Evaluating Recent Crackdowns on Disability Benefits: Effects on Income and Health Care Use in Australia

Manasi Deshpande
University of Chicago & NBER

Greg Kaplan
University of Chicago, e61 Institute & NBER

Tobias Leigh-Wood*
University of Chicago

March 28, 2025

PRELIMINARY AND INCOMPLETE

Abstract

Many developed countries have enacted reforms to reduce enrollment in disability benefits (DI). We evaluate the effects of a DI crackdown in Australia on the most comprehensive set of outcomes available to date, including earnings, government benefits, family income, and health care utilization. Using a 2014 reform to Australia's Disability Support Pension that removed many young recipients, we find that, on average, DI removal has a net zero effect on household income and increases prescriptions for strong mental health drugs. However, average effects mask heterogeneity by family structure. For removed recipients living with family, family members increase their earnings by enough to offset the lost DI income, with minimal increase in mental health prescriptions. In contrast, removed recipients living alone do not increase their own earnings or have family support, but their use of mental health drugs, especially strong antipsychotics, increases dramatically, suggestive of their use of medication as a coping mechanism. We develop a welfare analysis that considers multiple margins of behavioral adjustment and how they affect private utility. We find that behavioral adjustments offset more than half of the private welfare loss for recipients living with family but very little for those living alone. Government savings exceed household willingness to pay for DI for those living with family, but not for those living alone.

*Deshpande: University of Chicago Kenneth C. Griffin Department of Economics and NBER, mdeshpande@uchicago.edu. Kaplan: University of Chicago Kenneth C. Griffin Department of Economics, e61 Institute and NBER, gkaplan@uchicago.edu. Leigh-Wood: University of Chicago Becker-Friedman Institute, tjleighwood@uchicago.edu. We thank the Becker-Friedman Institute, the Ronzetti Initiative for the Study of Labor Markets, and the National Science Foundation (CAREER Grant 1941538) for funding. The views expressed are those of the authors and do not necessarily reflect the views of any funder. We thank Yalun Su and Marcia Ruiz Pulgar for excellent research assistance. We thank the Australian Bureau of Statistics and the Department of Social Services for making the data available. We thank Gemma van Haldren, Lachlan McColl, Benjamin Peoples, Caroline Stevens, Michael Harvey, Nathan Dean, Sara Morris, Timothy Sekuless, Sam McNamara, and Kayelle Drinkwater of DSS, and Matt Nolan of the e61 Institute, for sharing their knowledge of the program and the data. For helpful comments we thank Martin Andresen, Janet Currie, Morten Håvarstein, Jeff Hicks, Maxwell Kellogg, Kory Kroft, Kristen Sobeck, Michael Stepner, and seminar participants at NBER Public Economics Spring 2024 meeting, Brandeis, University of Oslo, BI Norwegian Business School, Macquarie University, e61 Institute, and Australian National University for helpful comments.

1 Introduction

In response to rising enrollment in disability insurance (DI) programs in 1990s and 2000s, countries across the developed world have enacted reforms to restrict entry onto DI and remove current DI recipients. Examples include the Netherlands, Sweden, the United Kingdom, Germany, and Australia (McVicar et al., 2023). Proposals for similar reforms have been discussed in other countries, including the United States.[1]

The normative implications of these DI crackdowns are unclear. The large body of evidence on the effect of DI on labor supply suggests that DI crackdowns will lead to a modest increase in work among people who are removed or denied entry (Chen and van der Klaauw, 2008; Von Wachter et al., 2011; Maestas et al., 2013; French and Song, 2014; Moore, 2015; Deshpande, 2016). Labor supply effects alone, however, do not speak to the cost effectiveness of these policies without broader evidence on the effects on household income and well-being.[2] DI crackdowns could increase social welfare if they encourage work-capable individuals, especially young people, to stay in the labor market. They could decrease social welfare if they push people for whom work is difficult into either working or losing income.

In this paper, we estimate the effect of DI crackdowns on the most comprehensive set of recipient outcomes available to researchers to date, including household income and health care utilization. We then use these estimates in combination with a model to estimate the effects of the DI crackdowns on both household welfare and social welfare. We study these questions in the context of the Australian Disability Support Pension (DSP) program, the main disability benefits program in Australia, which is a means-tested program with no work history requirement. In response to rising DSP enrollment, the Australian government in 2012 enacted stricter medical standards for DSP. In 2014, the Australian government extended these stricter standards to current DSP recipients by conducting medical reviews for younger recipients deemed to have some work capacity. The new medical reviews were targeted at DSP recipients who had entered DSP after January 1, 2008, and whose 35th birthday was after July 1, 2014, the date of the reform's enactment. Relative to other DSP recipients under the age of 40, those affected by the reform were more likely to have psychological conditions, less likely to live with family, and more likely to have earnings prior to DSP receipt.

We use this policy change to estimate a regression discontinuity in DSP start date and

[1] See, e.g., XXX. The film *I, Daniel Blake* portrays the experience of a disability applicant in the United Kingdom affected by the disability reforms in that country.

[2] Recent papers going beyond the labor supply effects of DI include Autor et al. (2019), who study the effect of DI on household consumption and spouse labor supply in Norway; and Gelber et al. (2023) and Black et al. (2024), who study the effect of DI on mortality in the United States; and Silver and Zhang (2022), who study the effect of the US Veterans Disability Compensation program on health care utilization.

birth date, and thereby estimate the effect of DSP removal on household income and health care utilization. We use newly available Australian administrative data to link DSP recipients to their family members (parents and spouses). We estimate the effect of the medical reviews and DSP loss on household income, including the recipient's own earnings and government benefits as well as the earnings and government benefits of parents and spouses; and on health care utilization, including visits to medical providers and prescription drug use.

We find that the average effect of DSP removal on household income across removed recipients is zero or even positive. Removed recipients recover about 55% of the loss by substituting to other programs, primarily the Newstart program (a type of unemployment benefit). They recover about 35% of the loss by working more, mainly in low-skilled jobs. Family members also increase their earnings: the earnings of parents who live with the DSP recipient replace 35% of the lost DSP benefits, and spouse earnings replace 15% of the loss, unconditional on living with a parent or spouse. Both the loss of DSP income and the household income responses to the loss are highly persistent, remaining unchanged from the time of the reform in 2014 to the latest available year of data in 2022.

However, this average zero effect on household income masks substantial heterogeneity by family structure. For individuals living with family members (43% of the sample), large increases in the earnings of parents and spouses more than offset the DSP loss, and the DSP recipients themselves work more as well. Household income actually increases as a result of the DSP loss. In contrast, individuals living alone (57% of the sample) do not increase their own earnings, nor do they have family members in the household to help offset the loss. Parents living away from the DSP recipient do not increase their earnings either. The only source of substitution for individuals living alone is to other government programs, which replaces about two-thirds of their DSP benefits. As a result, they experience a reduction in household income.

We also find that DSP removal increases prescriptions for mental health prescription drugs, especially antipsychotics. Antipsychotics are powerful drugs used to treat bipolar disorder, schizophrenia, and severe depression. They have strong side effects that vary by the exact formulation used, including movement disorders, cardiac events, weight gain, high cholesterol and blood sugar, and dizziness and sedation. DSP removal increases the likelihood of having a prescription for a mental health drug between 2016–18 by 23 pp and the likelihood of having an antipsychotic prescription by 23 pp, both statistically significant. This increase is driven exclusively by men, and mostly by people living alone rather than people living with family. We explore three channels through which DSP removal could affect the use of mental health drugs: DSP removal might increase the marginal utility of income and therefore increase the use of drugs to either increase work productivity or make work

easier (an "income effect"); DSP removal might reverse any potential disincentive that the program creates to seek treatments that increase work capacity (an "incentive effect"); or DSP removal might create stress that is mitigated by mental health drugs (a "stress effect"). We find that recipients who increase their use of antipsychotic medications the most in response to DSP removal are also those whose own earnings and family member earnings increase the least. These correlations suggest that the stress effect is the most plausible channel through which DSP removal increases prescription drug use.[3]

The results thus paint a picture in which people with disabilities, especially those with psychological conditions, are shifted from the formal safety net to an informal safety net. This shift has different effects depending on the extent of the informal safety net to which they have access. For removed recipients living with family members, their family members fully replace the lost DSP income with earnings from the labor market. The DSP recipients also work more themselves, and the increase in the use of mental health prescription drugs is minimal. In contrast, removed recipients living alone do not work more, experience a drop in household income, and dramatically increase their use of mental health drugs, especially antipsychotics, likely as a way to cope with the decline in income they experience. In particular, young men living alone drive this large increase in antipsychotics, suggesting that men may struggle more to cope with the income loss than women.[4]

To evaluate the welfare implications of these reforms, we model a household optimization problem that reflects the many margins of adjustment that we observe in the data: substitution to other programs, work by the removed recipient, work by family members, and the use of mental health prescription drugs. Since DSP loss is a large change in household income, we consider second-order effects on household welfare from the behavioral adjustments that we observe.

We find that the household welfare loss from DSP removal differs markedly by family structure. For DSP recipients living with family members, the behavioral adjustments (especially family member earnings) offset more than half of the first-order welfare loss from DSP removal. For DSP recipients living alone, not only is the first-order welfare loss large, but the behavioral adjustments they make—shifting to other programs and taking mental health drugs—offset a smaller fraction of the welfare loss.

When we compare the loss in household welfare to the gain to taxpayers, we also find different results by family structure. For DSP removal of recipients who live alone to be social-welfare-improving, taxpayers would need a social welfare weight 1.7 times greater than that of DSP recipients. In contrast, DSP removal for recipients living with family is

[3]We find imprecise zero effects on mortality.

[4]Prescription drug costs are largely covered by taxpayers through the Pharmaceutical Benefits Scheme (PBS).

welfare-improving as long as the social welfare weight for taxpayers is just 25% that of DSP recipients. In other words, removal of recipients living with family is much more likely to be social-welfare-improving than removal of recipients living alone. If we were to ignore the distinction between those living alone vs with family, we would conclude that DSP removal of the average DSP recipient is social-welfare-improving if taxpayers have a social welfare weight at least 87% that of DSP recipients. This average masks a huge amount of heterogeneity in the cost-effectiveness of removing each group.

There are two key contributions of our welfare analysis: 1) observing multiple margins of adjustment in the data and 2) taking into account the second-order welfare effects of those adjustment margins on private welfare. Regarding (1), if we were to use only the most commonly observed adjustment margin—the DSP recipient's own work—the welfare conclusions would be misleading. In a first-order welfare analysis, this would mean that DSP removal is social-welfare-improving if taxpayers have approximately equal weight (130%) as DSP recipients (140% for those who live alone, 120% for those who live with family).[5] Ignoring the other margins of adjustment makes it look like DSP removal is likely social-welfare-improving, and equally so for both groups.

Allowing for second-order effects on welfare is also essential. If we were to use all margins of adjustment to calculate the fiscal externality but focus only on first-order welfare effects, we would conclude that DSP removal is social-welfare-improving if taxpayers have a weight of at least 160% that of the average DSP recipient (500% for removing those living alone, 100% for removing those living with family). While this conclusion is roughly correct for those living alone (since their behavioral responses have little effect on private welfare), a welfare analysis that considers only first-order changes makes removal of those living with family look much worse than it actually is when we take into account second-order effects of behavioral responses.

Related literature. The main contribution of this paper is evaluating the effects of DI loss using the most comprehensive set of behavioral adjustments observable to date, including the recipient's own earnings and government benefits, the earnings and government benefits of family members, and health care utilization. Observing multiple margins of adjustment allows us to get closer to a complete normative picture of the effects of DI loss. We build on a substantial literature estimating the labor supply effects of disability benefits (Chen and van der Klaauw, 2008; Von Wachter et al., 2011; Maestas et al., 2013; French and Song, 2014; Moore, 2015; Deshpande, 2016). Three recent novel papers have estimated the effects of DI on more comprehensive measures of income and consumption. First, Borghans et al. (2014)

[5]The conclusion would be similar in a welfare analysis that takes into account second-order behavioral responses (120% on average, 130% for those who live alone, 100% for those who live with family).

estimate the effects of DI crackdowns in the Netherlands, specifically benefit reductions for current recipients. They find that the benefit cuts increased the recipient's own earnings and other government benefits, but had no effect on spouse earnings. Second, Haller et al. (2024) estimate the effects of DI crackdowns affecting new applicants in Austria on own earnings, spouse earnings, and other government benefits, finding that eligibility restrictions were more cost effective than reduced benefits. Third, Autor et al. (2019) study the effect of DI allowance in Norway on household consumption imputed from the recipient's own labor supply, spouse labor supply, substitution to other programs, and changes in assets. They find that DI allowance increases household consumption by 18%.[6] Our paper builds on these three papers by 1) creating a comprehensive measure of household income using earnings and government benefit receipt from the recipient, spouses, and parents; and 2) linking income responses to health care utilization responses for the first time.

Other recent papers study the effects of disability benefits on health and health care utilization. In studies of the effect of DI on mortality in the United states, Gelber et al. (2023) find that higher DI income reduces mortality among low-income recipients, while Black et al. (2024) find that DI allowance increases mortality among marginal applicants. Silver and Zhang (2022) find that the US Veterans Disability Compensation program increases health care utilization but has no detectable effect on health. Badji et al. (2023) find that the 2014 Australian DSP reforms increased the use of nervous system prescriptions. We build on these papers by studying the interaction between income responses and health care utilization responses. Our findings suggest that removed DSP recipients, especially those who live alone, increase their use of antipsychotic medications to cope with the income loss resulting from DSP removal, rather than as an aid to facilitate work.

Our finding that family structure is a key dimension of heterogeneity for the effect of disability benefits is consistent with other papers that study the effect of DI benefits or estimate the value of DI. Meyer and Mok (2019) find that disability onset is partially insured by spousal earnings. Autor et al. (2019) find that DI creates larger welfare gains for single individuals than for married individuals, since DI is more likely to crowd out spouse work and savings in married households. Kellogg (2024), building on the model of Low and Pistaferri (2015) to include household self-insurance, finds that gains from DI expansions would largely accrue to married individuals, who are more likely to be able to self-insure through spouse responses. Our findings on parent responses also provide an example of the "added worker effect," in which family members enter the workforce and stabilize household income after

[6]We observe the same income margins plus parent earnings. While we do not observe all assets, we observe mandatory and voluntary contributions to tax-advantaged accounts as well as interest income on savings. Average values for all of these savings measures are extremely low. Given that the Australian DI program is means-tested, the savings of this population is likely limited (Australian Government (1991a)). Therefore assets are likely to have a negligible effect on consumption in the Australian DI context.

an income shock, in the context of the loss of disability benefits (Lundberg (1985), Haan and Prowse (2024), Halla et al. (2020), Blundell et al. (2016)).

2 Australian administrative data

We link datasets from several agencies through the Australian Bureau of Statistics (ABS) Person-Level Integrated Data Asset (PLIDA). We construct a comprehensive analysis file that includes DSP benefit recipients' demographic information, medical reviews, earnings, government benefit receipt, medical utilization under the Medicare Benefits Schedule (MBS), and prescription utilization under the Pharmaceutical Benefits Scheme (PBS).

We start with the Benefit Determination History File and identify individuals who have ever received DSP. The Data Over Multiple Individual Occurrences (DOMINO) Demographics File and the 2011 Census provide demographic information, including education, family structure, ethnicity, and housing details. The Medical Condition Recipient File records data on medical reviews (both at the time of application and while receiving benefits), including impairment ratings, disability conditions, and work capacity assessments. In Appendix Section B.1, we describe how we link recipients to their corresponding medical reviews.[7]

We link DSP recipients to their spouses using the DOMINO Partner Relationship File and to their parents using the DOMINO Parent-Child Relationship File. We condition on relationships at the time of the reform to avoid picking up endogenous changes in household structure.[8] Since spousal earnings count against a recipient's DSP benefits, underreporting of marriage is a potential concern. However, spouse relationships appear to be well-reported in the DOMINO Partner Relationship File: 85% of DSP recipients who are married in 2014 in DOMINO have a spouse in the 2011 Census, and (most reassuringly) only 2% of unmarried DSP recipients in DOMINO are married in the Census.

Parent relationships are likely even better documented. Parent-child relationships are established in the data well before the recipient receives DSP benefits. This is because Australia has several near-universal safety net programs targeted at households with children. We use the parent-child linkages from these programs, documented at the time that the DSP recipient was a child. We code a DSP recipient as still living with their parent at the time of the July 2014 reform if they live in the same Mesh Block as their parent at that time.[9] We report estimates both for parents who live with the DSP recipient and for parents who

[7]The data include only the month and year of birth for individuals, not date of birth. This means that in the Birth Date RD the running variable is the same for everyone born in the same month within a year.

[8]In Appendix Table A.18, we report estimates of the effect of DSP removal on changes in household structure. They are mostly imprecise.

[9]Mesh Blocks are the smallest geographic areas defined by the Australian Bureau of Statistics and generally contain 30-60 households. Therefore, our parent sample potentially includes parents who live very close to the DSP recipient, but not with them. We do not observe exact addresses.

live away from the DSP recipient. Parent earnings do not count against the DSP recipient's benefits, even if the DSP recipient lives with the parent.

We obtain employer-reported earnings from the Australian Taxation Office (ATO) for each fiscal year between 2002 and 2022 (Australian Tax Office, ABS Datalab, 2023). Earnings are reported at the fiscal year (July to June) level. We aggregate earnings from different employers at the individual-fiscal year level. For government benefit receipt, we construct fiscal-year benefit receipt for DSP and other income support programs using the daily allowance amount in the Benefit Payment History File. We consider any individual who does not appear in the earnings data to have zero earnings, and similarly for government benefits. We use the Australian and New Zealand Standard Classification of Occupations (ANZSCO), which is self-reported on individual tax returns, to create occupation categories.

We measure health care utilization from the Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS) datasets. The MBS file includes outpatient provider visits, including date of visit, type of provider (e.g., GP or specialist), type of service, and cost of service. The MBS includes any visit for which Medicare (the public insurance program) pays any fraction of the cost. Even for visits that are primarily covered by private health insurance, Medicare generally pays some fraction of the cost and therefore most outpatient visits will appear in the data (Australian Government, 1973). We do not observe healthcare utilization that is not covered by MBS, including a substantial share of inpatient stays, emergency room visits, ambulance services, dental and vision services, and hearing aids.

Like the MBS file, the PBS file includes any prescription drug for which the government paid even a fraction of the cost. This means we observe nearly all on-label prescriptions, including the date of the prescription, the type and quantity of the drug prescribed, and a prescriber identifier. We also observe the share of the cost paid by the government and the patient.

We consider individuals to have zero health care utilization if we do not observe any MBS or PBS claim in a given year. We code health care utilization as missing if an individual in our sample does not have a valid DOMINO or MBS identifier or has multiple identifiers; this is less than 0.1 percent of our sample.

Using the spouse and parent linkages, we link DSP recipients to the earnings, government benefits, and health care utilization of spouses and parents.

3 Empirical strategy: variation in medical reviews

Disability Support Pension is Australia's main disability benefits program. In 2024, 3.7% of working-age adults were enrolled in DSP. This is down from 4.6% in 2011, when the Australian government began restricting DSP entry and removing current DSP recipients.[10]

[10]https://www.aihw.gov.au/reports/australias-welfare/disability-support-pension

To be eligible for DSP, individuals must have a medical condition that is expected to last 2 or more years and meets a severity threshold, and must be deemed to have a work capacity of less than 15 hours per week. Unlike DI programs in most developed countries, DSP is a means-tested program with no work history requirement. In 2024 the maximum annual benefit was $27,224 AUD ($18,200 USD) for a single adult. It has relatively generous asset limits: around $300,000 for a homeowner and $540,000 for a non-homeowner in 2024. DSP benefits are reduced by 50 cents for every dollar of labor market earnings, phasing out at $57,000 AUD ($37,000 USD) (Australian Government, 1991b).

As in many developed countries, Australia experienced rapid growth in disability enrollment in the 1990s and 2000s (Edwards, 2002). In 2012, the Australian government enacted reforms to increase the stringency of eligibility requirements for new DI recipients. In 2014, the government decided to apply the new standard to current recipients by conducting medical reviews. Current recipients who received a medical review would be assessed using the new disability standard and would be terminated if they did not meet the new standard. These medical reviews were targeted at younger recipients with some work capacity. The Australian government targeted reviews at recipients who entered DSP after January 1, 2008, and recipients who were under age 35 at the time of the reform (July 1, 2014).

From the medical review data, we see that medical reviews were rolled out across late 2014 and 2015, in decreasing order of recipient age (i.e., 34-year-olds were evaluated first, in late 2014). DSP recipients were notified by mail that Services Australia would be conducting a review of their benefits. Recipients had 21 days from the notification to provide medical documentation. The medical reviews themselves took about 2–3 months. Among those terminated, payments continued for 6 weeks after the termination decision.[11]

3.1 Start Date and Birth Date Cutoffs

We limit the sample to DSP recipients who were targeted for medical reviews. DSP recipients with a "work capacity with intervention" rating of zero or missing were exempt from medical reviews, as were recipients who were deemed "manifestly disabled" or had a missing "impairment score." We exclude them from the sample.[12]

For the "Start Date" cutoff, we limit to individuals who were under the age of 35 years at the time of the reform. Figure 1 shows that the likelihood of receiving a medical review between 2014–16 increased by 54 percentage points for individuals entering DSP after January 1, 2008 (top left). As a result, average annual DSP payments were $3,300 AUD lower

[11]We do not observe the start date of medical reviews or the date of the notification. We observe the end date of medical reviews and the date of the loss of DSP benefits. Documentation from the time of the reform discusses the 21-day response window and suggests that medical reviews took 2–3 months (Joint Committee of Public Accounts and Audit, 2017).

[12]See `https://www.legislation.gov.au/Details/C2015C00322`.

in subsequent years for individuals who entered after that date (top right).

The basic RD estimating equation for the Start Date experiment is:

$$Y_i = \alpha_1 + \beta_1 AfterJan2008_i + \delta_1 StartDate_i + \gamma_1(StartDate_i \times AfterJan2008_i) + \epsilon_{1i} \quad (1)$$

where Y_i is an outcome like earnings or prescription drugs for individual i; $AfterJan2008_i$ is an indicator for entering DSP after January 1, 2008; and $StartDate_i$ is the start date running variable. The RD estimate of interest is β_1. We run this regression among individuals who turned 35 years old on or after July 1, 2014, who were current recipients as of July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating"(since these individuals were exempt from review). We restrict the bandwidth of the Start Date experiment to after October 2006, since the "work capacity with intervention" variable was introduced at the end of 2006 and has high rates of missing values for those entering before October 2006. This means that the Start Date bandwidth is 18 months on the right-hand side but 15 months on the left-hand side.

For the "Birth Date" cutoff, we limit to individuals who entered DSP after January 1, 2008. The bottom left graph of Figure 1 shows that the likelihood of receiving a medical review between 2014–16 increased by 71 percentage points for individuals turning 35 years after July 1, 2014, the date of the reform enactment. Average DSP payments were $3,200 AUD lower in subsequent years for individuals with a 35th birthday after that date (bottom right).[13]

The basic estimating equation for the Birth Date experiment is:

$$Y_i = \alpha_2 + \beta_2 Under35_i + \delta_2 BirthDate_i + \gamma_2(BirthDate_i \times Under35_i) + \epsilon_{2i} \quad (2)$$

where $Under35_i$ is indicator for having a 35th birthday after July 1, 2014; and $BirthDate_i$ is the birth date running variable. The RD estimate of interest is β_2. We run this regression among DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating."

[13]In addition to having a higher likelihood of medical review, these "young" recipients were also subject to new work requirements. This could mean that the effects we estimate on earnings, income, and health care utilization operate not only through DSP removal but also through work requirements for those who stay on DSP. Since the substitution patterns for the Birth Date RD are similar to those for the Start Date RD, we think that work requirements are unlikely to be a major channel through which the birth date cutoff affects outcomes. However, we cannot rule out this channel entirely.

Figure 1: First stage in medical reviews and DSP pay for Start Date RD and Birth Date RD

Notes: Top left figure shows likelihood of receiving a medical review between 2014 and 2016 by start date for the Start Date RD sample. Top right figure shows total DSP payments between 2016 and 2018 for the Start Date RD sample. Bottom left figure shows likelihood of receiving a medical review between 2014 and 2016 by birth date for the Birth Date RD sample. Bottom right figure shows total DSP payments between 2016 and 2018 for the Birth Date RD sample. Start Date RD sample is DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date RD sample is DSP recipients whose 35th birthday was within 24 months of July 1, 2014, who entered DSP after January 1, 2008, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating."

3.2 Tests of validity

For the RD designs to be valid, it must be that counterfactual outcomes (i.e., in the absence of the policy change) are smooth across the cutoff. In particular, it is important to determine whether agents could have manipulated their start date or birth date, or whether policymakers chose the cutoff date in a way that created selection across the cutoff. Since the

2014 reform was decided and implemented well after the affected start dates, and 35 years after the affected birth dates, it is unlikely that either applicants or reviewers would have or could have tried to manipulate their start date or birth date to avoid a medical review.

Still, we conduct tests to probe the validity of the RD designs. Appendix Table A.2 presents covariate balance tests for the Start Date RD and Birth Date RD. Specifically, for the Start Date RD, we test for covariate balance by putting covariates on the left-hand side of equation (1) and testing for the significance of β_1; analogously for the Birth Date RD (equation (2) and β_2). We run seemingly unrelated regression and report the p-value on the F test for joint significance of the key coefficient. We observe a rich set of covariates from the DOMINO data, Census data, DSS medical review file, Medicare data, Pharmaceutical Benefit data, and Australian Tax Office data. The discontinuities are small as a fraction of the control mean for both the Start Date and Birth Date experiments. For both experiments, a joint F test of the coefficients fails to reject the null hypothesis that they are equal to zero.

One variable that shows imbalance, likely by chance, is parent earnings prior to the reform. In our baseline specification, we include parent earnings prior to the reform as a control to account for this imbalance. We show estimates with no controls and with the full set of controls in Appendix Tables A.20 and A.21 respectively.

We also test for a discontinuity in the density of the running variables for each of the RD designs. Histograms are shown in Appendix Figure A.1. In neither case is there a discontinuity in the density of the running variable at the cutoff.

3.3 Combining the Start Date and Birth Date RDs

To increase statistical power, we combine the Start Date and Birth Date RDs into a single RD design, with each running variable normalized to 0 at its respective cutoff. Specifically, we create the samples for the Start Date and Birth Date RDs separately, then stack these datasets and run the following RD specification:

$$\begin{aligned} Y_i = {} & \beta_1(AfterJan2008_i \times StartExp_i) + \beta_2(Under35_i \times BirthExp_i) \\ & + \kappa_1 StartExp_i + \delta_1(StartDt_i \times StartExp_i) + \gamma_1(StartDt_i \times AfterJan2008_i \times StartExp_i) \\ & + \kappa_2 BirthExp_i + \delta_2(BirthDt_i \times BirthExp_i) + \gamma_2(BirthDt_i \times Under35_i \times BirthExp_i) + \epsilon_3 \end{aligned} \tag{3}$$

To account for the small amount of overlap between the samples (6% of the combined sample is in both the Start Date RD and the Birth Date RD), we cluster standard errors at the individual level. For the "combined" RD, we use the minimum bandwidth of the two RDs (i.e., the Start Date RD bandwidth): 15 months before the cutoff and 18 months after the cutoff. We show in Appendix Table A.3 that the estimates from each RD separately are

qualitatively similar but less precise than if we combine the two.

We estimate the following equation to get the RD estimate in the stacked sample:

$$
\begin{aligned}
Y_i = {} & \beta_1 \mathbb{1}((Under35_i \times BirthExp_i = 1) or (AfterJan2008_i \times StartExp_i) = 1) \\
& + \kappa_1 StartExp_i + \delta_1(StartDt_i \times StartExp_i) + \gamma_1(StartDt_i \times AfterJan2008_i \times StartExp_i) \\
& + \kappa_2 BirthExp_i + \delta_2(BirthDt_i \times BirthExp_i) + \gamma_2(BirthDt_i \times Under35_i \times BirthExp_i) + \epsilon_{3i}
\end{aligned} \tag{4}
$$

where $[(Under35_i \times BirthExp_i)|(AfterJan2008_i \times StartExp_i)]$ is an indicator variable that is 1 if an individual is treated in either experiment.

We estimate IV regressions of the effect of DSP loss using the combined RD sample. We estimate the following IV equation using two-stage-least-squares (2SLS):

$$
\begin{aligned}
Y_i = {} & \alpha_4 + \beta_4 \widehat{DSPLoss_i} \\
& + \delta_1(StartDate_i \times StartExp_i) + \delta_2(BirthDate_i \times BirthExp_i) \\
& + \gamma_1(StartDate_i \times AfterJan2008_i \times StartExp_i) \\
& + \gamma_2(BirthDate_i \times Under35_i \times BirthExp_i) + \epsilon_4
\end{aligned} \tag{5}
$$

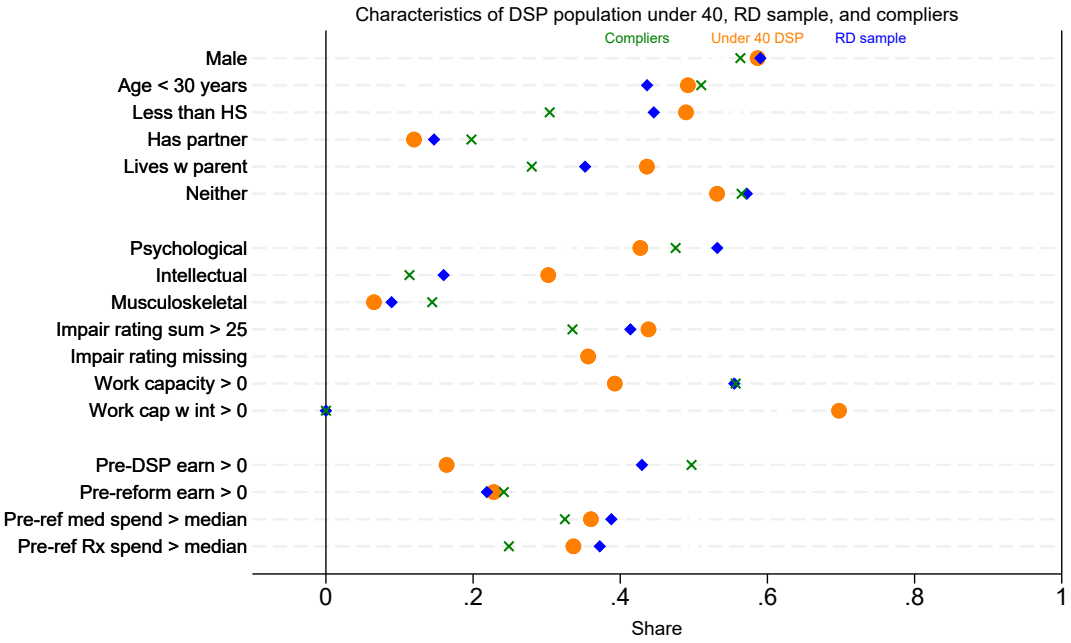
where the fitted values from equation (3) (i.e., $AfterJan2008_i \times StartExp_i$ and $Under35_i \times BirthExp_i$) with $DSPLoss_i$ on the left-hand side are used in place of the endogenous $DSPLoss_i$.

3.4 Sample and complier characteristics

Figure 2 shows the characteristics of the "complier" sample: DSP recipients who would have been removed from DSP if they had received a medical review but would not have been removed had they not received a medical review. Following the methodology of Angrist and Pischke (2009), we find that relative to all DSP recipients under 40 years of age, the complier sample is more likely to have a psychological condition (less likely to have an intellectual condition), more likely to have a high school education or greater, deemed to have more work capacity and had higher pre-DSP earnings, and more likely to live with a partner and less likely to live with a parent. These differences are consistent with medical reviews removing individuals who are more work-capable. We estimate the complier population to be 16% of the combined RD sample, meaning that about 16% of the RD sample is on the margin of losing benefits as a result of the reform. Appendix Table A.1 presents means of more characteristics for the full DSP population, the combined RD sample, and the complier sample.

There is little crossover between those who have a spouse and those living with parents in our sample. This means that close to 45% of DSP recipients in the combined sample live with either a spouse or a parent.

Figure 2: RD sample higher work capacity, more psych conditions than under-40 DSP



Notes: Figure plots summary statistics for the full sample of DSP recipients under 40 years old in July 2014, the combined RD sample, and the "complier" sample. The complier sample, identified using the methodology of Angrist and Pischke (2009), is the set of people who would have been removed from DSP if they received a medical review but would not have been removed in the absence of a medical review. See Appendix Table A.1 for summary statistics for all DSP recipients in 2014, DSP recipients under 40 years old in 2014, the combined RD sample, and the complier sample.

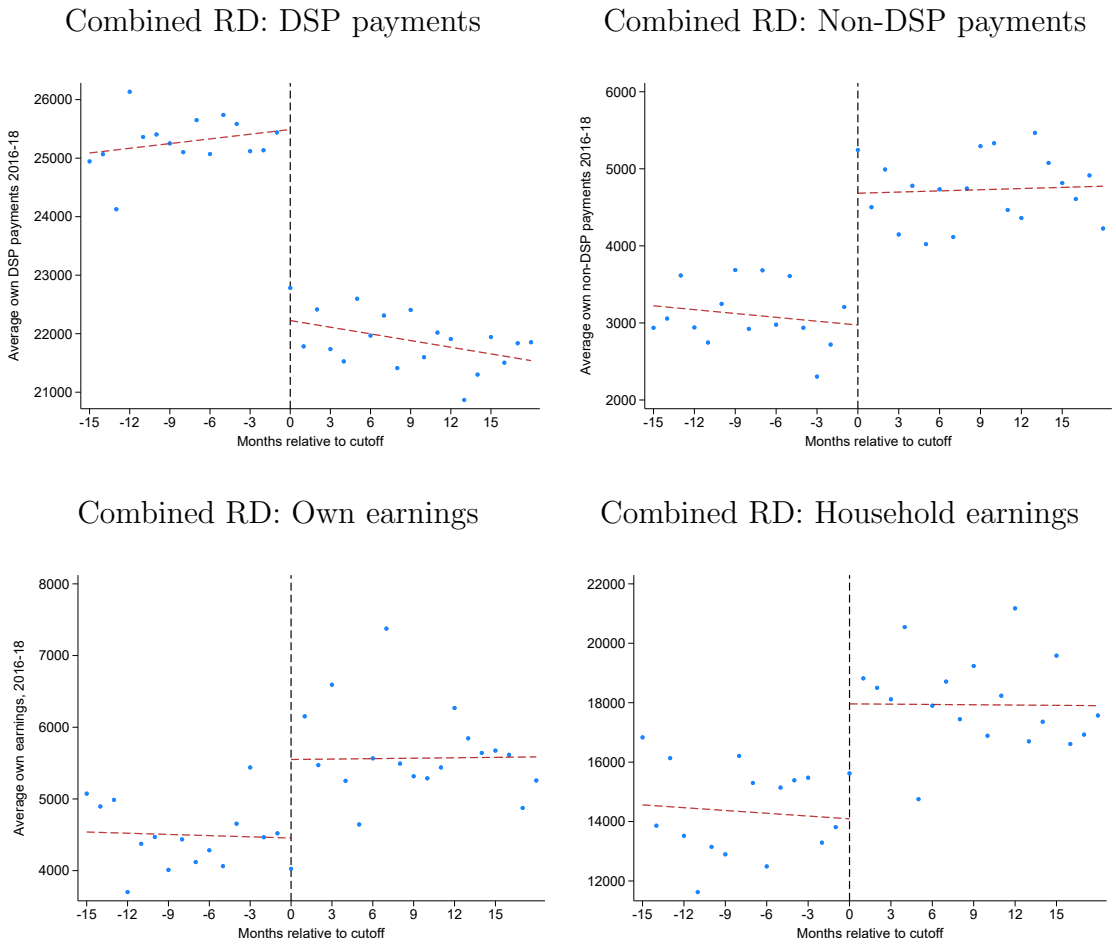
4 Estimates of effects on income and health care use

4.1 Estimates of effects on household income

Figure 3 shows key outcomes for the combined Start Date and Birth Date experiments. The top left graph shows that average annual DSP payments between 2016–18 fall by $3,200 across the cutoff in the combined sample. The top right graph shows that the DSP recipient's average annual non-DSP payments in 2016–18 jump by $1,700 across the cutoff. This substitution is mostly driven by the Newstart program, a type of unemployment benefit. The bottom left graph shows that the DSP recipient's average annual labor market earnings in 2016–18 jump by $1,200. The bottom right graph shows that average annual household labor market earnings in 2016–18, including earnings of the DSP recipient and parent or spouse, increase by $4,000 across the cutoff. In the Appendix, we present estimates controlling for covariates (Appendix Table A.21), using the "rdrobust" package developed by

Calonico et al. (2018) (Appendix Table A.22), and using higher-order polynomials in the running variable (Appendix Table A.24). See Appendix Figure A.2 for separate RD graphs for each experiment.

