score specification.

Treated workers were matched to controls using one-to-one nearest neighbour matching without replacement, a caliper equal to 0.1 of the standard deviation of the estimated propensity score, and common support restrictions. Thirty treated workers could not be matched under these restrictions. The final analysis sample therefore comprised 138,934 displaced workers and 138,934 matched controls. Each individual was observed annually from 2011–12 to 2018–19, producing a balanced panel of 277,868 individuals and 2,222,944 person-year observations. The matched treated workers were drawn from 10,893 mass layoff firms and the matched controls from 16,393 control firms. The full sample construction flow is reported in Appendix Section 3.

The resulting analysis therefore compared workers with strong prior attachment to their employer who were displaced from firms experiencing large workforce reductions with observably similar workers employed at firms that did not experience a mass layoff in the treatment year.

4.3 Descriptive statistics

Table 1 reports matching characteristics before and after propensity score matching. Before matching, treated and control workers differed substantially in several dimensions, particularly employer size and the distribution of workers across states and industries. Matching produced close balance in individual characteristics and prior mental healthcare use. Differences in employer characteristics were also reduced, although some gaps remain visible. In the matched sample, mean age was 41.6 years among treated workers and 41.8 years among controls; 50.8 per cent of treated workers and 52.1 per cent of controls were male; and mean employment income in 2014–15 was AUD 83,600 and AUD 85,000, respectively. Prior mental healthcare use was also closely aligned: 8.7 per cent of both groups used an MBS mental health service in 2014–15, while approximately 13.0 per cent used a relevant mental health medicine. The close balance in prior mental healthcare use is particularly important because previous treatment may be a strong predictor of subsequent utilisation, displacement likelihood in a mass layoff, and is a key dimension of the heterogeneity analysis.

4.4 Complementary panel survey data

The administrative records provide detailed measures of employment, income and healthcare utilisation but do not directly measure mental health status. We therefore complemented the PLIDA analysis with national panel data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey to examine whether job loss was also associated with changes in self-reported mental health. HILDA is a nationally representative longitudinal household survey that commenced in 2001 and collects repeated information on labour market experiences, income, health and wellbeing (Melbourne Institute 2026).

We measured mental health using the Short Form-36 (SF-36) mental health subscale, which ranges from 0 to 100, with higher scores indicating better mental health (Ware and Sherbourne 1992). We

identified respondents who reported being made redundant or dismissed in the previous year and restricted the sample to workers in workplaces with at least 20 employees, consistent with the minimum firm size used in the administrative data analysis. The HILDA analysis therefore provides complementary evidence on the mental-health-need side of the displacement shock, which cannot be observed directly in the administrative healthcare data. Construction of derived variables and combination of survey waves followed the HILDA Survey User Manual (Summerfield et al. 2026).

Table 1: Average pre-treatment characteristics (2014–15) before and after matching

Variable	Before matching		After matching	
	Control	Treated	Control	Treated
Male gender	47.5%	50.8%	52.1%	50.8%
Age in January 2015 (years)	43.19	41.63	41.83	41.63
Gross employment income, 2014–15 (AUD $000)	83.76	83.58	85.02	83.59
Gross employment income, 2013–14 (AUD $000)	82.14	81.79	83.18	81.80
Any mental health service use, 2014–15	8.69%	8.72%	8.73%	8.72%
Any mental health service use, 2013–14	7.95%	7.65%	7.55%	7.64%
Any mental health prescription use, 2014–15	13.44%	12.97%	12.95%	12.97%
Any mental health prescription use, 2013–14	12.71%	11.98%	11.93%	11.98%
State of primary employer in 2014–15				
NSW	34.80%	36.58%	37.13%	36.59%
VIC	27.55%	22.00%	21.81%	22.00%
QLD	15.95%	13.33%	14.22%	13.33%
SA	5.64%	4.51%	4.57%	4.52%
WA	7.57%	20.70%	19.43%	20.69%
TAS	1.81%	1.15%	1.21%	1.15%
NT	0.51%	0.52%	0.63%	0.52%
ACT	6.17%	1.21%	1.00%	1.21%
Industry of primary employer in 2014–15				
Agriculture, forestry and fishing	0.56%	0.80%	0.84%	0.80%
Mining	2.21%	3.46%	3.49%	3.46%
Manufacturing	8.55%	7.58%	7.46%	7.58%
Electricity, water and waste services	1.57%	2.23%	2.36%	2.23%
Construction	2.13%	5.19%	5.24%	5.19%
Wholesale trade	4.83%	4.65%	4.26%	4.65%
Retail trade	7.53%	6.76%	6.66%	6.76%
Accommodation and food services	0.86%	6.64%	3.99%	6.62%
Transport, postal and warehousing	4.65%	3.87%	3.91%	3.88%
Information, media and telecommunications	1.68%	1.63%	1.52%	1.63%

Variable	Before matching		After matching	
	Control	Treated	Control	Treated
Finance and insurance services	6.26%	3.83%	4.13%	3.83%
Rental, hiring and real estate services	0.75%	1.63%	1.55%	1.63%
Professional, scientific and technical services	4.61%	8.44%	8.91%	8.44%
Administrative and support services	2.76%	10.98%	15.74%	10.98%
Public administration and safety	24.64%	5.46%	5.15%	5.46%
Education and training	7.19%	3.09%	3.16%	3.09%
Health care and social assistance	14.92%	18.62%	16.68%	18.62%
Arts and recreation services	0.88%	1.12%	0.98%	1.12%
Other services	2.34%	2.83%	2.65%	2.84%
Missing or unknown	1.10%	1.18%	1.31%	1.18%
Primary employer headcount				
Headcount, 2014–15	18,356	4,800	3,842	4,801
Headcount, 2013–14	18,165	4,825	3,880	4,826
Number of individuals	**2,130,484**	**138,964**	**138,934**	**138,934**

Notes: Propensity scores are estimated by logit using the variables shown above, with the male indicator interacted with the remaining covariates. Matching uses one-to-one nearest-neighbour matching without replacement, a caliper equal to 0.1 of the standard deviation of the estimated propensity score, and common support. Monetary values are expressed in 2018–19 AUD.

5 Empirical strategy

5.1 Difference-in-differences specification

Let y_{it} denote an outcome for individual i in financial year $t \in \{2011\text{-}12, \ldots, 2018\text{-}19\}$, and let $D_i = 1$ if individual i belongs to the treatment group (displaced from a mass layoff firm), $D_i = 0$ for matched controls. Our primary estimator was a two-way fixed effects (TWFE) event study difference-in-differences (DiD):

$$y_{it} = \alpha_i + \delta_t + \sum_{\tau \neq -1} \beta_\tau \left(D_i \times \mathbf{1}[t = \bar{t} + \tau]\right) + \varepsilon_{it} \qquad (1)$$

where α_i are individual fixed effects, δ_t are year fixed effects, and $\bar{t}$ denotes the reference year 2014–15 (the last full financial year before the mass layoff event), so that $\tau = -1$ is omitted. The coefficients β_τ trace the evolution of the treatment–control gap relative to $\bar{t}$, for $\tau \in \{-4, -3, -2, +0, +1, +2, +3\}$ corresponding to years 2011–12 through 2013–14 and 2015–16 through 2018–19.

The *pooled* average treatment effect on the treated (ATT) was obtained from the restricted version of (1) that replaces the set of interaction terms with a single post-treatment indicator:

$$y_{it} = \alpha_i + \delta_t + \beta(D_i \times Post_t) + \varepsilon_{it} \qquad (2)$$

where $Post_t = \mathbf{1}[t \in \{2015\text{-}16, 2016\text{-}17, 2017\text{-}18, 2018\text{-}19\}]$. The pooled ATT was therefore defined over the four post-displacement years 2015–16 through 2018–19; the β_{+1} event-study coefficient, which corresponds to the layoff year itself, captured displacement-year effects including anticipation and the immediate shock of job loss.

All standard errors were clustered at the worker's 2014–15 primary employer (27,286 clusters), allowing for correlation in outcomes among workers employed by the same firm before displacement.

5.2 Identification

Identification of the ATT rests on the parallel trends assumption; in the absence of the mass layoff, the average outcomes of displaced and matched control workers would have evolved in parallel after 2014–15. The pre-treatment coefficients $\{\beta_{-4}, \beta_{-3}, \beta_{-2}\}$ from equation (1) provide suggestive evidence to this assumption. For the key outcomes, employment income, mental health service contacts, and medication fills, pre-trend coefficients were generally flat and statistically indistinguishable from zero, as shown in the event study results.

Two features of the design strengthen the plausibility of the identifying assumption. First, propensity-score matching on pre-layoff characteristics substantially reduces observable differences between displaced and comparison workers. Second, following the job displacement literature, we define displacement as separation from a firm experiencing a large workforce contraction. The mass layoff criterion is intended to distinguish plausibly involuntary separations from ordinary job changes. Identification does not require workers to be randomly selected for separation within affected firms; rather, it requires that, conditional on the matching design, displaced and comparison workers would have followed parallel outcome trends in the absence of displacement.

One potential threat to identification is *anticipation*. That is, workers who learn in advance that their firm is restructuring may begin adjusting their behaviour before the formal separation — for example, by seeking GP referrals in 2014–15 while still employed. Such anticipation would contaminate the reference year and bias event study estimates downward. The flat pre-period coefficients $\{\beta_{-4}, \beta_{-3}, \beta_{-2}\}$ in the results provide evidence against anticipation effects, as they make it unlikely that systematic anticipatory adjustment was already occurring before the layoff event. Nevertheless, as outcomes are observed annually, the data cannot isolate anticipatory responses occurring within 2014–15.

