The Effect of Disability Benefits Loss on Earnings, Income, and Health Care Utilization

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Abstract

Many developed countries are responding to the recent increase in disability insurance claiming in by tightening eligibility criteria. Using newly available Australian administrative data, we evaluate the effects of this increased stringency in Australia's Disability Support Pension (DSP) on the earnings, income, and health care utilization of disability recipients. We take advantage of a 2014 reform that tightened eligibility criteria for current recipients based on birth date and date of DSP entry. We find that removing young beneficiaries from DSP leads them to replace about one-half of the lost DSP income with income from other government programs (primarily Newstart Allowance, a type of unemployment benefit) and another one-third with labor market earnings. In addition, spouses and parents of DSP recipients have strong labor market responses to the individual's DSP removal. As a result, on net we estimate that DSP removal has no effect on total household income. Turning to health care utilization, we find an increase in the use of prescription drugs, driven by drugs used to treat mental health conditions. We find suggestive evidence that removed DSP beneficiaries increase their use of mental health drugs in order to facilitate their transition to work. We discuss the welfare implications of our findings.

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1 Introduction

Over the past two decades, Australia has made several changes to Disability Support Pension (DSP) aimed at increasing the stringency of the program. These include tighter eligibility criteria, more frequent and stricter medical reviews, and work requirements for young people. To our knowledge, little evidence exists on the effects of these changes on actual and potential DSP beneficiaries. Moreover, although there is substantial evidence on the effects of disability benefits on labor supply from other countries, there is little evidence from any country on household income more broadly or on other outcomes like health care utilization. [1]

In this paper, we use two natural experiments created by a 2014 reform to identify the causal effect of removing DSP beneficiaries on their individual earnings and income, household earnings and income, and medical and prescription spending. In 2014, the Department of Social Services (DSS) increased the number and stringency of medical reviews for DSP recipients whom it considered to have work potential. The goal of this reform was to make the medical standard for current recipients equivalent to the recently-updated (in 2012) medical standard for new applicants. Current recipients under the age of 35 years old who entered DSP between January 1, 2008, and December 31, 2011, faced a higher likelihood of receiving a medical review than those over 35 years old or those who started receiving benefits before 2008. This reform thus created two related natural experiments: a jump in the likelihood of receiving a medical review for current recipients who had entered DSP just after January 1, 2008; and a jump in the likelihood of receiving a medical review for current recipients who had a 35th birthday just after July 1, 2014. We use these two cutoffs in a regression discontinuity design to estimate the effect of DSP loss on earnings, income, and medical and prescription spending.

We find that removing DSP beneficiaries from DSP leads them to replace about one-half of the lost DSP income with income from other government programs (primarily Newstart Allowance, now JobSeeker Payment) and another one-third with labor market earnings. We also find an increase in the use of prescription drugs, driven by drugs used to treat mental health conditions. We find suggestive evidence that removed DSP beneficiaries increase their use of mental health drugs in order to facilitate their transition to work.

[1] Notable exceptions include Autor et al. (2019), who study the effect of disability insurance on household consumption and spouse labor supply in Norway; and Black et al. (2024) and Gelber et al. (2023), who study the effect of DI on mortality in the United States.

2 Data and sample characteristics

2.1 Data linkage and analysis file construction

We link datasets from several agencies through the Australian Bureau of Statistics (ABS) Multi-Agency Data Integration Project (MADIP) using the ABS synthetic ID. 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 also identify the spouses of DSP recipients using MADIP data. DSP recipients are required to report spouses, from both legal and de facto marriages, to DSS. [2]Therefore we can link DSP recipients to spouse earnings, government benefit receipt, and health care utilization.

To construct the analysis file, we start with the Benefit Determination History File and identify individuals who have ever received DSP. We keep up to five DSP episodes starting in chronological order (99% of recipients have 5 or fewer episodes). The Data Over Multiple Individual Occurrences (DOMINO) Demographics File and the 2011 Census provide demographic information, including education, family structure, and ethnicity. 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. Below we describe how we link recipients to their corresponding medical reviews. Note that the data include only the month and year of birth for individuals, not date of birth. This means that in the Birth Date experiment the running variable is the same for everyone born in the same month.

Turning to income, we obtain employer-reported earnings from the Australian Taxation Office (ATO) for each fiscal year between 2002 and 2022. We aggregate earnings from different employers at the individual-fiscal year level. We construct annual benefit receipt for DSP and other income support programs using the daily allowance amount in the Benefit Payment History File. For any individual who does not appear in the earnings data, we consider them to have zero earnings; the same is true for government benefit receipt. [3]

Our medical and prescription drug utilization measures come from the annual MBS and PBS extracts. We use "scheduled fees" in the MBS files as our measure of total medical spending that consists a list of health professional services subsidized by the Australian

[2]However, it is possible that some recipients do not report marriages, especially since spouse earnings can reduce the DSP benefit amount. To account for the possibility that DSP removal could affect marital status, we keep self-reported spouses as of July 2014, before the reform occurs.

[3]ATO data, including employer-reported earnings, are measured in fiscal years rather than calendar years. Since most other outcomes are measured by calendar year, we use calendar-year outcomes for all income sources except for earnings. In the future, we plan to test the robustness of our results to calculating annual benefit receipt at the fiscal year level.

Government. We use the "benefit amount" in the PBS files as our measure of prescription spending. We do not observe healthcare utilization that are not covered by MBS or PBS, including a substantial share of inpatient stays, ambulance services, most dental and vision services, and hearing aids. We consider individuals to have zero utilization if we do not observe any claim in a given year. We code health care utilization as missing if an individual in our sample does not have a valid or multiple DOMINO or MBS identifiers; this is less than 0.1 percent of our sample.

2.2 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 (Cutoff 1, discussed in detail below), 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 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. 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 819,733 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 (which we understand to be the date of onset, application, and/or eligibility) 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. Of the DSP start dates that are matched to a medical review, 90.6% have 0 days difference between the DSP start date and the medical review start/eligibility 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 assessed 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.[4] Therefore, work capacity is sometimes missing in the medical review that matches to a DSP spell; in our sample, 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%.

2.3 Sample characteristics

Table 1 presents means for full DSP population receiving benefits in 2014 and the specific samples that we use for the RD designs in this paper. Differences between the full DSP population and our samples reflect the fact that medical reviews were targeted at younger recipients and recipients with certain types of conditions. Compared to the full DSP population, the combined medical review sample is more likely to have a psychological or intellectual condition (and less likely to have a musculoskeletal condition), more likely to have worked in 2013 and to be deemed work capable, less likely to be married, and more likely to be a high school graduate or greater.

Within our quasi-experimental sample, we also calculate characteristics for the "complier" population (calculated using the methodology in mostly-harmless): DSP recipients who would be removed if they received a medical review but would not be removed without a review. We estimate the complier population to be 16% of the quasi-experimental sample. Compared to the quasi-experimental sample, the complier sample is more likely to have a musculoskeletal condition (less likely to have an intellectual disability), more likely to have a low impairment rating, more likely to be high school graduate or greater, and more likely to be married. These differences are consistent with medical reviews removing individuals who are more work-capable.