Figure 3: Medical reviews lead to increase in non-DSP payments, own work, family work

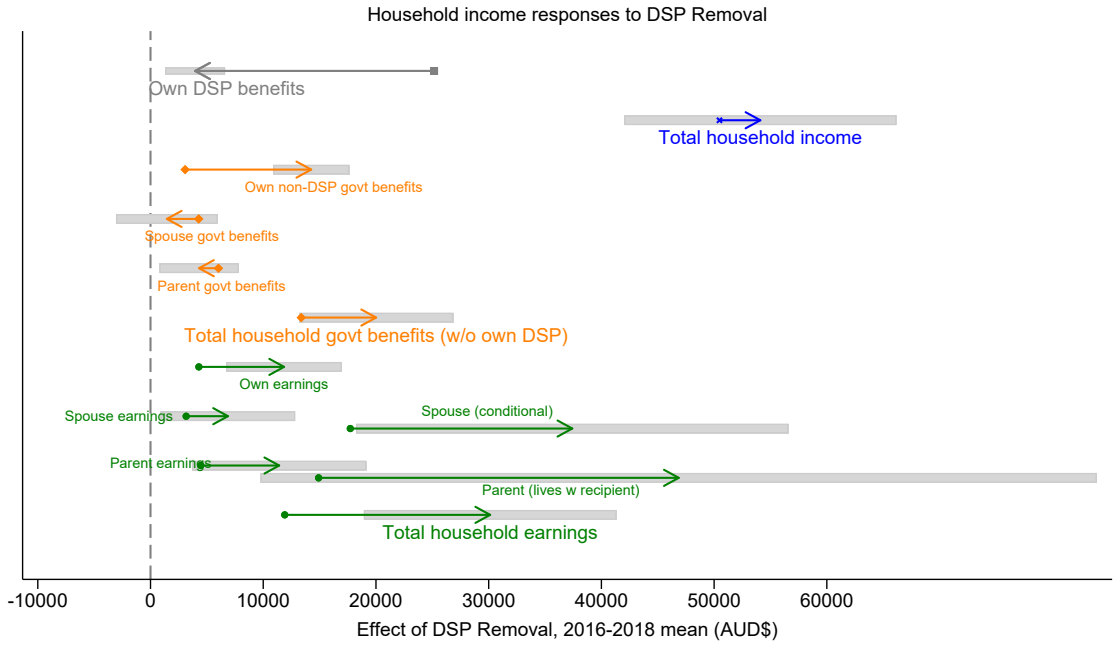


Notes: Top left figure shows average annual DSP payments between 2016 and 2018. Top right figure shows DSP recipient's average annual own non-DSP government payments from 2016 to 2018. Bottom right figure shows DSP recipient's average annual own earnings from 2016 to 2018. Bottom right figure shows combined household earnings between 2016 and 2018, including the earnings of the DSP recipient, spouse (where applicable), and parents who reside in the same household (where applicable). All figures use the combined RD sample. Combined sample stacks the Start Date RD sample (DSP recipients who entered DSP around January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating"and the Birth Date RD sample (DSP recipients with a 35th birthday around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating"). The bandwidth for the combined RD is the minimum bandwidth between the Start Date and Birth Date RDs—15 months to the left of the cutoff and 18 months to the right.

To estimate the effect of DSP removal on household income, we scale the RD estimates by the likelihood of being removed from DSP. Figure 4 shows the effect of DSP removal on all sources of household income that we observe. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate (i.e., β_4 from equation (5)), so that

the arrowhead represents the mean for those who are removed. In other words, DSP removal "moves" people from the marker to the arrowhead. The gray bars indicate 95% confidence intervals around the point estimate. Appendix Table A.4 presents IV estimates for the Start Date and Birth Date RD designs separately, as well as the IV estimates from the combined specification.

Figure 4: No average change in total household income as a result of DSP removal



Notes: Figure plots IV estimates (i.e. β_4 from equation (5)) of the effect of DSP loss on average annual income measures in AUD. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. "Own DSP benefits" are the average of the individual's DSP benefits from 2016-18. "Total household income" is the average of earnings and government (DSP and non-DSP) benefits from 2016-18 for the individual, spouse, and parent. "Own non-DSP govt benefits" is the average of the DSP recipient's non-DSP benefits from 2016-18. "Spouse govt benefits" is the average of spouse government (DSP and non-DSP) benefits from 2016-18 (unconditional on having a spouse). "Parent govt benefits" is the average of government (DSP and non-DSP) benefits from 2016-18 for parents who live with the DSP recipient (unconditional on living with a parent). "Total household govt benefits (w/o own DSP)" sums individual, spouse, and parent government payments (excluding recipient's own DSP benefits) and averages over 2016-18. "Own earnings" are average individual earnings from 2016-18. "Spouse earnings" are average spouse earnings from 2016-18 (unconditional on having a spouse); "Spouse (conditional)" are average spouse earnings conditional on having a spouse. "Parent earnings" are average earnings from 2016-18 for parents who live with the DSP recipient (unconditional on living with the DSP recipient); "Parent (conditional)" are average earnings from 2016-18 of parents who live with the DSP recipient (conditional on living with with the DSP recipient). Combined sample stacks the Start Date RD and Birth Date RD samples. See Table 1 for unconditional estimates and see Appendix Tables A.5 for conditional estimates.

On average, DSP removal results in a loss of $21,400 in average annual DSP benefits from 2016 to 2018. However, total household income actually increases slightly as a result of DSP removal. Which sources of income offset the DSP loss? Removed beneficiaries recover about one-half of the DSP income loss by substituting to other programs, mainly Newstart (see Appendix Table A.7). They recover another 35% of the loss by increasing

labor market earnings, on both the extensive and intensive margins (see Appendix Table 1 and Appendix Table A.10). Among the 29% of DSP recipients who live with a parent, parent earnings almost triple as a result of DSP removal and more than make up for the lost DSP income. Among the 15% of DSP recipients who have a spouse, spouse earnings approximately double. Summing over DSP benefits, non-DSP government benefits, and earnings for the DSP recipient and (where applicable) spouses and parents, we find that total household income slightly increases (not statistically distinguishable from zero) as a result of DSP removal.[14]

We find little heterogeneity in household income responses by gender, age, education, diagnosis, or disability severity (see Appendix Figure A.4 and Appendix Table A.5). However, the average income responses mask substantial heterogeneity by family structure, as shown in Figure 5. Parents and spouses fully replace the lost DSP income with labor market earnings. For parents, this increase in work is almost all on the extensive margin and driven by younger parents (see Appendix Table A.6). For spouses, the increase in work is almost all on the intensive margin (see Appendix Table A.10). In addition to the differences driven by having family members versus not, DSP recipients who live with family members (mostly those who live with parents) work more themselves in response to DSP removal.[15] In contrast, DSP recipients who live alone neither have family support replace the DSP income nor work more themselves to replace the DSP income. Their main channel for income replacement is other government programs, particularly Newstart. Even with substitution to Newstart, we estimate a decrease (imprecise) in household income after DSP removal for those who live alone.[16]

We find that the earnings and income responses to DSP removal are highly persistent over time (see Appendix Figure A.3). The drop in DSP income does not attenuate over time: removed DSP recipients do not find their way back on to DSP, and those who do not receive a medical review largely do not leave DSP for other reasons. The increases in earnings and non-DSP government benefits are also persistent over time, except for a drop in the earnings response in 2020 during the COVID-19 pandemic.

Do the same individuals respond to DSP removal by both working and substituting to other programs? Or do some individuals respond only by working and others respond only by substituting to other programs? In Appendix Figure A.5, we find that some of those removed

[14]We estimate the effect of DSP removal on enrollment in the National Disability Insurance Scheme (NDIS), an in-kind support program for people with disabilities that was rolled out in the late 2010s. The point estimates, shown in the bottom panel of Appendix Table A.7, are imprecise.

[15]The estimates in Appendix Table A.12 further confirm that the own earnings response and the family member earnings response move in the same direction.

[16]The variation of household income over time (standard deviation over mean) may increase for those who live alone and decrease for those who live with family, but these effects are imprecisely estimated (see Appendix Table A.11).

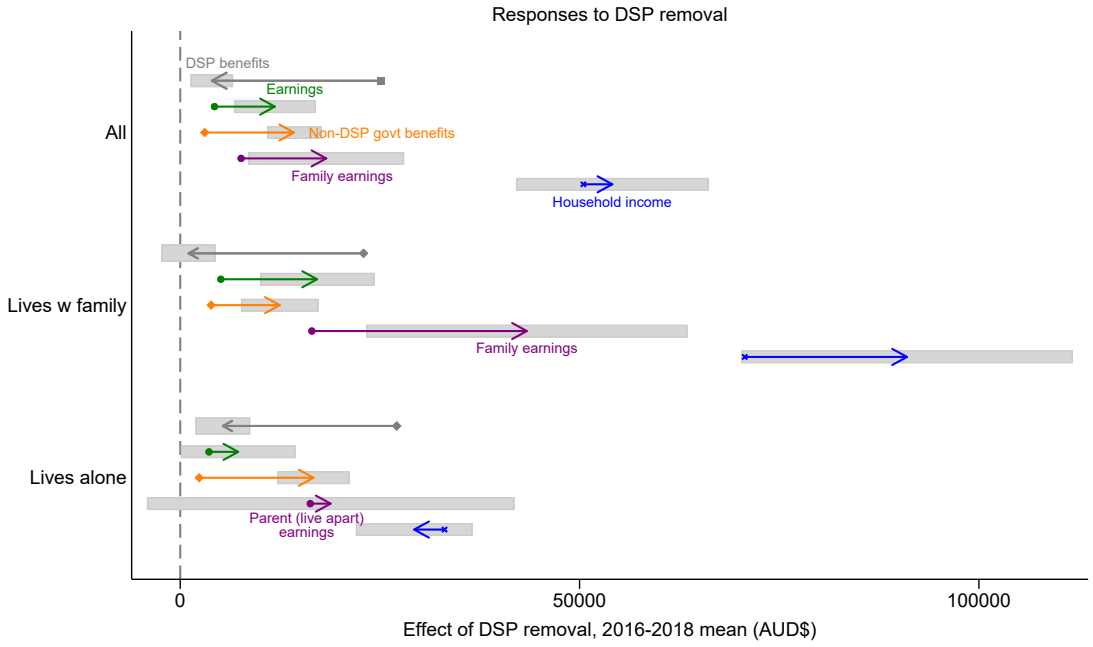
Table 1: Combined sample: IV estimates of the effect of DSP loss

	Combined RD			
	Pt Est	Std Err	Cntrl Mean	N
Own income				
Own DSP payments 2016-18	−$21.23	$1.36	$25.19	17,186
Own non-DSP payments 2016-18	$11.18	$1.73	$3.07	17,186
Own Newstart payments 2016-18	$8.41	$0.59	$0.09	17,186
Own all govt. payments 2016-18	−$10.05	$1.99	$28.26	17,186
Own earnings 2016-18	$7.56	$2.62	$4.29	17,186
Own income 2016-18	−$2.49	$2.68	$32.55	17,186
Spouse income				
Spouse all govt. payments 2016-18	−$2.82	$2.30	$4.27	17,186
Spouse all govt. payments 2016-18 (conditional on having a spouse)	−$0.75	$5.36	$23.94	2,525
Spouse earnings 2016-18	$3.71	$3.05	$3.16	17,186
Spouse earnings 2016-18 (conditional on having a spouse)	$19.69	$9.79	$17.73	2,525
Parent income				
Parent(s) all govt. payments 2016-18	$0.08	$3.78	$14.51	17,186
Parent(s) all govt. payments 2016-18 (conditional on living with parent)	−$7.47	$8.22	$20.17	5,017
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.72	$1.80	$6.03	17,186
Parent(s) earnings 2016-18	$7.20	$7.82	$14.50	17,186
Parent(s) earnings 2016-18 (conditional on living with parent)	$31.95	$18.93	$14.91	5,017
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$6.96	$3.95	$4.46	17,186
Family income				
Family member (parent/spouse) member earnings 2016-18	$10.66	$4.98	$7.62	17,186
Family member (parent/spouse) member earnings 2016-18 (conditional on living with family)	$26.92	$10.26	$16.49	7,355
Household all govt. payments (not including own DSP) 2016-18	$6.64	$3.49	$13.37	17,186
Household all govt. payments (not including own DSP) 2016-18 (conditional on living with family)	$3.26	$5.48	$26.16	7,355
Household earnings 2016-18	$18.22	$5.73	$11.91	17,186
Household earnings 2016-18 (conditional on living with family)	$38.97	$11.08	$21.57	7,355
Household income 2016-18	$3.62	$6.16	$50.48	17,186
Household income 2016-18 (conditional on living with family)	$20.32	$10.60	$70.69	7,355
Own health				
Prescriptions: Total value of mental drugs 2016-18	$0.88	$0.34	$0.66	16,754
Prescriptions: Any mental drug 2016-18	0.230	0.104	0.672	16,754
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.89	$0.33	$0.51	16,754
Prescriptions: Any antipsychotic drug 2016-18	0.226	0.107	0.350	16,754
Prescriptions: Total value of all drugs 2016-18	$2.85	$1.69	$2.69	16,754
Prescriptions: Any drug 2016-18	0.049	0.059	0.909	16,754
Died 2015-19	0.033	0.034	0.026	17,186

Notes: Table presents IV estimates for the combined Start and Birth Date RDs (i.e., β_4 from equation (5)). Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the Start Date RD sample, and within 61 days of the cutoff for the Birth Date RD sample. Combined sample stacks the Start Date RD and Birth Date RD samples. Household variables sum income across the individual DSP recipient and (where applicable) spouses and parents who live with the DSP recipient. For results for the Birth Date and Start Date RDs separately see Table A.4. For reduced form results see Table A.3. For results without controls see Table A.20.

from DSP shift to both work and other government benefits (27 pp) while a similar fraction shifts to other government benefits only (23 pp). No one shifts to work only (-14 pp). Most of the substitution to non-DSP benefits is the Newstart Allowance (now JobSeeker Payment). For those who shift to both work and Newstart, we investigate whether they literally work and receive Newstart at the same time, or whether they churn in and out of Newstart during the year and work when they are not receiving benefits. Appendix Figure A.6 shows that DSP removal increases Newstart receipt by about 82 pp at the 3-year level, by 50 pp at the annual level and by 45 pp at the monthly level in 2018. This suggests that removed

Figure 5: DSP removal reduces household income for those who live alone, but not for those who live with family



Notes: Figure plots IV estimates (i.e. β_4 from equation (5)) of the effect of DSP loss on income in AUD by subgroup. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. "DSP benefits" are the individual's DSP benefits from 2016-18. "Earnings" are the DSP recipient's individual earnings from 2016-18. "Non-DSP govt benefits" are the DSP recipient's non-DSP benefits from 2016-18. "Total household income" is the sum of earnings and government (DSP and non-DSP) benefits from 2016-18 for the individual, spouse, and parent. Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.5 for estimates.

DSP recipients mostly stay on Newstart year-round and work concurrently. This could be because the Newstart program implemented stricter training and work requirements in 2015 and some removed DSP recipients fulfilled these requirements with paid employment.[17]

Finally, we investigate the types of jobs that removed DSP recipients do based on self-reported occupation on tax returns (see Appendix Table A.9). Most of the increase in work comes from low-skilled occupations, including as machine operators and drivers and clerical and administrative work. The intensive margin response—the effect of DSP removal on earnings from each occupation—is more evenly split between blue and white collar work, in part because white-collar jobs have higher wages. Parents of removed DSP recipients work

[17]See `https://www.aph.gov/au/Parliamentary_Business/Committees/Senate/Scrutiny_of_Government_Budget_Measures/Budget_Measures/~/media/Committees/budgetcuts_ctte/First_Interim_Report/c02.pdf` for a Parliamentary review of these measures. We also find that the response of simultaneously working and receiving Newstart is strong even within year, suggesting concurrent Newstart receipt and work. Because ATO earnings data are reported at the annual level, we cannot study joint responses at the quarter or month levels.

in both blue-collar and white-collar occupations, while spouses mostly work in blue-collar occupations (see Appendix Table A.9).

4.2 Estimates of effects on health care utilization

Next we estimate effects of DSP removal on prescription drug use and outpatient visits. Given that the DSP recipients most affected by the reform were those with psychological conditions, we are interested especially in the use of mental health treatment.

Figure 6 shows the IV estimates of the effects of DSP removal on the likelihood of using any mental health prescription drug from 2016–18, as well as subcategories of mental health drugs. There is a large and significant increase in the use of mental health drugs (24 pp), with the largest increase coming from antipsychotics (23 pp, significant) and antidepressants (18 pp, not significant). We find no change in the use of anxiolytic, ADHD, or hypnotics and sedatives. Looking at quantities (we use the 'PBS adjusted quantity' variable which is usually a count of the number of pills in one prescription), we see increases for mental health drugs overall and antipsychotics and antidepressants.[18]

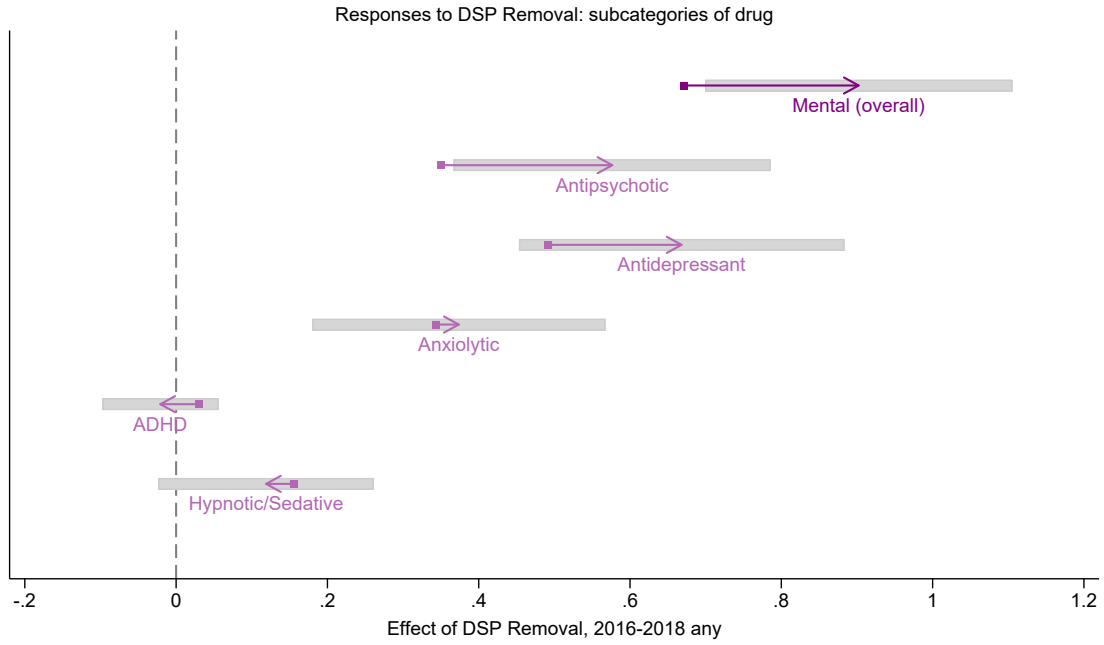
Antipsychotics are strong mental health drugs used to treat bipolar disorder, schizophrenia, and severe depression. They are known for having adverse side effects that vary by the exact formulation used, including movement disorders, cardiac events, weight gain, high cholesterol and blood sugar, dizziness and sedation, infertility, and jaundice (Chokhawala and Stevens, 2024). They are also expensive drugs: we find that the effect of DSP removal on antipsychotic spending—an increase of $900 per year, mostly paid by the government through PBS—dwarfs the increase in spending in any other mental health drug (Appendix Table A.15). Consistent with the effects on mental health prescription drugs, we find increases medical visits related to psychiatric and psychological health care (see Appendix Table A.17).

We estimate imprecise zero effects on mortality (Table 1). We also estimate imprecise zero effects on health care utilization of spouses and parents (Appendix Table A.17).

Figure 7 shows, by subgroup, the effect of DSP removal on the likelihood of taking any mental health drug from 2016–18 and total spending (mostly by the government through PBS) on mental health prescriptions. The increases in both any mental health drug and mental health drug spending are driven exclusively by men, with no increase for women. Cutting the sample by condition, we see that nearly all DSP recipients with psychological conditions are already taking a mental health drug at baseline, but their spending goes up as they switch to stronger drugs like antipsychotics. The effects for DSP recipients with

[18] Appendix Table A.15 presents changes in extensive and intensive margin use for select drug categories, and select specific mental health drugs. There is a large (21 pp) increase in the use of pain prescription drugs, including a 24 pp increase the use of opioid prescriptions (both marginally significant). However, there are no increases in quantity or total spending for pain drugs.

Figure 6: DSP removal leads to increase in mental health Rx drugs, esp antipsychotics

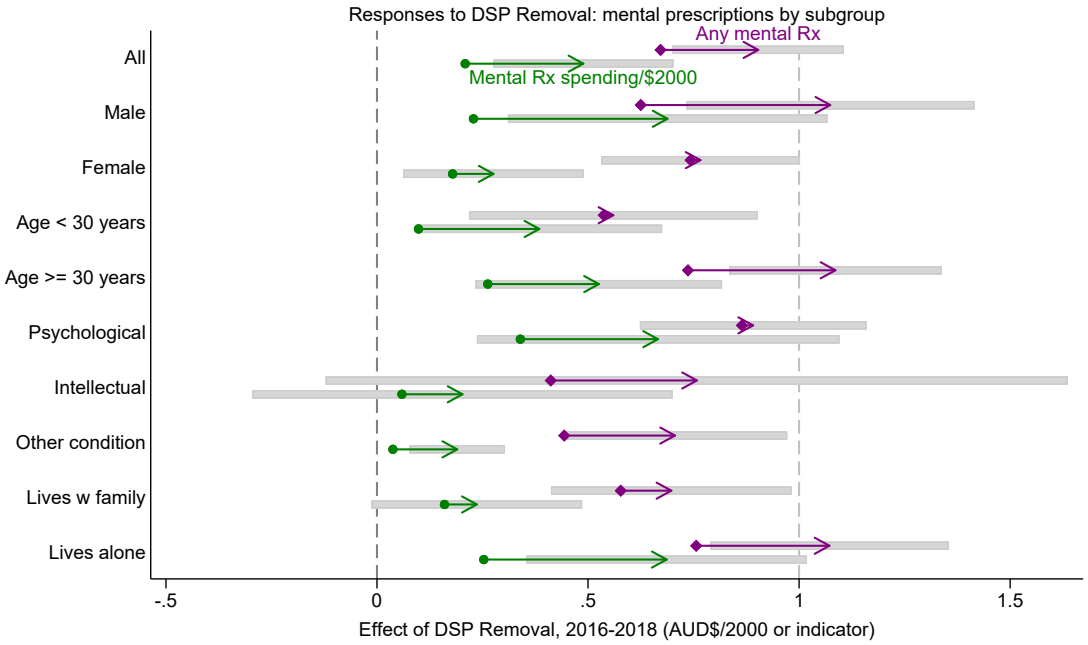


Notes: Figure plots IV estimates (i.e. β_4 from equation (5)) of the effect of DSP loss on the likelihood of having a prescription for a given prescription drug type. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.15 for estimates.

intellectual conditions are imprecise. DSP recipients with other conditions (not psychological or intellectual) experience increases in both any mental health drug and mental health drug spending.

As we saw with the effects on household income, we once again see substantial heterogeneity by family structure. DSP recipients who live alone experience large and significant increases in both the likelihood of taking mental health drugs and in mental health drug spending, while both effects are much smaller for those who live with family members. Antipsychotic use increases by 32 pp for those who live alone, but only by 8 pp for those who live with family (Appendix Table A.16). Spending on mental health drugs increases by $1,400 annually (significant) for those who live alone, and by only $200 (insignificant) for those who live with family. Thus, DSP recipients who live alone experience a drop in household income and a large increase in the use of antipsychotics, while DSP recipients who live with family experience no drop in household income and only a small increase in the use of mental health drugs.

Figure 7: Increase in mental health prescription drugs driven by men and those living alone



Notes: Figure plots IV estimates (i.e., β_4 from equation (5)) of the effect of DSP loss on the likelihood of any mental health drug prescription from 2016–18 (purple) or average annual mental health prescription drug costs from 2016–18 divided by $2000 (green). The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.16 for estimates.

4.3 Interpreting the effects on mental health prescription drugs

In Appendix Section B.2, we consider whether health care utilization effects could be driven by the medical reviews themselves rather than by DSP loss. We find that medical reviews do have direct and immediate effects on health care use, but that these effects are temporary. In particular, we look at the timing of GP visits and mental health prescriptions relative to the timing of medical reviews and DSP loss. For DSP recipients who get reviewed but have a low likelihood of being removed, RD estimates of GP visits and mental health prescriptions spike at the time of the medical review but return to zero after the medical review. For DSP recipients who get reviewed and have a high likelihood of being removed, RD estimates of GP visits and mental health prescriptions remain large for many years after the medical review has ended. This suggests that our main result, the long-term increase in mental health prescription drugs, is driven by DSP loss itself rather than medical reviews.[19]

Through what channels does DSP loss increase mental health drug prescriptions, especially for very strong drugs like antipsychotics? One possibility, especially for people with

[19]In addition, we find no effect on mental health prescription drugs during a 2016 reform when many DSP recipients got medical reviews but were not removed from the program due to political pushback.

psychological conditions, is that antipsychotics facilitate work, and DSP removal makes work more necessary (an "income effect"). It might be that they did not take these drugs when receiving DSP because of the harsh side effects, but after removal they decide that taking the drugs and working is less painful than experiencing a large consumption drop. A second possibility is that they were not taking the drugs when on DSP because the program created a disincentive to seek treatment. If DSP recipients believe that taking mental health drugs would make them look more able to work and put their benefits at risk, they may have chosen not to take them before (an "incentive effect"). DSP removal eliminates this disincentive. A third possibility is that antipsychotics help removed recipients cope with the loss in income resulting from DSP removal. To the extent that DSP removal creates stress and exacerbates mental health symptoms, mental health drugs might treat these symptoms (a "stress effect").

To determine which of these explanations is most likely, we investigate how the change in mental health prescription use is correlated with other behavior changes. For example, if removed recipients take mental health drugs to facilitate work, we would expect to see a positive correlation between the mental health prescription response and the work response across subgroups and across individuals. Instead, we find a negative (-0.12) correlation across subgroups between IV estimates of the likelihood of working and the likelihood of a mental health prescription (see top panel of Appendix Figure A.8 and Appendix Table A.14). To measure the correlation across individuals, we look at joint prescription and work outcomes in the full sample and by family structure (see bottom panel of Appendix Figure A.8). If mental health prescriptions facilitate work, we would expect to see people move from neither work nor mental health prescription to both. While the full sample shows movement from neither to both, the subgroup analysis reveals that the average masks important heterogeneity. Removed recipients who live with family shift from neither work nor mental health prescriptions to work only (no mental health prescription). Removed recipients who live alone shift from neither work nor mental health prescriptions to mental health prescriptions only (no work). These results suggest that the income effect—specifically taking mental health prescriptions in order to work more—is unlikely to explain the increase in mental health drug prescriptions.

To investigate the "stress" hypothesis, we do the same exercises but looking at family support instead of work. If antipsychotics are primarily helping removed recipients cope with income loss, we would expect to see a negative correlation between the mental health prescription response and family earnings response. Indeed, we find a negative (-0.37) correlation across subgroups between IV estimates of any family earnings and any mental health prescription (see top panel of Appendix Figure A.9). When we look at joint mental health

drug and family support outcomes, we see that people move out of having neither high family earnings nor a mental health prescription into doing one or the other, but not both (see bottom panel of Appendix Figure A.9). This pattern remains strong at the subgroup level. Removed recipients who live with family shift from having neither high family earnings nor an mental health prescription into having high family earnings only (no mental health drugs). Removed recipients who live alone shift from having neither to having an mental health prescription only (no family support). We find similar patterns when we look at the joint outcomes of having an mental health prescription and having any household earnings (either family earnings or DSP recipient own earnings): removed recipients shift into one or the other, but not both. These results suggest that the stress effect—specifically taking mental health drugs to cope with the income loss—could explain the increase in mental health drug prescriptions.

4.4 Discussion of results

On average, DSP removal increases own earnings, family member earnings, and other government benefits to a point that they fully offset the DSP loss, and at the same time permanently increase the use of strong mental health drugs like antipsychotics. Yet these averages mask important heterogeneity by family structure. For people who live with family, family members increase their earnings by enough to offset the DSP loss, and DSP recipients also work more, with small increases in the use of mental health drugs. In contrast, DSP recipients who live alone have limited family support, do not work much more themselves, and dramatically increase their use of mental health drugs. The results thus paint a picture of two different groups: one that is pushed from a formal safety net to a robust informal safety net, with minimal loss in income; and another that is pushed from a formal safety net to a sparse informal safety net and uses strong mental health drugs to cope with the income loss.

The welfare implications of these results, and especially the role that behavioral adjustments play, are not immediately obvious. For DSP recipients living alone, to what extent do the mental health drugs actually help them cope with the loss in DSP income? For DSP recipients who live with family members, the earnings of family members is not "free": it must impose some cost on family members since otherwise they would have worked prior to removal from DSP. In the next section, we combine our results with a model of household welfare and social welfare to estimate the effect of DSP removal on the welfare of DSP recipients, their families, and society.

5 Welfare implications

To determine the welfare implications of our results on the effects of DSP removal, we first model the household decision problem including the many margins of adjustment that we observe: substitution to other government benefits, own earnings, family member earnings, and prescription drug use. We show that the household behavioral responses are functions of the income effect, incentive effect, and stress effect discussed in the previous section. Given that DSP loss represents a large change in household income, we derive an expression for the change in household welfare using a welfare analysis in which behavioral responses to removal can offset the first-order loss from DSP removal. To determine the effects of DSP removal on social welfare, we compare the drop in household welfare to the increase in government revenue from household behavioral responses, again taking into account the many margins of adjustment we observe.

5.1 Individual decision problem

We model the individual decision as

$$\begin{aligned} V \equiv \max_{c,h,f,b,p} \; & (1+\kappa p)u(c) - v(h) - y(f) - (1-\eta p)s(b) - z(p) \\ \text{s.t. } & c \leq w(p)h(1-\tau) + D(1-\sigma(p)) + f(1-\alpha D)(1-\tau) + b(1-\delta D) \end{aligned} \tag{6}$$

where

- c is consumption, with $u'(c) > 0$, $u''(c) < 0$ to reflect a decreasing marginal utility of consumption;
- h is hours of work, with $v'(h) > 0$, $v''(h) > 0$ to reflect an increasing (at an increasing rate) disutility of work;
- f is family (i.e., parent and spouse) earnings, with $y'(f) > 0$, $y''(f) > 0$ to reflect an increasing (at an increasing rate) disutility of family member work;
- b is transfers from non-DSP government programs, with $s'(b) > 0$, $s''(b)$ to reflect an increasing (at an increasing rate) disutility of those programs (e.g., Newstart), which have work requirements and hassle costs to remain enrolled;
- p is mental health prescription drugs with $z'(p) > 0$, $z''(p) > 0$ to reflect an increasing (at an increasing rate) disutility of drugs due to side effects;
- $\kappa > 0$ determines the amount by which prescription drugs boost utility from consumption;
- $\eta > 0$ determines the amount by which prescription drugs reduce the disutility from participating in other government programs;

- $w(p)$ is wage as a function of mental health drugs, with $w'(p) > 0$, $w''(p) \leq 0$ to reflect that drugs make people more productive but at a decreasing rate;
- τ is the (linear) tax on earnings;
- D is the maximum DSP benefit;
- $\sigma(p)$ is the schedule for how DSP benefits are reduced with p, with $\sigma'(p) > 0$, $\sigma''(p) = 0$ to reflect a linear tax on drugs;
- $\alpha > 0$ is the extent to which family members reduce transfers to the DSP recipient in response to DSP receipt; and
- $\delta > 0$ is the extent to which other government programs reduce transfers to the DSP recipient in response to DSP receipt (e.g., DSP recipients cannot receive Newstart benefits).

Notice that this setup allows for several margins of adjustment. Removed DSP recipients can reduce their consumption to deal with the income loss ($u(c)$). In addition, DSP recipients can work more in response to the income loss ($v(h)$), ask family members to work more ($y(f)$), or turn to other government programs to recover some of the income ($s(b)$). Finally, DSP recipients can increase their use of mental health prescription drugs in response to DSP removal. We model three channels through which prescription drugs could operate, as discussed in the previous section. First, mental health drugs might facilitate work, which becomes more valuable as the marginal utility of income increases ($w(p)$, "income effect"), despite the disutility of drugs created by their side effects ($z(p)$). Second, if DSP recipients believe (correctly or not) that mental health treatment could put their benefits at risk by making them look capable of work, then DSP removal would reverse this disincentive to seek treatment ($\sigma(p)$, "incentive effect"). Third, especially for individuals with psychological conditions, mental health drugs like antipsychotics might treat stress caused by DSP removal ("stress effect"). Specifically, we model the stress effect as prescription drugs boosting utility from consumption (through κ) or reducing disutility from participating in other government programs that have work requirements and other hassle costs (η).

The first order conditions are as follows:

$$(1+\kappa p)u'(c) = \lambda \tag{7}$$

$$v'(h) = \lambda w(p)(1-\tau) \tag{8}$$

$$z'(p) - \kappa u(c) - \eta s(b) = \lambda[w'(p)h(1-\tau) - D\sigma'(p)] \tag{9}$$

$$s'(b)(1-\eta p) = \lambda(1-\delta D) \tag{10}$$

$$y'(f) = \lambda(1-\alpha D)(1-\tau) \tag{11}$$

$$w(p)h(1-\tau) + D(1-\sigma(p)) + b(1-\delta D) + f(1-\alpha D)(1-\tau) - c = 0 \tag{12}$$

In Appendix Section B.3, we show that household behavioral responses are functions of parameters that we intuitively think should matter, like the relative disincentive on drugs and the relative marginal (dis)utilities of consumption, own work, drugs, and family work.

5.2 Change in household welfare

We now determine the change in household welfare resulting from DSP removal. Because DSP removal involves a large loss in household income, we use a second-order welfare analysis in which we allow behavioral responses (i.e., work, other government programs, family member earnings, prescription drugs) to offset some of the first-order welfare loss from DSP removal.