5.3 Treatment effect heterogeneity

To examine whether the average effects of displacement conceal systematic differences across workers, we estimated individual-level conditional average treatment effects (CATEs) using generalized random forests (GRF - Athey, Tibshirani, and Wager 2019). The causal forest approach allows treatment effects to vary flexibly with observed pre-displacement characteristics without requiring particular interactions to be specified in advance. Following the Robinson (1988) orthogonalisation approach, the estimator residualised both the outcome and treatment indicator with respect to observed covariates before estimating treatment effect heterogeneity. This reduces sensitivity to differences in the conditional means of treatment and outcomes when estimating heterogeneous effects.

We estimated short-run CATEs using the 2015–16 cross-section of displaced workers and matched controls. Unlike the main DiD analysis, which identifies average effects from changes over time under a parallel trends assumption, the GRF estimates treatment effect heterogeneity conditional on observed pre-displacement covariates. Reassuringly, the average GRF estimates were similar in sign and magnitude to the corresponding 2015–16 event study estimates. Covariates were measured before displacement and included demographic, economic, employment, prior mental healthcare and local access characteristics. These included age, gender, employment income, non-labour income, firm headcount, industry, regional labour market conditions, prior mental health service use, prior mental health medication use, and measures of local mental healthcare and pharmacy availability. The CATE analysis was thus restricted to 212,235 workers with non-missing information on the additional covariates used in the GRF. We estimated CATEs for employment income and selected mental healthcare outcomes, including total mental health service use, GP mental health services, psychologist services and mental health medication use.

For each outcome, we split workers at the median estimated CATE and compare the pre-displacement characteristics of workers with relatively lower and higher predicted treatment effects. These comparisons identified observable characteristics associated with larger predicted responses to displacement, but should not be interpreted as causal effects of those characteristics themselves.

6 Results

This section presents key results of the analysis, with the full set presented in the Appendix.

6.1 Economic shock and welfare system response

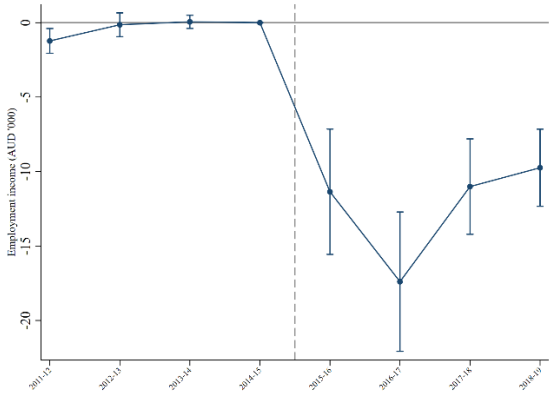
The results show that mass layoff-induced displacement generated a large and persistent economic shock for affected workers. The pooled DiD estimate indicates that annual employment income fell by AUD 12,046 (SE = 1,878), on average, equivalent to 15.0 per cent of the treated group pre-displacement mean (**Table 2**). The event study shows a sharp fall in earnings in 2015–16 – when some workers still received payments from the firm for a fraction of the year – an even larger decline in the following year, and only partial recovery by 2018–19 (**Figure 1**). The absence of significant pre-event effects supports the interpretation that the post-displacement decline reflects the mass layoff shock rather than a continuation of differential earnings trends.

Unemployment-related payments increased by an average of AUD 124 per year (SE = 20). At the sample average level, this increase was approximately 1 per cent of the estimated decline in employment income. Concession status increased by 2.59 percentage points (SE = 0.43 percentage points) from a pre-displacement mean of 8.6 per cent.

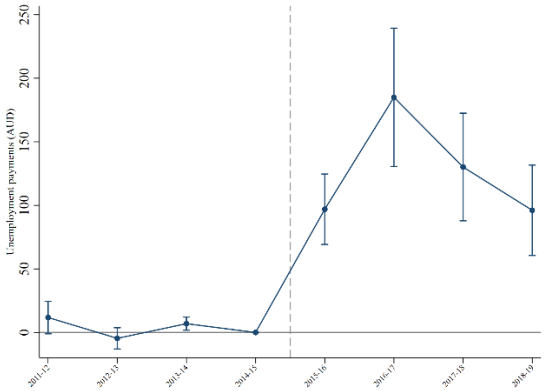
The dynamic estimates in **Figure 1** show that both unemployment payments and concession status rose around displacement, peaked shortly afterwards and then attenuated, although they remained above their pre-displacement levels.

Figure 1: Dynamic effects of displacement on employment income, unemployment-related payments and concession status

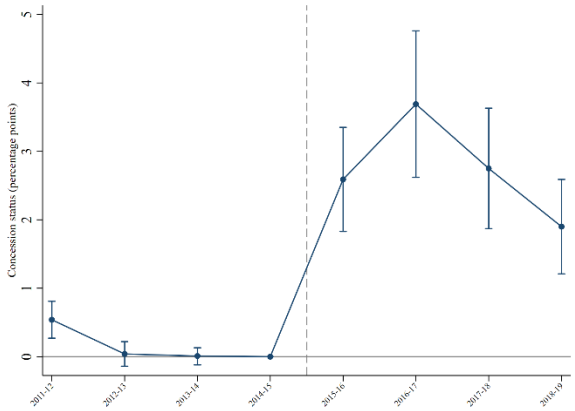
(a) Employment income (AUD)



(b) Unemployment-related welfare payments (AUD)



(c) Concession status (0/1)



6.2 Mental health shock: complementary evidence from survey data

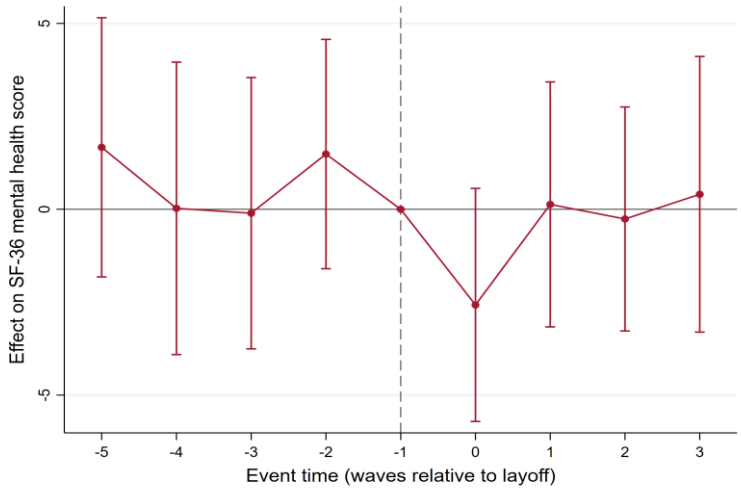
The PLIDA data provide detailed measures of realised mental healthcare use but do not directly measure underlying mental health. We therefore used the HILDA Survey to examine whether job loss was also associated with changes in self-reported psychological wellbeing, with this analysis intended to complement, rather than replicate, the administrative results by providing evidence on the mental health shock accompanying displacement.

Figure 2 presents event study estimates from the HILDA survey for the SF-36 mental health subscale, where higher scores indicate better mental health. The survey sample comprised 91 workers reporting redundancy or dismissal and 2,230 comparison workers. The pre displacement coefficients were close to zero and jointly insignificant (F test, p=0.605), providing no evidence of differential pre-trends. Self-reported mental health declined around the displacement event. In the event wave, the SF-36 mental health score fell by 2.57 points relative to the omitted pre-displacement wave (SE = 1.60). Given the small sample size, the estimate is imprecise and does not reach conventional significance using a two-sided test, although it is marginally significant using a one-sided test. The point estimate nevertheless indicates a deterioration in psychological wellbeing at the time of job

loss. The effect subsequently attenuated, with average mental health returning towards its pre-displacement level over the following two survey waves.

This result should be interpreted cautiously. The treated sample is small, which limits statistical precision and precludes the more detailed heterogeneity analysis undertaken using PLIDA. In addition, the survey analysis identifies the mental health trajectory experienced by displaced workers under the treatment, employment and income support arrangements they actually received. The subsequent recovery in mental health could therefore reflect natural recovery or adaptation, re-employment, mental healthcare use or some combination of these factors. Nevertheless, the pattern is informative for interpreting the administrative results. The conceptual framework treats displacement as a simultaneous shock to economic resources and mental health need. The HILDA estimates are consistent with this second component as they show that psychological wellbeing falls around the time of job loss.

Figure 2: Dynamic effects of job loss on self-reported mental health



Notes: The figure reports event study estimates for the SF 36 mental health subscale, scored from 0 to 100, with higher values indicating better mental health. Wave 15 (t=-1) is the omitted reference period. The treated group comprises respondents reporting redundancy or dismissal in the previous year. Vertical bars show 95 per cent confidence intervals based on standard errors clustered at the individual level.