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

Table 1: Summary statistics

	Full DSP Population			Start Date RD			Birth Date RD			Combined RDs Sample			
Variable	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Compliers
Male (D)	0.530	0.499	819,733	0.599	0.490	11,668	0.585	0.493	6,924	0.594	0.491	18,592	0.565
Edu (D): Less than HS	0.446	0.497	285,473	0.442	0.497	9,992	0.394	0.489	5,866	0.424	0.494	15,858	0.291
Edu (D): HS grad	0.512	0.500	285,473	0.505	0.500	9,992	0.545	0.498	5,866	0.520	0.500	15,858	0.695
Edu (D): Missing	0.661	0.473	819,733	0.166	0.372	11,668	0.179	0.383	6,924	0.171	0.376	18,592	−0.033
Spouse Jul 2014(D): yes	0.271	0.445	819,733	0.120	0.325	11,668	0.190	0.392	6,924	0.146	0.353	18,592	0.187
Spouse Jul 2014(D): no	0.729	0.445	819,733	0.880	0.325	11,668	0.810	0.392	6,924	0.854	0.353	18,592	0.813
Live with Parent Jul 2014(D): yes	0.092	0.288	819,733	0.421	0.494	11,668	0.167	0.373	6,924	0.327	0.469	18,592	0.285
Live with Parent Jul 2014(D): no	0.908	0.288	819,733	0.579	0.494	11,668	0.833	0.373	6,924	0.673	0.469	18,592	0.715
State (D): NSW	0.321	0.467	819,665	0.288	0.453	11,668	0.315	0.464	6,924	0.298	0.457	18,592	0.261
State (D): QLD	0.206	0.404	819,665	0.233	0.423	11,668	0.208	0.406	6,924	0.223	0.416	18,592	0.241
State (D): SA	0.090	0.286	819,665	0.092	0.289	11,668	0.080	0.272	6,924	0.088	0.283	18,592	0.086
State (D): VIC	0.243	0.429	819,665	0.251	0.434	11,668	0.255	0.436	6,924	0.253	0.435	18,592	0.253
State (D): WA	0.075	0.264	819,665	0.081	0.273	11,668	0.075	0.263	6,924	0.079	0.270	18,592	0.097
Matches to Census (C)	0.732	0.443	819,733	0.704	0.457	11,668	0.665	0.472	6,924	0.689	0.463	18,592	0.682
Edu (C): Less than HS	0.594	0.491	526,289	0.465	0.499	7,622	0.469	0.499	4,183	0.466	0.499	11,805	0.485
Edu (C): HS grad	0.406	0.491	526,289	0.535	0.499	7,622	0.531	0.499	4,183	0.534	0.499	11,805	0.515
Edu (C): Missing	0.358	0.479	819,733	0.347	0.476	11,668	0.396	0.489	6,924	0.365	0.481	18,592	0.363
Married (C)	0.322	0.467	600,096	0.111	0.314	8,213	0.244	0.430	4,603	0.159	0.366	12,816	0.199
Not married (C)	0.594	0.491	600,096	0.810	0.392	8,213	0.667	0.471	4,603	0.759	0.428	12,816	0.729
Labor force (C): NILF in 2011	0.768	0.422	600,096	0.691	0.462	8,213	0.773	0.419	4,603	0.720	0.449	12,816	0.689
Labor force (C): employed in 2011	0.152	0.359	600,096	0.184	0.388	8,213	0.126	0.331	4,603	0.163	0.370	12,816	0.141
Labor force (C): unemployed in 2011	0.040	0.196	600,096	0.097	0.297	8,213	0.070	0.255	4,603	0.088	0.283	12,816	0.135
Ethnicity (C): Oceanic	0.255	0.436	600,096	0.318	0.466	8,213	0.269	0.444	4,603	0.300	0.458	12,816	0.301
Ethnicity (C): European	0.603	0.489	600,096	0.571	0.495	8,213	0.584	0.493	4,603	0.576	0.494	12,816	0.582
Ethnicity (C): other	0.141	0.348	600,096	0.111	0.314	8,213	0.147	0.354	4,603	0.124	0.329	12,816	0.118
Aboriginal (C)	0.049	0.216	600,096	0.070	0.255	8,213	0.066	0.249	4,603	0.069	0.253	12,816	0.073
Fam (C): 2 parents	0.263	0.440	599,976	0.393	0.489	8,213	0.337	0.473	4,603	0.373	0.484	12,816	0.322
Fam (C): 1 parent	0.190	0.392	599,976	0.258	0.438	8,213	0.226	0.419	4,603	0.247	0.431	12,816	0.290
Fam (C): single	0.368	0.482	599,976	0.268	0.443	8,213	0.357	0.479	4,603	0.300	0.458	12,816	0.280
Condition (M): psy	0.327	0.469	561,057	0.475	0.499	11,257	0.596	0.491	6,617	0.520	0.500	17,874	0.485
Condition (M): int	0.099	0.299	561,057	0.240	0.427	11,257	0.047	0.212	6,617	0.169	0.375	17,874	0.109
Condition (M): mus	0.268	0.443	561,057	0.061	0.239	11,257	0.139	0.346	6,617	0.090	0.286	17,874	0.139
Condition (M): oth	0.258	0.437	561,057	0.173	0.379	11,257	0.175	0.380	6,617	0.174	0.379	17,874	0.221
Max imp rating (M): ≥20	0.922	0.269	506,821	0.950	0.219	10,443	0.951	0.216	6,305	0.950	0.218	16,748	0.930
Sum imp rating (M): <25	0.538	0.499	506,821	0.548	0.498	10,443	0.651	0.477	6,305	0.587	0.492	16,748	0.668
Sum imp rating (M): ≥25	0.462	0.499	506,821	0.452	0.498	10,443	0.349	0.477	6,305	0.413	0.492	16,748	0.332
Sum imp rating (M): missing	0.382	0.486	819,733	0.105	0.307	11,668	0.089	0.285	6,924	0.099	0.299	18,592	0.031
Work cap w/o (M): 0	0.624	0.484	388,787	0.434	0.496	10,715	0.451	0.498	6,584	0.440	0.496	17,299	0.438
Work cap w/o int (M): >0	0.376	0.484	388,787	0.566	0.496	10,715	0.549	0.498	6,584	0.560	0.496	17,299	0.562
Work cap w/o int (M): missing	0.526	0.499	819,733	0.082	0.274	11,668	0.049	0.216	6,924	0.070	0.254	18,592	0.001
Work cap w int (M): >0	0.619	0.486	387,042	1.000	0.000	10,663	1.000	0.000	6,548	1.000	0.000	17,211	1.000
Work cap w/int (M): missing	0.528	0.499	819,733	0.086	0.281	11,668	0.054	0.227	6,924	0.074	0.262	18,592	0.000
Labor force (T): pre-DSP earn = 0	0.590	0.492	503,631	0.631	0.483	11,668	0.442	0.497	6,924	0.561	0.496	18,592	0.464
Labor force (T): pre-DSP earn >0	0.410	0.492	503,631	0.369	0.483	11,668	0.558	0.497	6,924	0.439	0.496	18,592	0.536
Labor force (T): pre-reform earn = 0	0.847	0.360	819,726	0.736	0.441	11,668	0.823	0.382	6,924	0.769	0.422	18,592	0.746
Labor force (T): pre-reform earn >0	0.153	0.360	819,726	0.264	0.441	11,668	0.177	0.382	6,924	0.231	0.422	18,592	0.254
Med spending 2013 (MB): >median	0.656	0.475	813,609	0.495	0.500	11,609	0.611	0.488	6,869	0.538	0.499	18,478	0.462
Med spending 2013 (MB): <median	0.344	0.475	813,609	0.505	0.500	11,609	0.389	0.488	6,869	0.462	0.499	18,478	0.538
Rx spending 2013 (PB): >median	0.690	0.462	813,609	0.479	0.500	11,609	0.638	0.481	6,869	0.538	0.499	18,478	0.414
Rx spending 2013 (PB): <median	0.310	0.462	813,609	0.521	0.500	11,609	0.362	0.481	6,869	0.462	0.499	18,478	0.586

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 hours of work capacity with intervention". 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 hours of work capacity with intervention". The 'Combined RDs' sample stacks the 'Start Date RD' and 'Birth Date RD' 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).

3 Empirical strategy: variation in medical reviews

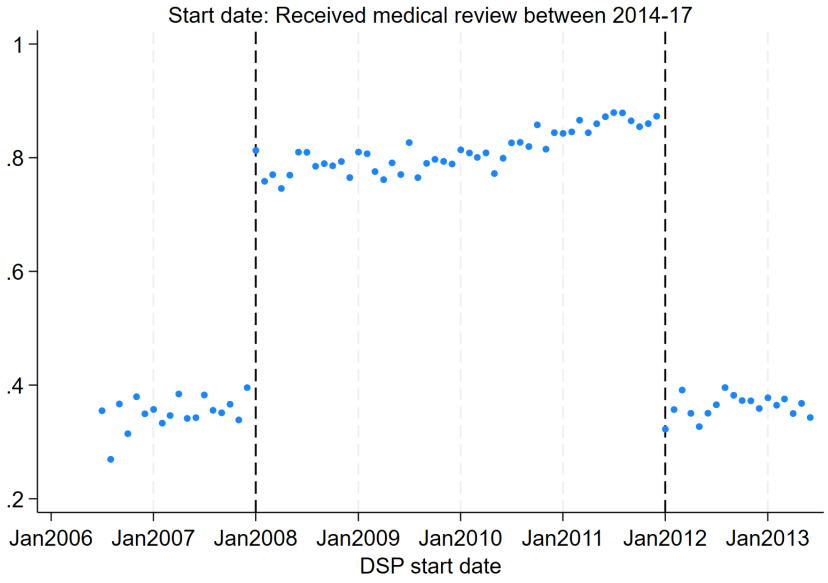
We start by discussing two related sources of variation in medical reviews among current DSP beneficiaries created by a 2014 reform. We test the validity of the designs and present basic estimates for each design. We then combine the two sources of variation to estimate the effect of DSP loss with more precision.

3.1 Cutoff 1: Increase in medical reviews based on start date

In 2014, DSS increased the number and stringency of medical reviews for young people (under 35) with a DSP start date between January 1, 2008, and December 31, 2011. The motivation for this policy was to re-evaluate existing DSP recipients using the new eligibility criteria that went into effect on January 1, 2012.

Figure 1 shows an increase in the number of medical reviews for DSP recipients with a start date between January 1, 2008, and December 31, 2011:

Figure 1: Higher medical review rates for DSP recipients with start date between 2008 and 2012

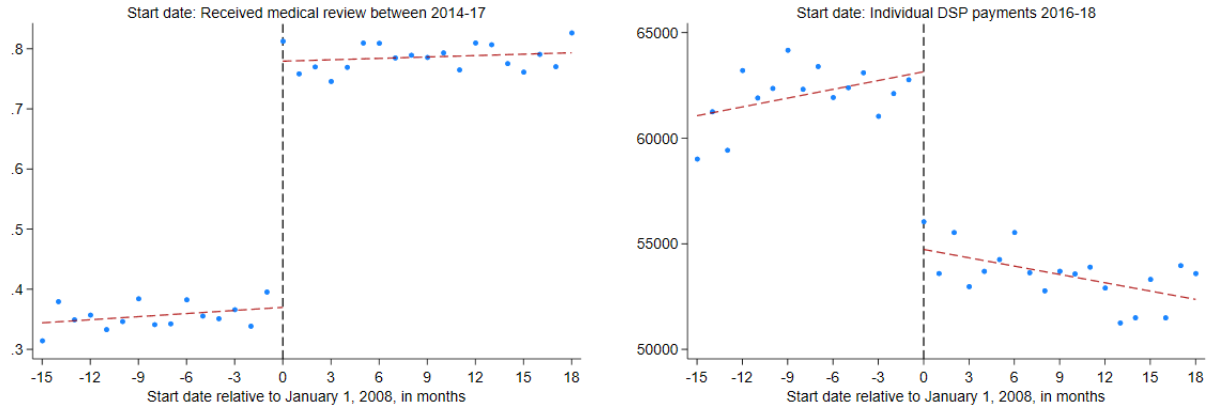


Notes: Figure shows likelihood of receiving a medical review between 2014 and 2017 by DSP start date. Sample is DSP recipients who turned 35 after July 1, 2014, who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 hours of work capacity with intervention".

Notice that there are two cutoffs: one on January 1, 2008, where review rates jump, and one on December 31, 2011, where review rates drop. The 2011 cutoff is invalid as a strategy for evaluating the effect of medical reviews because it is contaminated by the tightening of

eligibility criteria on January 1, 2012.[5] Therefore, we focus only on the January 1, 2008, cutoff. The left graph of Figure 2 shows, for the 2008 cutoff only, the discontinuity in the likelihood of receiving a medical review between July 1, 2014, and December 31, 2017, and the right graph shows DSP payments over the 3 years after the reviews were conducted (2016-18):

Figure 2: Start date RD: Medical review rate increases at 2008 cutoff



Notes: Left figure shows likelihood of receiving a medical review between 2014 and 2017 by start date for the Start Date RD sample. Right figure shows total DSP payments between 2016 and 2018 for the Start Date RD sample. 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 hours of work capacity with intervention".

The sample consists of individuals who entered DSP within a bandwidth around January 1, 2008, who turned 35 years old after July 1, 2014 (since the change only applied to young people), who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 hours of work capacity with intervention" (since these individuals were exempt from review).[6] We choose a bandwidth of 18 months on the right-hand side, but only 15 months on the left-hand side because the "work capacity with intervention" variable was introduced at the end of 2006 and has high rates of missing values before October 2006.

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

[5]Given the change in eligibility criteria on January 1, 2012, the people on either side of the December 31, 2011, cutoff may not be the same: those on the right-hand-side of the cutoff could be more severe, which would lead us to over-estimate the effect of the 2014 natural experiment studying effect of increase in medical reviews based on start date. In practice, we do not detect any differences in observable characteristics across this cutoff.

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

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, it is unlikely that either applicants or reviewers would have or could have tried to manipulate their start date to avoid a medical review. Appendix Table A.1 presents covariate balance tests for the Start Date RD design. We observe a rich set of covariates from the DOMINO data (D), Census data (C), DSS medical review file (M), Medicare data (MB), Pharmaceutical Benefit data (PB), and Australian Tax Office data (T). The discontinuities are small as a fraction of the control mean, and a joint F test of the coefficients fails to reject the null hypothesis that they are equal to zero.

Appendix Figure A.1 presents a histogram of start date around the January 1, 2008, cutoff. Although the density of start dates increases over time, there is no discrete change in density at the January 1, 2008, cutoff. These tests indicate that there was likely no manipulation or other type of selection around the cutoff.