We take a Taylor expansion of household utility (V) around the initial allocation $(c_0, h_0, f_0, b_0, p_0)$, with details in the appendix. Substituting the consumption change from the budget constraint into dV yields:

$$\begin{aligned} dV \approx & \underbrace{(1+\kappa p_0)u'(c_0)\left(1-\sigma(p_0)-\delta b_0-\alpha f_0(1-\tau)\right)dD}_{\text{First-order effect (excludes behavioral responses)}} \\ & \underbrace{-\frac{1}{2}(1+\kappa p_0)u''(c_0)\left(\frac{dc}{dD}dD\right)^2}_{\text{Second-order effect from consumption loss}} \\ & \underbrace{-\frac{1}{2}\left[v''(h_0)\left(\frac{dh}{dD}dD\right)^2 + y''(f_0)\left(\frac{df}{dD}dD\right)^2 + (1-\eta p_0)s''(b_0)\left(\frac{db}{dD}dD\right)^2 + z''(p_0)\left(\frac{dp}{dD}dD\right)^2\right]}_{\text{Second-order effect from behavioral responses (work, R}_x\text{, other programs, family)}} \\ & \underbrace{+\kappa u'(c_0)\left(\frac{dc}{dD}dD\right)\left(\frac{dp}{dD}dD\right) - \eta s'(b_0)\left(\frac{db}{dD}dD\right)\left(\frac{dp}{dD}dD\right)}_{\text{Second-order effect from behavioral responses (interactions)}} \end{aligned} \tag{13}$$

Although the first-order welfare effects of DSP loss do not depend on behavioral responses,

the behavioral responses show up in the second-order welfare effects.

Notice that dV in equation (19) is a function of unknown preference terms like u'', v'', y'', s'', and z''. By implicitly differentiating the FOCs (see appendix for details), we can replace these unknown preference terms with known behavioral responses. To express the welfare loss in terms of willingness to pay, we divide dV by the marginal utility of consumption:

$$\begin{aligned}
WTP \equiv \frac{dV}{(1+\kappa p)u'(c)} &= \left[1-\sigma(p_0)-\delta b_0-\alpha f_0(1-\tau)\right] dD \\
&+ \frac{1}{2}\left(\frac{dc}{dD}dD\right)^2\left[\gamma\frac{1}{c_0}\right] \\
&+ \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{dh}{dD}dD\right)\left[\gamma\frac{1}{c_0}w(p)(1-\tau)\right] \\
&- \frac{1}{2}\left(\frac{dh}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{\kappa}{1+\kappa p}w(p)(1-\tau)+2w'(p)(1-\tau)\right] \\
&- \left(\frac{db}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{2\eta(1-\delta D)}{1-\eta p}+\frac{\kappa}{2(1+\kappa p)}(1-\delta D)\right] \\
&- \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[-\frac{\kappa}{1+\kappa p}-\gamma\frac{1}{c_0}[w'(p)h(1-\tau)-D\sigma'(p)]\right] \\
&- \frac{1}{2}\left(\frac{dp}{dD}dD\right)^2\left[\frac{\kappa}{1+\kappa p}[w'(p)h(1-\tau)-D\sigma'(p)]+w''(p)h(1-\tau)\right] \\
&+ \frac{1}{2}\left(\frac{dp}{dD}dD\right)(dD)\left[\sigma'(p)\right] \\
&+ \frac{1}{2}\left(\frac{db}{dD}dD\right)\left(\frac{dc}{dD}dD\right)\left[\gamma\frac{1}{c_0}(1-\delta D)\right] \\
&+ \frac{1}{2}\left(\frac{db}{dD}dD\right)(dD)\left[\delta\right] \\
&+ \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{df}{dD}dD\right)\left[\gamma\frac{1}{c_0}(1-\alpha D)(1-\tau)\right] \\
&- \frac{1}{2}\left(\frac{df}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{\kappa}{1+\kappa p}(1-\alpha D)(1-\tau)\right] \\
&+ \frac{1}{2}\left(\frac{df}{dD}dD\right)(dD)\left[\alpha(1-\tau)\right]
\end{aligned} \tag{14}$$

where $\gamma \equiv -\frac{u''(c_0)}{u'(c_0)}c_0$ is the coefficient of relative risk aversion.

Notice that (with the exception of γ) we can write the change in private welfare entirely in terms of behavioral responses (and wage and tax functions) without any preferences (e.g., marginal disutility of drugs). In other words, assuming that households maximize the objective function in equation (6), the behavioral responses are sufficient for the change in private welfare due to DSP removal, without needing to know preferences (other than γ).

However, the behavioral responses themselves are a function of preferences.

5.3 Change in social welfare

We model social welfare W as the (weighted) sum of the agent's private welfare plus net government revenue:

$$W \equiv \underbrace{V(c,h,f,b,p)}_{\text{Private utility}} + \mu \underbrace{(-D - b(D) - p(D) + \tau(w(p)h + f))}_{\text{Net government revenue}} \tag{15}$$

where

- $b(D)$ is the government's spending on non-DSP programs, which is a function of DSP;
- $p(D)$ is the government's spending on prescription drugs, which is a function of DSP;
- μ is average marginal utility of consumption in society; and
- other terms are as above.

The change in social welfare resulting from DSP removal is then:

$$dW \approx dV + \mu \left[1 + \frac{db}{dD} + \frac{dP}{dD} - \tau \left(w'(p) h \frac{dp}{dD} dD + w(p) \frac{dh}{dD} + \frac{df}{dD} \right) \right] dD \tag{16}$$

Note that we do not consider the behavioral responses by taxpayers to their consumption change because we assume that the number of DSP recipients is small relative to the number of taxpayers.

5.4 Implementation

We use our estimates of the behavioral responses, plus a range of assumptions about the functional forms of the wage subsidy and drug tax, to estimate changes in household welfare and social welfare resulting from DSP removal. We make the following baseline assumptions but also consider a range of values:

- γ: baseline 2, range 0.5 to 4 (standard in welfare analysis).
- τ: baseline 0.1, range 0 to 0.2. This population has low earnings (control mean of own earnings is \$4,300 and control mean of family member (parent and spouse) earnings is \$16,500) and therefore a low tax rate.
- $w(p)$: baseline $w(p) = 14 + 6 * \log(p)$, range: $20 * p$, $10 + 10 * p$, $16 + 4 * p$, 20, $18 + 2 * log(p)$, $14 + 6 * log(p)$, $12 + 10 * log(p)$. The baseline wage function generates a change in hourly wages of \$4 if an individual takes mental health drugs.
- α: baseline 0.000024, range 0 to 0.00004. Implies families reduce transfers by roughly \$0.60 for every \$1 an individual gets in DSP.

- δ: baseline 0.000008, range 0 to 0.00004. Implies other programs reduce transfers by roughly \$0.20 for every \$1 an individual gets in DSP.
- σ: baseline 0.08, range 0 to 0.2. We assume a relatively small disincentive effect since there is no empirical evidence suggesting a large disincentive effect.
- η: baseline 0.1, range 0 to 0.5. Drugs reduce the disutility of onerous requirements of other programs by a moderate amount.
- κ: baseline 0.1, range 0 to 0.5. Drugs increase the utility from consumption by a moderate amount.

Since there is strong heterogeneity in responses by family structure in the empirical results, we split the welfare analysis into people who live with family and people who live alone. From the empirical results for people who live with family, we know that there is no change in income, and therefore probably no change in consumption, as a result of DSP removal; i.e., $\frac{dc}{dD} \approx 0$. Therefore we consider equation (21) using $\frac{dc}{dD} = 0$. From the empirical results for people who live alone, we know that there is a change in income, and therefore probably a change in consumption, as a result of DSP removal; i.e., $\frac{dc}{dD} < 0$. Family earnings are by definition 0 for this group, so we set $\frac{df}{dD} = 0$. Therefore we consider equation 21 with the empirical $\frac{dc}{dD}$ for this group and $\frac{df}{dD} = 0$.

5.5 Results

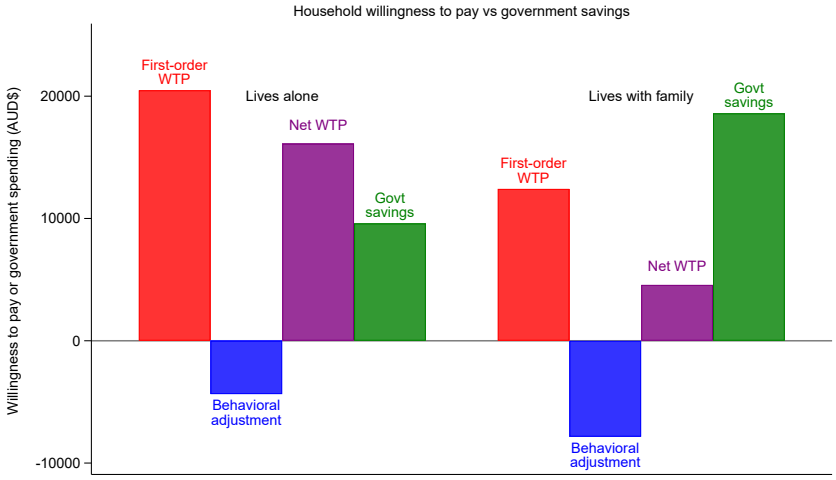
Figure 8 shows the results from our baseline assumptions. For people living with family, the first-order annual welfare loss to the household is \$12,400. However, the household's behavioral adjustments almost completely offset the first-order loss, reducing it by \$7,800 annually. The annual net welfare loss after incorporating behavioral adjustments is just \$4,600. By far the most effective behavioral adjustment is family member earnings (see Appendix Figure A.10). In this case, behavioral adjustments significantly reduce the welfare loss from losing DSP. The magnitude of the behavioral adjustments is not very sensitive to the wage function, unless we assume extreme wage functions.

For people living alone, the first-order welfare loss to the household (plus second-order loss from consumption decline) is much larger than that of people living with family, at \$20,500. The first-order welfare loss is larger for those who live alone than those who live with family for two reasons: those who live alone do not have an automatic adjustment from family earnings, and they experience a second-order loss from the consumption decline. The behavioral adjustments from work, other government programs, and prescription drugs reduce the welfare loss by \$4,400. The relatively small behavioral offsets come mostly from other government programs offsetting the consumption loss and prescription drugs reducing the disutility of other government programs (see Appendix Figure A.10). The total welfare

loss, including second-order effects which include behavioral responses, is \$16,100. In this case, the behavioral adjustments offset only a small fraction of household welfare loss from DSP remvoal.

Averaging over those who live alone (57%) and those who live with family (43%), we find that, on average, the first-order welfare loss (plus second-order loss from consumption decline) is \$16,100, the behavioral adjustments offset this by \$4,600, leaving a net household welfare loss of \$11,500. Of course, this average masks enormous heterogeneity in household welfare loss by family structure.

Figure 8: Behavioral adjustments offset more of loss for those living with family



Notes: Figure presents estimates of household willingness to pay to avoid DSP loss and government savings from DSP removal, for those who live alone (left) and those who live with family (right). Parameter choices are: $\gamma = 2$, $\kappa = 0.1$, $\eta = 0.1$, $\delta = 0.00002$, $\alpha = 0.00004$, $\sigma = 0.08$, a marginal tax rate of 0.1 and baseline wage function of $w(p) = 14 + 6 * \log(p)$. These estimates are presented in Appendix Table A.25.

Turning to social welfare, Figure 8 shows the change in net government revenue from DSP removal for each group. For those who live with family, government savings are \$18,600. For those who live alone, government savings are \$9,600. Government savings are much larger for those who live with family for several reasons. First, the increase in government benefits from other programs $\frac{db}{dD}$ is almost twice as large for those who live alone (\$14,300) than those who live with family (\$8,600)—in other words, the government doesn't save much from removing those who live alone because, without much increase in own earnings or family support, they are entitled to substantial non-DSP government benefits. Second, the increase in prescription drug costs, especially expensive antipsychotics, is driven almost entirely by people who live alone (\$0 vs \$2,700). Third, those who live with family have larger own earnings and family member earnings responses, meaning that the increase in tax revenue from earnings is larger for this group.

How large does the welfare weight μ on taxpayers in equation (16) have to be for DSP removal to be social-welfare-improving? For DSP removal to be welfare-improving for recipients who live with family, taxpayers would need to have a social welfare weight of at least 25% (=\$4,600/\$18,600) that of DSP recipients. In contrast, taxpayers would to have a social welfare weight of at least 168% (=\$16,100/\$9,600) that of DSP recipients for DSP removal to be welfare-improving for recipients who live alone. In other words, for people on the margin of being removed by the 2014 DSP reform, removal of those who live with family was likely social-welfare-improving, while removal of those who live alone was likely not.

To probe the sensitivity of the welfare analysis to different parameter values, we use a Sobol sequence with 100,000 draws from the ranges of parameter values specified in Section 5.4. For each draw, we calculate the first-order willingness to pay, behavioral adjustment, net willingness to pay, and government savings. We plot the distributions in Figure 9, separately for individuals living alone and individuals living with family. The results are qualitatively consistent with our baseline estimates from Figure 8. First-order willingness to pay is on average larger for those living alone, while the behavioral adjustment is larger (in magnitude) for those living with family. This means that net willingness to pay is on average higher for those living alone than those living with family. There is greater dispersion in both first-order WTP and behavioral adjustment for those living with family, primarily because of the range of values for sensitivity of family transfers (α). Government savings are on average higher for those living with family than those living alone.[20]

5.6 Contribution of welfare analysis

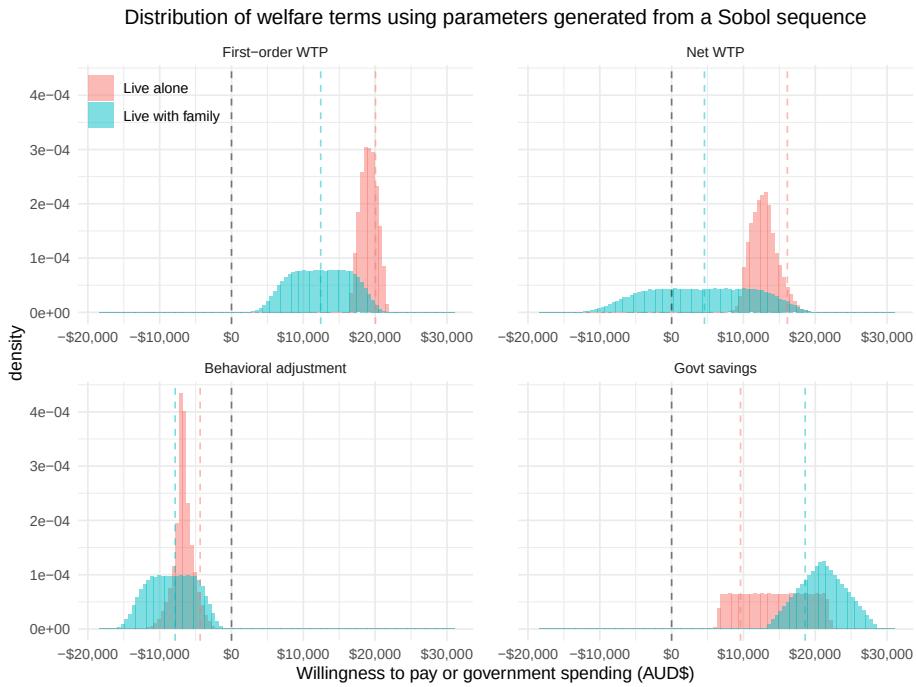
The richness of the Australian administrative data improves the insights from the welfare analysis in several ways relative to what would be possible in more standard administrative data. First, we observe who lives with family and who lives alone, which reveals a key dimension of heterogeneity in behavioral responses and therefore in the welfare effects of DSP removal. Without this data feature, a welfare analysis based on average responses would lead to an incomplete and misleading picture of household and social welfare.

Second, observing multiple dimensions of heterogeneity allows us to go beyond a first-order welfare analysis to consider how behavioral responses offset the household welfare loss from DSP removal. A standard first-order welfare analysis, as in Hendren and Sprung-Keyser (2020), would compare the first-order welfare loss (WTP) to government savings. Using all observable margins of adjustment, the first-order welfare loss (WTP) is \$12,400 and government savings is \$12,800 for those living with family. For recipients living alone, WTP is \$20,000 and government savings is \$4,000. (see Appendix Table A.26 for details).[21]

[20] Appendix Figures A.11 and A.12 show the sensitivity of the welfare estimates to specific parameters.

[21] If we used only the work adjustment but not other behavioral adjustments, we would conclude that for

Figure 9: Across range of parameter values, higher WTP and smaller behavioral adjustment for those living alone



Notes: Figure presents estimates using a grid of parameters generated from a Sobol sequence with the following bounds on each parameter: $\gamma \in (0.5, 4), \kappa \in (0, 0.5), \eta \in (0, 0.5), \delta \in (0, 0.00005), \alpha \in (0, 0.00005), \sigma \in (0, 0.2), \tau \in (0, 0.2)$. Dashed vertical lines correspond to the values chosen in our baseline specification in Figure 8.

By ignoring the offsets from behavioral adjustments, a standard first-order welfare analysis would miss the dramatic difference in household welfare loss by family structure.

Similarly, suppose that we used a second-order welfare analysis but that the only observable margin of adjustment was the DSP recipient's own work. Appendix Section B.5 derives the willingness to pay expression in this case. Making the same assumptions as above, and assuming a consumption floor of $15,000, we find that first-order welfare loss (WTP) is $25,400 for those living with family, with a -$3,800 offset from own earnings; and $29,800 for those living alone, with a -$1,700 offset from own earnings. Government savings are $20,700 for those living with family and $21,400 for those living alone. This analysis would suggest that there is very little offset from behavioral responses for either group and that government savings are similar for each group, both of which are incorrect in the presence of additional margins of adjustment.[22]

recipients living with family, WTP is $22,200 and government savings is $12,800. For recipients living alone, WTP is $21,800 and government savings is $4,000.

[22]We assume that consumption is equal to observed income (earnings plus DSP benefits), wages are constant at $17, and γ and the tax rate are the same as above.

6 Conclusion

In response to rising DI enrollment, many countries around the developed world have taken actions to curtail entry onto and increase exit from DI. The motivation behind these reforms has been twofold: 1) to reduce government expenditures on people who could potentially support themselves through work, thus at low cost to households and society; and 2) to encourage work among the work-capable, especially young people who might otherwise rely on government benefits for their lifetimes. These motivations echo those of broader crackdowns on welfare benefits, such as the US welfare reform of 1996 targeting single mothers and the introduction work requirements into welfare programs in Europe. In most of these cases, we have been left with an incomplete picture of the effects of these reforms on households and whether they achieved their goals.

We evaluate the success of DI crackdowns in Australia in the 2010s using newly available Australian administrative data covering multiple margins of adjustment, including substitution to other programs, increases in work by the individual, increases in work by family members, and health care utilization. We find that these reforms had mixed success in their two goals. With respect to the first goal of reducing government expenditures with minimal harm to society, we find that the DI crackdown had disparate effects on removed recipients based on family structure. For those living with family members, the support burden shifted from the DI program to family members, who worked more in response to the loss, with some increase in work by the recipients themselves. For those living alone, the support burden shifted from the DI program to other government programs, which provided partial support, and to recipients, who experienced income losses rather than supporting themselves through work. These income losses also generated large increases in the use of strong and expensive mental health drugs paid for by taxpayers. Our welfare calculations suggest that these reforms may have been welfare-improving with respect to those living with family—despite the additional burden on family members—but are unlikely to have been welfare-improving for those living alone. With respect to the second goal of encouraging work among those capable of work, we find that those living with family members worked modestly more, mostly in low-skilled occupations. In contrast, those living alone did not work more and appear to have turned to mental health drugs to cope with the income loss.

Our analysis highlights that the welfare consequences of reductions in the generosity of DI programs depend heavily on the informal support available to recipients. The welfare effects of DI cuts could be extremely different for those with a strong informal safety net compared to those with a patchy informal safety net. Policymakers may be wary of conditioning directly on informal support due to concerns about fairness or inducing distortions on behavior. However, policymakers can still consider the distribution of informal support in the relevant

population when making decisions about changes in generosity. They can also use proxies of informal support to condition benefits, for example means-testing benefits at the household level.

References

Angrist, J. D. and J.-S. Pischke (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Australian Government (1973). Health Insurance Act 1973. Consolidated Act, accessed November 18, 2024.

Australian Government (1991a). Social Security Act 1991. Consolidated Act, accessed March 24, 2025.

Australian Government (1991b). Social Security Act 1991, Section 117. Consolidated Act, accessed November 18, 2024.

Australian Tax Office, ABS Datalab (1999-2023). Person Level Integrated Data Asset (PLIDA). Findings based on use of PLIDA data.

Autor, D., A. Kostøl, M. Mogstad, and B. Setzler (2019, July). Disability Benefits, Consumption Insurance, and Household Labor Supply. *American Economic Review 109*(7), 2613–54.

Badji, S., A. Kavanagh, and D. Petrie (2023). The impact of disability insurance reassessment on healthcare use. *Health Economics 32*(7), 1581–1602.

Black, B., E. French, J. McCauley, and J. Song (2024). The Effect of Disability Insurance Receipt on Mortality. *Journal of Public Economics 229*, 105033.

Blundell, R., L. Pistaferri, and I. Saporta-Eksten (2016, February). Consumption inequality and family labor supply. *American Economic Review 106*(2), 387–435.

Borghans, L., A. C. Gielen, and E. F. P. Luttmer (2014, November). Social support substitution and the earnings rebound: Evidence from a regression discontinuity in disability insurance reform. *American Economic Journal: Economic Policy 6*(4), 34–70.

Calonico, S., M. D. Cattaneo, M. H. Farrell, and R. Titiunik (2018, May). RDROBUST: Stata module to provide robust data-driven inference in the regression-discontinuity design. Statistical Software Components, Boston College Department of Economics.

Chen, S. and W. van der Klaauw (2008). The Work Disincentive Effects of the Disability Insurance Program in the 1990s. *Journal of Econometrics 142*(2), 757–784.

Chokhawala, K. and L. Stevens (2024). *Antipsychotic Medications*. Treasure Island (FL): StatPearls Publishing. Copyright © 2024, StatPearls Publishing LLC.

Deshpande, M. (2016). Does Welfare Inhibit Success? The Long-Term Effects of Removing Low-Income Youth from the Disability Rolls. *American Economic Review 106*(11), 3300–3330.

Edwards, R. W. (2002). Australian social trends. Technical report, Australian Bureau of Statistics.

French, E. and J. Song (2014). The Effect of Disability Insurance Receipt on Labor Supply. *American Economic Journal: Economic Policy 6*(2), 291–337.

Gelber, A., T. Moore, Z. Pei, and A. Strand (2023). Disability Insurance Income Saves Lives. *Journal of Political Economy 131*(11), 3156–3185.

Haan, P. and V. Prowse (2024, April). The heterogeneous effects of social assistance and unemployment insurance: Evidence from a life cycle model of family labor supply and savings. *American Economic Journal: Macroeconomics 16*(2), 127–81.

Halla, M., J. Schmieder, and A. Weber (2020). Job displacement, family dynamics, and spousal labor supply. *American Economic Journal: Applied Economics 12*(4), pp. 253–287.

Haller, A., S. Staubli, and J. Zweimüller (2024). Designing disability insurance reforms: Tightening eligibility rules or reducing benefits? *Econometrica 92*(1), 79–110.

Joint Committee of Public Accounts and Audit (2017). Commonwealth risk management: Inquiry based on auditor-general's report 18 (2015-16). Technical report, PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

Kellogg, M. (2024). Self-insurance and selection into disability insurance.

Low, H. and L. Pistaferri (2015, October). Disability insurance and the dynamics of the incentive insurance trade-off. *American Economic Review 105*(10), 2986–3029.

Lundberg, S. (1985). The added worker effect. *Journal of Labor Economics 3*(1), 11–37.

Maestas, N., K. Mullen, and A. Strand (2013). Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of SSDI Receipt. *American Economic Review 103*(5), 1797–1829.

McVicar, D., R. Wilkins, and N. R. Ziebarth (2023, 11). 150Five Decades of Disability Benefit Policies in Five OECD Countries. In *Work and the Social Safety Net: Labor Activation in Europe and the United States*. Oxford University Press.

Meyer, B. D. and W. K. Mok (2019). Disability, earnings, income and consumption. *Journal of Public Economics 171*, 51–69. Trans-Atlantic Public Economics Seminar 2016.

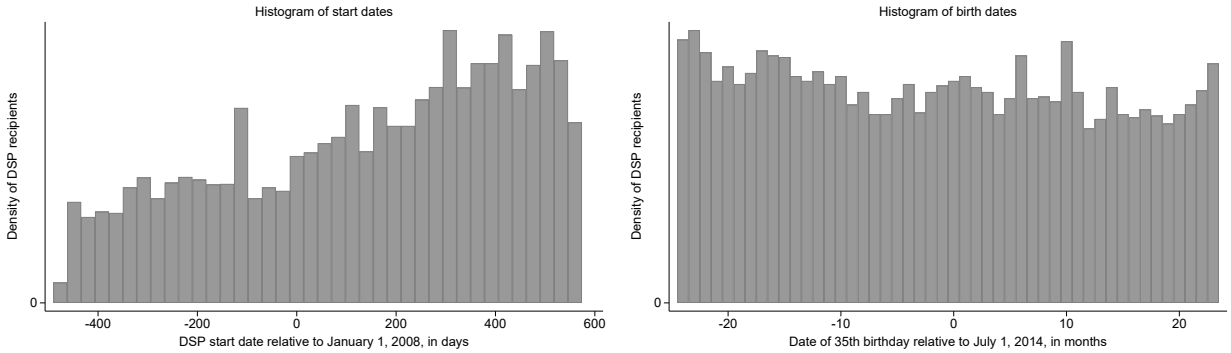
Moore, T. J. (2015). The Employment Effects of Terminating Disability Benefits. *Journal of Public Economics 124*, 30–43.

Silver, D. and J. Zhang (2022, March). Invisible wounds: Health and well-being impacts of mental disorder disability compensation on veterans. Working Paper 29877, National Bureau of Economic Research.

Von Wachter, T., J. Song, and J. Manchester (2011). Trends in Employment and Earnings of Allowed and Rejected Applicants to the Social Security Disability Program. *American Economic Review 101*(7), 3308–3329.

A Key Appendix Figures and Table

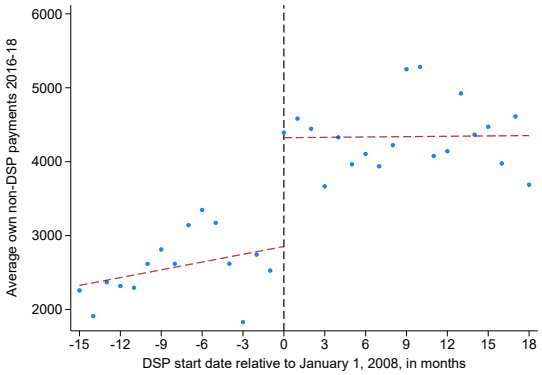
Appendix Figure A.1: Histogram of start dates and birth dates



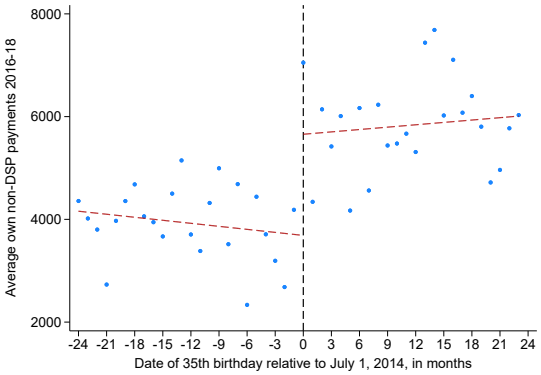
Notes: Left figure shows density of DSP spell starts around January 1, 2008. Sample is DSP recipients who entered DSP around the January 1, 2008, cutoff, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 (or missing) hours of work capacity with intervention". Right figure shows density of DSP recipients with 35th birthdays around July 1, 2014. The sample consists of DSP recipients with a 35th birthday around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 (or missing) hours of work capacity with intervention."

Appendix Figure A.2: Start Date and Birth Date RD: Reduced form graphs

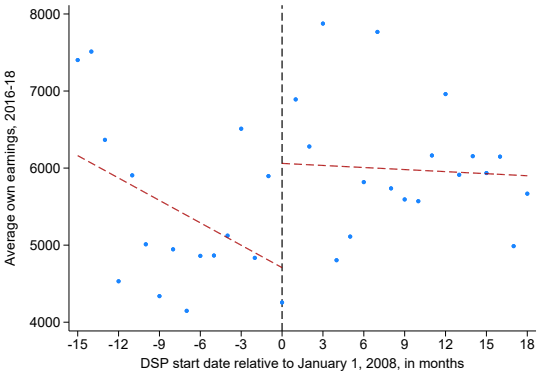
Start Date RD: Other govt payments



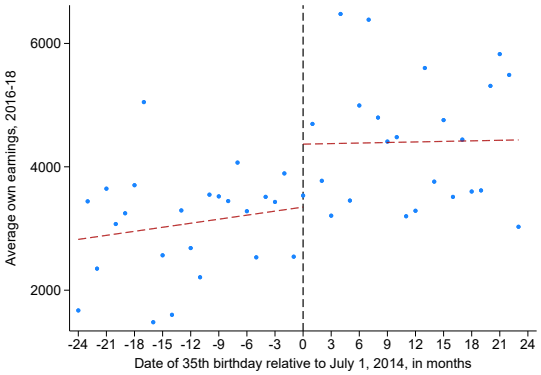
Birth Date RD: Other govt payments



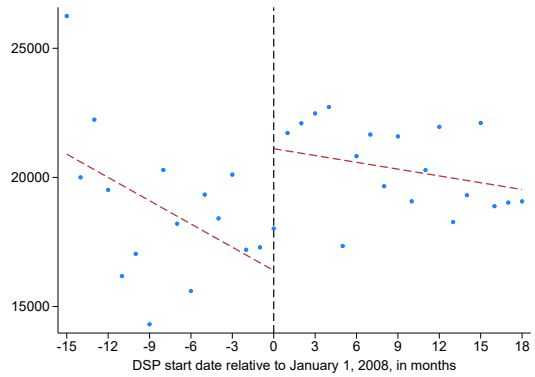
Start Date RD: Own earnings



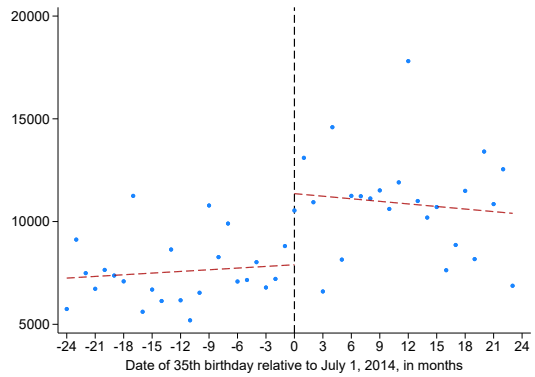
Birth Date RD: Own earnings



Start Date RD: Household earnings

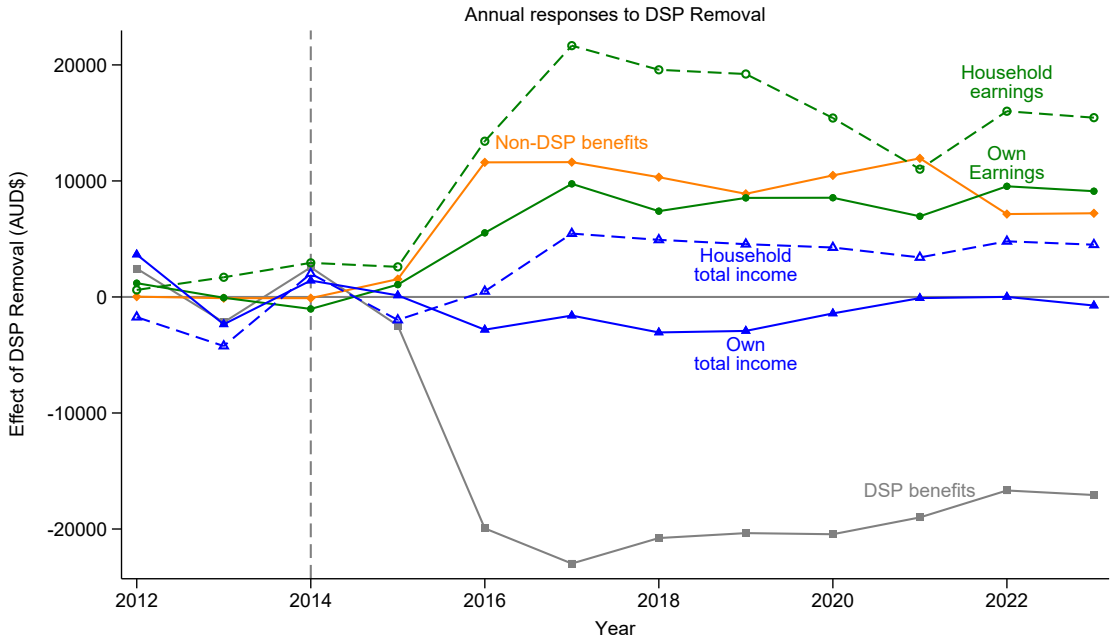


Birth Date RD: Household earnings



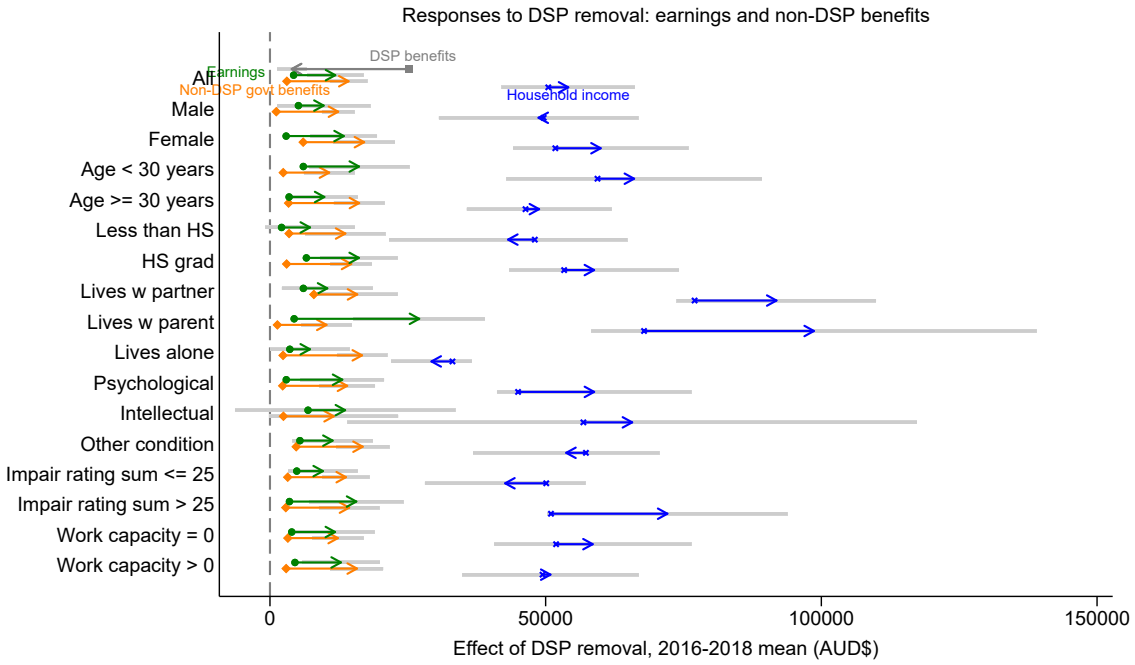
Notes: Top two figures show average annual non-DSP government payments from 2016 to 2018 for the Start Date RD (left) and Birth Date RD (right), respectively. Middle two figures show average annual own earnings between 2016 and 2018 for the Start Date RD (left) and Birth Date RD (right). Bottom two figures show average annual household earnings (own, spouse, and parent) between 2016 and 2018 for the Start Date RD (left) and Birth Date RD (right). Start Date sample is DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date RD sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating."