6.3 Average mental healthcare response

6.3.1 Overall service use and billing status

Table 2 reports the pooled DiD post-displacement effects on the main economic and mental healthcare outcomes. Despite the persistent decline in earnings, Medicare-subsidised mental health service use increased following displacement. The annual number of MBS mental health service contacts increased by 0.0139 (SE = 0.0065), equivalent to 4.2 per cent of the treated group pre-displacement mean. The probability of using any MBS mental health service increased by 0.43 percentage points (SE = 0.10 percentage points), or 5.8 per cent relative to its pre-displacement mean. The increase in service use therefore had a clear extensive margin component, with displacement increasing the probability of using any MBS mental health service.

The billing composition of this service response is particularly striking. Bulk billed mental health contacts increased by 0.0199 services per year (SE = 0.0047), equivalent to a 12.4 per cent annual increase relative to the pre-displacement mean. By contrast, non-bulk billed contacts declined by 0.0060 services, with this estimate statistically indistinguishable from zero. The additional MBS service response was therefore concentrated in care delivered at zero patient charge.

6.3.2 Composition of the service response

The aggregate average increase in MBS services was distributed across several components of the mental healthcare system. Total GP mental health contacts increased by 5.7 per cent relative to their pre-displacement mean. Within GP care, Mental Health Treatment Plans increased by 7.9 per cent. The pooled estimate for mental health treatment delivered directly by GPs was also positive, although it was not statistically significant.

Psychologist services increased by 4.7 per cent. More detailed decomposition indicates that the pooled estimate for clinical psychologist services was small in magnitude, and this response was concentrated among services delivered by other registered psychologists, which increased by approximately 9.6 per cent (see Appendix Section 4). Psychiatrist services, instead, did not increase significantly.

The pattern suggests that the MBS response operated through both primary care and psychological services. Significant GP Mental Health Treatment Plans responses are notable because they provide an important entry point into subsidised psychological treatment, while the increase in psychologist contacts indicates that at least some of the additional referrals translated into subsidised psychological treatment.

6.3.3 Pharmaceutical response

The average pharmaceutical response was considerably weaker than the MBS service response. Total antidepressant and anxiolytic fills increased by 1.3 per cent relative to the pre-displacement mean, but the pooled estimate was not statistically significant.

Anxiolytic fills increased by approximately 6.9 per cent, with weak statistical precision, while antidepressant fills changed little, on average. The probability of using any mental health medication also did not increase significantly, on average, over the post-displacement period.

Table 2: Pooled effects of displacement on selected economic and mental healthcare outcomes

Outcome	ATT	SE	Pre-mean	Change
Panel A. Economic resources and welfare payments				
Employment income (AUD $000)	-12.0461***	(1.8784)	80.416	-15.0%
Unemployment-related payments (AUD $)	123.5451***	(19.8810)	171.821	+71.9%
Concession status (0/1)	0.0259***	(0.0043)	0.0859	+2.59 pp
Panel B. Mental health services (annual count)				
All mental health services	0.0139**	(0.0065)	0.3306	+4.2%
Bulk billed mental health services	0.0199***	(0.0047)	0.1600	+12.4%

Outcome	ATT	SE	Pre-mean	Change
Non bulk billed mental health services	-0.0060	(0.0040)	0.1706	-3.5%
GP mental health services	0.0055***	(0.0021)	0.0973	+5.7%
- GP Treatment Plans	0.0041***	(0.0009)	0.0518	+7.9%
- GP provided therapy	0.0015	(0.0016)	0.0455	+3.3%
Psychologist services	0.0079**	(0.0039)	0.1666	+4.7%
Psychiatrist services	-0.0007	(0.0031)	0.0574	-1.2%
Panel C. Mental health medicines				
Anxiolytics and antidepressants	0.0097	(0.0114)	0.7356	+1.3%
Anxiolytics	0.0037*	(0.0021)	0.0538	+6.9%
Antidepressants	0.0060	(0.0110)	0.6822	+0.9%
Panel D. Extensive margin (0/1)				
Any mental health service use	0.0043***	(0.0010)	0.0743	+5.8%
Any mental health medication use	0.0013	(0.0010)	0.1098	+1.2%

Notes: Pooled post period is 2015–16 to 2018–19. All models include individual and year fixed effects. Standard errors are clustered at the worker's 2014–15 primary employer. Pre-mean is the treated group mean before displacement. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6.4 Dynamic mental healthcare response

The DiD event study estimates provide further evidence that the mental healthcare response was concentrated around the displacement event. To facilitate comparison across outcomes with different baseline frequencies, **Figure 3** expresses each event study coefficient as a percentage of the corresponding treated group pre-displacement mean.

The contrast between MBS services and PBS medicines utilisation (Panel a) is stark. In 2015–16, total MBS mental health service use increased by approximately 13.7 per cent of its pre-displacement mean. The effect then declined to around 5.6 per cent in 2016–17 and was close to its pre-displacement level by the final two years of the observation window. By comparison, the 2015–16 increase in mental health medication fills was approximately 2.5 per cent of the pre-displacement mean and subsequent estimates remained small and imprecise. The dynamic evidence therefore reinforces the pooled estimates by confirming that the principal mental healthcare response was a relatively immediate increase in MBS service use.

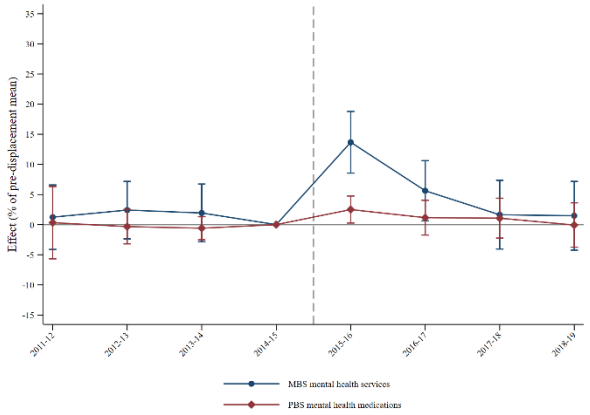
The billing decomposition (Panel b) shows an even sharper difference. Bulk billed mental health services increased by approximately 23.7 per cent of their pre-displacement mean in the displacement year and remained elevated in 2016–17. The corresponding estimate for non-bulk billed services was much smaller, at approximately 4.3 per cent, and statistically indistinguishable from zero. In subsequent years the non-bulk-billed estimates were close to zero or negative. The front-loaded service response was therefore driven primarily by services delivered at zero patient charge.

The provider-specific event studies show that both GP and psychologist services increased around displacement. GP Mental Health Treatment Plans increased by approximately 17 per cent of their pre-displacement mean in 2015–16, while GP-provided mental health treatment increased by approximately 16 per cent (Panel c). Psychologist contacts increased by approximately 13 per cent in the event year (Panel d). These responses attenuated thereafter, although GP Mental Health Treatment Plans remained somewhat elevated later in the observation period.

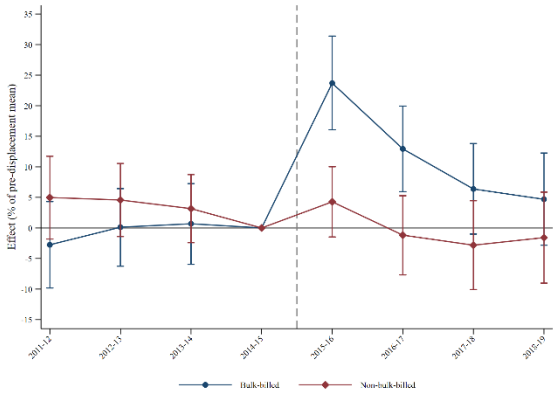
Overall, the dynamic event study estimates point to a pronounced and relatively immediate service response to displacement. MBS use rose sharply around the event and subsequently attenuated, with the increase concentrated in bulk-billed care. Dynamic pharmaceutical responses were considerably smaller than the service response. The full set of event study figures for all outcomes examined are presented in the Appendix (Section 5). Antidepressant use showed a modest increase around the displacement year that dissipated thereafter, while later increases in anxiolytic use also occurred and remained elevated, with statistical imprecision.

Figure 3: Dynamic effects of displacement on MBS, PBS and provider-specific utilisation

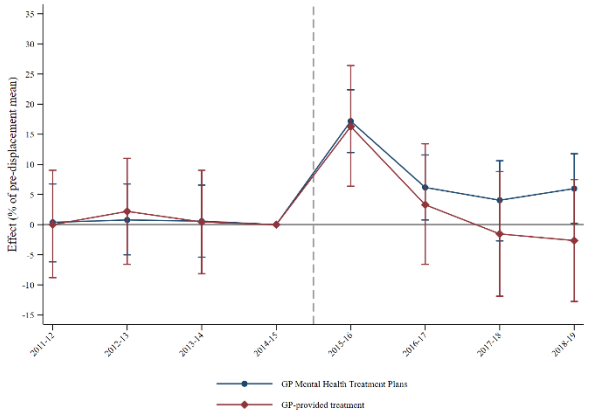
(a) MBS vs PBS utilisation



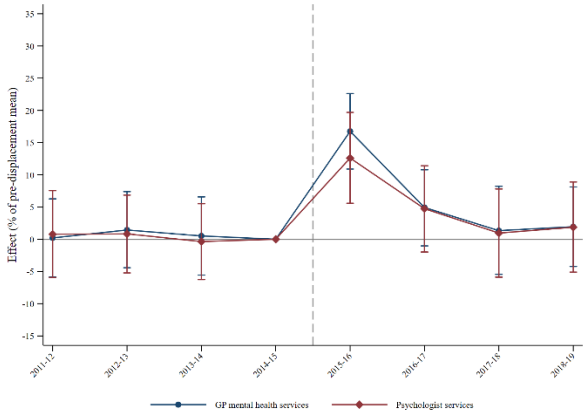
(b) Bulk-billed vs non-bulk billed MBS utilisation