We estimate the following estimating equation for the Start Date RD:

$$Y_i = \alpha_1 + \beta_1 AfterJan2008_i + \delta_1 StartDate_i + \gamma_1(StartDate_i \times AfterJan2008_i) + \epsilon_1 \quad (1)$$

where $AfterJan2008_i$ is an indicator having a start date 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 hours of work capacity with intervention" (since these individuals were exempt from review).

The results are shown in Appendix Table A.2 and Appendix Figure A.2. Having a start date after January 1, 2008, increases the likelihood of receiving a medical review between 2014-17 by 41 pp and the likelihood of losing DSP over this time period by 13.5 pp, which leads to a $8,400 reduction in DSP payments between 2016-18. On average, DSP recipients recover about 40% of this amount ($3,300) by substituting to other programs, and recover another one-third by increasing their labor market earnings. Among recipients who self-report having a spouse in the DOMINO data at the time of the reform (12%), spouses recover an additional one-half of the lost DSP with earnings (not significant).[7] Summing across DSP and non-DSP payments and earnings for the DSP recipient and spouse (where applicable), there is no change total household income as a result of DSP removal. Turning to health care utilization, we estimate a zero effect on medical spending, but a large and

[7]DSP recipients are required to report spouses, from both legal and defacto marriages, to DSS. However, it is possible that some recipients do not report marriages, especially since spouse earnings can reduce the DSP benefit amount. To account for the possibility that DSP removal could affect marital status, we keep self-reported spouses as of July 2014, before the reform occurs.

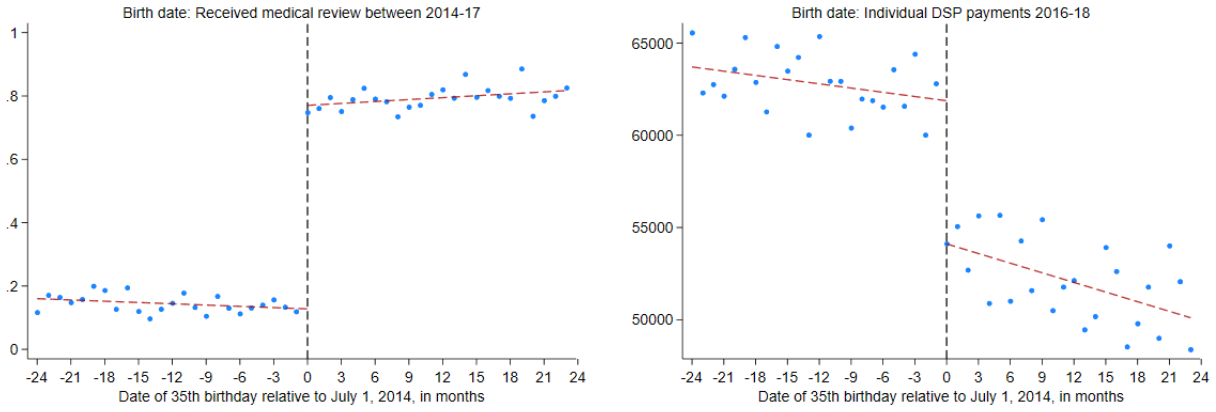
statistically significant increase in prescription spending. Appendix Table A.2 also presents IV estimates for the Start Date RD, which are the RD estimates scaled up by the "first stage" estimate of the effect of the cutoff on DSP loss between 2014 and 2017. In the Appendix, we show that the estimates are robust to controlling for covariates (Appendix Table A.9), to estimation using "rdrobust" (Appendix Table A.6), and to higher-order polynomials in the running variable (Appendix Table A.7 and Appendix Table A.8).

3.2 Cutoff 2: Increase in medical reviews and work requirements based on birth date

The second RD design comes from a jump in the likelihood of receiving a medical review among recipients with a 35th birthday just after July 1, 2014. (In addition to having a higher likelihood of medical review, these "young" recipients were also subject to new work requirements, called "program of support". We discuss below how this change could affect the interpretation of our results.)

The left graph of Figure 3 shows that DSP recipients with a 35th birthday on or after July 1, 2014, were more likely to get a medical review between 2014-17. The right graph shows that DSP recipients with a 35th birthday on or after July 1, 2014, received lower DSP payments between 2016-18:

Figure 3: Birth Date RD: Medical review rates increase after July 1, 2014, cutoff



Notes: Left figure shows likelihood of receiving a medical review between 2014 and 2017 by birth date for the Birth Date RD sample. Right figure shows total DSP payments between 2016 and 2018 for the Birth Date RD sample. The 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 (and thus were subject to higher review rates from the previous cutoff), who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 hours of work capacity with intervention".

The 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 (and

thus were subject to higher review rates from the previous cutoff), who were still receiving DSP benefits on July 1, 2014, and who were deemed neither "manifestly disabled" nor "0 hours of work capacity with intervention" (since these groups were exempt from medical reviews).

Once again, we probe the validity of the RD assumption that counterfactual outcomes (i.e., in the absence of the policy change) would be smooth around the cutoff. Manipulation is highly unlikely in this context because the running variable is birthdate. Appendix Table A.1 presents covariate balance tests for the RD design. Although the p-value on the joint F test is marginally significant, the discontinuities are generally small as a fraction of the control mean. In Appendix Table A.9, we show that our results are robust to controlling for covariates. Appendix Figure A.1 presents a histogram of 35th birthday around the July 1, 2014, cutoff. There is no discrete change in density around the birthdate cutoff.

We estimate the following equation for the Birth Date RD:

$$Y_i = \alpha_2 + \beta_2 Under35_i + \delta_2 BirthDate_i + \gamma_2(BirthDate_i \times Under35_i) + \epsilon_2 \quad (2)$$

where $Under35_i$ is an indicator having a 35th birthday on or 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 hours of work capacity with intervention".

The results are shown in Appendix Table A.2 and Appendix Figure A.2. Having a 35th birthday after July 1, 2014, increases the likelihood of receiving a medical review by 64 pp and the likelihood of losing DSP by 15.2 pp. These discontinuities are larger than those in the start date cutoff.[8] DSP payments over the next 3 years fall by $7,700 at the cutoff. On average, removed recipients recover about 60% of the lost DSP income by substituting to other programs ($4,100), and they recover another 40% by increasing their earnings ($3,100). Among self-reported married recipients (19%), spouses recover twice the amount of the lost DSP with earnings (marginally significant). Summing across DSP and non-DSP payments and earnings for the DSP recipient and spouse (where applicable), total household income decreases by about 20% of the original DSP loss. Appendix Table A.2 also presents IV estimates for the Birth Date RD, which are the RD estimates scaled up by the "first stage"

[8]This could be for a number of reasons. The birth date sample has higher rates of psychological conditions and lower rates of intellectual conditions, which have different review rates. The birth date sample also has fewer individuals who enter DSP when they are children, which could also affect review rates. The birth date sample also entered DSP on average later than the recipients in the start date cutoff and therefore have not had as long to be removed from DSP through other means (e.g., previous medical review, excess income).

estimate of the effect of the cutoff on DSP loss between 2014 and 2017. In the Appendix, we show that the estimates are robust to controlling for covariates (Appendix Table A.9), to estimation using "rdrobust" Calonico et al. (2018) (Appendix Table A.6), and to higher-order polynomials in the running variable (Appendix Table A.8 and Appendix Table A.7).

Finally, recall that DSP recipients with a 35th birthday after the cutoff were also subject to work requirements ("program of support"). 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.

4 Estimating the effects of DSP loss

We have established the validity of the Start Date and Birth Date RDs and estimated basic results for each design. Ultimately, we are interested in the effects of DSP loss, rather than the effects of the specific cutoffs. To estimate the effect of DSP loss with greater statistical power, we "stack" the start date and birth date samples and present our main analysis using this stacked sample.

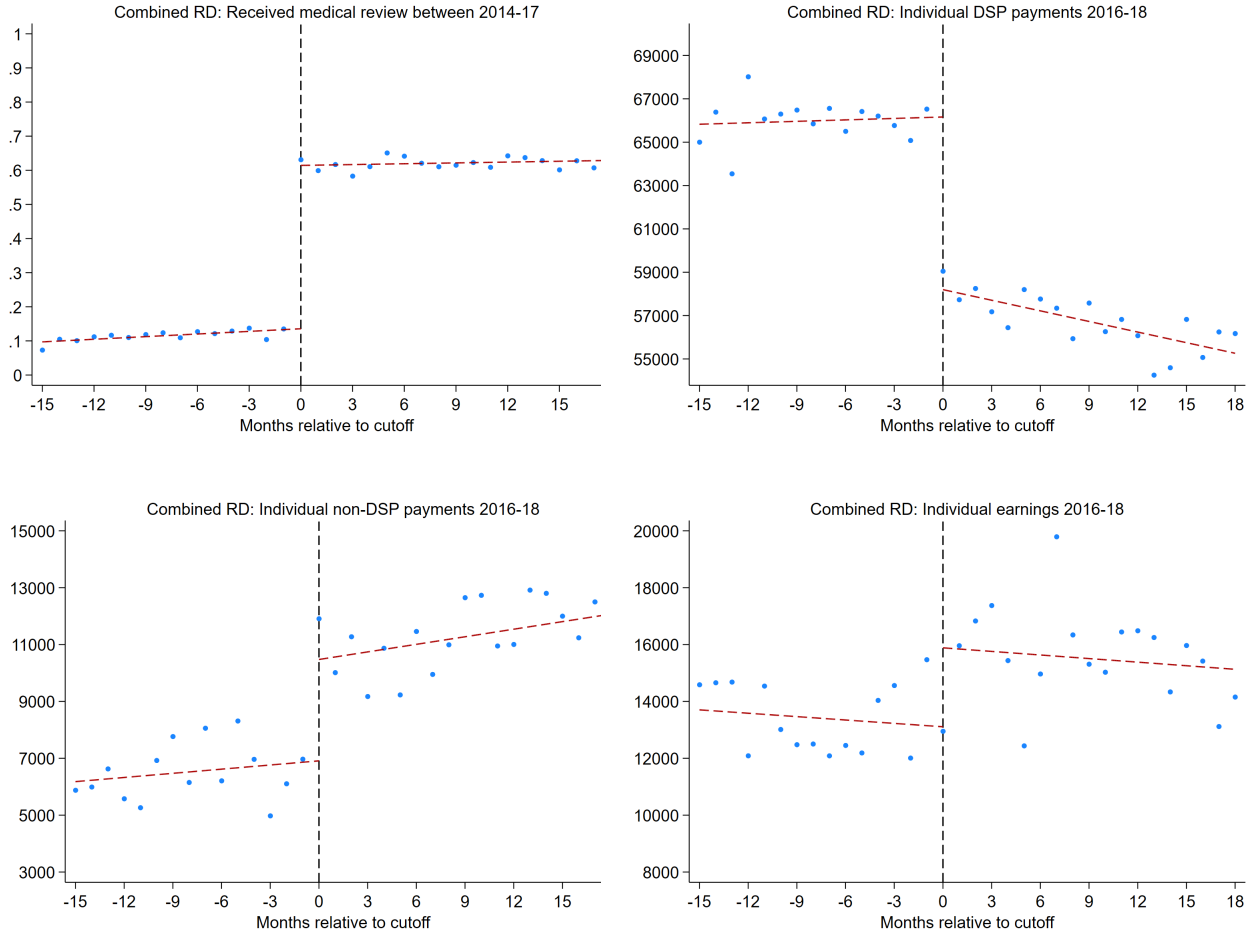
Figure 4 shows RD graphs for the stacked start date and birth date samples (see Appendix Figure A.2 for separate RD graphs for each cutoff). We plot the "Combined" experiment using the minimum bandwidth between the two cutoffs (i.e., the start date bandwidth): 15 months before the cutoff and 18 months after the cutoff. The top two graphs show a jump in medical review rates and a drop in DSP payments over the next 3 years in the combined sample. The bottom two graphs show that individuals substitute to other government programs and increase their earnings in response to DSP removal.