Appendix Figure A.3: Earnings and income responses to DSP removal highly persistent



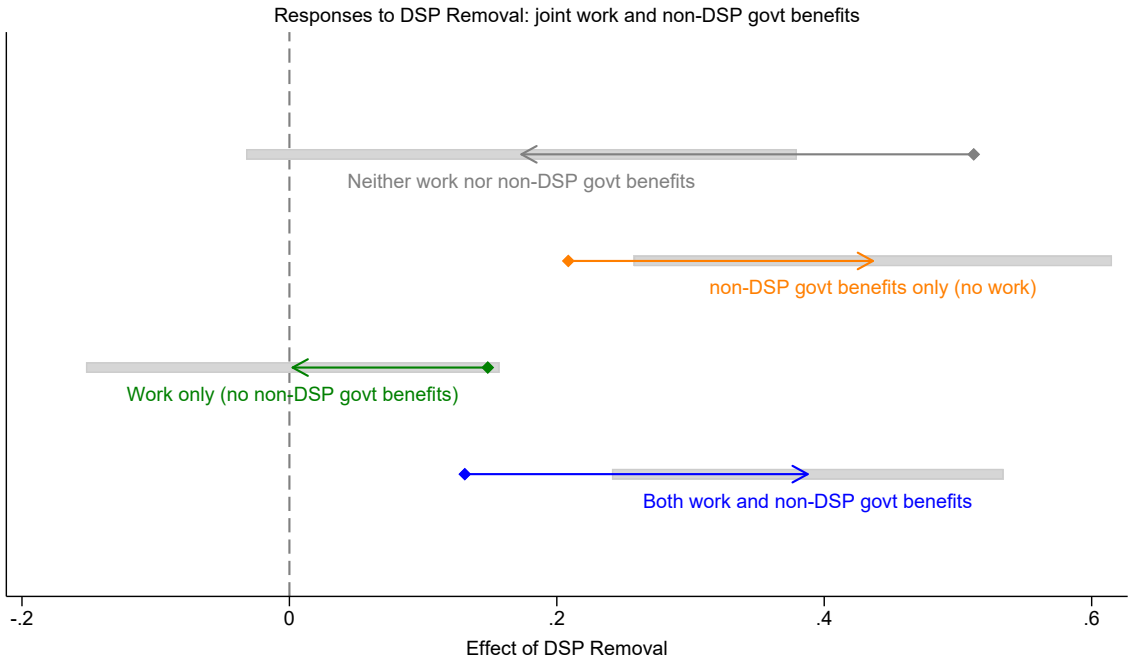
Notes: Figure plots IV estimates (i.e. β_4 from equation (5)) of the effect of DSP loss between 2014 and 2016 on annual earnings and income variables from 2012 to 2022. "DSP benefits" represents the IV estimate of the effect of DSP loss on DSP benefits in each year. "Own earnings" represents the IV estimate of the effect of DSP loss on the DSP recipient's own earnings in each year; "Household earnings" represents the IV estimate of the effect on the sum of recipient, spouse, and parent earnings in each year. "Non-DSP benefits" represents the IV estimate of the effect of DSP loss on the DSP recipient's non-DSP benefits in each year. "Own total income" represents the IV estimate of the effect of DSP loss on the DSP recipient's government benefits (DSP and non-DSP) and earnings; "Household total income" represents the IV estimate of the effect of DSP loss on government benefits and earnings for the individual recipient, spouse, parents. Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.8 for annual estimates.

Appendix Figure A.4: Responses to DSP removal: earnings and non-DSP benefits



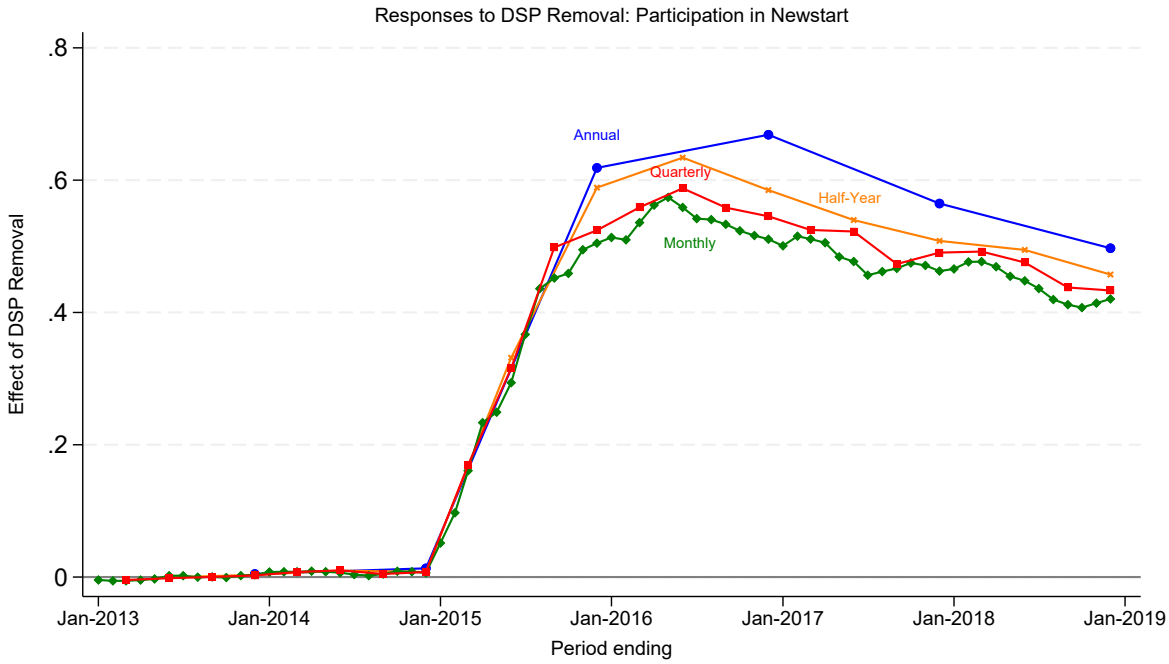
Notes: Figure plots IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on average annual income measures by subgroup. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. "Earnings" are individual earnings from 2016-18, "Non-DSP benefits" individual non-DSP benefits from 2016-18, and "Household income" is the sum of own, spouse, and parent earnings and government (DSP and non-DSP) benefits from 2016-18. Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.5 for point estimates.

Appendix Figure A.5: Removed DSP recipients move into work+Newstart, or just Newstart



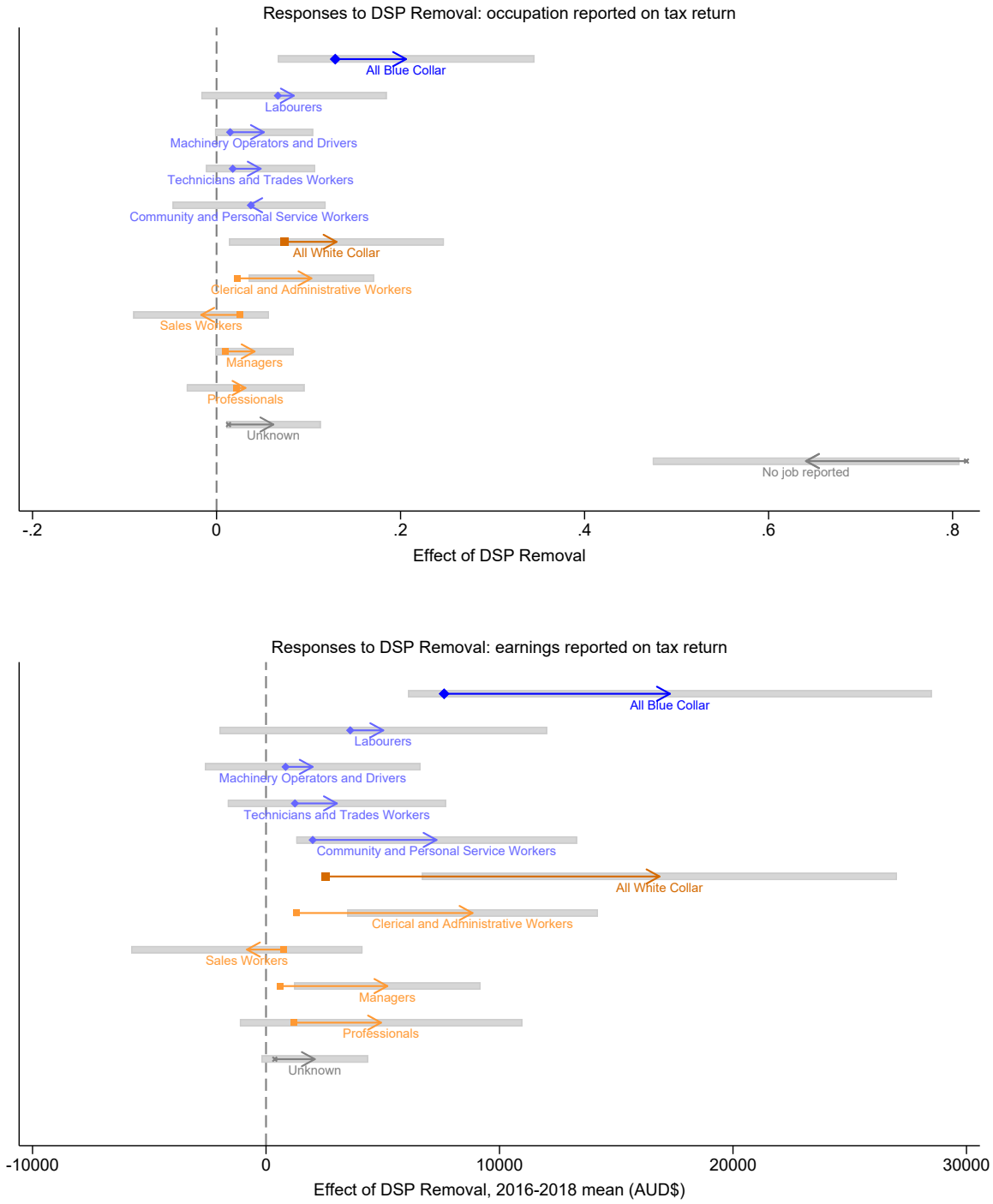
Notes: Figure plots IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on the joint likelihood of working and getting non-DSP benefits from 2016-18. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. The outcomes are divided into four mutually exclusive and collectively exhaustive categories: neither work nor non-DSP benefits, both work and non-DSP benefits, work only (no non-DSP benefits), and non-DSP benefits only (no work). Combined sample stacks the Start Date RD and Birth Date RD samples. See Appendix Table A.13 for point estimates.

Appendix Figure A.6: Not much "churn" on and off Newstart



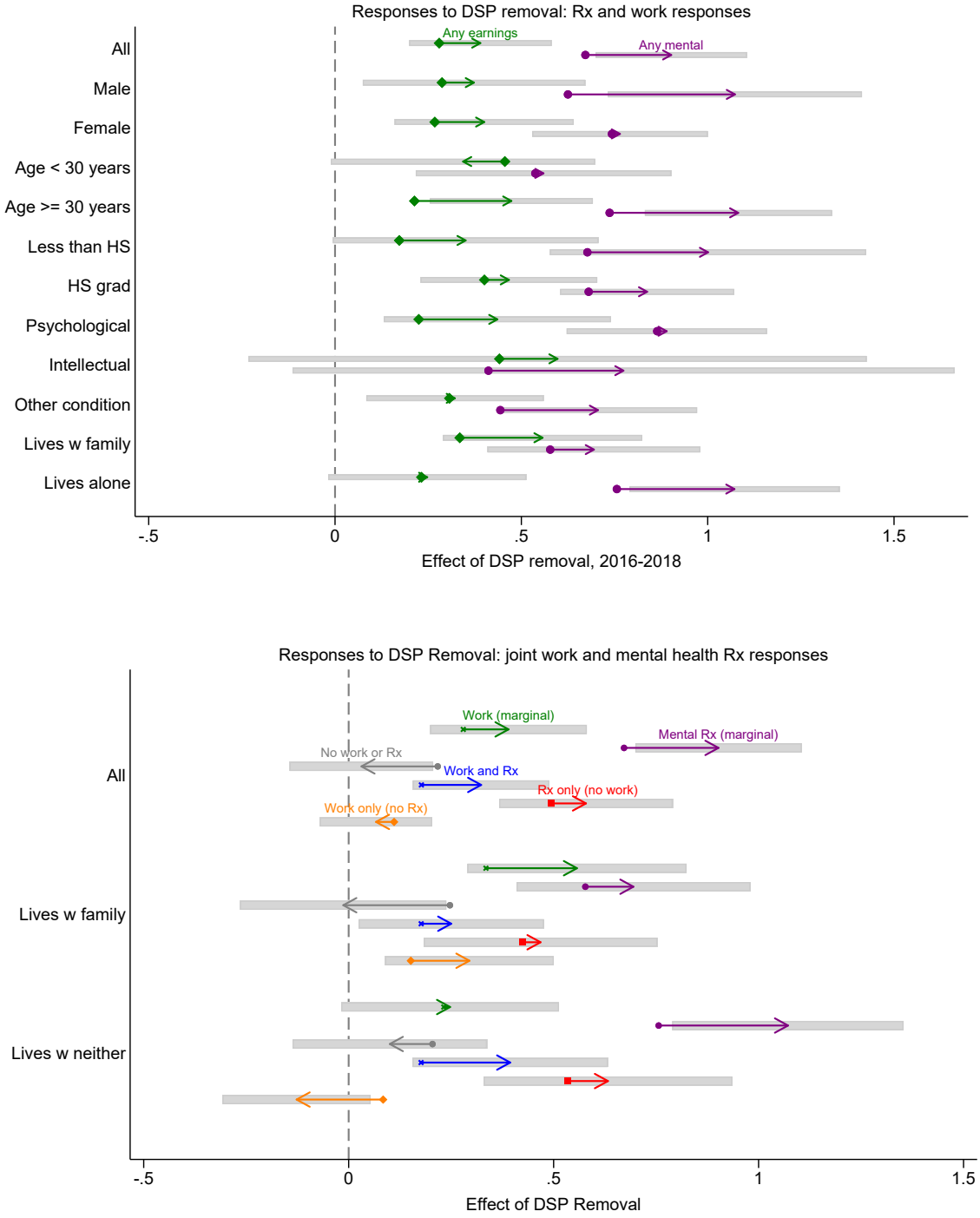
Notes: Figure plots IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on the likelihood of receiving Newstart in a given time frame. Combined sample stacks the Start Date RD and Birth Date RD samples.

Appendix Figure A.7: Most of increase in work comes from blue-collar jobs



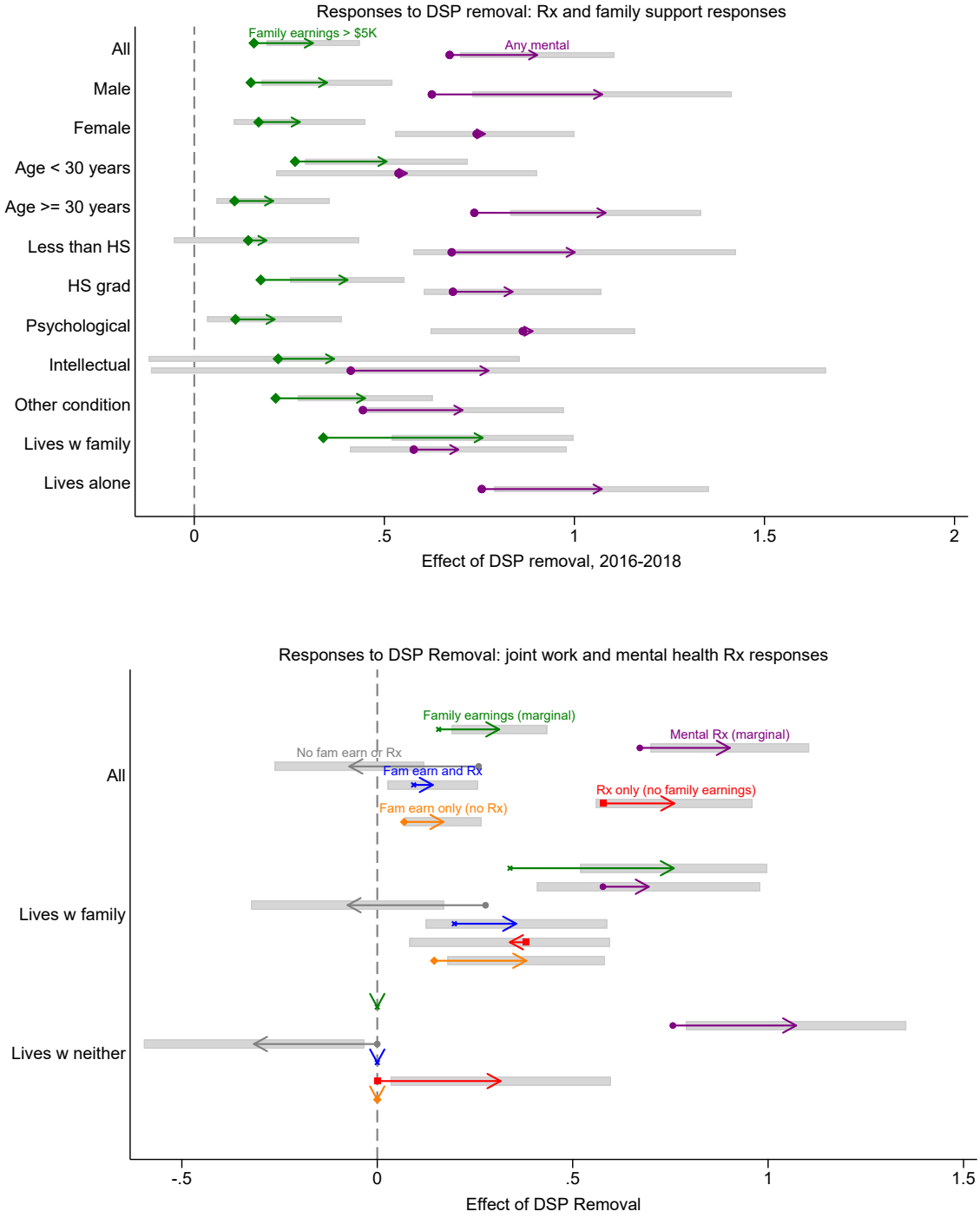
Notes: Figure plots IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on having any earnings (top graph) or earnings amount (bottom graph) from a given occupation for the combined Start Date and Birth Date sample. Occupations are self-reported on tax returns. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (5), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. See Appendix Table A.9 for point estimates.

Appendix Figure A.8: Correlation between increase in work and increase in mental health Rx across subgroups



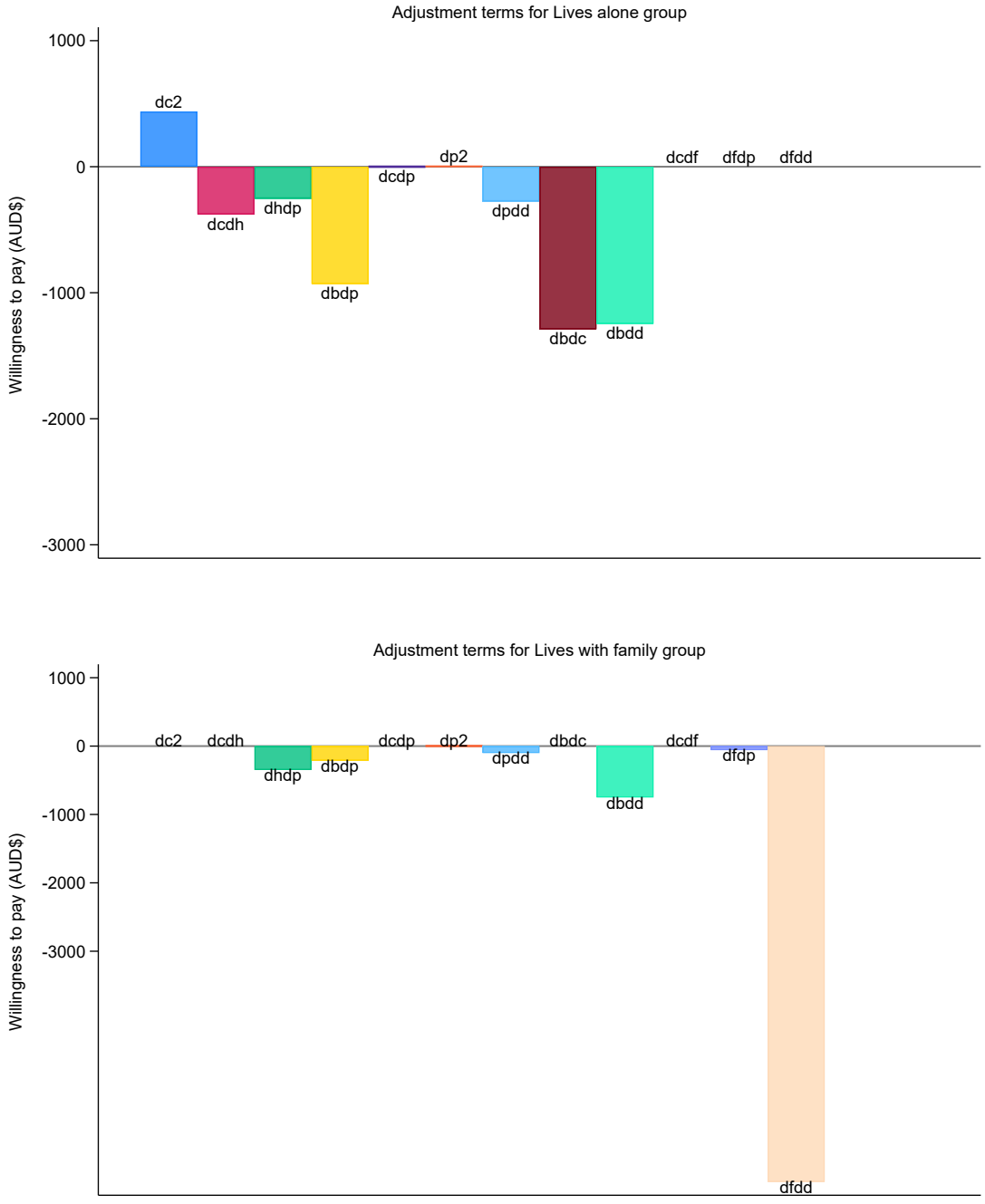
Notes: Top graph plots IV estimates (i.e. β_4 from equation 4) of the effect of DSP loss on the likelihood of having any earnings between 2016–18 and the likelihood of having a mental health drug prescription by subgroup. Bottom graph plots, by subgroup, IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on the joint likelihood of working and having a mental health drug prescription from 2016-18. The outcomes are divided into four mutually exclusive and collectively exhaustive categories: neither work nor mental health prescription, both work and mental health prescription, work only (no mental health prescription), and mental health prescription only (no work). The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (4), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. See Appendix Table A.19 for point estimates and Appendix Table A.14 for correlation coefficients between point estimates of any mental and any earnings (at different earnings thresholds) across subgroups.

Appendix Figure A.9: Correlation between increase in family support and increase in mental health Rx across subgroups



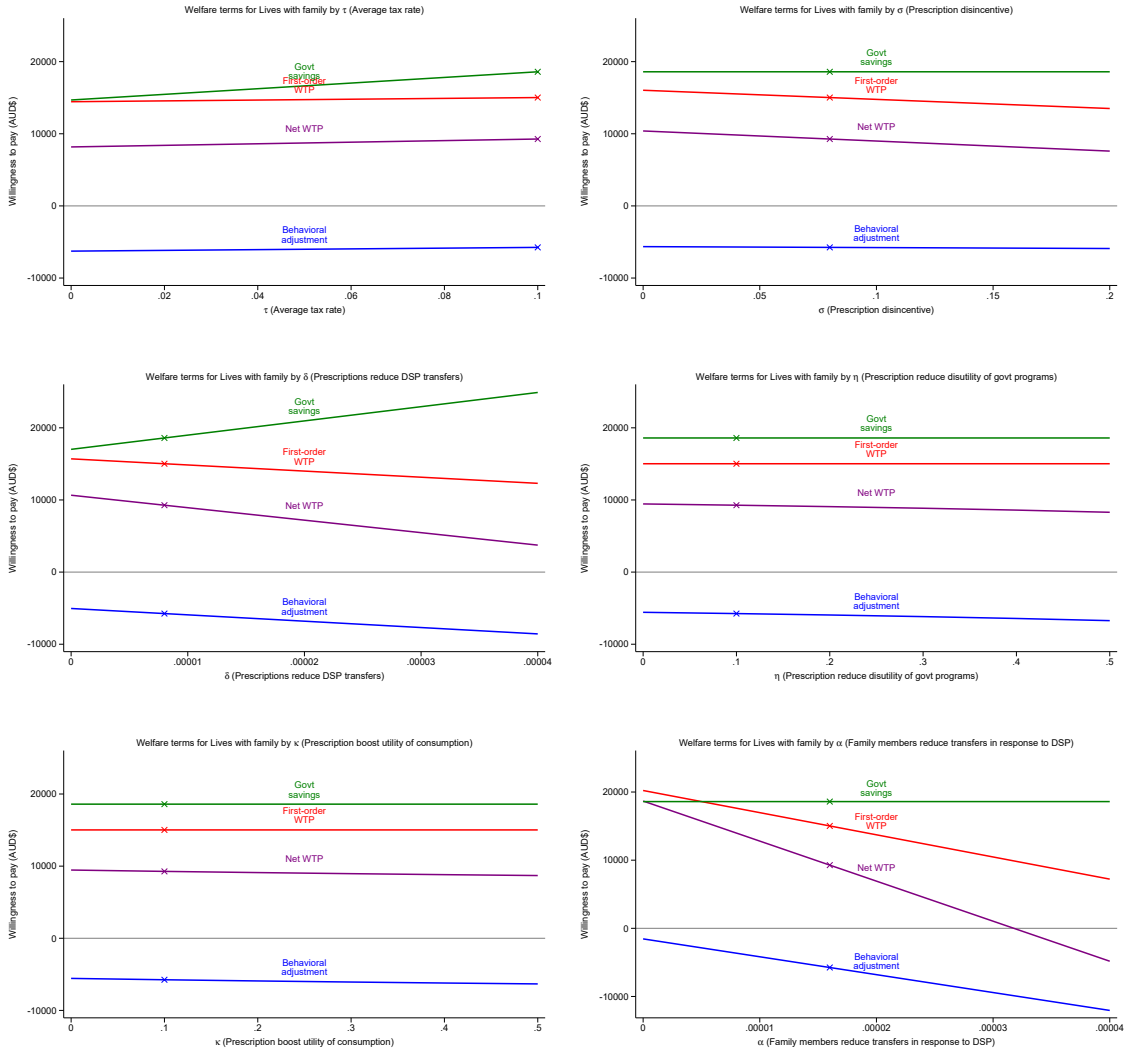
Notes: Top graph plots IV estimates (i.e. β_4 from equation 4) of the effect of DSP loss on the likelihood of family members earning more than $5,000 per year between 2016–18 and the likelihood of having a mental health drug prescription by subgroup. Bottom graph plots, by subgroup, IV estimates (i.e. β_4 of equation (5)) of the effect of DSP loss on the joint likelihood of family member earnings greater than $5,000 and having a mental health drug prescription from 2016-18. The outcomes are divided into four mutually exclusive and collectively exhaustive categories: neither family earnings nor mental health prescription, both family earnings and mental health prescription, family earnings only (no mental health prescription), and mental health prescription only (no family earnings). The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (4), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals around the point estimate. See Appendix Table A.19 for point estimates and Appendix Table A.14 for correlation coefficients between point estimates of any antipsychotic and any earnings (at different earnings thresholds) across subgroups.

Appendix Figure A.10: Behavioral adjustment terms for those who live alone vs with family



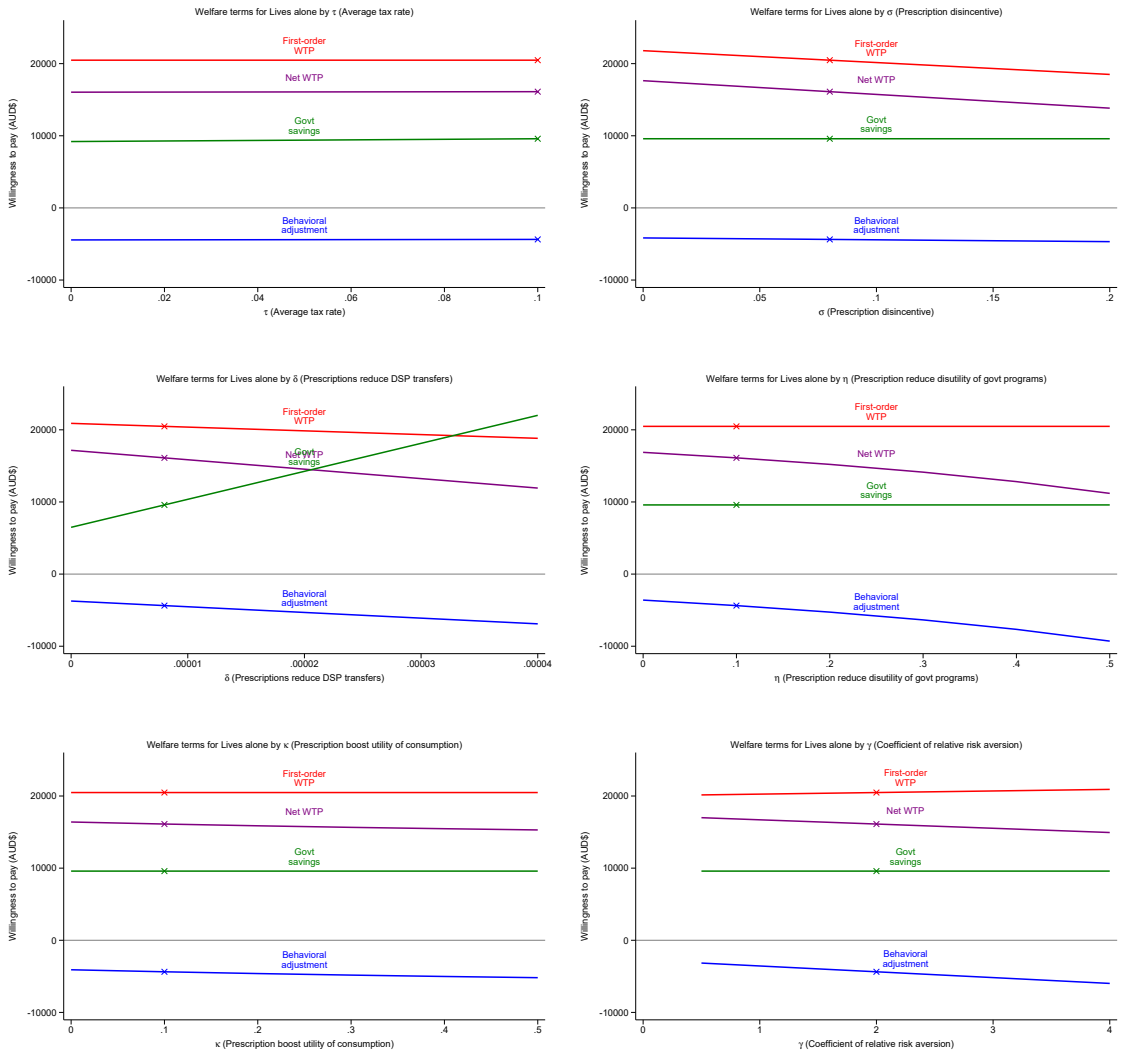
Notes: Figure shows each behavioral adjustment term from equation 21 for those who live with family and those who live alone. For those who live with family, we set $\frac{dc}{dD} = 0$. For those who live alone, we set $\frac{dc}{dD}$ to its empirical value and $\frac{df}{dD} = 0$.

Appendix Figure A.11: Lives with family: welfare terms sensitive to family member adjustment



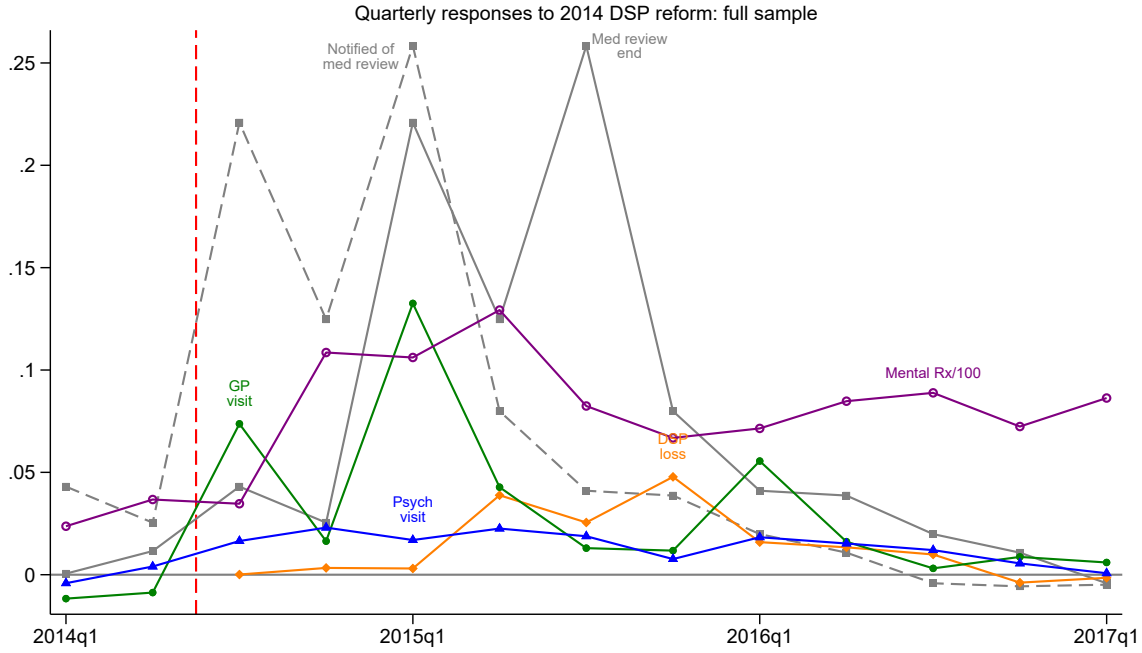
Notes: Figure shows first-order loss, second-order adjustment, and net welfare loss under different parameter values. Text labels are above the parameter value that we use in Figure 8.

Appendix Figure A.12: Lives alone: welfare terms sensitive to stress effect of other programs (η)



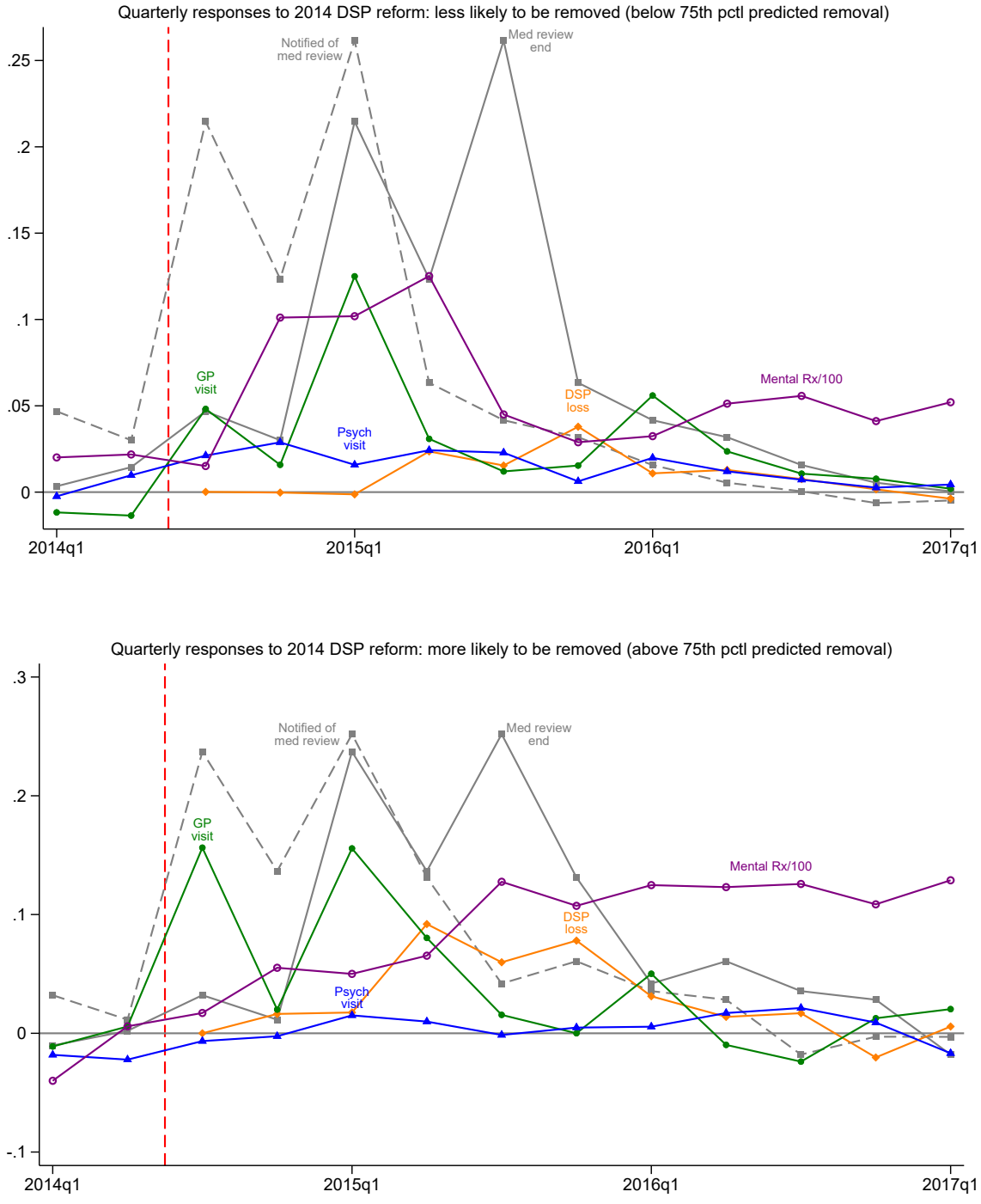
Notes: Figure shows first-order loss, second-order adjustment, and net welfare loss under different parameter values. X's mark the parameter values that we use in Figure 8.