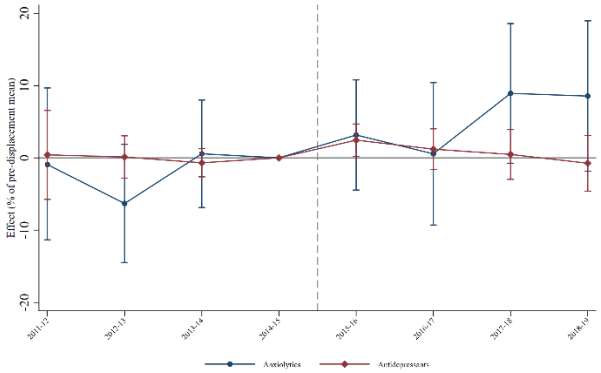
(c) GP Treatment Plans vs GP Therapy



(d) GP utilisation vs psychologist utilisation



e) Pharmaceutical fills by class



6.5 Heterogeneity in the mental healthcare response

We next examine whether workers with larger predicted mental healthcare responses differed systematically in their pre-displacement characteristics. **Table 3** compares workers above and below the median estimated conditional average treatment effect (CATEs) for key mental healthcare outcomes. These comparisons are descriptive of estimated CATEs and should not be interpreted as independently estimated subgroup treatment effects.

The clearest contrast is for prior engagement with mental healthcare. Among workers above the median CATE for total MBS mental health service use, 16.3 per cent had used an MBS mental health service before displacement, compared with only 0.6 per cent among workers below the median CATE. Prior mental health medication use differed even more markedly, at 24.9 per cent among workers above the median service CATE compared with 0.4 per cent among those below it.

A similar pattern is evident for more specific service outcomes. Among workers above the median GP service CATE, 13.6 per cent had previously used an MBS mental health service and 24.0 per cent had previously used a mental health medicine, compared with 3.3 per cent and 1.3 per cent, respectively, among those below the median. For psychologist services, prior MBS mental health use was 16.1 per cent among workers above the median CATE compared with 0.8 per cent below it, while prior medication use was 25.1 per cent compared with 0.1 per cent.

The differences are less pronounced for mental health medication CATEs. Workers above the median medication CATE were somewhat more likely to have used mental health services or medicines previously, but the contrasts were much smaller than for MBS service outcomes.

There is also clear income patterning in the predicted service responses. Workers above the median CATE for total MBS mental health services had substantially lower average pre-displacement employment income than those below the median CATE, at approximately $75,300 compared with $95,600. Similar differences are evident for GP services, at approximately $76,100 compared with $94,900, and psychologist services, at approximately $76,100 compared with $94,900. Larger predicted service responses are therefore not concentrated among workers with greater financial resources. In contrast, there is almost no income separation for the medication CATE, with average pre-displacement employment income of approximately $85,700 above the median and $85,300 below it.

These comparisons suggest that prior engagement with mental healthcare was strongly associated with predicted service responses. Larger predicted MBS, GP and psychologist responses were also

concentrated among workers with lower pre-displacement earnings, indicating that the service response was not confined to workers with greater financial resources. These descriptive CATE comparisons do not establish that income itself causes differences in the treatment response, nor do they identify whether the income pattern reflects differences in patient prices, billing arrangements or other characteristics correlated with pre-displacement income. The current analysis also does not distinguish between treatment initiation and intensification.

The full set of comparisons between workers above and below the median CATE across pre-displacement characteristics and outcomes is presented in the Appendix (Section 6).

Table 3: Pre-displacement characteristics of workers below / above median estimated CATE

Characteristic	Below median CATE	Above median CATE	p-value
Panel A. All mental health services			
Male (%)	60.1	43.0	<0.001
Age (years)	41.65	41.90	<0.001
Employment income (AUD $000)	95.62	75.34	<0.001
Prior MBS mental health service use (%)	0.6	16.3	<0.001
Prior mental health medication use (%)	0.4	24.9	<0.001
Bachelor degree (%)	34.3	33.6	0.002
Regional unemployment rate (%)	6.11	6.17	<0.001
Panel B. GP mental health services			
Male (%)	60.3	42.8	<0.001
Age (years)	41.65	41.91	<0.001
Employment income (AUD $000)	94.89	76.07	<0.001
Prior MBS mental health service use (%)	3.3	13.6	<0.001
Prior mental health medication use (%)	1.3	24.0	<0.001
Bachelor degree (%)	34.9	33.0	<0.001
Regional unemployment rate (%)	6.12	6.15	<0.001
Panel C. Psychologist services			
Male (%)	59.8	43.3	<0.001
Age (years)	41.93	41.62	<0.001
Employment income (AUD $000)	94.88	76.08	<0.001
Prior MBS mental health service use (%)	0.8	16.1	<0.001
Prior mental health medication use (%)	0.1	25.1	<0.001
Bachelor degree (%)	33.1	34.8	<0.001
Regional unemployment rate (%)	6.08	6.20	<0.001

Characteristic	Below median CATE	Above median CATE	p-value
Panel D. Mental health medications			
Male (%)	49.4	53.7	<0.001
Age (years)	40.19	43.36	<0.001
Employment income (AUD $000)	85.28	85.68	0.140
Prior MBS mental health service use (%)	5.8	11.0	<0.001
Prior mental health medication use (%)	10.7	14.6	<0.001
Bachelor degree (%)	36.8	31.1	<0.001
Regional unemployment rate (%)	5.99	6.29	<0.001

Notes: The table reports mean pre-displacement characteristics of workers classified as below or above the median estimated conditional average treatment effect (CATE), separately for each mental healthcare outcome. CATEs refer to the estimated short-run effect of displacement in 2015–16. Pre-displacement characteristics are measured in 2014–15. Binary characteristics are reported as percentages. Employment income is reported in AUD thousands. The below-median group contains 106,118 workers and the above-median group contains 106,117 workers. p-values are from tests of equality of means between the two CATE groups. CATE-group comparisons are descriptive of estimated treatment effect heterogeneity and should not be interpreted as causal effects of the characteristics themselves.

7 Discussion

Job displacement creates an unusual setting in which changes in mental health need and the financial resources available to obtain and sustain mental health treatment simultaneously move in opposite directions. The results of our analysis suggest that this tension is important for understanding why findings on healthcare (and mental healthcare) responses to job displacement may have been less consistent across past studies than the underlying health effects of job displacement.

Displacement produces a substantial and persistent reduction in earnings, while complementary survey evidence is consistent with a deterioration in psychological wellbeing in the displacement year. We find, within the Australian publicly subsidised healthcare setting, that realised mental healthcare treatment increases despite the substantial financial shock from displacement. The main result is a significant increase in zero patient charge outpatient mental health services concentrated close to the displacement year.

7.1 Mental healthcare treatment responses following job displacement

Our first main finding is that job displacement primarily increases service-based mental healthcare rather than pharmaceutical treatment. MBS-subsidised mental health service use rises around displacement, with responses across both GP mental health consultations and psychological therapy, while the average response in antidepressant and anxiolytic use is comparatively modest. This distinction helps clarify a mixed empirical literature on the healthcare consequences of job loss. Kuhn, Lalive, and Zweimüller (2009) find relatively little change in overall medical expenditure following plant closure in Austria, alongside increases in antidepressant expenditure and mental health-related hospitalisation among men. Rocco et al. (2018) report increases in psychotropic prescribing in Italy, while Tsai, Huang, and Yang (2024) document persistent increases in outpatient

mental health visits and expenditure in Taiwan. By contrast, Abayasekara, de New, and Johnston (2025) find no corresponding increase in mental healthcare use following the shutdown of Australia's automotive manufacturing industry, and Schaller and Stevens (2015) document reductions in doctor visits and prescription drug use among some displaced workers in the US, including those who lost employer-provided health insurance. Taken together, this literature suggests that deteriorating health does not translate mechanically into a common pattern of healthcare utilisation. Institutional context, treatment prices, insurance arrangements and the ease with which workers can enter or adjust treatment are likely to shape the form that the healthcare response takes.

The Australian institutional setting is informative in this respect because workers retain universal health insurance and access to publicly subsidised GP and psychological mental healthcare following displacement. Medicare subsidises outpatient mental healthcare, but providers retain discretion over the fees they charge, so otherwise subsidised services can involve very different out-of-pocket costs. The setting therefore separates formal insurance coverage from the effective price faced at the point of care and allowed us to observe whether adjustment occurs through different treatment pathways within a universal system.

The timing and composition of the response we find provides further insight into this adjustment. The increase in MBS mental health service use is concentrated around displacement and attenuates thereafter, rather than building gradually over the post-displacement period, consistent with a relatively immediate response to the shock. By comparison, the pharmaceutical response is substantially weaker. Antidepressant use increases only modestly around displacement, while later positive estimates for anxiolytic use are imprecise. The healthcare response to displacement therefore does not appear to reflect a general increase across all forms of mental health treatment. One possible interpretation is that relatively acute distress surrounding displacement is initially managed through consultations and psychological care, reflecting both treatment needs and clinical or patient decisions, whereas medication responses may be more likely to emerge when symptoms are more persistent.