We estimate IV regressions of the effect of DSP loss by using the combined sample. In particular, we estimate the following first stage/reduced form regression on the combined sample:

$$\begin{aligned} Y_i = \quad & \alpha_3 + \beta_1(AfterJan2008_i \times StartExp_i) + \beta_2(Under35_i \times BirthExp_i) \\ & + \delta_1(StartDate_i \times StartExp_i) + \delta_2(BirthDate_i \times BirthExp_i) \\ & + \gamma_1(StartDate_i \times AfterJan2008_i \times StartExp_i) \\ & + \gamma_2(BirthDate_i \times Under35_i \times BirthExp_i) + \epsilon_3 \end{aligned} \tag{3}$$

where $StartExp_i$ is an indicator being in the start date experiment sample, $BirthExp_i$ is an indicator for being in the birth date experiment sample, and the other variables are the same as above.

Figure 4: Combined RD: Increase in medical reviews leads DSP recipients to substitute to other programs and work



Notes: Top left figure shows likelihood of receiving a medical review between 2014 and 2017 by birth date for the combined start date and birth date samples. Top right figure shows total DSP payments between 2016 and 2018 for the combined samples. Bottom left figure shows total non-DSP DOMINO payments from 2016 to 2018 for the combined samples. Bottom right figure shows total earnings between 2016 and 2018 for the combined samples. Combined sample stacks the start date sample (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 hours of work capacity with intervention") and the birth date sample (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 hours of work capacity with intervention").

We then estimate the following IV equation:

$$
\begin{aligned}
Y_i = \quad & \alpha_4 + \beta_4 DSPLoss_i + \delta_1(StartDate_i \times StartExp_i) + \delta_2(BirthDate_i \times BirthExp_i) \\
& + \gamma_1(StartDate_i \times AfterJan2008_i \times StartExp_i) \\
& + \gamma_2(BirthDate_i \times Under35_i \times BirthExp_i) + \epsilon_4
\end{aligned} \tag{4}
$$

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 $DSPLoss_i$.

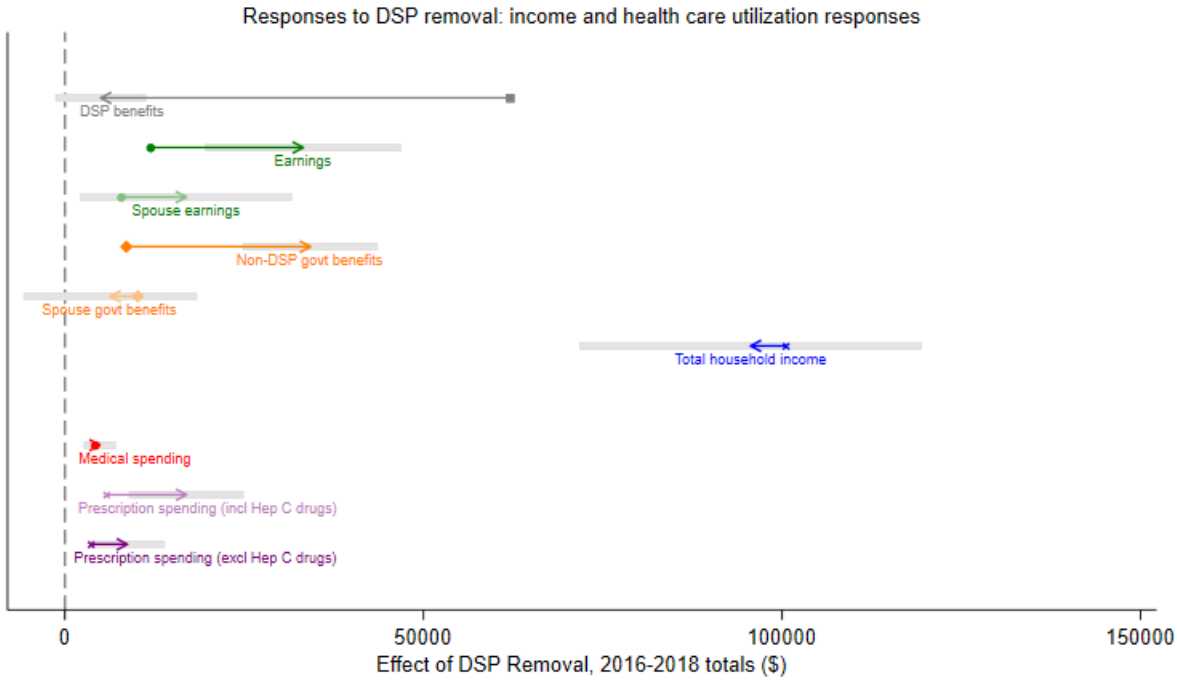
Figure 5 presents IV estimates of the effect of DSP removal; i.e., β_4 from equation 4. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate, so that the arrowhead represents the mean for those who are removed. In other words, DSP removal "moves" people from the marker to the arrowhead. The gray bars indicate 95% confidence intervals. Table 2 presents IV estimates for the start date and Birth Date RD designs separately, as well as the IV estimates from the combined specification.

Overall, DSP removal results in a loss of $57,000 in DSP benefits between 2016-18. Removed beneficiaries recover about one-half of the DSP income loss by substituting to other programs, mainly Newstart (see Appendix Table A.5), and another one-third of the loss by increasing labor market earnings, on both the extensive and intensive margins (see Table 2). Although only a minority of removed DSP recipients are married, spousal earnings increase substantially for those who are married. Summing over DSP benefits, non-DSP government benefits, and earnings for both the DSP recipient and spouse, we find that the overall drop in household income is small and statistically indistinguishable from zero. Five-year estimates of the effect of DSP removal are similar to the 3-year estimates (see Appendix Table A.3).

The Figure 6 presents IV estimates for earnings and income for various subgroups. The substitution to other programs is similar across subgroups (though, as show in Appendix Table A.5, women receive more Parenting Payment than men, and men receive more Newstart), but the substitution to work is heterogeneous across subgroups. High school graduates have a larger earnings response than those with less than a high school degree. Married individuals do not increase their earnings at all (instead, spouses increase their earnings substantially), but unmarried individuals have a large earnings response to removal. Perhaps surprisingly, the earnings response is larger for removed beneficiaries with higher impairment ratings. Across impairment types, the earnings response is slightly larger for those with psychological and intellectual conditions relative to other conditions, through the differences are not statistically significant.

The last three arrows of Figure 5 show the effects of DSP removal on medical and pre-

Figure 5: Responses to DSP removal: income and health care utilization responses



Notes: Figure plots IV estimates (i.e.β_4 of equation 4) of the effect of DSP loss on income and health care utilization outcomes. 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. "Earnings" are individual earnings from 2016-18, "Spouse earnings" are spouse earnings (where marriage is self-reported) from 2016-18 (unconditional on having spouse), "Non-DSP benefits" are individual non-DSP benefits from 2016-18, "Spouse govt benefits" are spouse government (DSP and non-DSP) benefits from 2016-18 (unconditional), and "Total household income" is the sum of own and spouse earnings and government (DSP and non-DSP) benefits from 2016-18. "Medical spending" is total spending on health care providers (inpatient and outpatient) from 2016-18, and "Prescription spending" is total spending on prescription drugs from 2016-18 (either including or excluding recently introduced Hepatitis C drugs). Combined sample stacks the Start Date RD and Birth Date RD samples."Low Impairment Rating" means that the sum of scores on all the 'impairment tables' that individuals who apply for DSP are assessed on is less than 25. "High Impairment Rating" means this total score is above or equal to 25.

scription spending. There is no economically or statistically significant increase in medical expenditures in response to DSP removal. However, there is a large and significant increase in prescription spending. Half of the overall increase in prescription spending is driven by the introduction of very expensive Hepatitis C drugs coverage under PBS in 2016, and is likely a matter of chance.[9] For this reason, we exclude Hepatitis C drugs for the remaining

[9]The treatment group has marginally more (0.3 percentage points, or 4%) people with Hepatitis C (ATC J05AP) prescriptions. Since a single 8-week course of the new Hepatitis C drugs cost upwards of $80,000, we see a large treatment effect on in Hepatitis C drug spending. However, it could also reflect different incentives to seek treatment when receiving DSP versus after being removed from DSP. The introduction of Hepatitis C direct-acting antiviral treatment (DAA) is considered a cure, which makes more difficult to establish DSP