Appendix Figure A.13: Timing of key outcomes



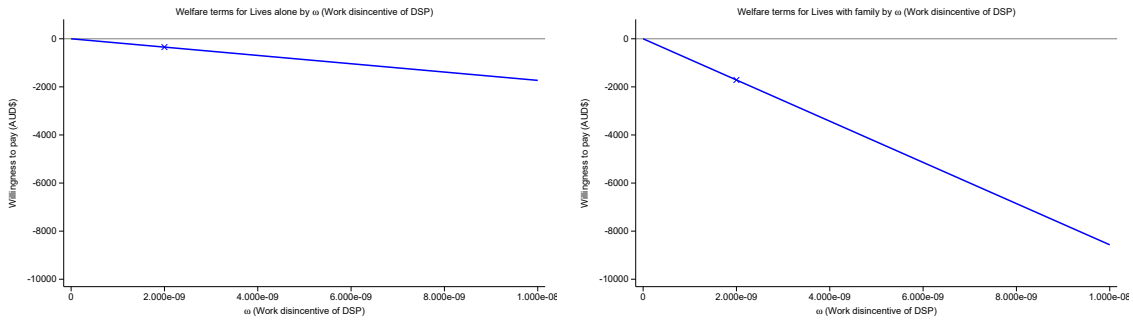
Notes: Graph plots β_1 from 4 (i.e. the RD estimate of the effect of the cutoff) on various quarterly outcomes. We stack the Start Date RD and Birth Date RD sample, and plot the coefficient on being above the cutoff.

Appendix Figure A.14: Persistent increase in mental health prescriptions only for those with high DSP loss rates



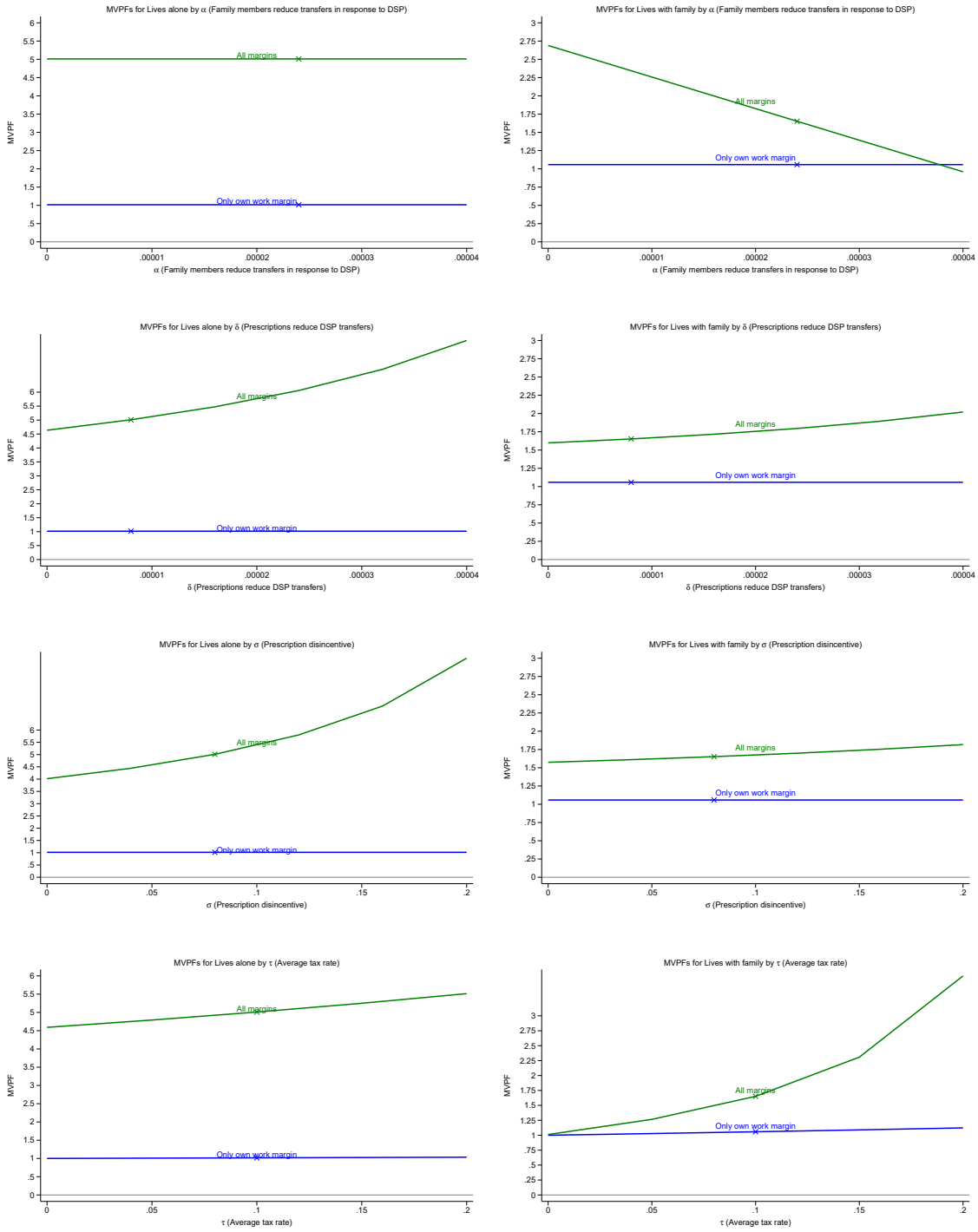
Notes: Top graph plots β_1 from 4 (i.e. the RD estimate of the effect of the cutoff) on various quarterly outcomes for a subgroup with a low chance of losing DSP. Bottom graph plots β_1 from 4 (i.e. the RD estimate of the effect of the cutoff) on various quarterly outcomes for a subgroup with a high chance of losing DSP.

Appendix Figure A.15: Adjustment term from state-dependent utility model is sensitive to choice of ω



Notes: Left figure shows how the adjustment term from 32 changes with ω for those that live alone. Right figure shows the same but for those that live with family.

Appendix Figure A.16: MVPF: welfare terms sensitive to stress effect of other programs (η)



Notes: Figure shows MVPF using all adjustment margins, and MVPF using only work adjustment for different parameter values. 8.

Appendix Table A.1: Summary statistics

	Full DSP Population		Under 40		Start Date RD		Birth Date RD		Combined RDs		
Variable	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Compliers
Male (D)	0.531	828,354	0.587	193,342	0.595	10,665	0.583	6,521	0.590	17,186	0.563
Edu (Comb): Less than HS	0.558	626,049	0.489	161,517	0.458	10,112	0.424	6,026	0.446	16,138	0.304
Edu (Comb): HS grad	0.436	626,049	0.498	161,517	0.517	10,112	0.549	6,026	0.529	16,138	0.677
Edu (Comb): Missing	0.244	828,354	0.165	193,342	0.052	10,665	0.076	6,521	0.061	17,186	0.028
Spouse Jul 2014(D): yes	0.280	828,354	0.120	193,342	0.121	10,665	0.189	6,521	0.147	17,186	0.198
Spouse Jul 2014(D): no	0.720	828,354	0.880	193,342	0.879	10,665	0.811	6,521	0.853	17,186	0.802
Married (C)	0.323	600,868	0.132	131,657	0.115	7,343	0.242	4,204	0.162	11,547	0.213
Not married (C)	0.593	600,868	0.752	131,657	0.806	7,343	0.671	4,204	0.757	11,547	0.711
Children (D): Has child in 2014	0.389	828,354	0.208	193,342	0.195	10,665	0.404	6,521	0.274	17,186	0.352
Children (D): Has child in 2014	0.611	828,354	0.792	193,342	0.805	10,665	0.596	6,521	0.726	17,186	0.648
Any Parent Jul 2014(D): yes	0.192	828,354	0.819	193,342	0.917	10,665	0.685	6,521	0.829	17,186	0.887
No Parent Jul 2014(D): no	0.808	828,354	0.181	193,342	0.083	10,665	0.315	6,521	0.171	17,186	0.113
Live with Parent Jul 2014(D): yes	0.437	159,130	0.436	158,294	0.407	9,779	0.233	4,464	0.352	14,243	0.280
Live with Parent Jul 2014(D): no	0.563	159,130	0.564	158,294	0.593	9,779	0.767	4,464	0.648	14,243	0.720
Live with Parent or have Spouse (D): yes	0.362	828,354	0.468	193,342	0.483	10,665	0.338	6,521	0.428	17,186	0.435
Live with Parent or have Spouse (D): no	0.638	828,354	0.532	193,342	0.517	10,665	0.662	6,521	0.572	17,186	0.565
DSP start age (D): over 25	0.145	828,354	0.274	193,342	-	10,665	1.000	6,521	0.528	17,186	0.474
DSP start age (D): under 25	0.219	828,354	0.680	193,342	0.761	10,665	-	6,521	0.472	17,186	0.526
Matches to Census (C)	0.275	828,354	0.319	193,342	0.311	10,665	0.355	6,521	0.328	17,186	0.325
Labor force (C): employed in 2011	0.152	600,868	0.190	131,657	0.182	7,343	0.120	4,204	0.160	11,547	0.140
Labor force (C): NILF in 2011	0.768	600,868	0.672	131,657	0.691	7,343	0.778	4,204	0.723	11,547	0.696
Labor force (C): unemployed in 2011	0.040	600,868	0.075	131,657	0.099	7,343	0.068	4,204	0.088	11,547	0.131
Ethnicity (C): European	0.602	600,868	0.551	131,657	0.572	7,343	0.580	4,204	0.575	11,547	0.601
Ethnicity (C): Oceanic	0.254	600,868	0.321	131,657	0.316	7,343	0.273	4,204	0.300	11,547	0.274
Ethnicity (C): other	0.144	600,868	0.128	131,657	0.112	7,343	0.147	4,204	0.125	11,547	0.125
Aboriginal (C)	0.049	600,868	0.066	131,657	0.071	7,343	0.066	4,204	0.069	11,547	0.071
Fam (C): 1 parent	0.189	600,748	0.254	131,634	0.262	7,343	0.230	4,204	0.251	11,547	0.281
Fam (C): 2 parents	0.263	600,748	0.411	131,634	0.388	7,343	0.332	4,204	0.368	11,547	0.338
Fam (C): single	0.368	600,748	0.266	131,634	0.267	7,343	0.360	4,204	0.301	11,547	0.273
Condition (M): int	0.099	571,066	0.302	152,540	0.229	10,665	0.047	6,521	0.160	17,186	0.114
Condition (M): missing	0.311	828,354	0.211	193,342	-	10,665	-	6,521	-	17,186	-
Condition (M): mus	0.268	571,066	0.065	152,540	0.062	10,665	0.134	6,521	0.089	17,186	0.144
Condition (M): ner	0.050	571,066	0.050	152,540	0.047	10,665	0.045	6,521	0.046	17,186	0.049
Condition (M): oth	0.256	571,066	0.157	152,540	0.173	10,665	0.175	6,521	0.174	17,186	0.218
Condition (M): psy	0.329	571,066	0.427	152,540	0.490	10,665	0.600	6,521	0.532	17,186	0.475
Max imp rating (M): ≥20	0.922	516,490	0.972	124,436	0.950	10,665	0.952	6,521	0.951	17,186	0.930
Sum imp rating (M): <25	0.538	516,490	0.562	124,436	0.548	10,665	0.649	6,521	0.586	17,186	0.665
Sum imp rating (M): ≥25	0.462	516,490	0.438	124,436	0.452	10,665	0.351	6,521	0.414	17,186	0.335
Sum imp rating (M): missing	0.376	828,354	0.356	193,342	-	10,665	-	6,521	-	17,186	-
Work cap w/o int (M): =0	0.623	393,314	0.607	100,438	0.437	10,665	0.458	6,521	0.445	17,186	0.443
Work cap w/o int (M): >0	0.377	393,314	0.393	100,438	0.563	10,665	0.542	6,521	0.555	17,186	0.557
Work cap w/o int (M): missing	0.525	828,354	0.481	193,342	-	10,665	-	6,521	-	17,186	-
Work cap w int (M): =0	0.381	391,732	0.303	100,090	-	10,665	-	6,521	-	17,186	-
Work cap w int (M): >0	0.619	391,732	0.697	100,090	-	10,665	-	6,521	-	17,186	-
Work cap w/int (M): missing	0.527	828,354	0.482	193,342	-	10,665	-	6,521	-	17,186	-
Labor force (T): pre-reform earn = 0	0.848	828,354	0.772	193,342	0.747	10,665	0.837	6,521	0.781	17,186	0.758
Labor force (T): pre-reform earn >0	0.152	828,354	0.228	193,342	0.253	10,665	0.163	6,521	0.219	17,186	0.242
Labor force (T): pre-DSP earn = 0	0.831	828,354	0.836	193,342	0.603	10,665	0.518	6,521	0.571	17,186	0.503
Labor force (T): pre-DSP earn >0	0.169	828,354	0.164	193,342	0.397	10,665	0.482	6,521	0.429	17,186	0.497
Med spending 2013 (MB): >median	0.500	819,145	0.360	188,030	0.342	10,455	0.464	6,299	0.388	16,754	0.325
Med spending 2013 (MB): <median	0.500	819,145	0.640	188,030	0.658	10,455	0.536	6,299	0.612	16,754	0.675
Prescription spending 2013 (P): >median	0.500	819,145	0.336	188,030	0.320	10,455	0.458	6,299	0.372	16,754	0.249
Prescription spending 2013 (P): <median	0.500	819,145	0.664	188,030	0.680	10,455	0.542	6,299	0.628	16,754	0.751
Don't live with parents	0.916	828,354	0.643	193,342	0.627	10,665	0.841	6,521	0.708	17,186	0.751
Live with parents & they have 0 earnings between 2012-14	0.040	828,354	0.171	193,342	0.160	10,665	0.094	6,521	0.135	17,186	0.104
Live with parents & they have on average less than 35k earnings 2012-14	0.018	828,354	0.076	193,342	0.082	10,665	0.033	6,521	0.063	17,186	0.060
Live with parents & they have on average more than 35k earnings 2012-14	0.026	828,354	0.111	193,342	0.131	10,665	0.032	6,521	0.093	17,186	0.084

Notes: Table presents summary statistics for four samples. The "Full DSP Population" is all DSP recipients as of July 1, 2014. The "Start Date RD" sample consists of individuals who entered DSP within 15 months before or 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." The "Birth Date RD" sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." The "Combined RDs" sample stacks the Start Date and Birth Date samples. Letters in parentheses indicate the source of the covariates: DOMINO (D), 2011 Census (C), medical review file (M), prescription benefits (PB), Medicare benefits (MB), or Australian Tax Office data (T). See text for details on parent and spouse linkages.

Appendix Table A.2: Covariate balance tests

	Start					Birth				
Group	Pt Est	Std Err	Cntrl Mean	% of mean	N	Pt Est	Std Err	Cntrl Mean	% of mean	N
Male (D)	0.009	0.021	0.595	1.50%	10,665	−0.015	0.025	0.615	−2.46%	6,521
Edu (D): Less than HS	0.008	0.023	0.444	1.74%	9,146	−0.069	0.027	0.426	−16.12%	5,369
Edu (D): HS grad	−0.012	0.023	0.490	−2.48%	9,146	0.040	0.027	0.511	7.88%	5,369
Edu (D): Missing	−0.033	0.016	0.241	−13.50%	10,665	−0.005	0.019	0.200	−2.30%	6,521
Edu (C): Less than HS	0.006	0.027	0.406	1.59%	6,832	0.038	0.033	0.507	7.43%	3,834
Edu (C): HS grad	−0.006	0.027	0.594	−1.09%	6,832	−0.038	0.033	0.493	−7.63%	3,834
Edu (C): Missing	0.017	0.021	0.344	5.09%	10,665	0.003	0.025	0.444	0.73%	6,521
Edu (Comb): Less than HS	0.013	0.022	0.458	2.94%	10,112	−0.038	0.026	0.466	−8.18%	6,026
Edu (Comb): HS grad	−0.015	0.022	0.514	−2.93%	10,112	0.029	0.026	0.506	5.67%	6,026
Edu (Comb): Missing	−0.009	0.010	0.082	−10.78%	10,665	0.004	0.013	0.085	5.27%	6,521
Parent eduction: less than high school	−0.001	0.027	0.519	−0.17%	6,784	−0.016	0.037	0.592	−2.73%	2,810
Parent eduction: high school or more	0.001	0.027	0.481	0.18%	6,784	0.016	0.037	0.408	3.95%	2,810
Parent eduction: missing	0.056	0.021	0.308	18.28%	10,665	0.004	0.025	0.556	0.79%	6,521
Spouse Jul 2014(D): yes	0.002	0.014	0.113	1.71%	10,665	−0.030	0.020	0.226	−13.38%	6,521
Spouse Jul 2014(D): no	−0.002	0.014	0.887	−0.22%	10,665	0.030	0.020	0.774	3.91%	6,521
Married (C)	0.000	0.016	0.090	0.11%	7,343	−0.050	0.026	0.264	−19.02%	4,204
Not married (C)	−0.017	0.020	0.854	−1.96%	7,343	0.022	0.029	0.663	3.28%	4,204
Children (D): Has child in 2014	−0.001	0.017	0.200	−0.42%	10,665	−0.019	0.024	0.422	−4.52%	6,521
Children (D): No child in 2014	0.001	0.017	0.800	0.10%	10,665	0.019	0.024	0.578	3.31%	6,521
Any Parent Jul 2014(D): yes	−0.025	0.012	0.913	−2.71%	10,665	−0.006	0.023	0.700	−0.92%	6,521
No Parent Jul 2014(D): no	0.025	0.012	0.087	28.37%	10,665	0.006	0.023	0.300	2.14%	6,521
Live with Parent Jul 2014(D): yes	−0.020	0.022	0.483	−4.16%	9,779	−0.015	0.026	0.280	−5.47%	4,464
Live with Parent Jul 2014(D): no	0.020	0.022	0.517	3.88%	9,779	0.015	0.026	0.720	2.13%	4,464
Live with Parent or have Spouse (D): yes	−0.027	0.022	0.533	−5.07%	10,665	−0.037	0.024	0.411	−9.02%	6,521
Live with Parent or have Spouse (D): no	0.027	0.022	0.467	5.79%	10,665	0.037	0.024	0.589	6.30%	6,521
DSP start age (D): 17	−0.027	0.020	0.349	−7.64%	10,665	-	-	-	-	-
DSP start age (D): 18-20	0.001	0.018	0.236	0.59%	10,665	-	-	-	-	-
DSP start age (D): 21-25	−0.002	0.019	0.256	−0.74%	10,665	-	-	-	-	-
DSP start age (D): 26-30	0.028	0.017	0.159	17.41%	10,665	0.006	0.021	0.237	2.38%	6,521
DSP start age (D): 31-35	-	-	-	-	-	−0.006	0.021	0.763	−0.74%	6,521
Matches to Census (C)	0.022	0.020	0.262	8.52%	10,665	0.003	0.024	0.396	0.80%	6,521
Labor force (C): employed in 2011	0.008	0.020	0.167	4.99%	7,343	−0.007	0.020	0.110	−6.09%	4,204
Labor force (C): NILF in 2011	0.008	0.024	0.694	1.16%	7,343	0.002	0.026	0.718	0.23%	4,204
Labor force (C): unemployed in 2011	−0.005	0.016	0.083	−6.47%	7,343	−0.003	0.016	0.123	−2.75%	4,204
Ethnicity (C): European	−0.017	0.025	0.597	−2.77%	7,343	0.002	0.031	0.571	0.39%	4,204
Ethnicity (C): Oceanic	0.037	0.024	0.257	14.56%	7,343	−0.002	0.027	0.252	−0.67%	4,204
Ethnicity (C): other	−0.021	0.016	0.146	−14.31%	7,343	−0.001	0.022	0.178	−0.30%	4,204
Aboriginal (C)	0.005	0.013	0.073	7.30%	7,343	−0.009	0.015	0.080	−11.73%	4,204
Fam (C): 1 parent	−0.035	0.023	0.326	−10.78%	7,343	−0.018	0.026	0.221	−8.08%	4,204
Fam (C): 2 parents	−0.023	0.025	0.375	−6.22%	7,343	−0.038	0.029	0.380	−10.08%	4,204
Fam (C): couple, no kids	−0.004	0.011	0.054	−7.59%	7,343	−0.025	0.013	0.056	−45.76%	4,204
Fam (C): single	0.056	0.023	0.229	24.46%	7,343	0.075	0.030	0.313	23.85%	4,204
Condition (M): int	−0.018	0.019	0.292	−6.03%	10,665	-	-	-	-	-
Condition (M): mus	−0.001	0.010	0.063	−0.89%	10,665	−0.043	0.017	0.119	−35.92%	6,521
Condition (M): oth	−0.020	0.016	0.169	−11.86%	10,665	0.021	0.019	0.159	12.97%	6,521
Condition (M): psy	0.033	0.021	0.441	7.57%	10,665	0.030	0.024	0.637	4.67%	6,521
Max imp rating (M): ≥20	−0.006	0.009	0.954	−0.62%	10,665	-	-	-	-	-
Max imp rating (M): <20	0.006	0.009	0.046	12.92%	10,665	-	-	-	-	-
Sum imp rating (M): <25	−0.005	0.022	0.492	−0.91%	10,665	0.048	0.024	0.622	7.78%	6,521
Sum imp rating (M): ≥25	0.005	0.022	0.508	0.89%	10,665	−0.048	0.024	0.378	−12.82%	6,521
Work capacity w/o int (M): 0 hours	0.058	0.021	0.456	12.76%	10,665	0.039	0.025	0.400	9.65%	6,521
Work capacity w/o int (M): 8 hours	−0.061	0.021	0.538	−11.28%	10,665	−0.032	0.025	0.581	−5.57%	6,521
Work cap w/o int (M): =0	0.058	0.021	0.456	12.76%	10,665	0.039	0.025	0.400	9.65%	6,521
Work cap w/o int (M): >0	−0.058	0.021	0.544	−10.72%	10,665	−0.039	0.025	0.600	−6.43%	6,521
Labor force (T): pre-reform earn = 0	0.013	0.019	0.754	1.69%	10,665	−0.007	0.018	0.867	−0.81%	6,521
Labor force (T): pre-reform earn >0	−0.013	0.019	0.246	−5.17%	10,665	0.007	0.018	0.133	5.28%	6,521
Labor force (T): pre-DSP earn = 0	−0.018	0.021	0.703	−2.50%	10,665	0.008	0.025	0.507	1.66%	6,521
Labor force (T): pre-DSP earn >0	0.018	0.021	0.297	5.90%	10,665	−0.008	0.025	0.493	−1.71%	6,521
State (D): NSW	−0.007	0.020	0.314	−2.13%	10,607	0.052	0.023	0.293	17.65%	6,479
State (D): QLD	0.003	0.018	0.237	1.15%	10,607	−0.008	0.020	0.185	−4.45%	6,479
State (D): SA	−0.004	0.013	0.082	−4.84%	10,607	0.005	0.014	0.067	7.33%	6,479
State (D): VIC	−0.017	0.019	0.263	−6.65%	10,607	−0.028	0.022	0.289	−9.83%	6,479
State (D): WA	0.023	0.011	0.062	37.03%	10,607	−0.005	0.013	0.081	−5.92%	6,479
Med spending 2013 (MB): >median	−0.008	0.021	0.323	−2.54%	10,455	0.032	0.025	0.452	7.12%	6,299
Med spending 2013 (MB): <median	0.008	0.021	0.677	1.21%	10,455	−0.032	0.025	0.548	−5.87%	6,299
Prescription spending 2013 (P): >median	0.003	0.020	0.292	0.87%	10,455	0.064	0.025	0.448	14.36%	6,299
Prescription spending 2013 (P): <median	−0.003	0.020	0.708	−0.36%	10,455	−0.064	0.025	0.552	−11.65%	6,299
Don't live with parents	0.029	0.021	0.559	5.12%	10,665	0.012	0.018	0.804	1.47%	6,521
Live with parents & they have 0 earnings between 2012-14	−0.044	0.016	0.221	−19.89%	10,665	−0.014	0.015	0.115	−12.24%	6,521
Live with parents & they have on average less than 35k earnings 2012-14	0.007	0.016	0.200	3.43%	10,665	−0.006	0.011	0.074	−7.61%	6,521
Live with parents & they have on average more than 35k earnings 2012-14	0.008	0.009	0.053	15.64%	10,665	-	-	-	-	-
p-value on joint F test	0.436	-	-	-	-	0.085	-	-	-	-

Notes: Table presents covariate balance tests for the Start Date RD and the Birth Date RD. Point estimates and standard errors are estimates of β_1 from equation (1) for the Start Date RD and β_2 from equation (2) for the Birth Date RD, where the covariate is the left-hand-side variable. For the Start Date sample, control means are means for individuals on the left-hand side of the cutoff within 30 days of the cutoff. The Start Date sample consists of individuals who entered DSP within 15 months before or 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." For the Birth Date sample, control means are means for individuals on the left-hand side of the cutoff within 61 days of the cutoff. If the number of individuals in that cell was too small, the mean for all individuals on the left of the respective cutoff was used. The Birth Date sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Letters in parentheses indicate the source of the covariates: DOMINO (D), 2011 Census (C), medical review file (M), prescription benefits (PB), Medicare benefits (MB), or Australian Tax Office data (T). Last row reports p-value on joint F test from seemingly unrelated regression.

Appendix Table A.3: Start Date and Birth Date RD estimates

	Start RD				Birth RD				Combined RD			
	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Own income												
Received medical review between 2014-16	0.540	0.018	0.338	10,665	0.710	0.017	0.107	6,521	0.612	0.013	0.204	17,186
Lost DSP between 2014-16	0.145	0.014	0.062	10,665	0.157	0.017	0.067	6,521	0.150	0.011	0.065	17,186
Own DSP payments 2016-18	−$3.21	$0.39	$25.30	10,665	−$3.17	$0.50	$25.12	6,521	−$3.19	$0.31	$25.19	17,186
Own non-DSP payments 2016-18	$1.48	$0.31	$2.55	10,665	$1.92	$0.45	$3.45	6,521	$1.67	$0.27	$3.07	17,186
Own Newstart payments 2016-18	$1.18	$0.10	$0.08	10,665	$1.36	$0.16	$0.10	6,521	$1.26	$0.09	$0.09	17,186
Own all govt. payments 2016-18	−$1.72	$0.42	$27.85	10,665	−$1.26	$0.54	$28.56	6,521	−$1.52	$0.33	$28.26	17,186
Own earnings 2016-18	$1.25	$0.58	$5.79	10,665	$1.01	$0.57	$3.21	6,521	$1.14	$0.41	$4.29	17,186
Own income 2016-18	−$0.47	$0.51	$33.64	10,665	−$0.24	$0.63	$31.77	6,521	−$0.38	$0.40	$32.55	17,186
Spouse income												
Spouse all govt. payments 2016-18	$0.19	$0.34	$1.47	10,665	−$1.19	$0.64	$6.30	6,521	−$0.40	$0.34	$4.27	17,186
Spouse all govt. payments 2016-18 (conditional on having a spouse)	$2.06	$2.00	$13.04	1,294	−$2.11	$2.14	$27.87	1,231	−$0.24	$1.49	$23.94	2,525
Spouse earnings 2016-18	$0.04	$0.51	$2.92	10,665	$1.19	$0.81	$3.34	6,521	$0.54	$0.45	$3.16	17,186
Spouse earnings 2016-18 (conditional on having a spouse)	$0.94	$3.75	$25.84	1,294	$9.29	$3.89	$14.80	1,231	$5.50	$2.73	$17.73	2,525
Parent income												
Parent(s) all govt. payments 2016-18	−$0.45	$0.80	$17.27	10,665	$0.55	$0.77	$12.51	6,521	−$0.01	$0.57	$14.51	17,186
Parent(s) all govt. payments 2016-18 (conditional on living with parent)	−$0.82	$1.14	$19.93	3,978	−$1.15	$1.59	$20.56	1,039	−$0.89	$0.95	$20.17	5,017
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$0.31	$0.44	$8.79	10,665	−$0.18	$0.25	$4.04	6,521	−$0.26	$0.27	$6.03	17,186
Parent(s) earnings 2016-18	$2.98	$1.83	$19.48	10,665	−$1.23	$1.30	$10.90	6,521	$1.17	$1.19	$14.50	17,186
Parent(s) earnings 2016-18 (conditional on living with parent)	$3.72	$2.63	$19.49	3,978	$4.20	$2.34	$7.48	1,039	$3.73	$2.09	$14.91	5,017
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$1.44	$1.00	$8.60	10,665	$0.68	$0.38	$1.47	6,521	$1.06	$0.60	$4.46	17,186
Family income												
Family member (parent/spouse) member earnings 2016-18	$1.49	$1.12	$11.51	10,665	$1.87	$0.90	$4.81	6,521	$1.60	$0.75	$7.62	17,186
Family member (parent/spouse) member earnings 2016-18 (conditional on living with family)	$3.20	$2.26	$21.59	5,154	$7.02	$2.42	$11.71	2,201	$4.38	$1.71	$16.49	7,355
Household all govt. payments (not including own DSP) 2016-18	$1.37	$0.66	$12.81	10,665	$0.55	$0.85	$13.78	6,521	$1.01	$0.53	$13.37	17,186
Household all govt. payments (not including own DSP) 2016-18 (conditional on living with family)	$1.13	$1.11	$22.43	5,154	−$0.27	$1.57	$29.65	2,201	$0.60	$0.91	$26.16	7,355
Household earnings 2016-18	$2.74	$1.30	$17.30	10,665	$2.88	$1.10	$8.02	6,521	$2.74	$0.89	$11.91	17,186
Household earnings 2016-18 (conditional on living with family)	$5.72	$2.47	$27.93	5,154	$8.29	$2.72	$15.61	2,201	$6.45	$1.89	$21.57	7,355
Household income 2016-18	$0.90	$1.30	$55.41	10,665	$0.25	$1.26	$46.91	6,521	$0.56	$0.93	$50.48	17,186
Household income 2016-18 (conditional on living with family)	$2.98	$2.36	$74.73	5,154	$4.66	$2.45	$66.89	2,201	$3.36	$1.78	$70.69	7,355
Own health												
Prescriptions: Total value of mental drugs 2016-18	$0.15	$0.07	$0.41	10,455	$0.10	$0.08	$0.84	6,299	$0.13	$0.05	$0.66	16,754
Prescriptions: Any mental drug 2016-18	0.035	0.021	0.568	10,455	0.034	0.022	0.749	6,299	0.035	0.015	0.672	16,754
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.17	$0.06	$0.28	10,455	$0.09	$0.07	$0.67	6,299	$0.14	$0.05	$0.51	16,754
Prescriptions: Any antipsychotic drug 2016-18	0.029	0.020	0.245	10,455	0.040	0.025	0.429	6,299	0.034	0.016	0.350	16,754
Prescriptions: Total value of all drugs 2016-18	$0.58	$0.29	$1.83	10,455	$0.23	$0.43	$3.33	6,299	$0.44	$0.25	$2.69	16,754
Prescriptions: Any drug 2016-18	0.001	0.013	0.880	10,455	0.015	0.012	0.931	6,299	0.007	0.009	0.909	16,754
Died 2015-19	0.000	0.006	0.020	10,665	0.012	0.008	0.031	6,521	0.005	0.005	0.026	17,186

Notes: Table presents RD estimates for the Start Date RD and the Birth Date RD. Dollar amounts are in 1000s of AUD. Start Date RD estimates are estimates of β_1 from equation (1). Birth Date RD estimates are estimates of β_2 from equation (2). Start Date control means are means for individuals on the left-hand side of the cutoff within 30 days of the cutoff. Birth Date control means are means for individuals on the left-hand side of the cutoff within 61 days of the cutoff. Start Date sample consists of DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating."

Appendix Table A.4: Start Date and Birth Date IV estimates

	Start RD				Birth RD			
	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Own income								
Own DSP payments 2016-18	−$22.12	$1.79	$25.30	10,665	−$20.26	$2.04	$25.12	6,521
Own non-DSP payments 2016-18	$10.25	$2.11	$2.55	10,665	$12.25	$2.75	$3.45	6,521
Own Newstart payments 2016-18	$8.17	$0.75	$0.08	10,665	$8.70	$0.91	$0.10	6,521
Own all govt. payments 2016-18	−$11.87	$2.50	$27.85	10,665	−$8.02	$3.12	$28.56	6,521
Own earnings 2016-18	$8.60	$3.78	$5.79	10,665	$6.46	$3.50	$3.21	6,521
Own income 2016-18	−$3.27	$3.55	$33.64	10,665	−$1.56	$4.00	$31.77	6,521
Spouse income								
Spouse all govt. payments 2016-18	$1.34	$2.36	$1.47	10,665	−$7.58	$4.21	$6.30	6,521
Spouse all govt. payments 2016-18 (conditional on having a spouse)	$7.34	$7.33	$13.04	1,294	−$7.73	$7.87	$27.87	1,231
Spouse earnings 2016-18	$0.31	$3.52	$2.92	10,665	$7.60	$5.15	$3.34	6,521
Spouse earnings 2016-18 (conditional on having a spouse)	$3.34	$13.28	$25.84	1,294	$34.03	$14.27	$14.80	1,231
Parent income								
Parent(s) all govt. payments 2016-18	−$3.09	$5.55	$17.27	10,665	$3.53	$4.92	$12.51	6,521
Parent(s) all govt. payments 2016-18 (conditional on living with parent)	−$6.57	$9.16	$19.93	3,978	−$12.14	$17.20	$20.56	1,039
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$2.16	$3.02	$8.79	10,665	−$1.18	$1.63	$4.04	6,521
Parent(s) earnings 2016-18	$20.53	$12.77	$19.48	10,665	−$7.85	$8.34	$10.90	6,521
Parent(s) earnings 2016-18 (conditional on living with parent)	$29.87	$21.57	$19.49	3,978	$44.34	$30.22	$7.48	1,039
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$9.97	$6.98	$8.60	10,665	$4.34	$2.45	$1.47	6,521
Family income								
Family member (parent/spouse) member earnings 2016-18	$10.28	$7.78	$11.51	10,665	$11.94	$5.71	$4.81	6,521
Family member (parent/spouse) member earnings 2016-18 (conditional on living with family)	$20.64	$14.66	$21.59	5,154	$37.65	$13.59	$11.71	2,201
Household all govt. payments (not including own DSP) 2016-18	$9.43	$4.55	$12.81	10,665	$3.49	$5.37	$13.78	6,521
Household all govt. payments (not including own DSP) 2016-18 (conditional on living with family)	$7.28	$7.16	$22.43	5,154	−$1.47	$8.41	$29.65	2,201
Household earnings 2016-18	$18.88	$8.80	$17.30	10,665	$18.40	$6.76	$8.02	6,521
Household earnings 2016-18 (conditional on living with family)	$36.92	$15.85	$27.93	5,154	$44.49	$14.41	$15.61	2,201
Household income 2016-18	$6.19	$9.01	$55.41	10,665	$1.62	$8.03	$46.91	6,521
Household income 2016-18 (conditional on living with family)	$19.22	$15.37	$74.73	5,154	$25.02	$13.29	$66.89	2,201
Own health								
Prescriptions: Total value of mental drugs 2016-18	$1.05	$0.46	$0.41	10,455	$0.64	$0.49	$0.84	6,299
Prescriptions: Any mental drug 2016-18	0.238	0.146	0.568	10,455	0.214	0.142	0.749	6,299
Prescriptions: Total value of antipsychotic drugs 2016-18	$1.13	$0.45	$0.28	10,455	$0.57	$0.48	$0.67	6,299
Prescriptions: Any antipsychotic drug 2016-18	0.194	0.137	0.245	10,455	0.254	0.164	0.429	6,299
Prescriptions: Total value of all drugs 2016-18	$3.93	$2.02	$1.83	10,455	$1.47	$2.74	$3.33	6,299
Prescriptions: Any drug 2016-18	0.009	0.085	0.880	10,455	0.093	0.078	0.931	6,299
Died 2015-19	−0.003	0.042	0.020	10,665	0.074	0.052	0.031	6,521

Notes: Table presents IV estimates for the Start Date RD, Birth Date RD, and combined Start and Birth Date RDs (i.e., β_4 from equation (5)). Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the Start Date RD sample, and within 61 days of the cutoff for the Birth Date RD sample. Combined sample stacks the Start Date RD and Birth Date RD samples. Household variables sum income across the individual DSP recipient and (where applicable) spouses and parents who live with the DSP recipient.