7.2 Financial access within a universal healthcare system

Within our results, the billing composition of the MBS response provides the clearest evidence on financial access. Additional MBS mental health service use is concentrated in bulk billed care, while non-bulk billed mental health services show no corresponding significant increase. Because this pattern emerges in the context of a substantial earnings shock, the financial conditions under which care is delivered are likely to be particularly relevant. The findings are therefore consistent with additional treatment response occurring disproportionately through services for which patients face no direct charge. This pattern may reflect provider charging decisions, patient sorting toward lower-cost providers and local competitive conditions in provider markets.

This interpretation is closely related to the broader literature on healthcare demand and patient prices. Gertler, Locay and Sanderson (1987) show that healthcare demand can become more price sensitive as resources fall, while Gross, Layton and Prinz (2022) demonstrate that even relatively small patient charges may affect healthcare consumption when liquidity is constrained. The present setting extends this idea to an adverse labour market shock within a universal health system. The relevant margin is not only whether workers are insured, but whether subsidised care ultimately carries a direct patient charge.

Our bulk billing result should nevertheless be interpreted carefully. Billing arrangements are not exogenously assigned: providers may adjust their charging behaviour in response to patients' financial circumstances, including concession status, while patients may also select providers according to the fees they charge. The comparison between bulk billed and non-bulk billed care therefore does not identify a causal effect of patient price. Instead, it shows that the additional treatment response occurs disproportionately through services for which patients face no direct charge. The bulk billing distinction is therefore informative about the financial conditions under which additional mental healthcare is accessed following a large earnings loss, even though it does not identify a price elasticity.

The provider-specific results also highlight that billing status and provider type are related. GP mental health services are more likely to be bulk billed than psychological services. However, both GP mental health services and psychologist services increase around displacement, indicating that the overall service response is not confined to the more commonly bulk-billed GP sector. The concentration of the aggregate response in bulk billed care may nevertheless reflect both the composition of additional services across provider types and billing decisions within these provider types. Billing status nevertheless directly identifies whether the realised service involved a patient charge, which is the financial margin of interest here.[1]

An important direction for future research is to distinguish more directly between the mechanisms through which workers adjust to the financial consequences of adverse economic shocks. Increased use of zero-price care may arise because affected workers sort toward providers who are already more likely to offer such care, because existing providers alter their charging behaviour in response to changes in patients' financial circumstances, or through some combination of the two. Distinguishing these mechanisms is beyond the scope of the present study, which focuses on worker-level treatment responses rather than longitudinal changes in patient–provider relationships. A provider-level longitudinal design could separate changes in provider composition from changes in billing within continuing patient–provider relationships and clarify the roles of concession status and provider discretion in shaping financial access to healthcare following income shocks.

7.3 Prior engagement with mental healthcare

Our heterogeneity analysis suggests a second potential access margin, that is, whether workers are already connected to mental healthcare before displacement. Workers with larger predicted MBS, GP and psychologist service responses in our study were substantially more likely to have used mental health services or medicines before displacement. The differences in prior treatment history were much larger than many of the corresponding differences in standard demographic characteristics.

This pattern is consistent with the idea that prior engagement changes the margin on which workers can respond when mental health deteriorates. Someone already receiving treatment may have an established GP, psychologist or prescribing clinician, prior recognition of a mental health condition

[1] Displacement may also increase the time available to seek care. If bulk-billed services involve longer waits or less flexible scheduling, greater time availability among displaced workers could contribute to their increased use. We cannot test this channel with our data.

and familiarity with the referral and reimbursement system. For these workers, a deterioration in mental health can potentially be accommodated through changes in an existing treatment pathway. Workers with no prior contact with the mental healthcare system face an additional entry margin including recognising a need for care, seeking an assessment, obtaining a referral where required and locating a suitable provider.

This interpretation is not definitive. The CATE comparisons identify characteristics associated with larger predicted responses, but do not separately estimate treatment entry and treatment intensification. Larger predicted responses among prior users may also reflect greater underlying mental health vulnerability or other characteristics correlated with previous treatment. The results therefore identify prior treatment engagement as a potentially important marker of heterogeneous responses, rather than establishing the mechanism through which this marker operates.

The CATE income patterns also suggest that larger predicted MBS service responses are not concentrated among higher-income workers. For total MBS, GP and psychologist services, workers above the median predicted response had lower average pre-displacement earnings, while the medication CATE showed relatively little separation by income. These patterns suggest that pre-displacement income alone may not capture financial access to mental healthcare in this setting. Access may instead depend on how income interacts with the effective patient price of care and with workers' existing engagement with the treatment system.

Because the administrative data do not capture psychological services paid entirely outside Medicare, these income patterns refer to Medicare-subsidised care rather than to all psychological treatment. These income patterns should also be considered in the context of broader socioeconomic gradients in access to subsidised psychological treatment. In their evaluation of the Better Access Initiative, Pirkis et al. (2022) show that among adults receiving a mental health treatment plan, 62.6 per cent of those in the lowest equivalised household-income quintile subsequently accessed treatment in 2017–18, compared with 71.6 per cent in the highest quintile. The lower income observed among workers with larger predicted MBS responses should therefore not be interpreted as evidence that financial resources are unimportant for treatment access.

The absence of a comparable income gradient in predicted medication responses is also relevant, and suggests that the service and pharmaceutical margins operate differently. One plausible institutional explanation is that service costs vary substantially with billing arrangements, whereas there is less heterogeneity in PBS co-payments, that are more regulated and capped.

7.4 Implications

The findings in our study have two broader implications for understanding healthcare use following economic shocks. First, universal health insurance should not be treated as equivalent to uniform financial access. Even where insurance coverage is maintained, the financial conditions under which care is delivered may affect which treatment pathways remain feasible when income falls, particularly when providers have autonomy over price-setting. For mental healthcare, where repeated visits and provider-set fees can create substantial cumulative costs, the distinction between subsidised and zero-price care may be particularly important.

Second, access to care may depend on more than affordability alone. Workers already connected to the mental healthcare system may be able to adjust their treatment relatively quickly, while those

outside it face additional informational, referral and provider search barriers. This means that the same deterioration in mental health need may produce different utilisation responses depending on both the financial conditions of care, pre-existing vulnerability and the worker's prior relationship with the treatment system.

These two margins have different implications. Financial protection concerns the financial conditions under which treatment is accessed, whereas prior engagement affects how easily workers can enter or modify a treatment pathway. Policies designed to protect mental health following labour market shocks may therefore need to consider both the cost of care and the frictions involved in initiating treatment.

7.5 Limitations

Several limitations qualify the findings and interpretation of this study. First, the administrative data we use measure realised publicly subsidised treatment rather than underlying mental health need. MBS and PBS records therefore cannot distinguish workers whose mental health deteriorated but who did not seek treatment from those whose mental health did not deteriorate. The HILDA analysis provides complementary evidence on self-reported mental health, but the treated sample is much smaller and the event wave estimate is imprecise.

Second, MBS and PBS data do not capture all mental healthcare. Some state-funded community and hospital based mental healthcare, and services paid entirely privately, sit outside the Medicare data used here. Our estimates should therefore be interpreted as effects on the large, publicly subsidised components of mental healthcare that can be observed in government administrative data.

Third, billing status is endogenous. Providers can decide whether to bulk bill, and patients may choose providers partly according to expected out-of-pocket costs. The concentration of the response in bulk billed services therefore identifies an important feature of the realised treatment response, but does not isolate the mechanism generating that billing pattern or identify the causal effect of moving a service from positive to zero patient price after displacement.

Fourth, the CATE analysis describes predicted treatment effect heterogeneity rather than causal effects of the characteristics used to organise that heterogeneity.

Finally, the study focuses on workers with sustained attachment to their employer before displacement. This restriction strengthens the interpretation of job loss as a meaningful labour market shock but it also means that the estimates in this study may not generalise to workers with intermittent employment, weaker labour force attachment or different forms of job separation.

Overall, these qualifications do not change the main conceptual implication. The healthcare consequences of job displacement are shaped not only by the health shock itself, but by the conditions under which increased need can be converted into treatment. Our Australian results suggest that both the financial conditions under which care is realised and workers' prior connection to the mental healthcare system are relevant parts of that process.

8 Conclusion

Job displacement highlights a broader problem in the economics of healthcare access, namely that adverse financial events may increase the need for psychological treatment while simultaneously

reducing the financial resources available to obtain it. Universal insurance reduces this tension but may not eliminate it, because patients may still face different prices and different barriers to entering care. Our analysis suggests that, when economic and health risks occur together, prior connection to the healthcare system and the financial conditions under which care is accessed may shape the path from increased need to treatment.

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Appendix

1 GRF Implementation Details

The causal forest is estimated on the 2015–16 cross-section using the grf package in R, with the following key parameters: 10,000 trees; minimum node size 20 (to prevent overfitting in small leaves); sample fraction 0.5 (to implement the honesty condition, where each tree uses one half of the sub-sample to determine splits and the other half to estimate leaf-level treatment effects); clusters defined by the worker's 2014–15 primary employer were passed to the forest, consistent with the DiD specification. Worker-level CATEs are recovered as out-of-bag predictions, so each worker's estimated CATE is never computed using a tree for which that worker was in the training sample.