Table 2: Combined sample: IV estimates of the effect of DSP loss

	Start				Birth				Both			
Variable	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Individual DSP payments 2016-18	−$62.28	$4.29	$62.80	11,668	−$51.14	$4.88	$61.42	6,924	−$57.04	$3.23	$62.05	18,592
Individual non-DSP payments 2016-18	$24.19	$5.94	$7.41	11,668	$27.26	$7.53	$9.54	6,924	$25.63	$4.81	$8.57	18,592
Individual DSP and non-DSP payments 2016-18	−$38.10	$6.45	$70.22	11,668	−$23.88	$8.10	$70.96	6,924	−$31.40	$5.15	$70.62	18,592
Individual Newstart payments 2016-18	$20.80	$2.10	$0.22	11,668	$19.99	$2.40	$0.26	6,924	$20.42	$1.61	$0.24	18,592
Individual earnings 2016-18	$21.80	$10.21	$17.15	11,668	$20.73	$8.95	$7.54	6,924	$21.30	$6.96	$11.91	18,592
Individual income 2016-18	−$16.30	$10.06	$87.36	11,668	−$3.14	$10.43	$78.50	6,924	−$10.11	$7.33	$82.53	18,592
Individual any earnings 2016-18	0.031	0.146	0.409	11,668	0.276	0.132	0.215	6,924	0.146	0.099	0.303	18,592
Individual earnings over $10K 2016-18	0.172	0.126	0.257	11,668	0.120	0.112	0.127	6,924	0.147	0.085	0.186	18,592
Individual earnings over $20K 2016-18	0.212	0.112	0.194	11,668	0.179	0.103	0.106	6,924	0.196	0.077	0.146	18,592
Individual earnings over $50K 2016-18	0.147	0.086	0.110	11,668	0.085	0.081	0.060	6,924	0.118	0.060	0.083	18,592
Spouse DSP payments 2016-18	−$19.38	$9.87	$6.37	1,396	−$4.64	$8.06	$6.08	1,313	−$12.55	$6.46	$6.16	2,709
Spouse non-DSP payments 2016-18	$44.53	$21.20	$27.47	1,396	−$11.21	$25.61	$61.37	1,313	$18.70	$16.17	$52.05	2,709
Spouse DSP and non-DSP payments 2016-18	$25.15	$19.94	$33.84	1,396	−$15.85	$24.72	$67.45	1,313	$6.15	$15.54	$58.22	2,709
Spouse earnings 2016-18	$17.22	$33.10	$56.74	1,396	$73.54	$39.68	$40.23	1,313	$43.31	$25.58	$44.76	2,709
Household DSP payments 2016-18	−$65.85	$4.76	$63.48	11,668	−$53.75	$5.26	$62.83	6,924	−$60.16	$3.52	$63.12	18,592
Household non-DSP payments 2016-18	$37.08	$8.77	$10.31	11,668	$11.19	$13.22	$23.81	6,924	$24.90	$7.74	$17.67	18,592
Household DSP and non-DSP payments 2016-18	−$28.77	$8.92	$73.79	11,668	−$42.56	$12.66	$86.64	6,924	−$35.26	$7.65	$80.79	18,592
Household earnings 2016-18	$29.40	$13.64	$23.13	11,668	$31.49	$15.72	$16.89	6,924	$30.38	$10.42	$19.73	18,592
Household income 2016-18	$0.62	$14.85	$96.92	11,668	−$11.08	$19.54	$103.53	6,924	−$4.88	$12.18	$100.52	18,592
Medicare Schedule fees: 2016-18	−$0.44	$1.42	$3.53	11,609	$1.94	$1.80	$4.74	6,869	$0.66	$1.14	$4.19	18,478
Prescriptions: total value 2016-18	$15.68	$4.94	$3.81	11,609	$5.95	$6.47	$7.39	6,869	$11.16	$4.08	$5.77	18,478
Prescriptions: benefit amount 2016-18	$15.38	$4.89	$3.46	11,609	$5.90	$6.44	$6.86	6,869	$10.98	$4.05	$5.32	18,478
Prescriptions: benefit amount excluding HPC 2016-18	$7.55	$3.85	$3.14	11,609	$2.18	$3.62	$4.01	6,869	$5.06	$2.68	$3.62	18,478
Prescriptions: total benefit for pain 2016-18	$0.07	$0.35	$0.30	11,609	−$0.15	$0.49	$0.50	6,869	−$0.03	$0.30	$0.41	18,478
Prescriptions: total benefit for mental 2016-18	$2.50	$1.08	$0.88	11,609	$1.11	$1.17	$1.80	6,869	$1.86	$0.81	$1.38	18,478
Died 2015-17	0.003	0.032	0.000	11,668	0.027	0.040	0.014	6,924	0.014	0.026	0.008	18,592

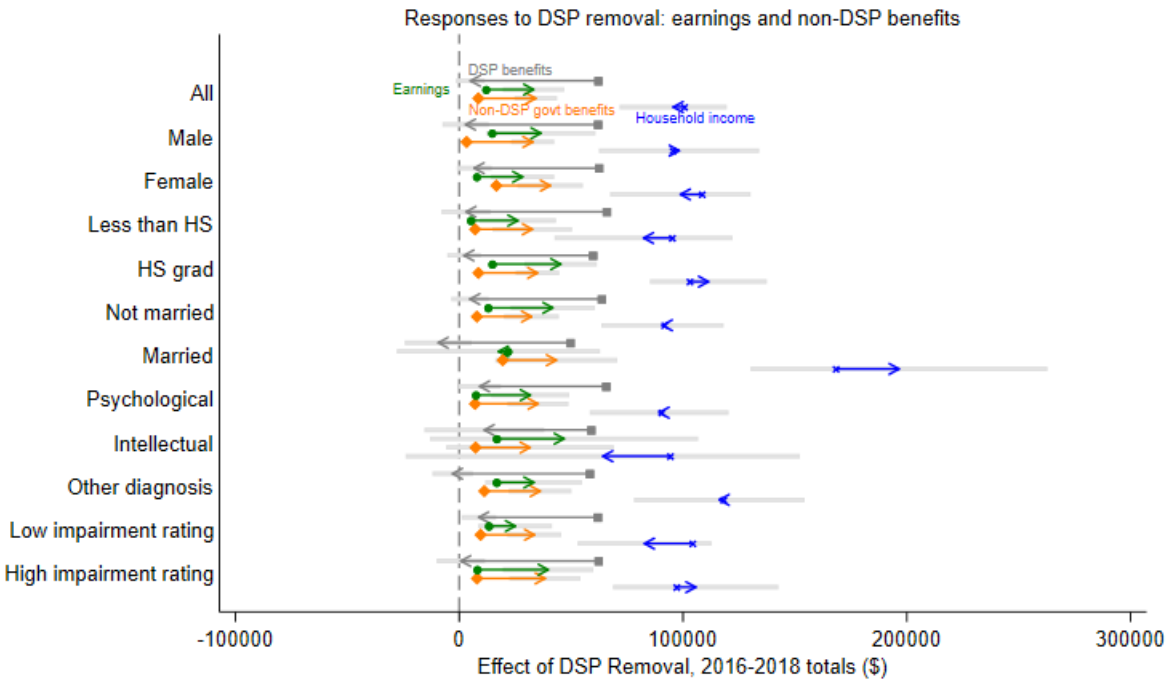
Notes: Table presents IV estimates for the Start Date RD, Birth Date RD, and combined Start Date/Birth Date RDs β_4 from equation 4. Dollar amounts are in 1000s of AUD. Control means are means for individuals on the left-hand side of the cutoff, within 30 days of the cutoff for the start date sample, and within 61 days of the cutoff for the birthdate sample. Combined sample stacks the Start Date RD and Birth Date RD samples. The sample size for the Start Date RD is 11,668, the sample size for the Birth Date RD is 6,924 and the sample size for the Combined sample is 18,592. The spouse related variables in this table are conditional on having a spouse. For these variables, the sample sizes for Start Date, Birth Date and Combined sample RDs are 1396, 1313 and 2709 respectively.

analysis on prescription utilization. The last arrow in Figure 5 shows that there is still a significant, though smaller, increase in prescription spending without the Hepatitis C drugs. This increase is driven mostly by increases in prescription spending on mental health drugs (including antidepressants, psychostimulants, antipsychotics, anxiolytics, and hypnotics and sedatives). We estimate a significant $1,900 increase in spending on mental health drugs (significant) and a 16 pp increase (not significant) in the fraction of individuals with mental health prescriptions. We estimate no effect on pain prescriptions. Figure 7 presents IV estimates for spending on pain and mental health drugs by subgroup. The increase in mental health prescription spending is driven entirely by men, with no increase for women. It is concentrated among DSP recipients with psychological conditions and those with higher impairment ratings.

We can also study whether these outcomes move together or separately. For example, do the same individuals respond to DSP removal by both working and substituting to other

eligibility for Hepatitis C-related impairments. Continuing DSP recipients may have faced disincentives to take up the DAA treatments, whereas recipients who lost DSP may have had greater incentive to take up the new treatment and increase their work capacity.

Figure 6: Responses to DSP removal: earnings and non-DSP benefits

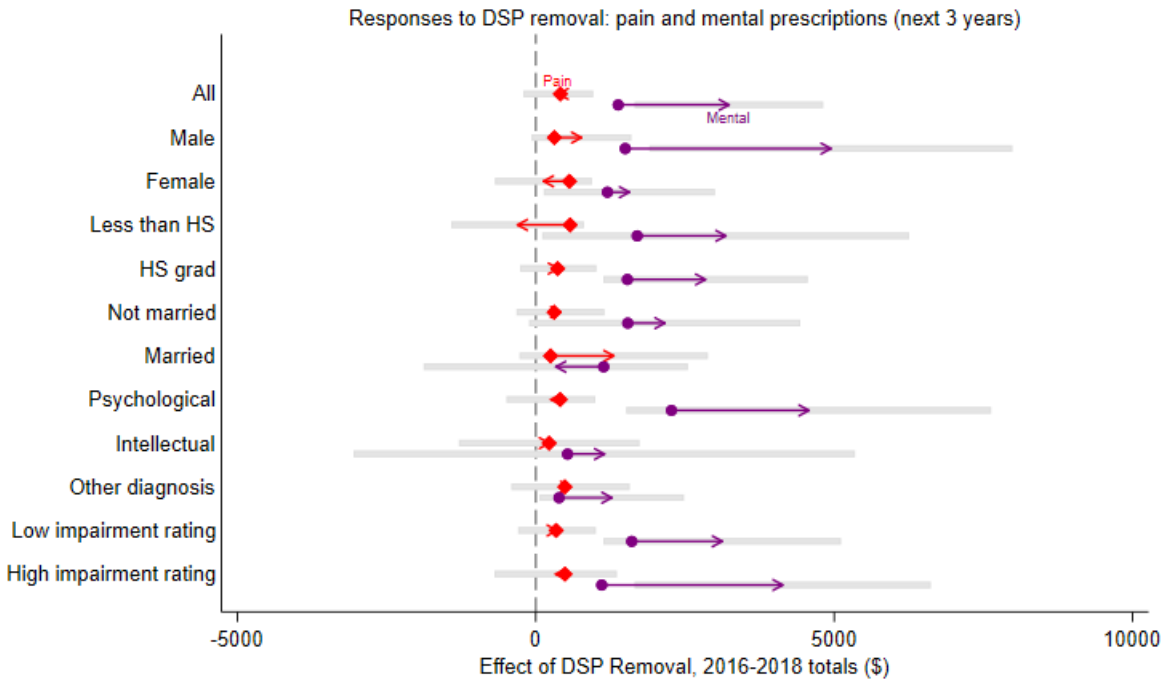


Notes: Figure plots IV estimates (i.e. β_4 of equation 4) of the effect of DSP loss on income by subgroup. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (4), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals. "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 and spouse earnings and government (DSP and non-DSP) benefits from 2016-18. Combined sample stacks the Start Date RD and Birth Date RD samples.

programs? Or do some individuals respond by working and others respond by substituting to other programs? Figure 8 shows that most of those removed from DSP shift to both work and non-DSP benefits (23 pp). A smaller fraction shifts to non-DSP benefits only (13 pp), but no one shifts to work only (-9 pp). Most of the substitution to non-DSP benefits is the Newstart Allowance (now JobSeeker Payment). How is it that removed DSP recipients can both work and receive Newstart? We find that there is substantial volatility employment and earnings over time, with removed DSP recipients churning in and out of work. While Newstart did not allow individuals to claim benefits at the same time as working, it did allow individuals to stop and restart their benefits based on earnings. When we look at Newstart and work outcomes over time, we see that half of the earnings response is in years where an individual also claims Newstart, and the rest is in years an individual does not claim Newstart.