Appendix Table A.5: Combined sample: IV estimates by subgroup

	DSP benefits			Earnings			Non-DSP benefits			Household income			
Group	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
All	−$21.23	$1.36	$25.19	$7.56	$2.62	$4.29	$11.18	$1.73	$3.07	$3.62	$6.16	$50.48	17,186
Male	−$19.99	$2.08	$25.26	$4.58	$4.31	$5.17	$11.22	$1.51	$1.15	−$0.95	$9.23	$49.65	10,148
Female	−$22.45	$1.73	$25.08	$10.46	$3.07	$2.94	$11.06	$2.85	$6.03	$8.23	$8.11	$51.75	7,038
29 and below	−$20.30	$2.14	$24.74	$10.10	$4.67	$6.05	$8.34	$2.35	$2.41	$6.64	$11.83	$59.40	7,501
30 and above	−$21.94	$1.74	$25.40	$6.39	$3.10	$3.47	$12.80	$2.36	$3.38	$2.46	$6.71	$46.35	9,685
Has spouse	−$17.26	$1.96	$18.66	$4.34	$4.21	$6.06	$7.87	$3.73	$7.96	$14.84	$9.22	$77.02	2,525
No spouse	−$23.62	$1.49	$26.61	$8.99	$3.18	$3.90	$12.94	$1.83	$2.01	$5.22	$6.38	$44.71	14,661
Lives with parents	−$28.00	$2.75	$25.45	$22.68	$6.09	$4.38	$8.91	$2.34	$1.35	$30.81	$20.61	$67.84	5,017
Lives away from parents	−$19.40	$1.70	$24.94	$6.17	$3.04	$4.38	$11.00	$2.21	$3.59	−$5.23	$6.13	$43.09	9,226
Live with family	−$21.92	$1.75	$22.96	$12.05	$3.64	$5.08	$8.58	$2.49	$3.87	$20.32	$10.60	$70.69	7,355
Live alone	−$21.78	$1.75	$27.11	$3.66	$3.67	$3.61	$14.31	$2.33	$2.38	−$3.81	$3.73	$33.10	9,831
Psychological condition	−$22.28	$2.13	$26.77	$10.16	$3.87	$2.96	$11.70	$2.58	$2.31	$13.79	$8.99	$45.00	9,141
Intellectual condition	−$14.34	$5.47	$23.56	$6.72	$10.19	$6.91	$9.14	$5.97	$2.44	$8.85	$26.35	$56.84	2,750
Other diagnosis	−$22.47	$1.73	$23.09	$5.92	$3.72	$5.44	$12.06	$2.48	$4.76	−$3.57	$8.62	$57.30	5,297
High impairment rating	−$22.27	$2.35	$25.15	$12.12	$4.36	$3.54	$11.50	$2.80	$2.87	$21.11	$11.11	$50.97	7,112
Low impairment rating	−$20.74	$1.64	$25.23	$4.74	$3.23	$4.86	$10.56	$2.18	$3.22	−$7.45	$7.43	$50.11	10,074

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for various subgroups. Dollar amounts are in 1000s of AUD. "Earnings" are DSP recipient's average annual own earnings from 2016–18, "Non-DSP benefits" average annual own non-DSP benefits from 2016–18, and "Household income" is the average annual sum of own, spouse, and parent earnings and government (DSP and non-DSP) benefits from 2016–18. Age and family structure are measured in the year of the reform. "Lives with family" means lives with either a parent or a spouse; "lives alone" means lives with neither a parent nor a spouse. Diagnosis and impairment rating are measured at the medical review individuals associated with DSP start date (see Appendix Section B.1 for a full description of this matching process). "High impairment rating" means having more than 25 'points' across multiple impairment tables, low impairment rating means having 25 or fewer 'points'.

Appendix Table A.6: Combined sample: Parent heterogeneity

	Any Parents						Parents that live with DSP recipient								
	Extensive margin			Intensive margin			Extensive margin			Intensive margin			Household income		
Group	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
All	$7.20	$7.82	$14.50	0.120	0.093	0.301	$6.96	$3.95	$4.46	0.124	0.037	0.099	$3.62	$6.16	$50.48	17,186
Any parent	$10.09	$8.91	$18.37	0.177	0.102	0.381	$8.10	$4.56	$5.65	0.147	0.044	0.125	$3.88	$6.77	$52.46	14,243
Live with parent 2014	$31.95	$18.93	$14.91	0.519	0.179	0.331	$31.95	$18.93	$14.91	0.519	0.179	0.331	$30.81	$20.61	$67.84	5,017
Live away from parent 2014	$2.56	$10.24	$20.47	0.038	0.124	0.412	$0.00	$0.00	-	0.000	0.000	-	−$5.23	$6.13	$43.09	9,226
Live with parent or have Spouse	$11.62	$9.50	$12.42	0.190	0.112	0.302	$14.32	$8.27	$9.64	0.266	0.081	0.214	$20.32	$10.60	$70.69	7,355

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for various subgroups of parents. Dollar amounts are in 1000s of AUD. Combined sample stacks the Start Date RD and Birth Date RD samples. "Any Parents" shows results for all parents that are linked in DOMINO. "Parents that live with DSP recipient" shows results for parents with rows set to 0 when the parent does not live with the DSP recipient. "Any parent" means any parent that is ever linked to a DSP recipient, "Live away from parent 2014" means that the parent does not live with the DSP recipient in July 2014, "Live with parent at least once in 2014, 2011 or 2009" means that at least in one of those three years the parent lived with the DSP recipient, SA2's are the second finest Census geography in Australia they "represent a community that interacts together socially and economically", parent age variables are all as of July 2014, "careers allowance" is a DOMINO payment for those that "provide daily care and attention to someone who needs it in their home".

Appendix Table A.7: Combined sample: IV estimates of the effect of DSP loss on other program receipt

	Own				Spouses				Parents: any parent				Parents: live with DSP recipient			
	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
All programs	−$10.05	$1.99	$28.26	17,186	−$0.75	$5.36	$23.94	2,525	$2.08	$4.09	$18.38	14,243	−$7.47	$8.22	$20.17	5,017
Non-DSP programs	$11.18	$1.73	$3.07	17,186	$3.76	$5.59	$21.45	2,525	$1.61	$3.59	$12.11	14,243	−$9.46	$7.61	$14.37	5,017
People with Disability																
Disability Support Pension (DSP)	−$21.23	$1.36	$25.19	17,186	−$4.51	$2.29	$2.49	2,525	$0.48	$2.70	$6.27	14,243	$1.99	$5.32	$5.80	5,017
Medical Equipment Payment (MEP)	−$0.00	$0.00	$0.00	17,186	−$0.01	$0.01	$0.00	2,525	−$0.00	$0.01	$0.00	14,243	$0.02	$0.02	$0.00	5,017
Mobility Allowance (MOB)	$0.32	$0.12	$0.08	17,186	−$0.06	$0.06	$0.01	2,525	$0.06	$0.06	$0.02	14,243	$0.07	$0.09	$0.01	5,017
Wife Pension (Disability Support Pension) (WFD)	-	-	-	-	-	-	-	-	$0.39	$0.31	$0.12	14,243	$0.22	$0.77	$0.09	5,017
Carers																
Carer Allowance (CDA)	−$0.23	$0.25	$0.20	17,186	$0.07	$0.93	$1.71	2,525	−$0.59	$0.65	$1.50	14,243	−$1.34	$1.69	$2.18	5,017
Carer Payment (CAR)	$0.47	$0.26	$0.03	17,186	$0.66	$2.77	$5.41	2,525	−$3.92	$1.96	$3.36	14,243	−$11.22	$5.35	$6.21	5,017
Families																
Child Care Benefit (Formal) (CCF)	$0.01	$0.10	$0.08	17,186	$0.31	$0.40	$0.17	2,525	$0.08	$0.07	$0.01	14,243	$0.31	$0.19	$0.01	5,017
Child Care Benefit (Informal) (CCI)	$0.00	$0.00	$0.00	17,186	−$0.00	$0.00	$0.00	2,525	$0.00	$0.00	-	14,243	$0.00	$0.00	-	5,017
Dad and Partner Pay (DAP)	−$0.01	$0.01	$0.00	17,186	−$0.01	$0.03	$0.01	2,525	$0.00	$0.00	-	0	-	-	-	-
Double Orphan Pension (DOP)	−$0.00	$0.00	-	17,186	$0.00	$0.00	-	0	$0.00	$0.02	-	14,243	$0.01	$0.01	-	5,017
Family Tax Benefit (FTB)	−$0.95	$1.37	$2.45	17,186	$2.06	$3.18	$8.37	2,525	$2.09	$1.14	$1.21	14,243	$3.63	$2.23	$1.20	5,017
Parental Leave Pay (PPL)	−$0.03	$0.07	$0.02	17,186	$0.20	$0.24	$0.13	2,525	$0.03	$0.02	-	14,243	$0.00	$0.00	-	0
Parenting Payment Partnered (PPP)	$0.74	$0.15	-	17,186	−$0.06	$1.13	$1.68	2,525	$0.18	$0.11	$0.01	14,243	$0.31	$0.31	$0.02	5,017
Parenting Payment Single (PPS)	$1.97	$0.33	$0.03	17,186	$0.95	$1.41	$1.55	2,525	$0.29	$0.42	$0.15	14,243	−$0.03	$0.78	$0.10	5,017
Partner Allowance (PTA)	-	-	-	-	-	-	-	-	$0.14	$0.13	$0.01	14,243	$0.61	$0.41	-	5,017
Stillborn Baby Payment (SBP)	−$0.00	$0.00	$0.00	17,186	$0.00	$0.00	-	0	$0.00	$0.00	-	0	$0.00	$0.00	-	0
Youth and Students																
Abstudy (ABY)	−$0.02	$0.02	-	17,186	−$0.02	$0.02	-	2,525	−$0.08	$0.07	$0.01	14,243	−$0.30	$0.21	-	5,017
Austudy (AUS)	$0.53	$0.16	-	17,186	$0.15	$0.33	$0.13	2,525	−$0.07	$0.12	$0.02	14,243	$0.10	$0.14	$0.01	5,017
Pensioner Education Supp. - Abstudy (EPA)	$0.01	$0.02	$0.00	17,186	−$0.01	$0.01	-	2,525	$0.00	$0.01	-	14,243	−$0.04	$0.05	-	5,017
Pensioner Education Supp. - FaCS (EPF)	−$0.02	$0.05	$0.05	17,186	−$0.00	$0.04	$0.02	2,525	−$0.01	$0.02	$0.01	14,243	−$0.01	$0.04	$0.01	5,017
Youth Allowance (YAL)	$0.00	$0.03	-	17,186	−$0.62	$0.37	$0.05	2,525	-	-	-	-	-	-	-	-
Job Seekers																
Jobseeker Payment (JSP)	$0.00	$0.00	-	17,186	$0.00	$0.00	-	0	−$0.00	$0.00	-	14,243	$0.00	$0.00	-	0
Newstart Allowance (NSA)	$8.41	$0.59	$0.09	17,186	$0.48	$1.34	$1.96	2,525	$1.45	$1.03	$1.58	14,243	$1.46	$1.88	$1.27	5,017
Older Australians																
Age Pension (AGE)	-	-	-	-	−$0.22	$0.32	-	2,525	$0.39	$2.06	$4.02	14,243	−$3.85	$3.58	$3.07	5,017
Wife Pension (Age Pension) (WFA)	-	-	-	-	-	-	-	-	$0.48	$0.25	$0.10	14,243	−$0.02	$0.72	$0.17	5,017
Other Programs																
Bereavement Allowance (BVA)	-	-	-	-	-	-	-	-	$0.00	$0.00	$0.00	14,243	$0.00	$0.00	-	0
Business Services Wage Assessment Tool (BSW)	−$0.05	$0.06	$0.01	17,186	−$0.00	$0.00	-	2,525	$0.03	$0.03	-	14,243	−$0.03	$0.03	-	5,017
Senior Health Card (SHC)	-	-	-	-	-	-	-	-	−$0.00	$0.01	$0.00	14,243	$0.00	$0.01	$0.00	5,017
Sickness Allowance (SKA)	$0.04	$0.03	-	17,186	−$0.11	$0.10	-	2,525	−$0.04	$0.08	$0.02	14,243	$0.11	$0.20	$0.01	5,017
Transition to Independent Living Allowance (TLA)	−$0.00	$0.00	-	17,186	$0.00	$0.00	-	0	-	-	-	-	-	-	-	-
Widow Allowance (WDA)	-	-	-	-	-	-	-	-	$0.72	$0.34	$0.13	14,243	$0.53	$0.63	$0.12	5,017
NDIS																
NDIS: first plan value	$3.87	$12.00	$19.17	17,186	-	-	-	-	-	-	-	-	-	-	-	-
NDIS: on NDIS in 2022	−0.061	0.088	0.239	17,186	-	-	-	-	-	-	-	-	-	-	-	-
NDIS: started NDIS in 2017	0.016	0.034	0.025	17,186	-	-	-	-	-	-	-	-	-	-	-	-

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)). Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. Cells marked with '-' either contained 0 observations, or so few that the cell did not meet the clearance rules set by the Australian Bureau of Statistics. Program codes are in parenthesis following the program name. More information about each program can be found on the Services Australia website.

Appendix Table A.8: Combined sample: Annual DSP, non-DSP and total income variables

	DSP benefits		Non-DSP benefits		Own earnings		Own total income		Household earnings		Household total income		
Year	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	N
2010	\$1.59	\$1.93	−\$2.08	\$1.85	\$0.53	\$2.29	\$0.04	\$2.41	−\$2.12	\$5.35	−\$8.29	\$5.77	17,186
2011	\$0.57	\$1.92	\$0.02	\$1.71	−\$0.11	\$1.98	\$0.49	\$2.22	−\$1.56	\$5.20	−\$6.38	\$5.67	17,186
2012	\$2.44	\$1.56	\$0.02	\$1.55	\$1.19	\$1.83	\$3.66	\$2.21	\$0.60	\$4.97	−\$1.74	\$5.61	17,186
2013	−\$2.18	\$1.40	−\$0.10	\$1.51	−\$0.07	\$1.99	−\$2.35	\$2.28	\$1.70	\$5.14	−\$4.23	\$5.73	17,186
2014	\$2.55	\$1.45	−\$0.10	\$1.62	−\$1.03	\$2.03	\$1.41	\$2.31	\$2.94	\$5.18	\$2.01	\$5.74	17,186
2015	−\$2.46	\$1.55	\$1.54	\$1.71	\$1.06	\$2.22	\$0.14	\$2.50	\$2.59	\$5.43	−\$1.98	\$5.90	17,186
2016	−\$19.95	\$1.57	\$11.60	\$1.89	\$5.52	\$2.53	−\$2.82	\$2.75	\$13.42	\$5.79	\$0.49	\$6.30	17,186
2017	−\$22.98	\$1.45	\$11.62	\$1.87	\$9.75	\$2.85	−\$1.61	\$2.95	\$21.66	\$6.01	\$5.46	\$6.46	17,186
2018	−\$20.78	\$1.66	\$10.32	\$1.66	\$7.40	\$3.26	−\$3.06	\$3.17	\$19.58	\$6.34	\$4.92	\$6.61	17,186
2019	−\$20.35	\$1.84	\$8.89	\$1.74	\$8.54	\$3.65	−\$2.93	\$3.49	\$19.21	\$6.72	\$4.55	\$6.92	17,186
2020	−\$20.45	\$2.07	\$10.48	\$1.86	\$8.55	\$4.10	−\$1.42	\$3.87	\$15.42	\$7.17	\$4.26	\$7.32	17,186
2021	−\$19.00	\$2.20	\$11.95	\$1.88	\$6.95	\$4.26	−\$0.10	\$3.94	\$11.01	\$7.47	\$3.41	\$7.46	17,186
2022	−\$16.68	\$2.15	\$7.14	\$1.70	\$9.54	\$4.35	\$0.01	\$4.05	\$16.01	\$7.33	\$4.79	\$7.31	17,186
2023	−\$17.07	\$2.19	\$7.21	\$1.65	\$9.12	\$4.51	−\$0.74	\$4.16	\$15.45	\$7.41	\$4.50	\$7.34	17,186
2024	−\$15.64	\$2.37	\$7.90	\$1.73	-	-	-	-	-	-	-	-	17,186

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for annual outcome variables. Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. All variables are at the fiscal year level.

Appendix Table A.9: Combined sample: IV estimates of the effect of DSP loss on occupation

	Any work				Earnings			
Variable	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Own occupation								
No work reported	−0.174	0.085	0.815	17,186	-	-	-	-
All Blue Collar	0.077	0.071	0.129	17,186	$9.67	$5.72	$7.63	17,186
Technician and Trades Workers	0.030	0.030	0.018	17,186	$1.79	$2.39	$1.24	17,186
Community and Personal Service Workers	−0.002	0.042	0.037	17,186	$5.30	$3.07	$2.00	17,186
Machinery Operators and Drivers	0.037	0.027	0.015	17,186	$1.16	$2.36	$0.84	17,186
Labourers	0.017	0.051	0.067	17,186	$1.41	$3.58	$3.61	17,186
All White Collar	0.057	0.060	0.074	17,186	$14.30	$5.19	$2.56	17,186
Managers	0.032	0.022	0.010	17,186	$4.59	$2.04	$0.61	17,186
Professionals	0.010	0.033	0.021	17,186	$3.73	$3.09	$1.19	17,186
Clerical and Administrative Workers	0.080	0.035	0.023	17,186	$7.54	$2.74	$1.31	17,186
Sales Workers	−0.042	0.038	0.025	17,186	−$1.56	$2.53	$0.74	17,186
Unknown	0.049	0.026	0.013	17,186	$1.71	$1.17	$0.38	17,186
Parent(s) occupation								
No work reported	−0.648	0.220	0.748	5,017	-	-	-	-
All Blue Collar	0.413	0.193	0.167	5,017	$57.60	$37.74	$14.93	5,017
Technician and Trades Workers	0.000	0.087	-	5,017	−$9.29	$24.35	$5.09	5,017
Community and Personal Service Workers	0.192	0.144	0.073	5,017	$43.55	$24.17	$6.00	5,017
Machinery Operators and Drivers	−0.047	0.077	-	5,017	$4.72	$14.19	$4.66	5,017
Labourers	0.192	0.122	0.049	5,017	$18.62	$15.97	$4.26	5,017
All White Collar	0.203	0.188	0.225	5,017	$9.87	$53.59	$27.03	5,017
Managers	0.066	0.104	0.037	5,017	$3.69	$38.12	$7.58	5,017
Professionals	−0.053	0.147	0.091	5,017	$13.14	$36.14	$12.98	5,017
Clerical and Administrative Workers	0.175	0.147	0.082	5,017	$0.43	$25.51	$12.47	5,017
Sales Workers	0.018	0.091	-	5,017	−$7.39	$10.97	$3.06	5,017
Unknown	0.037	0.071	-	5,017	$10.32	$12.89	$1.12	5,017
Spouse occupation								
No work reported	−0.036	0.133	0.775	2,525	-	-	-	-
All Blue Collar	−0.061	0.147	0.310	2,525	$27.28	$24.43	$37.92	2,525
Technician and Trades Workers	0.053	0.077	0.061	2,525	$27.67	$14.49	$6.92	2,525
Community and Personal Service Workers	0.132	0.093	0.103	2,525	$11.23	$9.98	$8.81	2,525
Machinery Operators and Drivers	−0.246	0.084	0.058	2,525	−$32.29	$13.08	$11.84	2,525
Labourers	0.011	0.101	0.109	2,525	$20.67	$15.02	$11.07	2,525
All White Collar	0.107	0.117	0.167	2,525	$26.01	$19.37	$14.03	2,525
Managers	−0.028	0.058	0.039	2,525	$2.12	$10.02	$5.64	2,525
Professionals	0.057	0.071	0.055	2,525	$22.98	$12.65	$6.16	2,525
Clerical and Administrative Workers	0.022	0.062	0.039	2,525	−$0.11	$7.78	$3.34	2,525
Sales Workers	0.011	0.069	0.053	2,525	$1.01	$8.42	$4.64	2,525
Unknown	0.016	0.042	-	2,525	$2.84	$2.46	$0.64	2,525

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for occupation, and earnings inside an occupation. Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. Cells marked with '-' either contained 0 observations, or so few that the cell did not meet the clearance rules set by the Australian Bureau of Statistics. Occupation is taken from annual tax returns, if an individual reports an occupation in any one of 2015-16, 2016-17 or 2017-18 we code them in that occupation, therefore individuals can have multiple occupations across the three years.

Appendix Table A.10: Combined sample: Earnings thresholds

	Earnings above: $0			$5,000			$10,000			$40,000			
	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
Own earnings	0.110	0.098	0.280	0.138	0.082	0.155	0.148	0.073	0.123	0.144	0.038	0.030	17,186
Parent earnings (any parent)	0.177	0.102	0.381	0.228	0.101	0.338	0.155	0.098	0.311	0.139	0.088	0.188	14,243
Parent earnings (live with DSP recipient)	0.519	0.179	0.331	0.607	0.182	0.302	0.475	0.171	0.266	0.326	0.161	0.216	5,017
Spouse earnings	−0.041	0.155	0.489	0.222	0.153	0.378	0.211	0.150	0.349	0.112	0.129	0.196	2,525
Other family member earnings	0.232	0.121	0.391	0.419	0.122	0.340	0.364	0.118	0.302	0.227	0.105	0.186	7,355
Household earnings	0.221	0.130	0.540	0.473	0.130	0.414	0.508	0.128	0.367	0.262	0.110	0.214	7,355

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for earnings above different thresholds. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples.

Appendix Table A.11: Combined sample: Income variation

	SD of own income			SD over mean of own income			SD of household income			SD over mean of household income			
Group	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
All	$1.350	$1.326	$4.647	0.107	0.062	0.171	−$2.657	$2.103	$6.804	0.007	0.057	0.161	17,186
Lives with family	$3.360	$1.678	$4.600	0.185	0.080	0.159	−$4.047	$3.672	$9.267	−0.040	0.052	0.137	7,355

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for income variance outcomes. Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. All variables are at the fiscal year level.

Appendix Table A.12: Combined sample: Joint own work and family work

Variable	Pt Est	Std Err	Cntrl Mean	N
Household				
Positive own earnings and positive household earnings	0.222	0.136	0.335	7,355
No own earnings and positive household earnings	−0.001	0.124	0.205	7,355
No own earnings and no household earnings	−0.221	0.130	0.460	7,355
Spouse				
Positive own earnings and positive spouse earnings	0.117	0.124	0.188	2,525
No own earnings and positive spouse earnings	−0.158	0.142	0.301	2,525
Positive own earnings and no spouse earnings	−0.024	0.097	0.096	2,525
No own earnings and no spouse earnings	0.065	0.151	0.415	2,525
Parent				
Positive own earnings and positive parental earnings	0.378	0.190	0.186	5,017
No own earnings and positive parental earnings	0.141	0.201	0.222	5,017
Positive own earnings and no parent earnings	0.023	0.178	0.161	5,017
No own earnings and no parent earnings	−0.542	0.210	0.431	5,017

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for joint own work and family work. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples.

Appendix Table A.13: Combined sample: Joint work of DSP recipients and program receipt

	Work and receive benefits			No work and receive benefits			Work and no benefits			No work and no benefits			
	Pt Est	Cntrl Mean	Std Err	Pt Est	Cntrl Mean	Std Err	Pt Est	Cntrl Mean	Std Err	Pt Est	Cntrl Mean	Std Err	N
Own government payments													
Any non-DSP payments	0.256	0.131	0.075	0.228	0.209	0.091	−0.146	0.148	0.079	−0.338	0.512	0.105	17,186
Any program	0.071	0.275	0.097	−0.111	0.709	0.098	0.039	0.007	0.019	0.001	0.009	0.020	17,186
Disability Support Pension (DSP)	−0.118	0.270	0.096	−0.309	0.706	0.097	0.229	0.012	0.032	0.199	0.012	0.032	17,186
Newstart Allowance (NSA)	0.423	0.011	0.040	0.398	0.006	0.038	−0.313	0.271	0.097	−0.509	0.712	0.096	17,186

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for joint own work and own program receipt. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples.

Appendix Table A.14: Correlation between earnings and prescription use

		Earnings above threshold ($AUD)						
Any drug	Earnings variable	0	1,000	5,000	10,000	20,000	30,000	40,000
Mental	Other family member earnings	−0.40	−0.36	−0.32	−0.29	−0.36	−0.37	−0.11
Mental	Own earnings	−0.13	−0.19	−0.49	−0.42	−0.60	−0.58	−0.34

Notes: Table shows correlation coefficients between the IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for earnings above a given threshold and either any mental health prescription.

Appendix Table A.15: Combined sample: Prescription results

	Any			Quantity			Total cost			
	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
Main categories										
All (any drug in PBS)	0.049	0.059	0.909	422.2	383.4	1,027.7	$2,846	$1,694	$2,687	16,754
All excluding drugs for Hep C	-	-	-	417.0	382.9	1,024.3	$1,862	$1,138	$1,669	16,754
Mental (overall)	0.230	0.104	0.672	210.1	155.3	453.0	$875	$342	$657	16,754
Antipsychotic	0.226	0.107	0.350	148.4	88.3	176.2	$885	$333	$506	16,754
Antidepressant	0.176	0.110	0.492	76.6	71.1	159.5	$44	$40	$98	16,754
Anxiolytic	0.030	0.099	0.344	−4.6	50.0	90.5	−$1	$19	$33	16,754
ADHD	−0.051	0.039	0.030	−0.5	43.0	16.5	−$47	$30	$13	16,754
Hypnotic/Sedatives	−0.036	0.073	0.155	−9.9	9.7	10.3	−$6	$6	$6	16,754
Pain (overall)	0.203	0.108	0.530	43.3	152.0	157.5	−$36	$130	$192	16,754
Opioid	0.231	0.108	0.412	−18.8	132.7	83.9	−$15	$88	$108	16,754
Select Anatomical Therapeutic Chemical (ATC) Classifications										
Drugs for Acid Related Disorders (A02)	0.131	0.098	0.304	23.2	28.9	46.2	$15	$22	$42	16,754
Drugs for Functional Gastrointestinal Disorders (A03)	0.062	0.076	0.131	15.7	6.6	4.1	$7	$3	$2	16,754
Corticosteroids, Dermatological Preparations (D07)	0.099	0.086	0.184	1.3	0.6	0.2	$18	$7	$3	16,754
Sex Hormones and Modulators of the Genital System (G03)	0.055	0.084	0.151	−9.1	10.1	7.2	−$71	$37	$29	16,754
Corticosteroids for Systemic Use (H02)	−0.113	0.082	0.180	−25.9	16.0	8.5	−$8	$5	$4	16,754
Antibacterials for Systemic Use (J01)	0.019	0.099	0.685	15.3	17.6	28.0	$12	$48	$32	16,754
Antivirals for Systemic Use (J05)	0.080	0.054	0.071	5.2	8.0	3.4	$984	$1,224	$1,018	16,754
Immunosuppressants (L04)	−0.033	0.036	0.029	3.2	40.5	16.4	$111	$596	$309	16,754
Antiinflammatory and Antirheumatic Products (M01)	−0.007	0.099	0.299	13.7	17.7	21.3	$5	$8	$11	16,754
Analgesics (N02)	0.260	0.109	0.450	10.3	145.3	130.5	−$44	$114	$164	16,754
Antiepileptics (N03)	0.154	0.080	0.124	41.2	100.6	114.5	$30	$93	$53	16,754
Psycholeptics (N05)	0.257	0.110	0.539	133.9	108.5	277.0	$878	$335	$546	16,754
Psychoanaleptics (N06)	0.140	0.110	0.501	76.3	85.7	176.0	−$3	$51	$111	16,754
Other Nervous System Drugs (N07)	0.101	0.074	0.140	−36.3	28.6	9.7	−$1	$26	$25	16,754
Drugs for Obstructive Airway Diseases (R03)	0.080	0.096	0.273	−1.1	3.2	2.5	$23	$66	$64	16,754
Otologicals (S02)	0.007	0.065	0.091	0.0	0.1	0.1	−$1	$1	$2	16,754
Parent prescriptions										
Alimentary Tract and Metabolism (A)	−0.252	0.261	0.590	124.1	258.4	211.0	$137	$342	$253	4,972
Blood and Blood Forming Organs (B)	−0.276	0.223	0.237	−121.4	65.8	24.5	−$518	$352	$87	4,972
Cardiovascular System (C)	−0.240	0.259	0.604	−177.6	262.6	264.5	$58	$329	$177	4,972
Dermatologicals (D)	0.606	0.262	0.288	−0.5	4.5	1.0	$21	$27	$13	4,972
Genito Urinary System and Sex Hormones (G)	−0.264	0.227	0.226	3.0	43.2	11.4	−$17	$41	$18	4,972
Systemic Hormonal Preparations, Excl. Sex Hormones and Insulins (H)	0.032	0.251	0.331	−44.3	95.7	48.3	−$23	$24	$10	4,972
Antiinfectives for Systemic Use (J)	−0.036	0.203	0.791	−6.3	50.0	54.3	−$952	$1,748	$287	4,972
Antineoplastic and Immunomodulating Agents (L)	0.171	0.132	0.072	371.2	394.5	84.1	$614	$2,533	$414	4,972
Musculo-Skeletal System (M)	0.446	0.271	0.360	−11.6	76.3	40.9	$169	$125	$34	4,972
Nervous System (N)	−0.006	0.239	0.655	260.2	493.2	370.4	$203	$431	$238	4,972
Antiparasitic Products, Insecticides and Repellents (P)	0.003	0.049	-	−0.1	0.1	0.0	−$0	$1	$0	4,972
Respiratory System (R)	0.062	0.255	0.424	−29.6	33.1	17.0	$9	$174	$133	4,972
Sensory Organs (S)	0.331	0.242	0.259	3.2	4.4	0.3	$182	$177	$7	4,972
Various (V)	0.103	0.067	0.022	−21.5	18.3	-	−$97	$65	-	4,972
All (any drug in PBS)	−0.080	0.111	0.942	354.0	993.7	1,061.4	−$215	$3,341	$1,540	4,972
All excluding drugs for Hep C	−0.080	0.111	0.942	354.5	993.6	1,061.2	$237	$2,906	$1,404	4,972
Mental (overall)	−0.366	0.269	0.489	−48.7	223.0	181.0	−$29	$189	$111	4,972
Antipsychotic	−0.211	0.139	0.080	−30.4	69.3	13.1	$13	$133	$13	4,972
Antidepressant	−0.514	0.273	0.374	−24.7	143.1	112.2	−$38	$89	$68	4,972
Anxiolytic	−0.002	0.212	0.201	−9.5	68.9	39.4	$2	$30	$20	4,972
ADHD	0.015	0.032	-	46.1	36.4	6.2	$12	$9	$1	4,972
Hypnotic/Sedatives	−0.016	0.181	0.144	−30.2	25.0	16.3	−$19	$15	$10	4,972
Pain (overall)	0.219	0.253	0.604	123.6	333.9	207.7	$205	$341	$136	4,972
Opioid	0.117	0.263	0.468	64.1	231.7	87.5	$97	$222	$66	4,972
Hep C	0.007	0.045	-	−0.5	2.5	0.3	−$451	$1,638	$224	4,972
Missing code	0.037	0.029	-	2.4	2.6	0.5	−$1	$8	$2	4,972
Spouse prescriptions										
Alimentary Tract and Metabolism (A)	−0.070	0.148	0.384	19.8	63.2	71.3	$113	$101	$102	2,470
Blood and Blood Forming Organs (B)	−0.063	0.100	0.125	−12.3	11.1	8.4	$18	$54	$10	2,470
Cardiovascular System (C)	0.025	0.101	0.181	−20.2	49.8	43.8	−$35	$39	$38	2,470
Dermatologicals (D)	0.136	0.117	0.170	1.6	1.2	0.6	$12	$6	$2	2,470
Genito Urinary System and Sex Hormones (G)	0.192	0.127	0.212	−3.4	6.7	3.2	$54	$25	$16	2,470
Systemic Hormonal Preparations, Excl. Sex Hormones and Insulins (H)	0.116	0.117	0.180	35.3	20.3	12.8	$24	$21	$3	2,470
Antiinfectives for Systemic Use (J)	0.326	0.141	0.694	28.6	24.1	15.4	−$190	$682	$17	2,470
Antineoplastic and Immunomodulating Agents (L)	0.001	0.041	-	−169.4	177.4	5.3	$899	$786	$40	2,470
Musculo-Skeletal System (M)	0.275	0.145	0.311	51.5	23.1	11.1	$14	$10	$8	2,470
Nervous System (N)	0.172	0.151	0.603	−8.1	186.2	307.9	−$182	$203	$311	2,470
Antiparasitic Products, Insecticides and Repellents (P)	−0.019	0.032	-	0.0	0.0	0.0	−$0	$0	$0	2,470
Respiratory System (R)	0.180	0.129	0.207	5.5	6.8	2.8	$238	$252	$14	2,470
Sensory Organs (S)	0.141	0.115	0.155	0.5	0.9	0.1	−$15	$17	$1	2,470
Various (V)	−0.026	0.029	-	0.1	0.1	-	−$2	$2	$0	2,470
All (any drug in PBS)	0.189	0.102	0.871	−65.2	308.2	483.3	$949	$1,204	$673	2,470
Mental (overall)	−0.039	0.148	0.386	−20.0	97.4	123.4	−$185	$166	$163	2,470
Antipsychotic	−0.092	0.068	0.062	−57.8	41.4	42.4	−$217	$160	$49	2,470
Antidepressant	−0.091	0.141	0.316	6.2	62.4	75.0	$18	$33	$39	2,470
Anxiolytic	0.088	0.105	0.132	3.8	26.5	5.6	−$1	$11	$2	2,470
ADHD	0.008	0.027	-	19.5	26.6	-	$11	$9	-	2,470
Hypnotic/Sedatives	0.080	0.076	0.063	8.4	4.7	1.8	$5	$3	$1	2,470
Pain (overall)	0.277	0.156	0.529	141.8	95.5	65.5	$29	$77	$92	2,470
Opioid	0.316	0.154	0.403	48.4	69.2	27.9	$10	$56	$44	2,470
Hep C	−0.023	0.023	-	−0.7	0.7	0.3	−$536	$619	$225	2,470
Missing code	0.007	0.007	-	0.0	0.0	-	$0	$0	-	2,470

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for mental health drugs, sub-categories of mental health drug, pain drugs and select classifications from the Anatomical Therapeutic Chemical Classification System. Dollar amounts are in AUD. Combined sample stacks the Start Date RD and Birth Date RD samples. Drug classifications come from the Anatomical Therapeutic Chemical Classification System. "Any" is extensive margin drug taking between July 2015 and June 2018. "Quantity" is the mean of 'PBS adjusted quantity' between July 2015 and June 2018. "Total cost" is the sum of government and own spending on prescriptions in the PBS between July 2015 and June 2018.