2 Medicare-subsidised mental health-specific items

Table A

Provider type	Item group	MBS group	MBS item numbers
Psychiatrists	Initial consultation new patient	Group A08	296, 297, 299
	Patient attendances	Group A08	288, 291, 293, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 319, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 353, 355, 356, 357, 358, 359, 361, 364, 366, 367, 369, 370
	Interview with non-patient	Group A08	348, 350, 352
	Case conferencing	Group A15	855, 857, 858, 861, 864, 866
	Electroconvulsive therapy	Group T01	14224
	Psychiatrist services - Other: Assessment and treatment of pervasive developmental disorder (PDD)	Group A08	289
	Psychiatrist services - Other: Group psychotherapy	Group A08	342, 344, 346
General practitioners	Mental Health Treatment Plan preparation and review	Group A07	272, 276, 277, 281, 282
		Group A20	2700, 2701, 2702, 2710, 2712, 2715, 2717, 2719
	Mental Health Treatment service	Group A07	279
		Group A20	2713
		Group A30	2121, 2150, 2196
	Focussed Psychological Strategies	Group A07	283, 285, 286, 287, 372
		Group A20	2721, 2723, 2725, 2727, 2729, 2731

Provider type	Item group	MBS group	MBS item numbers
	Family Group Therapy	Group A06	170, 171, 172
		Group A07	221, 222, 223
	Electroconvulsive therapy	Group T10	20104
Clinical psychologists	Psychological Therapy Services	Group M06	80000, 80001, 80005, 80010, 80011, 80015, 80020, 80021
Provider type	Item group	MBS group	MBS item numbers
Other psychologists	Focussed Psychological Strategies	Group M07	80100, 80101, 80105, 80110, 80111, 80115, 80120, 80121
	Enhanced Primary Care	Group M03	10968
	Psychology health service - Other	Group M11	81355
	Psychology health service - Other: Assessment and treatment of PDD	Group M10	82000, 82015
Allied health providers	Focussed Psychological Strategies - Occupational Therapist	Group M07	80125, 80126, 80130, 80135, 80136, 80140, 80145, 80146
	Focussed Psychological Strategies - Social Worker	Group M07	80150, 80151, 80155, 80160, 80161, 80165, 80170
	Enhanced Primary Care	Group M03	10956
	Mental Health service	Group M11	81325

Source: Australian Institute of Health and Welfare (2024).

Notes: Item numbers that were no longer in use or had not yet been introduced during the sample period are not shown.

3 Sample construction

Table B

Sample construction step	# of individuals	# of firms
All individuals (firms) in 2014-15 ATO payment summary file	11689994	771522
Individuals (firms) who received (paid) individual non-business payment	11594945	762144
Individuals (firms) who can be linked to (are identified to be) a primary employer	11594945	712244
Individuals who left in 2014-15 are excluded		
Individuals who received termination payment from their primary employer in 2014-15	191906	20820
Individuals whose wage payment received from their 2014-15 primary employer dropped at least 50% from 2013-14 to 2014-15	567549	154928
Individuals who did not received any wage payment from their 2014-15 primary employer in 2015-16	2731902	405996
Total excluded	**2900614**	**421373**
Individuals remained	**8694331**	**562645**
Keep firms with at least 20 employees	**6664431**	**44207**
Individuals who left in 2015-16 are identified		
Their 2014-15 primary employer was still their primary employer in 2015-16, but		
Individuals who received termination payment from their 2014-15 primary employer in 2015-16	132012	12446
Individuals whose wage payment received from their 2014-15 primary employer dropped at least 50% from 2014-15 to 2015-16	371915	37699
Individuals who did not received any wage payment from their 2014-15 primary employer in 2016-17	972436	43180
Their 2014-15 primary employer was their secondary employer in 2015-16	566276	40163
Total identified	**1649887**	**43992**

Firm size change from 2014-15 to 2015-16

Sample construction step	# of individuals	# of firms
Control: No mass layoff or closure, more than -30%	5120899	26264
Treatment: no more than -30%	1543532	17943
Mass layoffs, no more than -30% but more than -100%	1392050	15537
Closure, -100%	151482	2406

Control group sample restriction

Sample construction step	# of individuals	# of firms
Employed by the same primary employer in 2011-12, 2012-13, 2013-14, and 2014-15	2914408	22485
Can be linked to DOMINO, MBS, and PBS datasets	2488939	22435
Exclude those who died no later than 2018-19	2466394	22432
Aged 20 to 65 from 2011-12 to 2018-19	2130617	22389
Non-missing information on covariates	2130484	22380

Matched to an individual in the treatment group	**138934**	**16393**

Treatment group sample restriction

Sample construction step	# of individuals	# of firms
Individuals who left the treated firm in 2015-16	809011	17943
Employed by the same primary employer in 2011-12, 2012-13, 2013-14, and 2014-15	203219	12090
Can be linked to DOMINO, MBS, and PBS datasets	174042	11754
Exclude those who died no later than 2018-19	172690	11730
Aged 20 to 65 from 2011-12 to 2018-19	138964	10900
Non-missing information on covariates	138964	10900
Matched to an individual in the control group	**138934**	**10893**

Notes: These tables report the number of individuals and firms remaining in the analysis sample at each step of the sample construction process.

4 Full set of DiD pooled study estimates

Table C

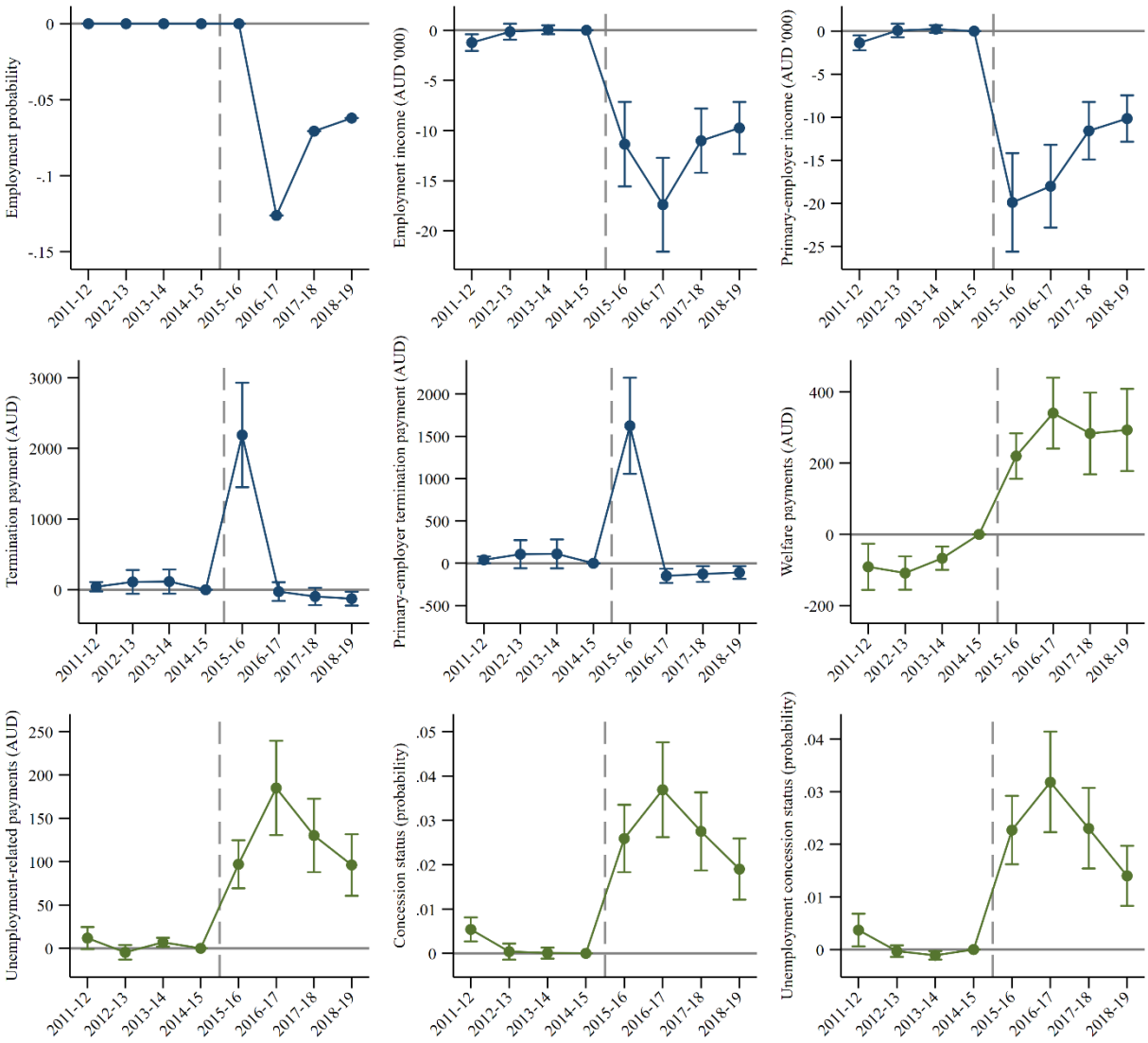
Outcome	ATT	SE	Pre-mean	Change
Employed (0/1)	-0.0648***	(0.0092)	1	-6.5%
Employment income ($1,000)	-12.0461***	(1.8784)	80.4158	-15.0%
Employment income from primary employer ($1,000)	-14.6385***	(2.0960)	79.0507	-18.5%
Termination payment ($)	418.2097***	(108.7826)	104.3432	400.8%
Termination payment from primary employer ($)	245.1621***	(79.6264)	70.2229	349.1%
Welfare payments ($)	350.9481***	(62.6177)	2107.4764	16.7%
Unemployment benefits ($)	123.5451***	(19.8810)	171.8214	71.9%
Concession status (0/1)	0.0259***	(0.0043)	0.0859	30.1%
Unemployment concession status (0/1)	0.0223***	(0.0034)	0.0319	69.9%
All mental health services (count)	0.0139**	(0.0065)	0.3306	4.2%
Bulk billed mental health services (count)	0.0199***	(0.0047)	0.1600	12.4%
Non-bulk billed mental health services (count)	-0.0060	(0.0040)	0.1706	-3.5%
Mental health services provided by GPs (count)	0.0055***	(0.0021)	0.0973	5.7%
GP mental health treatment plans (count)	0.0041***	(0.0009)	0.0518	7.9%
GP mental health therapy services (count)	0.0015	(0.0016)	0.0455	3.3%
Mental health services provided by psychiatrists (count)	-0.0007	(0.0031)	0.0574	-1.2%
Mental health services provided by psychologists (count)	0.0079**	(0.0039)	0.1666	4.7%
Mental health services provided by clinical psychologists (count)	-0.0001	(0.0026)	0.0832	-0.1%
Mental health services provided by other psychologists (count)	0.0080***	(0.0025)	0.0834	9.6%
Mental health services provided by allied health (count)	0.0012	(0.0008)	0.0093	12.9%