We similarly estimate work and prescription outcomes jointly. Figure 8 shows that removed DSP recipients mostly shift from "not working or taking mental health drugs" to

Figure 7: Combined sample: Increase in mental health prescription spending driven by men



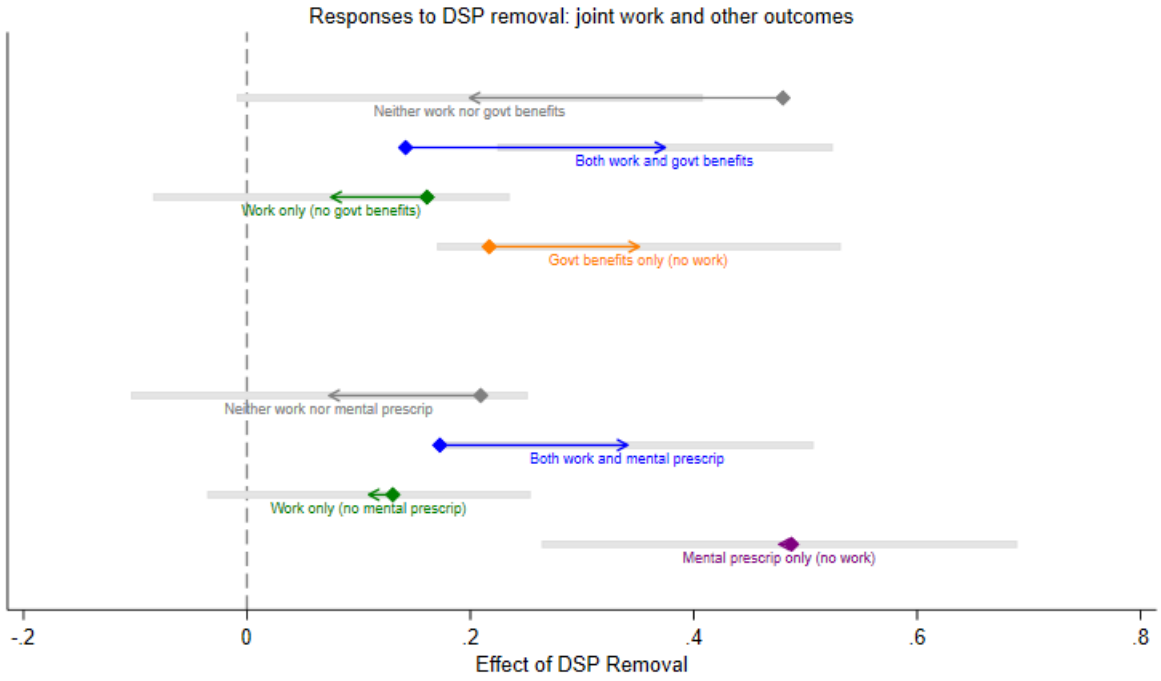
Notes: Figure plots IV estimates (i.e. β_4 of equation 4) of the effect of DSP loss on prescription spending for pain medication and mental health medication by subgroup from 2016-18. The marker indicates the RD control mean, and the distance of the arrow represents the IV estimate from equation (4), so that the arrowhead represents the mean for those who are removed. Gray bars indicate 95% confidence intervals. Pain prescriptions include analgesics, antispasmodic/psycholeptics/analgesic combinations, antiinflammatory and antirheumatic products , topical products for joint and muscular pain, and muscle relaxants. Mental health prescriptions include antidepressants, psychostimulants (used to treat ADHD), antipsychotics, anxiolytics (used to treat anxiety), and hypnotics and sedatives. Combined sample stacks the Start Date RD and Birth Date RD samples.

"working and taking mental health drugs" (17 pp). There is no shift into either working alone (-2 pp) or taking mental health drugs alone (-1 pp). This result suggests that mental health drugs may play an important role in helping removed DSP recipients transition to work.[10]

What do these results imply about the well-being of removed DSP recipients? Removed DSP recipients and their families almost entirely replace the lost DSP income with other sources of income, both other government benefits and labor market earnings. For labor market earnings in particular, the question for well-being is how difficult it is for removed DSP recipients (and their spouses) to work. It could be that removed DSP recipients are highly work capable work is relatively easy for them. In this case, we would conclude that

[10] An alternative interpretation is that DSP recipients could have worked while they were on DSP if they had taken mental health drugs, but chose not to because they wanted to maintain their DSP benefits.

Figure 8: Combined sample: joint outcomes



Notes: Figure plots IV estimates (i.e. β_4 of equation 4) of the effect of DSP loss on joint work and other outcomes from 2016-18. 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. The top set of arrows are joint work and non-DSP government benefits, where 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). The bottom set of arrows are joint work and mental health prescription spending, where the outcomes are defined similarly. Combined sample stacks the Start Date RD and Birth Date RD samples.

DSP removal does not hurt families very much. On the other hand, it could be that work is very difficult but they decide to work anyway because they are desperate for additional consumption. In this case, we would conclude that DSP removal is harmful to families even though household income does not fall. Although it is difficult to know which scenario is more likely, two pieces of evidence are relevant. On the one hand, we find no effects of DSP removal on mortality (see Table 2). Shifting to work is not harmful enough to kill removed recipients, though of course they could have health problems short of death that we do not observe. On the other hand, virtually everyone who shifts to work also shifts into taking mental health prescription drugs. This result might suggest that work is difficult for them, and that the mental health drugs alleviate some of these difficulties.

5 Conclusion

We study the effect of the 2014 policy change that increased medical review rates, and thus DSP removal rates, for young DSP recipients who had entered DSP under less stringent eligibility criteria than those passed in 2012. We find that removed DSP recipients replaced about one-half of the lost DSP income with benefits from other government programs, and another one-third with earnings. For the 15% who were married, spouse earnings, rather than own earnings, made up a substantial fraction of the lost DSP income. DSP removal did not change the medical spending of DSP recipients, but it did increase spending on prescription drugs, especially drugs used to treat mental health conditions. We find suggestive evidence that DSP recipients may have used mental health drugs to facilitate their transition to work.

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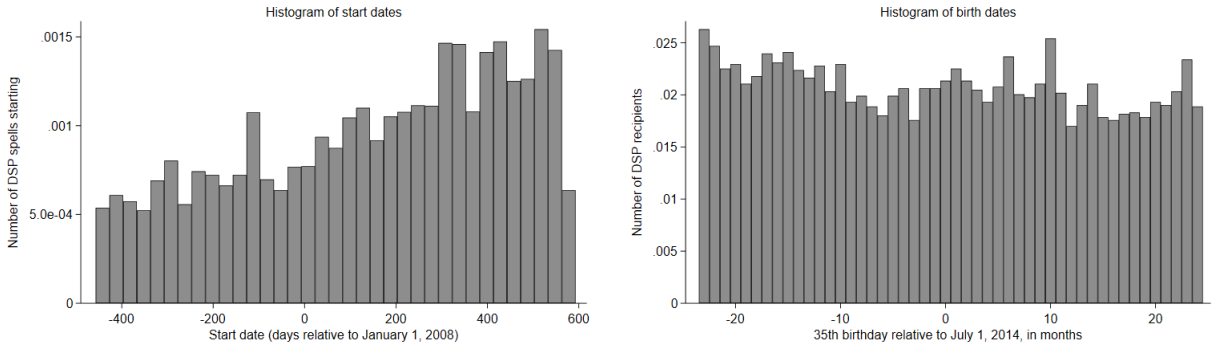
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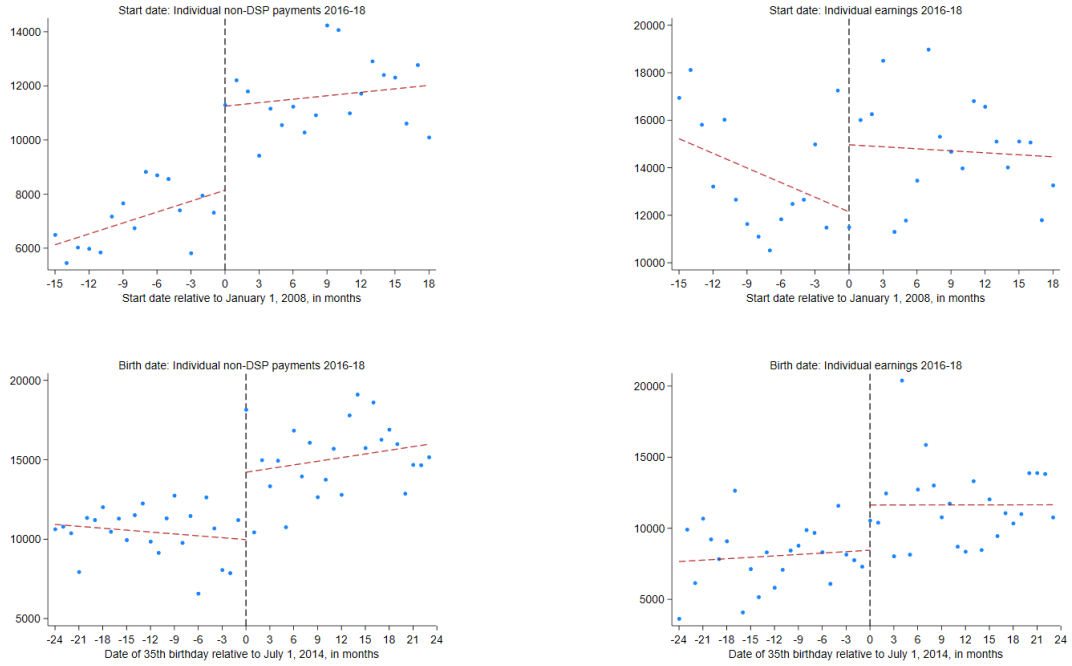
Appendix

Appendix Figure A.1: Start Date and Birth Date: Histogram of start 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 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 hours of work capacity with intervention".

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



Notes: Top left figure shows total non-DSP DOMINO payments from 2016 to 2018 for the Start Date RD sample. Top right figure shows total earnings between 2016 and 2018 for the Start Date RD sample. 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 hours of work capacity with intervention". Bottom left figure shows total non-DSP DOMINO payments from 2016 to 2018 for the Birth Date RD sample. Bottom right figure shows total earnings between 2016 and 2018 for the Birth Date RD sample. The 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 hours of work capacity with intervention".