Appendix Table A.16: Combined sample: Mental and antipsychotics by subgroup

	Total spending			Mental Rx spending			Any mental Rx			Antipsychotic spending			Any antipsychotic Rx			
Group	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
All	$1,862	$1,138	$1,669	$875	$342	$657	0.230	0.104	0.672	$885	$333	$506	0.226	0.107	0.350	16,754
Male	$2,433	$1,185	$1,349	$1,434	$606	$718	0.448	0.174	0.625	$1,493	$595	$583	0.294	0.171	0.393	9,892
Female	$1,251	$1,908	$2,155	$312	$343	$564	0.022	0.120	0.743	$268	$329	$389	0.150	0.129	0.285	6,862
29 and below	$2,481	$2,063	$1,101	$896	$468	$309	0.022	0.175	0.537	$944	$449	$186	−0.058	0.152	0.224	7,401
30 and above	$1,415	$1,330	$1,943	$805	$466	$825	0.345	0.128	0.737	$799	$458	$661	0.385	0.146	0.411	9,353
Has spouse	−$2,345	$1,508	$1,834	−$99	$289	$360	0.149	0.152	0.622	−$160	$275	$271	0.068	0.130	0.241	2,466
No spouse	$3,428	$1,451	$1,633	$1,154	$450	$722	0.236	0.128	0.692	$1,199	$441	$558	0.252	0.134	0.378	14,288
Lives with parents	$1,961	$1,873	$1,474	$455	$721	$567	0.015	0.246	0.583	$591	$698	$427	0.041	0.220	0.281	4,969
Lives away from parents	$2,126	$1,439	$1,392	$793	$373	$604	0.189	0.117	0.703	$799	$364	$440	0.167	0.122	0.360	9,079
Live with family	−$79	$1,287	$1,649	$226	$400	$502	0.117	0.146	0.577	$239	$386	$380	0.089	0.133	0.258	7,252
Live alone	$3,460	$1,795	$1,687	$1,365	$533	$796	0.316	0.144	0.756	$1,373	$523	$619	0.321	0.160	0.433	9,502
Psychological condition	$791	$1,298	$1,711	$1,024	$689	$1,068	0.025	0.137	0.865	$1,276	$689	$850	0.164	0.182	0.546	8,903
Intellectual condition	$2,766	$1,709	$476	$441	$805	$187	0.362	0.453	0.412	$164	$746	$151	−0.027	0.323	0.147	2,689
Other diagnosis	$2,612	$2,079	$2,189	$479	$181	$118	0.262	0.136	0.444	$362	$162	$61	0.175	0.088	0.111	5,164
High impairment rating	$4,147	$2,471	$1,566	$985	$533	$558	0.325	0.190	0.577	$1,032	$516	$404	0.349	0.177	0.281	6,942
Low impairment rating	$747	$1,146	$1,748	$729	$435	$733	0.163	0.119	0.745	$716	$426	$585	0.134	0.132	0.404	9,812

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for any mental health prescription, total spending on mental health prescriptions, any antipsychotics, and total spending on antipsychotic prescriptions. Dollar amounts are in unscaled AUD. Combined sample stacks the Start Date RD and Birth Date RD samples. Drug classifications come from the Anatomical Therapeutic Chemical Classification System. Age and family structure are measured in the year of the reform. "Lives with family" means lives with either a parent or a spouse; "lives alone" means lives with neither a parent nor a spouse. Diagnosis and impairment rating are measured in the last medical review. High/low impairment rating is split at the median.

Appendix Table A.17: Combined sample: Medicare Benefit Schedule

	Any			
	Pt Est	Std Err	Cntrl Mean	N
Own MBS utilization				
A01: General Practitioner	0.085	0.050	0.940	16,754
A02: Other non-referred	−0.270	0.096	0.257	16,754
A03: Specialist	0.201	0.097	0.246	16,754
A04: Consultant Physician (other than Psychiatry)	0.013	0.097	0.257	16,754
A08: Consultant Psychiatrist	0.198	0.089	0.173	16,754
A10: Optometrical Consultations	0.147	0.105	0.313	16,754
A11: After Hours	−0.075	0.083	0.191	16,754
A15: Multidisciplinary Care Plans and Case Conferences	0.109	0.107	0.392	16,754
A20: GP Mental Health Treatment	0.151	0.109	0.477	16,754
A22: GP after-hours attendances to which no other item applies	−0.345	0.111	0.432	16,754
D01: Miscellaneous Diagnostic Procedures and Investigations	−0.019	0.103	0.335	16,754
I01: Ultrasound	0.107	0.109	0.432	16,754
I02: Computerised Tomography	0.056	0.092	0.233	16,754
I03: Diagnostic Radiology	0.156	0.109	0.490	16,754
M01: Management of Bulk Billed services	0.053	0.057	0.925	16,754
M03: Allied Health Services	0.056	0.089	0.191	16,754
M07: Focussed Psychological Strategies	0.170	0.084	0.146	16,754
M12: Services provided by a Practice Nurse/Registered Aboriginal Health Worker	0.038	0.083	0.177	16,754
P01: Haematology	0.067	0.108	0.548	16,754
P02: Chemical	0.119	0.095	0.718	16,754
P03: Microbiology	−0.042	0.107	0.552	16,754
P04: Immunology	0.117	0.090	0.222	16,754
P06: Cytopathology	0.172	0.083	0.157	16,754
T08: Surgical Operations	0.163	0.098	0.239	16,754
Spouse MBS utilization				
A01: General Practitioner	0.016	0.071	0.944	2,470
A08: Consultant Psychiatrist	0.041	0.073	0.052	2,470

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for select "MBS group" services. We only present results for services that at least 15% of the control sample utilizes across the three years. Dollar amounts are in unscaled AUD. Combined sample stacks the Start Date RD and Birth Date RD samples. "MBS groups" group together different service types that are provided on the Medicare Benefits Schedule. "Any" indicates having at least one service of that type within 2016-18.

Appendix Table A.18: Combined sample: Family structure

Variable	Pt Est	Std Err	Cntrl Mean	N
Has spouse in 2019	−0.106	0.080	0.163	17,186
No spouse in 2019	0.106	0.080	0.837	17,186
Same spouse in 2019	−0.112	0.065	0.118	17,186
Live with parents 2019	−0.032	0.082	0.332	14,243
Live away from parents 2019	0.032	0.082	0.668	14,243
Change in live with parents	0.007	0.071	0.131	17,186
Change location between 2014 and 2019	0.105	0.105	0.553	17,186
Individual has a child between 2016 and 2021	−0.054	0.055	0.069	17,186
Distance to SA2 of parent 2019	−106.335	117.490	150.329	13,482
Number of children individual has beteween 2016 and 2021	−0.047	0.072	0.077	17,186

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for family structure outcome variables. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. All variables are at the fiscal year level.

Appendix Table A.19: Combined sample: Joint work (at different thresholds) and prescriptions

	No rx, earnings below threshold			No rx, earnings above threshold			Rx, earnings below threshold			Rx, earnings above threshold			
	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	N
Mental joint with Other family member earnings													
\$0	−0.260	0.095	0.242	0.030	0.054	0.086	0.197	0.102	0.572	0.034	0.063	0.100	16,754
\$1,000	−0.278	0.096	0.248	0.048	0.052	0.080	0.207	0.102	0.574	0.024	0.061	0.098	16,754
\$5,000	−0.331	0.098	0.259	0.101	0.050	0.069	0.181	0.102	0.579	0.049	0.059	0.093	16,754
\$10,000	−0.309	0.098	0.276	0.079	0.048	0.059	0.188	0.102	0.579	0.042	0.057	0.086	16,754
\$20,000	−0.272	0.098	0.283	0.042	0.046	0.052	0.186	0.102	0.591	0.044	0.053	0.074	16,754
\$30,000	−0.263	0.099	0.292	0.032	0.042	0.043	0.183	0.103	0.602	0.048	0.050	0.063	16,754
\$40,000	−0.259	0.100	0.297	0.029	0.040	0.037	0.182	0.103	0.613	0.048	0.047	0.053	16,754
Mental joint with Own earnings													
\$0	−0.186	0.089	0.217	−0.044	0.070	0.111	0.084	0.108	0.494	0.146	0.085	0.177	16,754
\$1,000	−0.262	0.093	0.235	0.031	0.065	0.093	0.154	0.109	0.521	0.076	0.078	0.151	16,754
\$5,000	−0.255	0.095	0.260	0.025	0.058	0.074	0.121	0.109	0.568	0.109	0.066	0.098	16,754
\$10,000	−0.272	0.098	0.278	0.042	0.051	0.057	0.127	0.108	0.595	0.103	0.058	0.070	16,754
\$20,000	−0.258	0.100	0.303	0.028	0.041	0.032	0.171	0.107	0.622	0.059	0.046	0.043	16,754
\$30,000	−0.279	0.101	0.315	0.048	0.033	0.020	0.190	0.106	0.636	0.040	0.038	0.029	16,754
\$40,000	−0.317	0.103	0.323	0.086	0.026	0.011	0.172	0.105	0.646	0.058	0.031	0.019	16,754

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs (i.e., β_4 from equation (5)) for joint work and prescription outcomes. Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. All variables are at the fiscal year level.

Appendix Table A.20: RD estimates with no controls

	Start RD				Birth RD				Combined RD			
	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Own income												
Received medical review between 2014-16	0.541	0.018	0.338	10,665	0.710	0.017	0.107	6,521	0.613	0.013	0.204	17,186
Lost DSP between 2014-16	0.147	0.014	0.062	10,665	0.157	0.017	0.067	6,521	0.151	0.011	0.065	17,186
Own DSP payments 2016-18	−$3.28	$0.39	$25.30	10,665	−$3.18	$0.50	$25.12	6,521	−$3.24	$0.31	$25.19	17,186
Own non-DSP payments 2016-18	$1.54	$0.32	$2.55	10,665	$1.95	$0.45	$3.45	6,521	$1.72	$0.27	$3.07	17,186
Own Newstart payments 2016-18	$1.19	$0.10	$0.08	10,665	$1.36	$0.16	$0.10	6,521	$1.26	$0.09	$0.09	17,186
Own all govt. payments 2016-18	−$1.73	$0.42	$27.85	10,665	−$1.23	$0.54	$28.56	6,521	−$1.52	$0.33	$28.26	17,186
Own earnings 2016-18	$1.36	$0.58	$5.79	10,665	$1.02	$0.57	$3.21	6,521	$1.22	$0.42	$4.29	17,186
Own income 2016-18	−$0.38	$0.51	$33.64	10,665	−$0.21	$0.63	$31.77	6,521	−$0.30	$0.40	$32.55	17,186
Spouse income												
Spouse all govt. payments 2016-18	$0.27	$0.34	$1.47	10,665	−$1.15	$0.64	$6.30	6,521	−$0.33	$0.34	$4.27	17,186
Spouse all govt. payments 2016-18 (conditional on having a spouse)	$2.08	$1.99	$13.04	1,294	−$2.10	$2.13	$27.87	1,231	−$0.23	$1.48	$23.94	2,525
Spouse earnings 2016-18	$0.14	$0.51	$2.92	10,665	$1.23	$0.82	$3.34	6,521	$0.61	$0.46	$3.16	17,186
Spouse earnings 2016-18 (conditional on having a spouse)	$0.89	$3.74	$25.84	1,294	$9.47	$3.89	$14.80	1,231	$5.62	$2.73	$17.73	2,525
Parent income												
Parent(s) all govt. payments 2016-18	−$1.03	$0.83	$17.27	10,665	$0.29	$0.79	$12.51	6,521	−$0.47	$0.59	$14.51	17,186
Parent(s) all govt. payments 2016-18 (conditional on living with parent)	−$2.24	$1.25	$19.93	3,978	−$2.17	$1.72	$20.56	1,039	−$2.23	$1.04	$20.17	5,017
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.39	$0.62	$8.79	10,665	−$0.58	$0.45	$4.04	6,521	−$1.04	$0.41	$6.03	17,186
Parent(s) earnings 2016-18	$5.27	$2.03	$19.48	10,665	−$0.58	$1.35	$10.90	6,521	$2.77	$1.30	$14.50	17,186
Parent(s) earnings 2016-18 (conditional on living with parent)	$10.03	$3.48	$19.49	3,978	$8.24	$3.33	$7.48	1,039	$9.60	$2.78	$14.91	5,017
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$2.98	$1.47	$8.60	10,665	$1.21	$0.58	$1.47	6,521	$2.23	$0.88	$4.46	17,186
Family income												
Family member (parent/spouse) member earnings 2016-18	$3.12	$1.53	$11.51	10,665	$2.45	$0.98	$4.81	6,521	$2.83	$0.98	$7.62	17,186
Family member (parent/spouse) member earnings 2016-18 (conditional on living with family)	$8.03	$2.90	$21.59	5,154	$8.88	$2.68	$11.71	2,201	$8.32	$2.12	$16.49	7,355
Household all govt. payments (not including own DSP) 2016-18	$0.43	$0.75	$12.81	10,665	$0.22	$0.89	$13.78	6,521	$0.34	$0.58	$13.37	17,186
Household all govt. payments (not including own DSP) 2016-18 (conditional on living with family)	$0.08	$1.19	$22.43	5,154	−$0.96	$1.67	$29.65	2,201	−$0.28	$0.98	$26.16	7,355
Household earnings 2016-18	$4.48	$1.69	$17.30	10,665	$3.47	$1.17	$8.02	6,521	$4.05	$1.10	$11.91	17,186
Household earnings 2016-18 (conditional on living with family)	$10.84	$3.13	$27.93	5,154	$10.14	$2.98	$15.61	2,201	$10.60	$2.30	$21.57	7,355
Household income 2016-18	$1.63	$1.73	$55.41	10,665	$0.52	$1.35	$46.91	6,521	$1.15	$1.15	$50.48	17,186
Household income 2016-18 (conditional on living with family)	$6.86	$2.79	$74.73	5,154	$6.01	$2.64	$66.89	2,201	$6.57	$2.05	$70.69	7,355
Own health												
Prescriptions: Total value of mental drugs 2016-18	$0.16	$0.07	$0.41	10,455	$0.10	$0.08	$0.84	6,299	$0.14	$0.05	$0.66	16,754
Prescriptions: Any mental drug 2016-18	0.039	0.021	0.568	10,455	0.035	0.022	0.749	6,299	0.037	0.015	0.672	16,754
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.17	$0.06	$0.28	10,455	$0.09	$0.07	$0.67	6,299	$0.14	$0.05	$0.51	16,754
Prescriptions: Any antipsychotic drug 2016-18	0.032	0.020	0.245	10,455	0.041	0.025	0.429	6,299	0.036	0.016	0.350	16,754
Prescriptions: Total value of all drugs 2016-18	$0.60	$0.29	$1.83	10,455	$0.26	$0.43	$3.33	6,299	$0.46	$0.25	$2.69	16,754
Prescriptions: Any drug 2016-18	0.002	0.013	0.880	10,455	0.016	0.012	0.931	6,299	0.008	0.009	0.909	16,754
Died 2015-19	0.000	0.006	0.020	10,665	0.012	0.008	0.031	6,521	0.005	0.005	0.026	17,186

Notes: Table presents RD estimates for the separate Start and Birth RDs (i.e., β_1 from equation (1) and β_2 from equation (2)) and RD estimates for the combined Start and Birth Date RDs (i.e., β_4 from equation (3)) when using all the variables in the covariate balance tables as controls. Dollar amounts are in 1000s of AUD. Start Date sample consists of DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Combined sample stacks the start date sample and the birth date sample.

Appendix Table A.21: RD estimates with many controls

	Combined		Birth		Start	
	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err
Own income						
Received medical review between 2014-16	0.590	0.023	0.719	0.035	0.532	0.029
Lost DSP between 2014-16	0.181	0.017	0.187	0.030	0.180	0.021
Own DSP payments 2016-18	−$4.60	$0.48	−$4.14	$0.89	−$4.87	$0.56
Own non-DSP payments 2016-18	$1.70	$0.39	$2.56	$0.79	$1.30	$0.44
Own Newstart payments 2016-18	$1.22	$0.15	$1.18	$0.31	$1.24	$0.16
Own all govt. payments 2016-18	−$2.90	$0.50	−$1.58	$0.93	−$3.57	$0.58
Own earnings 2016-18	$2.67	$0.71	$3.04	$1.10	$2.58	$0.88
Own income 2016-18	−$0.24	$0.64	$1.46	$1.10	−$0.99	$0.77
Spouse income						
Spouse all govt. payments 2016-18	$0.26	$0.34	−$0.12	$0.73	$0.49	$0.37
Spouse earnings 2016-18	$0.87	$0.68	$1.93	$1.52	$0.40	$0.66
Parent income						
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.47	$0.57	−$1.80	$0.75	−$1.32	$0.75
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$3.27	$1.74	$2.14	$1.75	$3.84	$2.38
Family income						
Family member (parent/spouse) member earnings 2016-18	$4.13	$1.87	$4.07	$2.32	$4.23	$2.46
Household all govt. payments (not including own DSP) 2016-18	$0.50	$0.74	$0.64	$1.21	$0.46	$0.92
Household income 2016-18	$2.69	$1.82	$3.61	$2.25	$2.41	$2.41
Own health						
Prescriptions: Total value of mental drugs 2016-18	−$0.05	$0.08	−$0.02	$0.15	−$0.06	$0.09
Prescriptions: Any mental drug 2016-18	0.024	0.025	−0.005	0.040	0.032	0.031
Prescriptions: Total value of antipsychotic drugs 2016-18	−$0.03	$0.08	$0.01	$0.15	−$0.04	$0.09
Prescriptions: Any antipsychotic drug 2016-18	−0.010	0.024	0.025	0.045	−0.028	0.028
Prescriptions: Total value of all drugs 2016-18	$0.78	$0.43	$0.75	$0.73	$0.79	$0.55
Prescriptions: Any drug 2016-18	−0.004	0.014	−0.023	0.019	0.005	0.018
Died 2015-19	−0.002	0.008	−0.002	0.016	−0.002	0.009

Notes: Table presents RD estimates for the separate Start and Birth RDs (i.e., β_1 from equation (1) and β_2 from equation (2)) and RD estimates for the combined Start and Birth Date RDs (i.e., β_4 from equation (3)) when using all the variables in the covariate balance table (Table **??**) as controls. Dollar amounts are in 1000s of AUD. Start Date sample consists of DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Combined sample stacks the start date sample and the birth date sample.

Appendix Table A.22: RD estimates using "rdrobust" package

	Combined				Birth				Start			
	Pt Est	Std Err	N: Left bandwidth	N: Right bandwidth	Pt Est	Std Err	N: Left bandwidth	N: Right bandwidth	Pt Est	Std Err	N: Left bandwidth	N: Right bandwidth
Own income												
Received medical review between 2014-16	0.565	0.012	8,223	19,079	0.714	0.012	13,400	9,621	0.527	0.041	1,539	2,077
Lost DSP between 2014-16	0.143	0.008	10,492	29,385	0.168	0.014	9,192	7,340	0.127	0.029	1,618	2,213
Own DSP payments 2016-18	−$3.28	$0.21	14,836	33,291	−$4.06	$0.36	13,836	9,841	−$2.60	$0.79	1,674	2,291
Own non-DSP payments 2016-18	$1.83	$0.21	10,996	30,970	$1.92	$0.35	11,504	8,698	$2.36	$0.74	1,551	2,078
Own Newstart payments 2016-18	$1.32	$0.06	12,556	31,962	$1.55	$0.12	9,958	7,814	$1.16	$0.22	1,995	2,726
Own all govt. payments 2016-18	−$1.28	$0.26	10,492	29,050	−$2.12	$0.37	14,749	10,288	−$0.33	$0.90	1,423	1,914
Own earnings 2016-18	$0.83	$0.28	15,031	33,418	$1.20	$0.44	11,504	8,698	−$0.65	$1.16	1,551	2,078
Own income 2016-18	−$0.76	$0.29	14,634	33,177	−$0.87	$0.50	10,750	8,240	−$0.83	$0.98	1,995	2,726
Spouse income												
Spouse all govt. payments 2016-18	$0.30	$0.25	11,175	31,090	−$0.12	$0.43	14,749	10,288	$0.19	$0.62	1,791	2,427
Spouse earnings 2016-18	$0.77	$0.32	11,883	31,535	$0.95	$0.56	12,762	9,228	$0.62	$1.15	1,574	2,134
Parent income												
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.83	$0.40	7,881	17,254	−$0.40	$0.40	6,951	5,882	−$2.99	$1.42	1,411	1,887
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	−$0.13	$0.83	8,379	20,001	$1.24	$0.49	9,192	7,340	$2.64	$2.44	1,999	2,740
Family income												
Family member (parent/spouse) member earnings 2016-18	$0.30	$0.83	9,474	24,918	$2.09	$0.79	9,192	7,340	$3.41	$2.68	1,852	2,520
Household all govt. payments (not including own DSP) 2016-18	$0.67	$0.42	12,908	32,173	$1.04	$0.61	14,749	10,288	−$0.43	$1.48	1,821	2,472
Household income 2016-18	−$1.85	$1.01	9,015	22,434	$0.43	$1.05	9,580	7,491	−$0.23	$3.07	1,923	2,605
Own health												
Died 2015-19	0.002	0.003	15,438	33,640	0.000	0.006	16,946	11,226	0.007	0.011	2,041	2,832

Notes: Table presents "rdrobust" estimates, using the package developed by Calonico et al. (2018), for the Start Date and Birth Date RDs. Start Date point estimates and standard errors are estimates of β_1 from equation (1). Birth Date point estimates and standard errors are estimates of β_2 from equation (2). The Start date sample consists of individuals who turned 35 after July 1, 2014 (since the change only applied to young people) and who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." The Birth Date sample consists of DSP recipients who entered DSP after January 1, 2008, and before January 1, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Combined sample stacks the Start date and Birth date samples. Point estimates and standard errors are the bias-corrected local-polynomial RD estimates given by "rdrobust." N is the full sample size of the data before bandwidths are selected by "rdrobust". "Left-bandwidth" and "Right-bandwidth" are the bandwidths to the left and right of the cutff that "rdrobust" uses to calculate the regression function.

Appendix Table A.23: RD estimates with polynomials

	Polynomial of order 1		Polynomial of order 2		Polynomial of order 3		Polynomial of order 4	
	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err
Combined experiment (Own income)								
Received medical review between 2014-16	0.613	0.013	0.652	0.015	0.631	0.021	0.666	0.022
Lost DSP between 2014-16	0.151	0.011	0.146	0.013	0.144	0.018	0.145	0.019
Own DSP payments 2016-18	−$3.23	$0.32	−$2.93	$0.39	−$3.18	$0.52	−$3.14	$0.57
Own non-DSP payments 2016-18	$1.71	$0.27	$1.85	$0.35	$2.10	$0.47	$1.90	$0.52
Own Newstart payments 2016-18	$1.26	$0.09	$1.28	$0.12	$1.37	$0.17	$1.38	$0.18
Own all govt. payments 2016-18	−$1.52	$0.33	−$1.08	$0.42	−$1.08	$0.56	−$1.24	$0.61
Own earnings 2016-18	$1.22	$0.42	$0.45	$0.49	$0.62	$0.63	$0.78	$0.66
Own income 2016-18	−$0.30	$0.40	−$0.63	$0.50	−$0.45	$0.67	−$0.46	$0.72
Combined experiment (Spouse income)								
Spouse all govt. payments 2016-18	−$0.33	$0.34	−$0.71	$0.45	−$0.66	$0.61	−$0.89	$0.68
Spouse earnings 2016-18	$0.61	$0.46	$0.65	$0.60	$1.00	$0.85	$0.96	$0.93
Combined experiment (Parent income)								
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.04	$0.41	−$0.74	$0.45	−$1.58	$0.61	−$1.46	$0.62
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$2.23	$0.88	$1.54	$0.86	$1.76	$1.08	$0.89	$1.02
Combined experiment (Family income)								
Family member (parent/spouse) member earnings 2016-18	$2.84	$0.98	$2.19	$1.03	$2.76	$1.35	$1.86	$1.36
Household income 2016-18	$1.17	$1.15	$0.10	$1.27	$0.06	$1.67	−$0.96	$1.73
Combined experiment (Own health)								
Prescriptions: Total value of mental drugs 2016-18	$0.14	$0.05	$0.14	$0.06	$0.16	$0.08	$0.15	$0.09
Prescriptions: Any mental drug 2016-18	0.037	0.015	0.023	0.018	0.022	0.025	0.031	0.026
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.14	$0.05	$0.14	$0.06	$0.16	$0.08	$0.14	$0.09
Prescriptions: Any antipsychotic drug 2016-18	0.036	0.016	0.043	0.020	0.033	0.026	0.038	0.028
Prescriptions: Total value of all drugs 2016-18	$0.46	$0.25	$0.30	$0.32	$0.47	$0.42	$0.47	$0.45
Prescriptions: Any drug 2016-18	0.008	0.009	0.013	0.011	0.008	0.014	0.019	0.015
Died 2015-19	0.005	0.005	0.010	0.006	0.013	0.009	0.017	0.009
Birth experiment (Own income)								
Received medical review between 2014-16	0.709	0.017	0.709	0.017	0.707	0.023	0.707	0.023
Lost DSP between 2014-16	0.157	0.017	0.157	0.017	0.148	0.022	0.148	0.023
Own DSP payments 2016-18	−$3.16	$0.51	−$3.16	$0.51	−$3.28	$0.68	−$3.27	$0.68
Own non-DSP payments 2016-18	$1.93	$0.45	$1.93	$0.45	$1.92	$0.61	$1.90	$0.61
Own Newstart payments 2016-18	$1.35	$0.16	$1.34	$0.17	$1.45	$0.22	$1.45	$0.22
Own all govt. payments 2016-18	−$1.23	$0.54	−$1.23	$0.54	−$1.36	$0.71	−$1.37	$0.72
Own earnings 2016-18	$1.03	$0.57	$1.04	$0.58	$1.04	$0.74	$1.04	$0.74
Own income 2016-18	−$0.20	$0.63	−$0.20	$0.63	−$0.32	$0.84	−$0.33	$0.84
Birth experiment (Spouse income)								
Spouse all govt. payments 2016-18	−$1.13	$0.64	−$1.13	$0.64	−$1.20	$0.87	−$1.20	$0.87
Spouse earnings 2016-18	$1.24	$0.82	$1.24	$0.82	$1.08	$1.14	$1.09	$1.14
Birth experiment (Parent income)								
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$0.58	$0.45	−$0.58	$0.45	−$0.68	$0.61	−$0.68	$0.61
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$1.23	$0.58	$1.23	$0.58	$0.57	$0.78	$0.54	$0.78
Birth experiment (Family income)								
Family member (parent/spouse) member earnings 2016-18	$2.47	$0.99	$2.48	$0.99	$1.64	$1.35	$1.63	$1.36
Household income 2016-18	$0.56	$1.36	$0.58	$1.36	−$0.56	$1.81	−$0.58	$1.82
Birth experiment (Own health)								
Prescriptions: Total value of mental drugs 2016-18	$0.11	$0.08	$0.11	$0.08	$0.05	$0.10	$0.05	$0.10
Prescriptions: Any mental drug 2016-18	0.035	0.022	0.035	0.022	0.017	0.029	0.018	0.029
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.09	$0.07	$0.10	$0.07	$0.05	$0.10	$0.05	$0.10
Prescriptions: Any antipsychotic drug 2016-18	0.041	0.025	0.041	0.025	0.016	0.033	0.016	0.033
Prescriptions: Total value of all drugs 2016-18	$0.26	$0.43	$0.26	$0.43	$0.33	$0.56	$0.32	$0.56
Prescriptions: Any drug 2016-18	0.016	0.012	0.015	0.012	0.013	0.016	0.014	0.016
Died 2015-19	0.012	0.008	0.012	0.008	0.015	0.011	0.015	0.011
Start experiment (Own income)								
Received medical review between 2014-16	0.541	0.018	0.551	0.029	0.486	0.040	0.536	0.051
Lost DSP between 2014-16	0.147	0.014	0.127	0.021	0.137	0.028	0.138	0.036
Own DSP payments 2016-18	−$3.28	$0.39	−$2.53	$0.60	−$2.99	$0.80	−$2.74	$1.01
Own non-DSP payments 2016-18	$1.54	$0.32	$1.72	$0.51	$2.46	$0.73	$1.92	$0.93
Own Newstart payments 2016-18	$1.19	$0.10	$1.17	$0.16	$1.22	$0.22	$1.15	$0.29
Own all govt. payments 2016-18	−$1.73	$0.42	−$0.81	$0.64	−$0.53	$0.88	−$0.82	$1.11
Own earnings 2016-18	$1.36	$0.58	−$0.61	$0.88	−$0.17	$1.20	−$0.04	$1.50
Own income 2016-18	−$0.38	$0.51	−$1.42	$0.79	−$0.71	$1.10	−$0.86	$1.41
Start experiment (Spouse income)								
Spouse all govt. payments 2016-18	$0.27	$0.34	$0.04	$0.50	$0.37	$0.66	$0.08	$0.80
Spouse earnings 2016-18	$0.14	$0.51	−$0.41	$0.80	$0.84	$1.15	$0.57	$1.49
Start experiment (Parent income)								
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$1.39	$0.62	−$1.04	$0.98	−$3.31	$1.36	−$3.92	$1.74
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$2.98	$1.47	$2.08	$2.15	$4.06	$2.77	$1.99	$3.42
Start experiment (Family income)								
Family member (parent/spouse) member earnings 2016-18	$3.12	$1.53	$1.67	$2.25	$4.90	$2.94	$2.56	$3.65
Household income 2016-18	$1.63	$1.73	−$0.75	$2.58	$1.25	$3.42	−$2.14	$4.28
Start experiment (Own health)								
Prescriptions: Total value of mental drugs 2016-18	$0.16	$0.07	$0.21	$0.10	$0.37	$0.14	$0.47	$0.17
Prescriptions: Any mental drug 2016-18	0.039	0.021	0.001	0.033	0.031	0.045	0.072	0.058
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.17	$0.06	$0.21	$0.10	$0.36	$0.13	$0.45	$0.17
Prescriptions: Any antipsychotic drug 2016-18	0.032	0.020	0.046	0.031	0.064	0.042	0.104	0.054
Prescriptions: Total value of all drugs 2016-18	$0.60	$0.29	$0.38	$0.45	$0.72	$0.57	$0.93	$0.65
Prescriptions: Any drug 2016-18	0.002	0.013	0.008	0.020	−0.001	0.027	0.035	0.035
Died 2015-19	0.000	0.006	0.007	0.009	0.009	0.012	0.021	0.013

Notes: Table presents RD estimates for the Combined, Start Date RD, and Birth Date RD samples with linear, quadratic, cubic and quartic running variables. Dollar amounts are in 1000s of AUD. Start Date sample consists of DSP recipients who entered DSP within 15 months before and 18 months after January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date sample consists of DSP recipients with a 35th birthday within a 24-month bandwidth around July 1, 2014, who entered DSP after January 1, 2008, and before January, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Combined sample stacks Birth Date and Start Date samples.