Outcome	ATT	SE	Pre-mean	Change
All mental health medications (count)	0.0097	(0.0114)	0.7356	1.3%
Medications prescribed by GPs (count)	0.0076	(0.0102)	0.6665	1.1%
Medications prescribed by psychiatrists (count)	0.0018	(0.0029)	0.0505	3.6%
Medications prescribed by other specialists (count)	-0.0001	(0.0015)	0.0169	-0.6%
Medications prescribed by allied health (count)	0.0001	(0.0003)	0.0007	14.0%
Anxiolytics (count)	0.0037*	(0.0021)	0.0538	6.9%
Antidepressants (count)	0.0060	(0.0110)	0.6822	0.9%
Any mental health service use (0/1)	0.0043***	(0.0010)	0.0743	5.8%
Any mental health medication use (0/1)	0.0013	(0.0010)	0.1098	1.2%
Mental health services only (0/1)	0.0011*	(0.0006)	0.0379	2.9%
Mental health medications only (0/1)	-0.0019**	(0.0008)	0.0734	-2.6%
Both mental health services and medications (0/1)	0.0032***	(0.0007)	0.0364	8.8%
Any mental health service or medication use (0/1)	0.0024*	(0.0013)	0.1477	1.6%

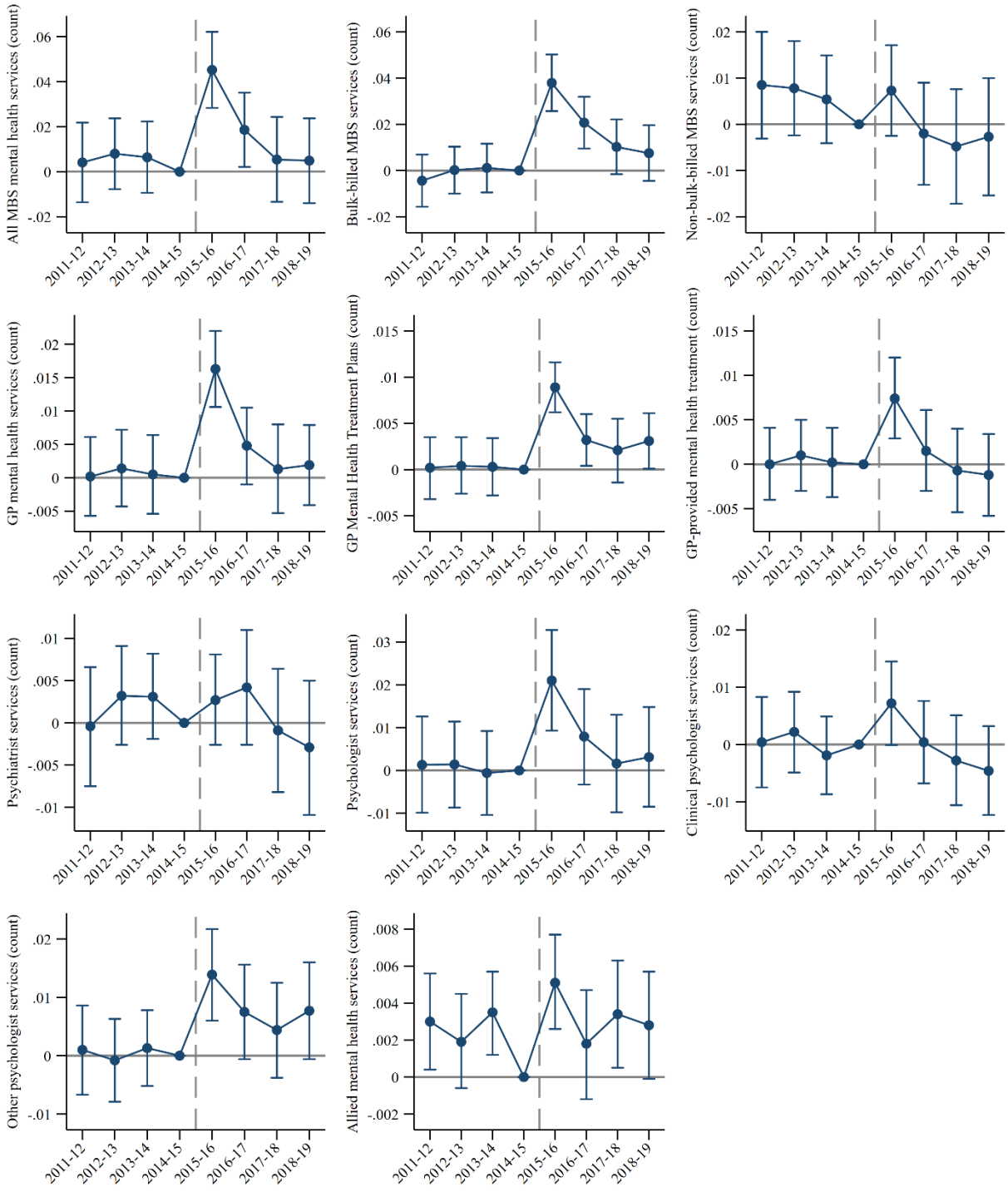
Notes: Pooled post period is 2015–16 to 2018–19. All models include individual and year fixed effects. Standard errors are clustered at the worker's 2014–15 primary employer. Pre-mean is the treated group mean before displacement. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5 Full set of DiD event study figures

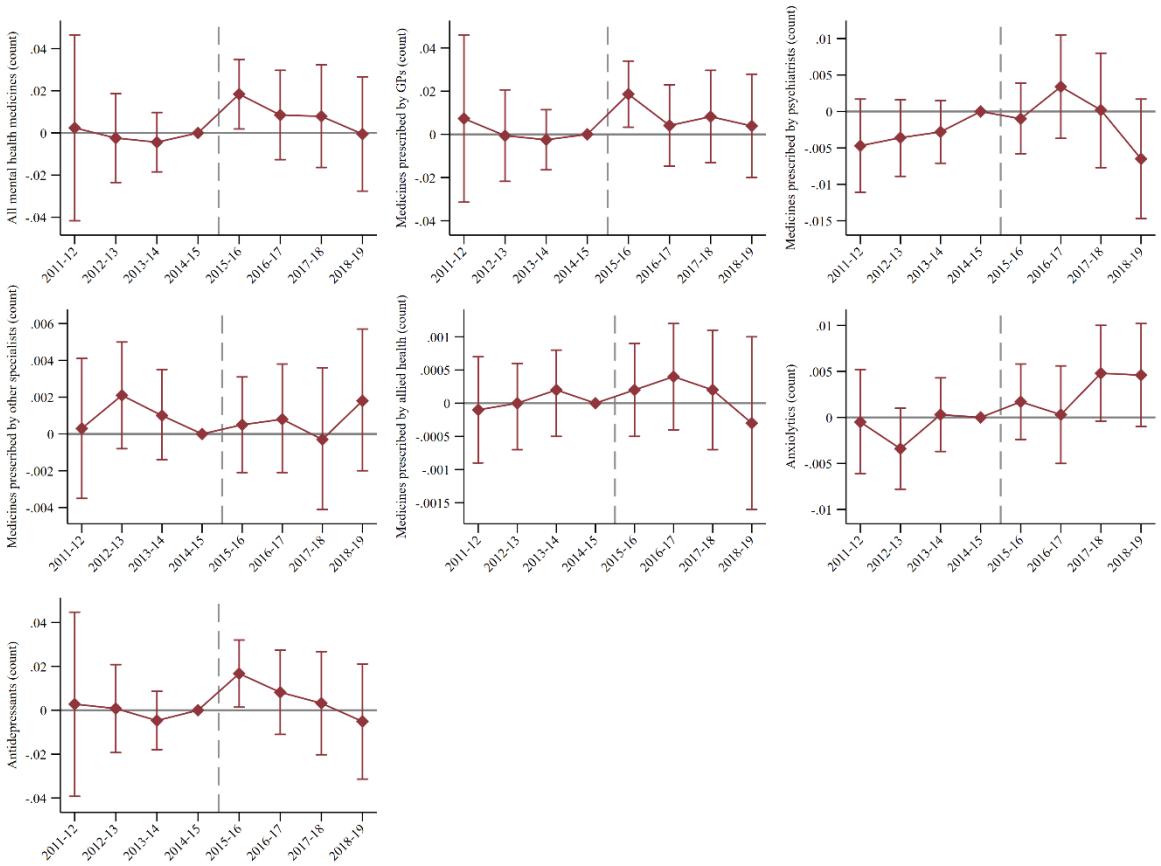
A: Financial and welfare payment outcomes:



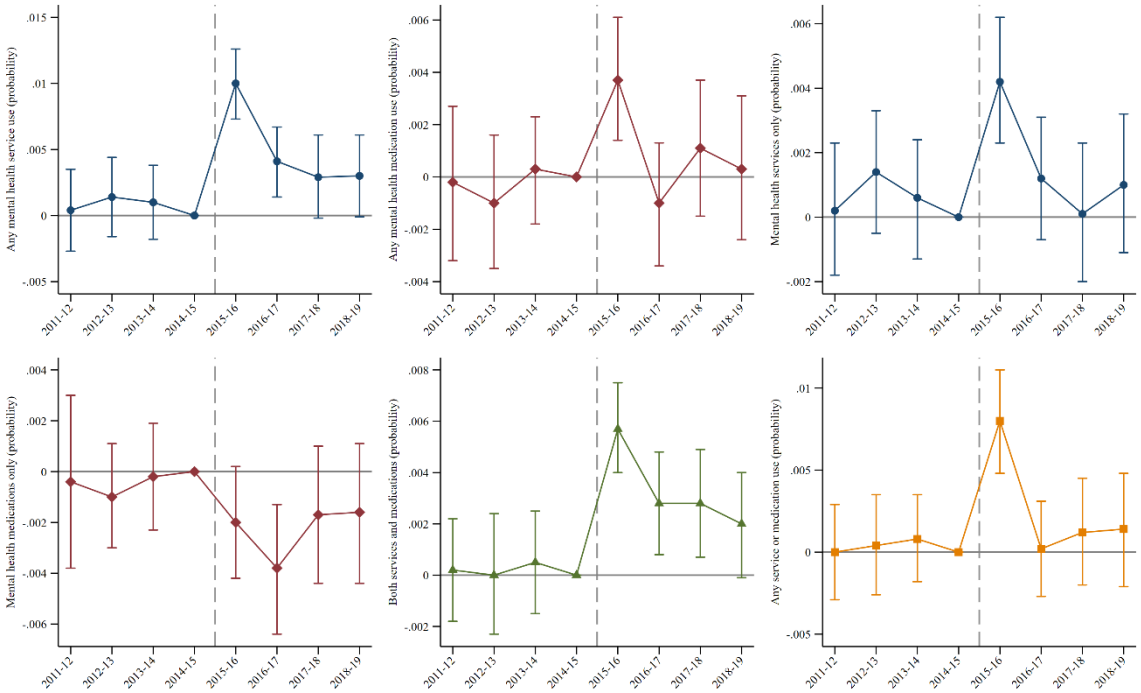
B: MBS outcomes:



C: PBS outcomes:



D: Binary (0/1) mental health treatment variables



6 Full set of below and above median CATEs by pre-displacement characteristics

Table D

Characteristic	Below-median CATE	Above-median CATE	p-value
Panel A. All mental health services			
Male (%)	60.1	43.0	<0.001
Age (years)	41.65	41.90	<0.001
Employment income (AUD $000)	95.62	75.34	<0.001
Primary employer headcount	4,232	4,620	<0.001
Prior MBS mental health service use (%)	0.6	16.3	<0.001
Prior mental health medication use (%)	0.4	24.9	<0.001
Goods production industry (%)	25.0	14.8	<0.001
Distribution services industry (%)	14.9	15.5	<0.001
Business services industry (%)	29.3	28.6	<0.001
Consumer services industry (%)	5.1	13.2	<0.001
Public and social services industry (%)	25.7	27.9	<0.001
Bachelor degree (%)	34.3	33.6	0.002
High-skilled job (%)	38.1	36.1	<0.001
Medium-skilled job (%)	27.2	24.1	<0.001
Low-skilled job (%)	34.7	39.8	<0.001
Non-labour income (AUD $)	2,125	1,063	<0.001
Regional unemployment rate (%)	6.11	6.17	<0.001
Regional mental health waiting time (days)	71.56	69.23	<0.001
Psychiatrists and psychologists per 1,000 residents	0.881	0.881	0.927
Pharmacies per 1,000 residents	0.253	0.251	<0.001
Panel B. GP mental health services			
Male (%)	60.3	42.8	<0.001
Age (years)	41.65	41.91	<0.001
Employment income (AUD $000)	94.89	76.07	<0.001
Primary employer headcount	4,707	4,146	<0.001
Prior MBS mental health service use (%)	3.3	13.6	<0.001
Prior mental health medication use (%)	1.3	24.0	<0.001
Goods production industry (%)	22.6	17.2	<0.001
Distribution services industry (%)	15.1	15.3	0.166
Business services industry (%)	29.3	28.6	<0.001
Consumer services industry (%)	6.3	12.1	<0.001
Public and social services industry (%)	26.8	26.8	0.981
Bachelor degree (%)	34.9	33.0	<0.001
High-skilled job (%)	38.0	36.2	<0.001

Characteristic	Below-median CATE	Above-median CATE	p-value
Medium-skilled job (%)	26.8	24.4	<0.001
Low-skilled job (%)	35.2	39.3	<0.001
Non-labour income (AUD $)	1,465	1,723	0.011
Regional unemployment rate (%)	6.12	6.15	<0.001
Regional mental health waiting time (days)	71.50	69.29	<0.001
Psychiatrists and psychologists per 1,000 residents	0.896	0.867	<0.001
Pharmacies per 1,000 residents	0.254	0.250	<0.001
Panel C. Psychologist mental health services			
Male (%)	59.8	43.3	<0.001
Age (years)	41.93	41.62	<0.001
Employment income (AUD $000)	94.88	76.08	<0.001
Primary employer headcount	4,172	4,680	<0.001
Prior MBS mental health service use (%)	0.8	16.1	<0.001
Prior mental health medication use (%)	0.1	25.1	<0.001
Goods production industry (%)	25.5	14.4	<0.001
Distribution services industry (%)	15.1	15.3	0.253
Business services industry (%)	28.7	29.2	0.006
Consumer services industry (%)	5.7	12.7	<0.001
Public and social services industry (%)	25.1	28.5	<0.001
Bachelor degree (%)	33.1	34.8	<0.001
High-skilled job (%)	37.4	36.8	0.007
Medium-skilled job (%)	27.5	23.8	<0.001
Low-skilled job (%)	35.1	39.4	<0.001
Non-labour income (AUD $)	2,260	928	<0.001
Regional unemployment rate (%)	6.08	6.20	<0.001
Regional mental health waiting time (days)	71.86	68.93	<0.001
Psychiatrists and psychologists per 1,000 residents	0.899	0.863	<0.001
Pharmacies per 1,000 residents	0.257	0.248	<0.001
Panel D. Mental health medications			
Male (%)	49.4	53.7	<0.001
Age (years)	40.19	43.36	<0.001
Employment income (AUD $000)	85.28	85.68	0.140
Primary employer headcount	5,468	3,384	<0.001
Prior MBS mental health service use (%)	5.8	11.0	<0.001
Prior mental health medication use (%)	10.7	14.6	<0.001
Goods production industry (%)	18.6	21.3	<0.001
Distribution services industry (%)	15.0	15.4	0.031
Business services industry (%)	30.1	27.8	<0.001

Characteristic	Below-median CATE	Above-median CATE	p-value
Consumer services industry (%)	4.9	13.4	<0.001
Public and social services industry (%)	31.4	22.2	<0.001
Bachelor degree (%)	36.8	31.1	<0.001
High-skilled job (%)	37.9	36.3	<0.001
Medium-skilled job (%)	22.9	28.3	<0.001
Low-skilled job (%)	39.2	35.4	<0.001
Non-labour income (AUD $)	1,189	1,998	<0.001
Regional unemployment rate (%)	5.99	6.29	<0.001
Regional mental health waiting time (days)	71.70	69.08	<0.001
Psychiatrists and psychologists per 1,000 residents	0.957	0.805	<0.001
Pharmacies per 1,000 residents	0.261	0.243	<0.001

Notes: The table reports mean pre-displacement characteristics of workers classified as below or above the median estimated conditional average treatment effect (CATE), separately for each mental healthcare outcome. CATEs are estimated for the short-run effect of displacement in 2015–16. Pre-displacement characteristics are measured in 2014–15. Binary characteristics are reported as percentages. Employment income is reported in AUD thousands. Regional mental health workforce and pharmacy measures are expressed per 1,000 residents. The below-median group contains 106,118 workers and the above-median group contains 106,117 workers for each outcome. p-values are from tests of equality of means between the two CATE groups. These comparisons describe characteristics associated with estimated treatment effect heterogeneity and should not be interpreted as causal effects of the characteristics themselves.