Appendix Table A.1: Start Date and Birth Date: Covariate balance tests

	Start					Birth				
Variable (Source File)	Pt Est	Std Err	Cntrl Mean	% of mean	N	Pt Est	Std Err	Cntrl Mean	% of mean	N
Male (D)	0.017	0.020	0.595	2.83%	11,668	0.014	0.024	0.576	2.26%	6,883
Female (D)	−0.017	0.020	0.405	−4.15%	11,668	−0.014	0.024	0.424	−3.58%	6,883
Edu (D): Less than HS	0.007	0.022	0.469	1.69%	9,992	−0.059	0.026	0.410	−14.73%	5,860
Edu (D): HS grad	−0.014	0.022	0.475	−2.83%	9,992	0.041	0.026	0.527	7.74%	5,860
Edu (D): Missing	−0.036	0.016	0.209	−13.30%	11,668	−0.032	0.018	0.242	−16.61%	6,883
Edu (C): Less than HS	0.004	0.025	0.444	0.93%	7,622	0.015	0.032	0.476	2.88%	4,156
Edu (C): HS grad	−0.004	0.025	0.556	−0.70%	7,622	−0.015	0.032	0.524	−3.06%	4,156
Edu (C): Missing	0.022	0.019	0.334	6.83%	11,668	0.027	0.024	0.395	6.46%	6,883
Labor force (C): NILF in 2011	0.002	0.022	0.662	0.22%	8,213	0.000	0.025	0.778	−0.04%	4,572
Labor force (C): employed in 2011	0.004	0.019	0.220	1.96%	8,213	−0.022	0.020	0.127	−15.82%	4,572
Labor force (C): unemployed in 2011	0.002	0.014	0.091	1.98%	8,213	0.013	0.015	0.063	12.12%	4,572
Ethnicity (C): Oceanic	0.025	0.022	0.322	8.12%	8,213	0.001	0.026	0.271	0.47%	4,572
Ethnicity (C): European	−0.014	0.024	0.575	−2.49%	8,213	−0.009	0.029	0.576	−1.54%	4,572
Ethnicity (C): other	−0.010	0.015	0.103	−8.16%	8,213	0.008	0.021	0.152	4.55%	4,572
Aboriginal (C)	0.004	0.012	0.070	7.27%	8,213	−0.014	0.015	0.071	−18.38%	4,572
Fam (C): couple, no kids	−0.005	0.011	0.053	−10.34%	8,213	−0.030	0.014	0.061	−45.21%	4,572
Fam (C): 2 parents	−0.023	0.023	0.396	−6.23%	8,213	−0.040	0.028	0.347	−10.42%	4,572
Fam (C): 1 parent	−0.025	0.021	0.260	−8.16%	8,213	−0.016	0.025	0.231	−8.05%	4,572
Fam (C): single	0.052	0.021	0.263	20.71%	8,213	0.078	0.029	0.344	24.64%	4,572
Married (C)	0.004	0.015	0.107	5.03%	8,213	−0.054	0.026	0.261	−20.13%	4,572
Not married (C)	−0.020	0.019	0.809	−2.36%	8,213	0.016	0.028	0.653	2.39%	4,572
Has kids (C)	−0.047	0.023	0.656	−7.10%	8,213	−0.056	0.030	0.579	−9.62%	4,572
No kids (C)	0.047	0.023	0.344	14.09%	8,213	0.056	0.030	0.421	13.55%	4,572
Spouse Jul 2014(D): yes	0.010	0.013	0.111	9.68%	11,668	−0.030	0.019	0.198	−13.11%	6,883
Spouse Jul 2014(D): no	−0.010	0.013	0.889	−1.14%	11,668	0.030	0.019	0.802	3.97%	6,883
Live with Parent Jul 2014(D): yes	−0.030	0.020	0.440	−6.28%	11,668	−0.012	0.018	0.157	−6.22%	6,883
Live with Parent Jul 2014(D): no	0.030	0.020	0.560	5.92%	11,668	0.012	0.018	0.843	1.46%	6,883
Matches to Census (C)	−0.023	0.018	0.717	−3.00%	11,668	−0.037	0.023	0.667	−5.70%	6,883
State (D): NSW	−0.012	0.018	0.293	−4.19%	11,668	0.020	0.023	0.317	7.33%	6,883
State (D): QLD	0.015	0.017	0.230	6.41%	11,668	−0.005	0.020	0.204	−2.63%	6,883
State (D): SA	−0.005	0.012	0.099	−5.63%	11,668	−0.004	0.013	0.078	−4.40%	6,883
State (D): VIC	−0.020	0.018	0.253	−7.33%	11,668	−0.011	0.021	0.261	−4.02%	6,883
State (D): WA	0.015	0.011	0.076	24.27%	11,668	0.008	0.013	0.073	10.22%	6,883
Condition (M): mus	0.000	0.010	0.061	1.10%	11,257	−0.041	0.017	0.147	−33.13%	6,582
Condition (M): psy	0.039	0.021	0.439	9.57%	11,257	0.035	0.024	0.591	5.53%	6,582
Condition (M): oth	−0.021	0.016	0.169	−11.49%	11,257	0.021	0.019	0.172	13.08%	6,582
Condition (M): not mus & not psy	−0.032	0.020	0.520	−5.42%	11,668	0.015	0.022	0.292	5.59%	6,883
Condition (M): not psy & not int	−0.011	0.019	0.316	−3.06%	11,668	−0.013	0.024	0.388	−3.78%	6,883
Max imp rating (M): ≥30	−0.002	0.019	0.283	−0.53%	10,443	−0.014	0.018	0.136	−9.86%	6,265
Max imp rating (M): <30	0.002	0.019	0.717	0.25%	10,443	0.014	0.018	0.864	1.61%	6,265
Max imp rating (M): missing	−0.006	0.014	0.127	−2.85%	11,668	0.022	0.014	0.087	29.16%	6,883
Sum imp rating (M): ≥25	0.005	0.022	0.485	1.03%	10,443	−0.040	0.024	0.346	−10.62%	6,265
Sum imp rating (M): <25	−0.005	0.022	0.515	−0.97%	10,443	0.040	0.024	0.654	6.41%	6,265
Sum imp rating (M): ≥35	0.003	0.018	0.242	1.22%	10,443	−0.007	0.016	0.122	−5.31%	6,265
Sum imp rating (M): <35	−0.003	0.018	0.758	−0.39%	10,443	0.007	0.016	0.878	0.82%	6,265
Sum imp rating (M): missing	−0.006	0.014	0.127	−2.85%	11,668	0.022	0.014	0.087	29.16%	6,883
Work cap w/o (M): 0	0.057	0.021	0.411	12.58%	10,715	0.037	0.025	0.449	9.04%	6,547
Work cap w/o int (M): >0	−0.057	0.021	0.589	−10.53%	10,715	−0.037	0.025	0.551	−6.21%	6,547
Work cap w/int (M): missing	−0.005	0.013	0.122	−2.45%	11,668	0.017	0.011	0.049	54.64%	6,883
Rx spending 2013 (PB): >median	0.020	0.020	0.474	4.52%	11,609	0.005	0.023	0.643	0.76%	6,827
Rx spending 2013 (PB): <median	−0.020	0.020	0.526	−3.43%	11,609	−0.005	0.023	0.357	−1.44%	6,827
Pain med. 2013 (PB): >0	0.014	0.017	0.249	5.62%	11,609	0.001	0.024	0.394	0.28%	6,827
Pain med. 2013 (PB): none	−0.014	0.017	0.751	−1.85%	11,609	−0.001	0.024	0.606	−0.16%	6,827
Labor force (T): pre-DSP earn = 0	−0.017	0.019	0.696	−2.40%	11,668	−0.015	0.024	0.454	−3.22%	6,883
Labor force (T): pre-DSP earn >0	0.017	0.019	0.304	6.34%	11,668	0.015	0.024	0.546	2.80%	6,883
Labor force (T): pre-reform earn = 0	0.013	0.018	0.714	1.83%	11,668	−0.005	0.018	0.827	−0.60%	6,883
Labor force (T): pre-reform earn >0	−0.013	0.018	0.286	−4.65%	11,668	0.005	0.018	0.173	3.35%	6,883
Med spending 2013 (MB): >median	−0.025	0.020	0.502	−5.13%	11,609	0.049	0.024	0.617	8.16%	6,827
Med spending 2013 (MB): <median	0.025	0.020	0.498	4.71%	11,609	−0.049	0.024	0.383	−12.21%	6,827
p-value on joint F test	0.553	-	-	-	-	0.033	-	-	-	-

Notes: Right set of columns present covariate balance tests for the Birth Date RD. Point estimates and standard errors are estimates of β_2 from equation (2). Control means are means for individuals on the left-hand side of the cutoff within 61 days of the cutoff. The 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 hours of work capacity with intervention". 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).

Appendix Table A.2: Start Date and Birth Date: RD (β_1) and (β_2) estimates

	Start				Birth			
Variable	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Received medical review between 2014-17	0.412	0.019	0.397	11,668	0.642	0.018	0.127	6,924
Lost DSP between 2014-17	0.135	0.013	0.089	11,668	0.152	0.017	0.106	6,924
Individual DSP payments 2016-18	−$8.38	$0.95	$62.80	11,668	−$7.75	$1.24	$61.42	6,924
Individual non-DSP payments 2016-18	$3.26	$0.81	$7.41	11,668	$4.13	$1.16	$9.54	6,924
Individual DSP and non-DSP payments 2016-18	−$5.13	$1.04	$70.22	11,668	−$3.62	$1.39	$70.96	6,924
Individual earnings 2016-18	$2.93	$1.45	$17.15	11,668	$3.14	$1.44	$7.54	6,924
Individual income 2016-18	−$2.19	$1.35	$87.36	11,668	−$0.48	$1.59	$78.50	6,924
Individual any earnings 2016-18	0.004	0.020	0.409	11,668	0.042	0.021	0.215	6,924
Individual earnings over $10K 2016-18	0.023	0.017	0.257	11,668	0.018	0.017	0.127	6,924
Individual earnings over $20K 2016-18	0.029	0.016	0.194	11,668	0.027	0.016	0.106	6,924
Individual earnings over $50K 2016-18	0.020	0.012	0.110	11,668	0.013	0.013	0.060	6,924
Spouse DSP payments 2016-18	−$5.08	$2.51	$6.37	1,396	−$1.03	$1.80	$6.08	1,313
Spouse non-DSP payments 2016-18	$11.67	$5.16	$27.47	1,396	−$2.48	$5.66	$61.37	1,313
Spouse DSP and non-DSP payments 2016-18	$6.59	$5.04	$33.84	1,396	−$3.51	$5.47	$67.45	1,313
Spouse earnings 2016-18	$4.51	$8.75	$56.74	1,396	$16.29	$8.84	$40.23	1,313
Household DSP payments 2016-18	−$8.86	$0.99	$63.48	11,668	−$8.14	$1.28	$62.83	6,924
Household non-DSP payments 2016-18	$4.99	$1.17	$10.31	11,668	$1.70	$2.03	$23.81	6,924
Household DSP and non-DSP payments 2016-18	−$3.87	$1.31	$73.79	11,668	−$6.45	$2.01	$86.64	6,924
Household earnings 2016-18	$3.96	$1.92	$23.13	11,668	$4.77	$2.49	$16.89	6,924
Household income 2016-18	$0.08	$2.00	$96.92	11,668	−$1.68	$2.95	$103.53	6,924
Medicare Schedule fees: 2016-18	−$0.06	$0.19	$3.53	11,609	$0.29	$0.27	$4.74	6,869
Prescriptions: total value 2016-18	$2.14	$0.63	$3.81	11,609	$0.90	$0.97	$7.39	6,869
Prescriptions: benefit amount 2016-18	$2.10	$0.63	$3.46	11,609	$0.90	$0.97	$6.86	6,869
Died 2015-17	0.000	0.004	0.000	11,668	0.004	0.006	0.014	6,924

Notes: Left set of columns presents RD for the Start Date RD. Dollar amounts are in 1000s of AUD. RD estimates are estimates of β_1 from equation 1. Control means are means for individuals on the left-hand side of the cutoff within 30 days of the cutoff. The 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 (since the change only applied to young people), who are still receiving DSP benefits on July 1, 2014, and who are deemed neither "manifestly disabled" nor "0 hours of work capacity with intervention". Right set of columns presents RD estimates for the Birth Date RD. Dollar amounts are in 1000s of AUD. RD estimates are estimates of β_2 from equation (2). Control means are means for individuals on the left-hand side of the cutoff within 61 days of the cutoff. The 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 hours of work capacity with intervention".