Appendix Table A.24: RD estimates with different bandwidths

	Bandwidth: 2 months		Bandwidth: 5 months		Bandwidth: 10 months		Bandwidth: 15 months		Bandwidth: 25 months	
	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err
Combined experiment (Own income)										
Received medical review between 2014-16	0.504	0.022	0.547	0.018	0.585	0.015	0.588	0.014	0.566	0.013
Lost DSP between 2014-16	0.124	0.015	0.143	0.012	0.143	0.010	0.149	0.010	0.155	0.009
Own DSP payments 2016-18	−$2.63	$0.46	−$3.15	$0.38	−$3.07	$0.32	−$3.21	$0.29	−$3.28	$0.28
Own non-DSP payments 2016-18	$1.74	$0.43	$1.58	$0.33	$1.66	$0.29	$1.52	$0.26	$1.64	$0.24
Own Newstart payments 2016-18	$1.14	$0.12	$1.24	$0.09	$1.23	$0.08	$1.24	$0.07	$1.25	$0.07
Own all govt. payments 2016-18	−$0.89	$0.53	−$1.57	$0.43	−$1.41	$0.36	−$1.69	$0.33	−$1.64	$0.30
Own earnings 2016-18	$0.32	$0.65	$0.55	$0.52	$0.76	$0.43	$1.30	$0.40	$1.43	$0.37
Own income 2016-18	−$0.57	$0.66	−$1.02	$0.53	−$0.65	$0.44	−$0.39	$0.40	−$0.21	$0.37
Combined experiment (Spouse income)										
Spouse all govt. payments 2016-18	−$0.33	$0.56	−$0.10	$0.47	−$0.45	$0.38	−$0.34	$0.34	−$0.14	$0.31
Spouse earnings 2016-18	$0.65	$0.73	$0.84	$0.59	$0.42	$0.51	$0.47	$0.45	$0.47	$0.41
Combined experiment (Parent income)										
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$2.47	$0.64	−$1.72	$0.49	−$1.02	$0.44	−$0.73	$0.40	−$0.99	$0.37
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$0.99	$1.19	$1.06	$1.06	$1.72	$0.89	$2.57	$0.85	$2.05	$0.80
Combined experiment (Family income)										
Family member (parent/spouse) member earnings 2016-18	$1.64	$1.37	$1.90	$1.19	$2.15	$1.01	$3.03	$0.95	$2.52	$0.89
Household all govt. payments (not including own DSP) 2016-18	−$1.07	$0.92	−$0.24	$0.74	$0.18	$0.63	$0.46	$0.57	$0.51	$0.53
Household income 2016-18	−$1.74	$1.68	−$0.94	$1.43	$0.02	$1.21	$1.58	$1.12	$1.18	$1.05
Combined experiment (Own health)										
Prescriptions: Total value of mental drugs 2016-18	$0.17	$0.08	$0.19	$0.07	$0.17	$0.06	$0.12	$0.05	$0.12	$0.05
Prescriptions: Any mental drug 2016-18	0.020	0.025	0.034	0.020	0.019	0.017	0.021	0.015	0.028	0.014
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.16	$0.08	$0.18	$0.07	$0.17	$0.06	$0.12	$0.05	$0.12	$0.04
Prescriptions: Any antipsychotic drug 2016-18	0.050	0.025	0.060	0.021	0.044	0.017	0.030	0.015	0.035	0.014
Prescriptions: Total value of all drugs 2016-18	$0.54	$0.38	$0.51	$0.31	$0.39	$0.26	$0.38	$0.23	$0.41	$0.22
Prescriptions: Any drug 2016-18	−0.007	0.015	0.000	0.012	0.000	0.010	−0.001	0.009	0.005	0.008
Died 2015-19	0.015	0.008	0.015	0.007	0.006	0.006	0.004	0.005	0.002	0.005
Birth experiment (Own income)										
Received medical review between 2014-16	0.594	0.067	0.582	0.038	0.629	0.027	0.631	0.022	0.655	0.018
Lost DSP between 2014-16	0.141	0.054	0.146	0.032	0.144	0.023	0.133	0.019	0.148	0.015
Own DSP payments 2016-18	−$4.11	$1.83	−$2.76	$1.02	−$3.20	$0.72	−$2.94	$0.59	−$2.96	$0.47
Own non-DSP payments 2016-18	$0.24	$1.90	$2.55	$1.00	$2.18	$0.68	$1.55	$0.54	$1.68	$0.43
Own Newstart payments 2016-18	$1.02	$0.32	$1.34	$0.25	$1.47	$0.20	$1.26	$0.17	$1.26	$0.14
Own all govt. payments 2016-18	−$3.87	$2.28	−$0.21	$1.18	−$1.02	$0.81	−$1.38	$0.65	−$1.27	$0.51
Own earnings 2016-18	$2.34	$1.97	$0.69	$1.13	$1.14	$0.85	$0.89	$0.68	$1.13	$0.55
Own income 2016-18	−$1.54	$2.49	$0.47	$1.34	$0.12	$0.98	−$0.49	$0.77	−$0.14	$0.61
Birth experiment (Spouse income)										
Spouse all govt. payments 2016-18	−$0.16	$2.71	−$1.82	$1.43	−$2.08	$0.98	−$1.29	$0.80	−$1.26	$0.62
Spouse earnings 2016-18	−$3.12	$3.49	$0.68	$1.87	$1.65	$1.21	$0.73	$0.97	$1.02	$0.76
Birth experiment (Parent income)										
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	$0.23	$1.99	−$1.92	$1.03	−$1.22	$0.70	−$0.98	$0.55	−$0.74	$0.43
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$1.19	$2.32	$1.22	$1.28	$0.52	$0.87	$0.81	$0.71	$1.12	$0.58
Birth experiment (Family income)										
Family member (parent/spouse) member earnings 2016-18	−$1.94	$4.12	$1.91	$2.23	$2.18	$1.47	$1.54	$1.18	$2.14	$0.95
Household all govt. payments (not including own DSP) 2016-18	$0.31	$3.70	−$1.18	$1.96	−$1.12	$1.34	−$0.71	$1.10	−$0.31	$0.85
Household income 2016-18	−$3.40	$5.39	−$1.35	$2.94	−$1.01	$2.01	−$1.22	$1.63	$0.01	$1.30
Birth experiment (Own health)										
Prescriptions: Total value of mental drugs 2016-18	−$0.65	$0.35	−$0.23	$0.18	−$0.05	$0.12	$0.13	$0.10	$0.15	$0.08
Prescriptions: Any mental drug 2016-18	−0.003	0.090	0.003	0.048	0.010	0.033	0.013	0.027	0.031	0.021
Prescriptions: Total value of antipsychotic drugs 2016-18	−$0.71	$0.34	−$0.21	$0.17	−$0.05	$0.12	$0.13	$0.09	$0.14	$0.07
Prescriptions: Any antipsychotic drug 2016-18	−0.012	0.102	−0.019	0.054	0.001	0.038	0.033	0.031	0.059	0.024
Prescriptions: Total value of all drugs 2016-18	$0.06	$1.71	−$0.20	$0.88	$0.05	$0.62	$0.37	$0.52	$0.27	$0.41
Prescriptions: Any drug 2016-18	−0.041	0.052	0.003	0.028	0.009	0.019	0.005	0.015	0.009	0.012
Died 2015-19	0.022	0.027	0.012	0.016	0.027	0.012	0.012	0.010	0.013	0.008
Start experiment (Own income)										
Received medical review between 2014-16	0.421	0.060	0.419	0.035	0.452	0.024	0.457	0.020	0.495	0.018
Lost DSP between 2014-16	0.108	0.037	0.112	0.023	0.117	0.016	0.123	0.013	0.157	0.011
Own DSP payments 2016-18	−$2.55	$1.05	−$2.29	$0.66	−$2.53	$0.47	−$2.82	$0.39	−$3.48	$0.34
Own non-DSP payments 2016-18	$1.58	$1.00	$2.25	$0.60	$1.30	$0.40	$1.29	$0.32	$1.60	$0.28
Own Newstart payments 2016-18	$1.11	$0.27	$1.04	$0.17	$1.03	$0.12	$1.03	$0.10	$1.23	$0.08
Own all govt. payments 2016-18	−$0.97	$1.18	−$0.05	$0.73	−$1.22	$0.51	−$1.54	$0.42	−$1.88	$0.38
Own earnings 2016-18	−$1.24	$1.63	−$0.24	$0.98	$0.06	$0.69	$0.85	$0.58	$1.60	$0.52
Own income 2016-18	−$2.21	$1.55	−$0.29	$0.90	−$1.17	$0.62	−$0.69	$0.52	−$0.27	$0.47
Start experiment (Spouse income)										
Spouse all govt. payments 2016-18	$1.70	$0.87	$1.06	$0.62	$0.72	$0.43	$0.62	$0.37	$0.60	$0.33
Spouse earnings 2016-18	−$0.52	$1.67	$0.46	$0.95	−$0.47	$0.62	$0.13	$0.52	$0.07	$0.46
Start experiment (Parent income)										
Parent(s) all govt. payments 2016-18 (0 if live away from DSP recipient)	−$4.67	$1.94	−$3.26	$1.13	−$1.70	$0.76	−$1.62	$0.62	−$1.24	$0.56
Parent(s) earnings 2016-18 (0 if live away from DSP recipient)	$0.86	$3.52	$2.16	$2.37	$1.16	$1.71	$1.48	$1.46	$2.48	$1.29
Start experiment (Family income)										
Family member (parent/spouse) member earnings 2016-18	$0.34	$3.81	$2.62	$2.50	$0.70	$1.79	$1.61	$1.52	$2.56	$1.34
Household all govt. payments (not including own DSP) 2016-18	−$1.40	$2.26	$0.04	$1.37	$0.32	$0.93	$0.29	$0.76	$0.97	$0.69
Household income 2016-18	−$4.85	$4.52	$0.12	$2.89	−$1.45	$2.05	−$0.07	$1.72	$1.65	$1.53
Start experiment (Own health)										
Prescriptions: Total value of mental drugs 2016-18	$0.59	$0.17	$0.38	$0.11	$0.20	$0.08	$0.20	$0.07	$0.11	$0.06
Prescriptions: Any mental drug 2016-18	0.131	0.064	0.049	0.038	0.013	0.026	0.049	0.021	0.023	0.019
Prescriptions: Total value of antipsychotic drugs 2016-18	$0.57	$0.17	$0.35	$0.11	$0.21	$0.08	$0.21	$0.07	$0.13	$0.06
Prescriptions: Any antipsychotic drug 2016-18	0.156	0.059	0.067	0.036	0.048	0.025	0.056	0.020	0.023	0.018
Prescriptions: Total value of all drugs 2016-18	$0.51	$0.70	$0.70	$0.53	$0.60	$0.37	$0.68	$0.30	$0.50	$0.26
Prescriptions: Any drug 2016-18	0.055	0.040	0.015	0.023	−0.001	0.015	0.002	0.013	0.001	0.011
Died 2015-19	0.024	0.012	0.004	0.011	0.004	0.008	0.004	0.006	−0.005	0.006

Notes: Table presents RD estimates for the Combined, Start Date RD, and Birth Date RD samples using different bandwidths. Dollar amounts are in 1000s of AUD. Start Date sample consists of DSP recipients who entered DSP within the number of months specified bat the top of the column around January 1, 2008, who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Birth Date sample consists of DSP recipients with a 35th birthday within the number of months specified at the top of the column around around July 1, 2014, who entered DSP after January 1, 2008, and before January, 2012, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0/missing hours of work capacity with intervention" nor missing "impairment rating." Combined sample stacks Birth Date and Start Date samples.

Appendix Table A.25: Welfare and adjustment terms

	Lives with family	Lives alone	Whole sample
Model with all adjustment terms (Welfare terms)			
First Order	$12,422	$20,483	$16,075
Behavioral	−$7,848	−$4,367	−$4,566
Net Private	$4,574	$16,116	$11,509
Govt Rev	$18,596	$9,591	$13,272
Model with all adjustment terms (First order terms)			
dD	$21,918	$21,777	$21,233
sigma	−$1,013	−$1,318	−$1,141
b	−$679	−$415	−$522
f	−$7,805	$0	−$3,496
Model with all adjustment terms (Adjustment terms)			
dc2	$0	−$438	$0
dcdh	$0	$378	$0
dhdp	$349	$252	$403
dbdp	$213	$930	$537
dcdp	$0	$0	$0
dp2	−$3	−$5	−$6
dpdD	$103	$275	$196
dbdc	$0	$1,289	$0
dbdD	$753	$1,247	$950
dcdf	$0	$0	$0
dfdp	$60	$0	$41
dfdD	$6,372	$0	$2,445
Model with only work adjustment (Welfare terms)			
First Order	$25,389	$29,820	$27,578
Behavioral	−$3,816	−$1,683	−$3,155
Net Private	$21,573	$28,137	$24,423
Govt Rev	$20,713	$21,411	$20,478
Model with only work adjustment (First order terms)			
dD	$21,918	$21,777	$21,233
Model with only work adjustment (Adjustment terms)			
dc2	−$3,471	−$8,044	−$6,344
dcdh	$3,816	$1,683	$3,155

Notes: Table shows welfare and adjustment terms for the main model specification. First order terms equal DSP (dD) plus the second order consumption term. For the model with only work adjustment, we calculate the change in consumption using only the earnings response and the change in DSP, if implied consumption is less than 15,000$ we increase dc such that consumption is at least this threshold. Whole sample welfare terms also set *dcdD* to 0.

Appendix Table A.26: Marginal Value of Public Funds analysis

	Whole sample	Lives alone	Lives with family
Numerator (WTP)			
$\frac{dD}{dD}dD$: DSP change	$21,233	$21,777	$21,918
σ: prescription disincentive	−$1,141	−$1,318	−$1,013
α: automatic family earnings	−$3,496	$0	−$7,805
δ: automatic benefit change	−$522	−$415	−$679
Denominator (Govt Savings)			
$\frac{dD}{dD}dD$: DSP change	$21,233	$21,777	$21,918
σ: prescription disincentive	−$1,141	−$1,318	−$1,013
δ: automatic benefit change	−$522	−$415	−$679
$\frac{db}{dD}dD$: other govt programs	−$11,182	−$14,314	−$8,584
$\frac{dpt}{dD}dD$: mental health prescription spending	−$875	−$1,365	−$226
$\frac{dfb}{dD}dD$: other govt programs family	$4,545	$0	$5,321
$\tau\frac{df}{dD}dD$: family earnings	−$1,066	$0	−$2,692
$\tau\frac{de}{dD}dD$: own earnings	−$756	−$366	−$1,205
MVPF			
All margins	1.570	5.011	0.967
Only own work margin	1.037	1.017	1.058

Notes: Table shows terms that would feature in the denominator or numerator of a MVPF calculation depending on the margins of adjustment observed. In the numerator: prescription disincentive term uses σ, other family earnings uses α and benefit change uses δ. Appendix Figure A.16 shows sensitivity of the MVPF to various parameters values

B Appendix Sections

B.1 Identification of DSP spells and medical review matching procedure

Since we study a reform that occurs in July 2014, our sample includes all individuals receiving DSP benefits in July 2014. To create the running variable for the "Start Date" reform, we need to know when the current DSP spell started. We therefore must determine what constitutes a single DSP spell. In the data, we observe that DSP episodes end either with a suspension or a cancellation. Suspensions occur for a number of reasons, including entering the criminal justice system, moving temporarily abroad or working temporarily above the 29-hour week limit. Individuals returning from a suspension do not need to go through the normal application process and usually do not face another medical review.[23] For this reason, we combine DSP episodes that end in suspension with their succeeding episodes into a single DSP spell. The start date of episodes that follow a suspension is therefore the start date of the previous episode that ended in a suspension. Since individuals who have their DSP cancelled have to go through the normal application process, we do not combine cancelled episodes with their succeeding episode. This data cleaning process leaves us with 828,354 current DSP recipients in July 2014.

Since the policy change we study is about medical reviews, it is important for us to link DSP spells to the relevant initial medical review (upon application) and any continuing medical reviews (during DSP receipt). Centrelink has one database for all medical reviews that are conducted for any Centrelink program; this includes DSP but also includes other programs such as Sickness Allowance. Each medical review record has a start date and, in some cases, a medical review reason code that identifies the program for which the review was conducted. We match DSP spells to initial medical reviews in two steps. In the first step, we take the first 15 medical reviews with either a DSP or missing review reason. We match each DSP spell with the medical review that has a start date closest to the spell start date, restricting to medical reviews whose start date is within 100 days of the DSP spell start date. We match 96.5% of spells in our sample in this step. For the remaining 3.5% of spells that are unmatched, we match the closest medical review (from any program) from the two years before an individual's DSP start. This matches another 1.6% of spells. The remaining 1.9% of DSP start dates remain unmatched to a medical review. Among DSP start dates that are matched to a medical review, in more than 90% of cases the medical review is the same date as the DSP start date.

One component of the medical review is the assessed "work capacity" of an individual. Work capacity is particularly important for our study because DSP recipients who are as-

[23] For example, see the Disability support pension section here `https://guides.dss.gov.au/social-security-guide/8/2/2`.

sessed to have zero "work capacity with intervention" are exempt from medical reviews. Work capacity ratings are valid for two years no matter which program they were originally used for.[24] Work capacity is sometimes missing in the medical review that matches to a DSP spell because the work capacity assessment occurred in a previous medical review. In our sample, before conditioning on any medical review related variables, just over 20% of DSP spells are missing "work capacity" after the matching process described above. To address this, we carry forward work capacity for a maximum of two years before the DSP start date. This means that for a given DSP spell, the work capacity variable sometimes comes from a different medical review than the primary medical review to which the spell is matched. After carrying forward work capacity assessments from previous medical reviews, the proportion of our sample with missing work capacity falls to around 15%.

B.2 Direct effects of medical reviews

We present our main results as IV estimates of the effect of DSP loss on income and health care utilization in 2016–18, well after medical reviews have ended. However, it is possible that the medical reviews themselves have direct (and possibly persistent) effects on outcomes, especially on health care utilization. In Appendix Figure A.13, we plot RD estimates (rather than IV estimates) by quarter on key outcomes to assess the timing of health care outcomes relative to the time of the medical review and DSP loss. Since our data contain medical review end dates but not medical review start dates, we approximate the timing of when DSP recipients would have been notified about a medical review by shifting the medical review end date line two quarters ahead. RD estimates of DSP loss spike about one quarter after the spike in medical review end. On top of the medical review and DSP loss plots, we overlay quarterly RD estimates of the effect on GP visits and mental health prescription spending. Effects on GP visits spike at the time of the medical review. Effects on mental health drug spending also increase at the time of the medical review and remain elevated for several years after that.

Clearly, medical reviews have direct effects on GP visits and mental health drug prescriptions, since these effects show up before DSP loss. This raises the question: are the long-term effects on health care utilization that we estimate the direct (and persistent) effects of the medical review, or are they the effects of DSP loss? To answer this question, we predict the likelihood of DSP removal for our sample, using the rich set of covariates available to us.[25] Since DSP removal rates are around 20%, we cut the predicted removal probability at the 75th percentile.

In Appendix Figure A.14, we plot the same graph of quarterly RD estimates for the

[24] See, e.g., `servicesaustralia.gov.au/if-you-have-reduced-capacity-to-work?context=22276`.

[25] The R-squared on the prediction regression is 0.13, which is relatively high given that the outcome is a binary variable.

low removal probability group (top panel) and the high removal probability group (bottom panel). For the low removal probability group, we see that RD estimates for GP visits and mental health prescriptions spike at the time of the medical reviews but then attenuate after medical reviews are complete. In contrast, for the high removal probability group, RD estimates of mental health prescription spending (also psychiatric visits) remain elevated for several years after the medical reviews are completed. These results suggest that although medical reviews do have direct effects on health care utilization, they cannot explain the persistent long-term effects on these outcomes. DSP loss itself is likely responsible for long-term effects on medical visits and mental health prescription drugs.

What explains the direct effect of medical reviews on mental health prescriptions? We consider three possible explanations. First, increases in GP visits due to the medical review could create mechanical increases in mental health drug prescriptions if every GP visit has some probability of resulting in a mental health drug prescription. However, this seems unlikely because GP visits are extremely frequent in this population (median 5 per year). Moreover, there is an increase in mental health drug prescriptions even conditional on visiting a GP. Second, the increase in mental health drug prescriptions might reflect strategic behavior on the part of DSP recipients. If DSP recipients think having a mental health drug prescription will signal that their condition is severe, they might seek out such prescriptions at the time of the medical review. While we do not have direct evidence on this channel, it is perhaps unlikely given that even people with a low likelihood of removal (who should be less concerned about being removed) increase their use of mental health drugs. A third possibility is that medical reviews increase stress and exacerbate mental health symptoms, and that the mental health drugs treat these symptoms.

B.3 Showing that behavioral responses are a function of preferences

We show that household behavioral responses are functions of parameters that we intuitively think should matter, like the relative disincentive on drugs and the relative marginal (dis)utilities of consumption, own work, drugs, and family work. The easiest way to see this is to focus on one channel at a time and shut down other channels. Here we work through two examples:

1. **Income effect channel**. Suppose we shut down the drug disincentive ($\sigma(p) = 0$). For simplicity, also shut down family earnings (i.e., $f = 0$, $y(f) = 0$) and other government benefits (i.e., $b = 0$, $s(b) = 0$). Also assume $\tau = 0$ and $\frac{dc}{dD} = 0$. If we use the expressions above to solve for the behavioral responses, we get that the work and drug responses are functions of the marginal disutilities of work/drugs relative to the marginal utility of consumption:

$$\frac{dh}{dD} = -\frac{(1+\kappa p_0)u'(c_0)}{v'(h_0)}\left(1+\frac{db}{dD}\right)\beta_h$$
$$\frac{dp}{dD} = -\frac{(1+\kappa p_0)u'(c_0)}{z'(p_0)}\left(1+\frac{db}{dD}\right)\beta_p$$

where

$$0 \leq \beta_h \equiv \frac{z''(p_0)w(p_0) - \kappa u'(c_0)w'(p_0)h_0 w(p_0) - (1+\kappa p_0)u'(c_0)w''(p_0)h_0 w(p_0)}{z''(p_0)w(p_0) - \kappa u'(c_0)w'(p_0)h_0 w(p_0) - (1+\kappa p_0)u'(c_0)w''(p_0)h_0 w(p_0) + (1+\kappa p_0)u'(c_0)(w'(p_0))^2 h_0} \leq 1$$
$$0 \leq \beta_p \equiv \frac{(1+\kappa p_0)u'(c_0)(w'(p_0))^2 h_0}{z''(p_0)w(p_0) - \kappa u'(c_0)w'(p_0)h_0 w(p_0) - (1+\kappa p_0)u'(c_0)w''(p_0)h_0 w(p_0) + (1+\kappa p_0)u'(c_0)(w'(p_0))^2 h_0} \leq 1$$

The work response is larger when the marginal disutility of work is small relative to the marginal utility of consumption. The prescription drug response is larger when the marginal disutility of drugs is small relative to the marginal utility of consumption.

If we allow for a family earnings response (i.e., $f \neq 0$, $y(f) \neq 0$) or other government benefit response (i.e., $b \neq 0$, $s(b) \neq 0$), we get similar expressions but smaller work and drug responses since households have another margin of adjustment.

2. **Drug disincentive channel**. Suppose instead we shut down the disutility from taking drugs (i.e., $z(p) = 0$). For simplicity, also shut down family earnings (i.e., $f = 0$, $y(f) = 0$) and other government benefits (i.e., $b = 0$, $s(b) = 0$). Also assume $\tau = 0$ and $\frac{dc}{dD} = 0$. Then the work response reflects the relative drug disincentive effect (i.e., DSP tax $\sigma'(p)$ relative to wage subsidy $w'(p)$):

$$\frac{dh}{dD} = \underbrace{\frac{\sigma'(p_0)}{w'(p_0)}}_{\text{Relative drug disincentive}} \underbrace{- \frac{w''(p)}{w'(p)}\left(\frac{v''(h)\sigma'(p)}{u'(c)(w'(p)^2 + v''(h)w''(p)h}\right)h}_{\text{Second-order wage effect}}$$

B.4 Determining the change in household welfare

Taking a Taylor expansion of household utility (V) around the initial allocation $(c_0, h_0, f_0, b_0, p_0)$:

$$\begin{aligned} dV \approx & (1+\kappa p_0)u'(c_0)(c-c_0) - v'(h_0)(h-h_0) - y'(f_0)(f-f_0) \\ & - (1-\eta p_0)s'(b_0)(b-b_0) - [z'(p_0) - \kappa u(c_0) - \eta s(b_0)](p-p_0) \\ & + \frac{1}{2}[(1+\kappa p_0)u''(c_0)(c-c_0)^2 - v''(h_0)(h-h_0)^2 - y''(f_0)(f-f_0)^2 \\ & - (1-\eta p_0)s''(b_0)(b-b_0)^2 - z''(p_0)(p-p_0)^2] \\ & + \kappa u'(c_0)(c-c_0)(p-p_0) - \eta s'(b_0)(b-b_0)(p-p_0) \end{aligned} \tag{17}$$

We determine the consumption change from the budget constraint (where we sign loss as being positive):

$$\begin{aligned} & c = w(p)h(1-\tau) + D(1-\sigma(p)) + b(1-\delta D) + f(1-\alpha D)(1-\tau) \\ \implies & dc = \underbrace{dD\,(1-\sigma(p) - \delta b - \alpha f(1-\tau))}_{\text{mechanical change} > 0} \\ & \quad + \underbrace{w(p)(1-\tau)\frac{dh}{dD}dD}_{\text{work adjustment} < 0} + \underbrace{\left(hw'(p)(1-\tau)\frac{dp}{dD} - D\sigma'(p)\frac{dp}{dD}\right)dD}_{\text{Rx adjustment} < 0} \\ & \quad + \underbrace{(1-\delta D)\frac{db}{dD}dD}_{\text{other program adjustment} < 0} + \underbrace{(1-\alpha D)(1-\tau)\frac{df}{dD}dD}_{\text{family adjustment} < 0} \end{aligned} \tag{18}$$

Substitute dc into dV to get:

$$\begin{aligned} dV \approx & \underbrace{(1+\kappa p_0)u'(c_0)\,(1-\sigma(p_0) - \delta b_0 - \alpha f_0(1-\tau))\,dD}_{\text{First-order effect (excludes behavioral responses)}} \\ & \underbrace{-\frac{1}{2}(1+\kappa p_0)u''(c_0)\left(\frac{dc}{dD}dD\right)^2}_{\text{Second-order effect from consumption loss}} \\ & \underbrace{-\frac{1}{2}\left[v''(h_0)\left(\frac{dh}{dD}dD\right)^2 + y''(f_0)\left(\frac{df}{dD}dD\right)^2 + (1-\eta p_0)s''(b_0)\left(\frac{db}{dD}dD\right)^2 + z''(p_0)\left(\frac{dp}{dD}dD\right)^2\right]}_{\text{Second-order effect from behavioral responses (work, R}_\text{x}\text{, other programs, family)}} \\ & \underbrace{+\kappa u'(c_0)\left(\frac{dc}{dD}dD\right)\left(\frac{dp}{dD}dD\right) - \eta s'(b_0)\left(\frac{db}{dD}dD\right)\left(\frac{dp}{dD}dD\right)}_{\text{Second-order effect from behavioral responses (interactions)}} \end{aligned} \tag{19}$$

Notice that the first-order welfare effects of DSP loss do not depend on behavioral responses.

However, the behavioral responses show up in the second-order welfare effects.

Notice that dV in equation (19) is a function of unknown preference terms like u'', v'', y'', s'', and z''. By implicitly differentiating the FOCs, we can replace these unknown preference terms with known behavioral responses:

$$\begin{aligned}
v''(h)\frac{dh}{dD}dD =& u''(c)(1+\kappa p)w(p)(1-\tau)\frac{dc}{dD}dD + u'(c)(1-\tau)[\kappa w(p) + (1+\kappa p)w'(p)]\frac{dp}{dD}dD \\
z''(p)\frac{dp}{dD}dD - \kappa u'(c)\frac{dc}{dD}dD - \eta s'(b)\frac{db}{dD}dD & \\
=& u''(c)(1+\kappa p)[w'(p)h(1-\tau) - D\sigma'(p)]\frac{dc}{dD}dD \\
&+ u'(c)\kappa[w'(p)h(1-\tau) - D\sigma'(p)]\frac{dp}{dD}dD \\
&+ u'(c)(1+\kappa p)[w''(p)h(1-\tau)\frac{dp}{dD}dD + w'(p)(1-\tau)\frac{dh}{dD}dD - \sigma'(p)dD] \\
s''(b)(1-\eta p)\frac{db}{dD}dD - \eta s'(b)\frac{dp}{dD}dD & \\
=& u''(c)(1+\kappa p)(1-\delta D)\frac{dc}{dD}dD + u'(c)\kappa(1-\delta D)\frac{dp}{dD}dD + u'(c)(1+\kappa p)(-\delta D) \\
y''(f)\frac{df}{dD}dD =& u''(c)(1+\kappa p)(1-\alpha D)(1-\tau)\frac{dc}{dD}dD \\
&+ u'(c)(1+\kappa p)(-\alpha dD)(1-\tau) + u'(c)\kappa(1-\alpha D)(1-\tau)\frac{dp}{dD}dD
\end{aligned} \tag{20}$$

We substitute these terms into the dV expression to get the change in household welfare as as function of behavioral responses. To express the welfare loss in terms of willingness to

pay, we divide dV by the marginal utility of consumption:

$$
\begin{aligned}
WTP \equiv \frac{dV}{(1+\kappa p)u'(c)} = {} & [1-\sigma(p_0)-\delta b_0-\alpha f_0(1-\tau)]\,dD \\
& + \frac{1}{2}\left(\frac{dc}{dD}dD\right)^2\left[\gamma\frac{1}{c_0}\right] \\
& + \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{dh}{dD}dD\right)\left[\gamma\frac{1}{c_0}w(p)(1-\tau)\right] \\
& - \frac{1}{2}\left(\frac{dh}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{\kappa}{1+\kappa p}w(p)(1-\tau)+2w'(p)(1-\tau)\right] \\
& - \left(\frac{db}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{2\eta(1-\delta D)}{1-\eta p}+\frac{\kappa}{2(1+\kappa p)}(1-\delta D)\right] \\
& - \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[-\frac{\kappa}{1+\kappa p}-\gamma\frac{1}{c_0}[w'(p)h(1-\tau)-D\sigma'(p)]\right] \\
& - \frac{1}{2}\left(\frac{dp}{dD}dD\right)^2\left[\frac{\kappa}{1+\kappa p}[w'(p)h(1-\tau)-D\sigma'(p)]+w''(p)h(1-\tau)\right] \\
& + \frac{1}{2}\left(\frac{dp}{dD}dD\right)(dD)\left[\sigma'(p)\right] \\
& + \frac{1}{2}\left(\frac{db}{dD}dD\right)\left(\frac{dc}{dD}dD\right)\left[\gamma\frac{1}{c_0}(1-\delta D)\right] \\
& + \frac{1}{2}\left(\frac{db}{dD}dD\right)(dD)\left[\delta\right] \\
& + \frac{1}{2}\left(\frac{dc}{dD}dD\right)\left(\frac{df}{dD}dD\right)\left[\gamma\frac{1}{c_0}(1-\alpha D)(1-\tau)\right] \\
& - \frac{1}{2}\left(\frac{df}{dD}dD\right)\left(\frac{dp}{dD}dD\right)\left[\frac{\kappa}{1+\kappa p}(1-\alpha D)(1-\tau)\right] \\
& + \frac{1}{2}\left(\frac{df}{dD}dD\right)(dD)\left[\alpha(1-\tau)\right]
\end{aligned}
\tag{21}
$$

where $\gamma \equiv -\frac{u''(c_0)}{u'(c_0)}c_0$ is the coefficient of relative risk aversion.

Notice that (with the exception of γ) we can write the change in private welfare entirely in terms of behavioral responses (and wage and tax functions) without any preferences (e.g., marginal disutility of drugs). In other words, assuming that households maximize the objective function in equation (6), the behavioral responses are sufficient for the change in private welfare due to DSP removal, without needing to know preferences (other than γ). Recall from the discussion in Section 5.1 that the behavioral responses themselves are a function of preferences.

B.5 Welfare analysis with limited margins of adjustment

Suppose that we used a non-marginal welfare analysis but that the only observable margin of adjustment, as is the case in most previous work, was the DSP recipient's own work. The problem would become the following:

$$\begin{aligned} V = \max_{c,h} \; & u(c) - v(h) \\ \text{s.t. } & c \leq wh + D - \tau(wh) \end{aligned} \tag{22}$$

The first order conditions are as follows:

$$u'(c) = \lambda \tag{23}$$

$$v'(h) = \lambda w \tag{24}$$

$$wh + D - \tau(wh) - c = 0 \tag{25}$$

Implicit differentiation of the FOCs, and assuming the tax function $\tau()$ is linear, yields:

$$\begin{aligned} v''(h)\frac{dh}{dD}dD &= u''(c)w(1-\tau'(wh))\frac{dc}{dD}dD \\ w(1-\tau'(wh))\frac{dh}{dD}dD + 1 - \frac{dc}{dD}dD &= 0 \end{aligned}$$

The change in private welfare becomes

$$\begin{aligned} dV_{\text{simple}} &= u'(c_0)dD - \frac{1}{2}u''(c_0)\left(\frac{dc}{dD}dD\right)^2 - \frac{1}{2}v''(h_0)\left(\frac{dh}{dD}dD\right)^2 \\ &= u'(c_0)dD - \frac{1}{2}u''(c_0)\left(\frac{dc}{dD}dD\right)^2 - \frac{1}{2}w_0\left[u''(c)(1-\tau'(w_0h_0))\left(\frac{dc}{dD}dD\right)\left(\frac{dh}{dD}dD\right)\right] \end{aligned} \tag{26}$$

The willingness to pay to avoid DSP loss becomes

$$\begin{aligned} WTP_{\text{simple}} &\equiv \frac{dV}{u'(c_0)} \\ &= dD + \frac{1}{2}\frac{\gamma}{c_0}\left(\frac{dc}{dD}dD\right)^2 + \frac{1}{2}\frac{\gamma}{c_0}w_0(1-\tau'(w_0h_0))\left(\frac{dc}{dD}dD\right)\left(\frac{dh}{dD}dD\right) \end{aligned} \tag{27}$$

B.6 Welfare analysis with state-dependent disutility of work

We consider a modification of the basic utility setup in which the disutility of work depends on DSP receipt. This modification allows for the possibility that DSP recipients,

when removed from DSP, learn that their disutility of work is not as high as they previously thought, and therefore that working might improve their well-being.

In the modified setup, the disutility of work becomes a function of both h and D:

$$\begin{aligned} V = \max_{c,h,f,b,p} &(1+\kappa p)u(c) - v(h,D) - y(f) - (1-\eta p)s(b) - z(p) \\ \text{s.t. } & c \leq w(p)h(1-\tau) + D(1-\sigma(p)) + f(1-\alpha D)(1-\tau) + b(1-\delta D) \end{aligned} \tag{28}$$

with

$$v(h,D) = \frac{1}{2}\omega D h^2 \tag{29}$$

The first order conditions with respect to h becomes:

$$v_h(h,D) = \lambda w(p)(1-\tau'(w(p)h)) \tag{30}$$

Implicit differentiation of this FOC yields

$$v_{hh}(h,D)\frac{dh}{dD}dD + v_{hD}(h,D)dD = u'(c)w'(p)(1-\tau')\frac{dp}{dD}dD + u_{cc}(c)w(p)(1-\tau')\frac{dc}{dD}dD$$

and the change in private welfare and willingness to pay become

$$dV_{\text{workgood}} = dV - v_{hD}dD\left(\frac{dh}{dD}dD\right) \tag{31}$$

$$WTP_{\text{workgood}} = WTP - \frac{v_{hD}}{u_c}dD\left(\frac{dh}{dD}dD\right) \tag{32}$$

where dV and WTP are defined in equation (21).

Suppose $u(c) = 2\sqrt{c}$ so $u'(c) = \frac{1}{\sqrt{c_0}}$, and $\omega = 2.0e-09$. For those who live with family, the net household welfare loss (WTP) under state-dependent utility is \$100, a decrease of \$780 (88% decrease) relative to the baseline model. The relative drop is so large for this group in part because the baseline welfare loss is small to begin with. In contrast, for those who live alone (who do not increase their own earnings much), the net household welfare loss under state-dependent utility is \$14,644, approximately the same (1% decrease) as under the baseline model. Appendix Figure A.15 shows welfare loss under different values of ω, which determines the disutility of work. Assuming work to not be harmful does not change the welfare picture of DSP loss much.

B.7 Derivation of income effect and prescription disincentive channel

Setting $f = 0$, $\sigma(p) = 0$, $b = 0$, $\frac{dc}{dD} = 0$, $\tau = 0$ and $\eta = 0$ we get the following first order conditions:

$$\begin{aligned} v'(h) =&(1+\kappa p)u'(c)w(p) \\ z'(p) =&\kappa u(c) + (1+\kappa p)u'(c)w'(p)h \\ c =&w(p)h + D \end{aligned} \tag{33}$$

Implicitly differentiating these and the budget constraint we get:

$$\begin{aligned} v''(h)\frac{dh}{dD} =&\frac{dp}{dD}\left((1+\kappa p)u'(c)w'(p) + \kappa p u'(c)w(p)\right) \\ z''(p)\frac{dp}{dD} =&\frac{dp}{dD}\left(\kappa u'(c)w'(p)h + (1+\kappa p)u'(c)w''(p)h\right) + \frac{dh}{dD}(1+\kappa p)u'(c)w'(p) \\ 0 =&\frac{dp}{dD}w'(p)h + \frac{dh}{dD}w(p) + 1 \\ \implies \frac{dp}{dD} =&\frac{(1+\kappa p)u'(c)w'(p)}{z''(p) - \kappa u'(c)w'(p)h - (1+\kappa p)u'(c)w''(p)h}\frac{dh}{dD} \\ \implies \frac{dh}{dD} =&\frac{1}{w(p)}\frac{\left(z''(p) - \kappa u'(c)w'(p)h - (1+\kappa p)u''(c)w''(p)h\right)w(p)}{(1+\kappa p)u''(c)(w'(p))^2 + z''(p)w(p) - \kappa u'(c)w(p)w'(p)h - (w+\kappa p)u'(c)w(p)w''(p)h} \\ \frac{dh}{dD} =&-\frac{(1+\kappa p)u'(c)}{v'(h)}\alpha_h \end{aligned} \tag{34}$$

where $\alpha_h = \frac{(z''(p)-\kappa u'(c)w'(p)h-(1+\kappa p)u''(c)w''(p)h)w(p)}{(1+\kappa p)u''(c)(w'(p))^2+z''(p)w(p)-\kappa u'(c)w(p)w'(p)h-(w+\kappa p)u'(c)w(p)w''(p)h}$.

Now we bring back in the prescription disincentive, but let $z(p) = 0$. The FOCs are:

$$\begin{aligned} 0 =&u'(c)(w'(p)h - D\sigma'(p)) \\ \implies w'(p)h =&D\sigma'(p) \\ v'(h) =&u'(c)w(p) \end{aligned} \tag{35}$$

Implicitly differentiating these and the budget constraint we get:

$$
\begin{aligned}
0 =& w'(p)\frac{dh}{dD} + w''(p)h\frac{dp}{dD} - \sigma'(p) \\
v''(h)\frac{dh}{dD} =& u'(c)w'(p)\frac{dp}{dD} \\
\implies \frac{u'(c)w'(p)}{v''(h)}\frac{dp}{dD} =& \frac{\sigma'(p) - w''(p)h\frac{dp}{dD}}{w'(p)} \\
\sigma'(p) - w''(p)h\frac{dp}{dD} =& \frac{u'(c)(w'(p))^2}{v''(h)}\frac{dp}{dD}
\end{aligned} \tag{36}
$$

$$
\begin{aligned}
\frac{dp}{dD} =& \frac{v''(h)\sigma'(p)}{u'(c)(w'(p))^2 + v''(h)w''(p)h} \\
\frac{dh}{dD} =& \frac{\sigma'(p)}{w'(p)} - \frac{w''(p)}{w'(p)}\frac{v''(h)\sigma'(p)}{u'(c)(w'(p))^2 + v''(h)w''(p)h}
\end{aligned}
$$