Appendix Table A.3: Combined RD: IV estimates of the effect of DSP loss over 5 years

	Start				Birth				Both			
Variable	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N	Pt Est	Std Err	Cntrl Mean	N
Individual DSP payments 2016-20	−$99.36	$7.61	$106.14	11,668	−$89.16	$8.51	$104.18	6,924	−$94.56	$5.72	$105.07	18,592
Individual non-DSP payments 2016-20	$40.99	$9.89	$12.23	11,668	$48.81	$12.07	$15.86	6,924	$44.67	$7.83	$14.21	18,592
Individual DSP and non-DSP payments 2016-20	−$58.37	$11.26	$118.37	11,668	−$40.35	$13.41	$120.03	6,924	−$49.89	$8.75	$119.28	18,592
Individual earnings 2016-20	$36.86	$18.93	$33.96	11,668	$38.95	$15.75	$14.39	6,924	$37.84	$12.58	$23.29	18,592
Individual income 2016-20	−$21.51	$17.94	$152.33	11,668	−$1.40	$17.63	$134.43	6,924	−$12.04	$12.72	$142.57	18,592
Household DSP payments 2016-20	−$105.19	$8.38	$107.29	11,668	−$93.96	$9.18	$106.56	6,924	−$99.91	$6.23	$106.89	18,592
Household non-DSP payments 2016-20	$62.09	$14.86	$17.67	11,668	$24.77	$21.71	$39.36	6,924	$44.53	$12.90	$29.49	18,592
Household DSP and non-DSP payments 2016-20	−$43.10	$15.58	$124.96	11,668	−$69.20	$21.11	$145.91	6,924	−$55.38	$12.98	$136.38	18,592
Household earnings 2016-20	$50.63	$24.65	$43.80	11,668	$52.28	$27.88	$32.39	6,924	$51.41	$18.62	$37.58	18,592
Household income 2016-20	$0.62	$14.85	$96.92	11,668	−$11.08	$19.54	$103.53	6,924	−$4.88	$12.18	$100.52	18,592
Died 2015-20	−0.064	0.049	0.017	11,668	0.056	0.058	0.028	6,924	−0.007	0.038	0.023	18,592

Notes: Table presents IV estimates for the Start Date RD, Birth Date RD, and combined Start Date/Birth Date RDs β_4 from equation 4. 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.

Appendix Table A.4: Combined RD: IV estimates of the effect of DSP loss on benefit receipt across programs

	All			Female			Male		
Program	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean	Pt Est	Std Err	Cntrl Mean
All non-DSP programs	$25.63	$4.81	$8.80	$24.05	$7.41	$17.36	$29.54	$4.87	$2.71
Program: NSA	$20.42	$1.61	$0.22	$14.57	$1.67	$0.18	$27.04	$3.12	$0.25
Program: PPS	$5.08	$0.89	$0.07	$9.06	$1.57	$0.14	$0.59	$0.44	$0.02
Program: PPP	$1.73	$0.36	$0.01	$2.27	$0.55	$0.01	$1.10	$0.45	$0.01
Program: CAR	$1.56	$0.72	$0.07	$2.54	$0.98	$0.09	$0.44	$1.05	$0.06
Program: AUS	$1.15	$0.38	$0.01	$1.13	$0.59	$0.02	$1.17	$0.46	$0.00
Program: MOB	$0.57	$0.32	$0.31	$1.03	$0.38	$0.29	$0.05	$0.53	$0.31
Program: SKA	$0.10	$0.06	$0.00	−$0.03	$0.05	$0.00	$0.24	$0.13	$0.01
Program: CCF	$0.06	$0.17	$0.10	$0.15	$0.30	$0.21	−$0.01	$0.14	$0.02
Program: CCI	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Program: TLA	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	−$0.00	$0.00	$0.00
Program: JSP	$0.00	$0.00	$0.00	−$5.08	$6.22	$0.00	$0.00	$0.00	$0.00
Program: SBP	−$0.00	$0.01	$0.00	$0.00	$0.01	$0.00	$0.59	$0.44	$0.00
Program: DOP	−$0.00	$0.00	$0.00	−$0.00	$0.00	$0.00	−$0.06	$0.04	$0.00
Program: MEP	−$0.01	$0.01	$0.00	−$0.01	$0.01	$0.01	−$0.01	$0.02	$0.00
Program: YAL	−$0.02	$0.06	$0.00	$0.04	$0.06	$0.00	−$0.08	$0.11	$0.00
Program: EPA	−$0.02	$0.04	$0.01	−$0.02	$0.08	$0.01	−$0.02	$0.03	$0.00
Program: DAP	−$0.03	$0.02	$0.00	−$0.86	$1.09	$0.00	−$0.06	$0.04	$0.01
Program: ABY	−$0.05	$0.06	$0.00	−$0.11	$0.10	$0.00	$0.02	$0.05	$0.00
Program: PPL	−$0.17	$0.18	$0.05	−$0.30	$0.33	$0.13	$0.00	$0.00	$0.00
Program: BSW	−$0.23	$0.23	$0.07	−$0.08	$0.19	$0.05	−$0.42	$0.46	$0.08
Program: EPF	−$0.23	$0.14	$0.14	−$0.26	$0.20	$0.21	−$0.18	$0.19	$0.10
Program: CDA	−$0.49	$0.63	$0.53	−$0.86	$1.09	$1.04	$0.05	$0.46	$0.17
Program: FTB	−$3.77	$3.88	$7.18	−$5.08	$6.22	$14.95	−$0.37	$3.01	$1.65
All programs	−$31.40	$5.15	$71.30	−$31.59	$7.39	$78.52	−$29.48	$6.49	$66.15
Program: DSP	−$57.04	$3.23	$62.49	−$55.64	$3.92	$61.16	−$59.02	$5.24	$63.44

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs β_4 from equation 4 for the "All", "Female" and "Male" samples. Total columns refer to the total amount of that benefit received in 2016-18. 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. Programs that were used by no indivdiuals in our sample are excluded. These programs are: ABA, ABS, AEP, AGE, BBY, BRV, BVA, DWS, EIC, FPA, FTP, JSA, MAA, MAT, MIA, MPA, MPY, NMA, NSS, PDB, PEN, PES, PGA, PTA, SHC, SPP, TAP, WDA, WFA, WFD, WFR, WID, YLA, YLO, YLS, YTA.

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

	Individual DSP payments 2016-18			Individual non-DSP payments 2016-18			Individual earnings 2016-18			Household income 2016-18		
label	Pt Est	Std Err	N	Pt Est	Std Err	N	Pt Est	Std Err	N	Pt Est	Std Err	N
All	−$57.04	$3.23	18,592	$25.63	$4.81	18,592	$21.30	$6.96	18,592	−$4.88	$12.18	18,592
Male (D)	−$59.02	$5.24	11,040	$29.54	$4.87	11,040	$21.87	$12.44	11,040	$2.91	$18.24	11,040
Female (D)	−$55.64	$3.92	7,552	$24.05	$7.41	7,552	$20.56	$7.19	7,552	−$9.57	$15.97	7,552
Edu (D): Less than HS	−$62.80	$5.58	6,731	$25.50	$9.02	6,731	$21.06	$8.68	6,731	−$12.69	$20.26	6,731
Edu (D): HS grad	−$57.56	$3.79	8,242	$26.38	$4.93	8,242	$30.64	$8.23	8,242	$8.39	$13.29	8,242
Edu (D): Missing	−$28.45	$26.34	3,173	$60.97	$52.45	3,173	$56.30	$48.51	3,173	$22.80	$109.07	3,173
Edu (C): Less than HS	−$59.02	$5.11	5,504	$30.23	$8.56	5,504	$11.62	$9.40	5,504	−$7.87	$20.09	5,504
Edu (C): HS grad	−$53.49	$5.89	6,301	$13.51	$7.61	6,301	$37.00	$15.29	6,301	−$0.17	$22.14	6,301
Edu (C): Missing	−$61.33	$5.43	6,787	$30.90	$8.45	6,787	$17.64	$10.64	6,787	−$3.55	$19.95	6,787
Labor force (C): NILF in 2011	−$57.36	$4.21	9,230	$28.44	$7.11	9,230	$14.41	$7.82	9,230	$0.21	$16.80	9,230
Labor force (C): employed in 2011	−$58.85	$10.91	2,093	$4.22	$10.61	2,093	$66.55	$30.70	2,093	$9.58	$39.73	2,093
Labor force (C): unemployed in 2011	−$37.53	$13.91	1,122	−$2.20	$14.64	1,122	$41.70	$26.63	1,122	−$46.28	$43.54	1,122
Ethnicity (C): Oceanic	−$46.85	$7.40	3,851	$19.05	$10.07	3,851	$14.56	$14.55	3,851	−$35.70	$27.18	3,851
Ethnicity (C): European	−$58.44	$4.79	7,379	$20.24	$6.81	7,379	$20.65	$11.43	7,379	$1.13	$18.14	7,379
Ethnicity (C): other	−$71.70	$11.63	1,586	$45.17	$21.29	1,586	$55.72	$20.82	1,586	$54.55	$46.22	1,586
Aboriginal (C)	−$31.26	$18.51	880	$39.47	$26.40	880	−$9.03	$35.51	880	−$64.56	$70.08	880
Fam (C): couple, no kids	−$63.10	$14.16	716	$14.16	$12.63	716	$5.69	$46.53	716	$32.84	$55.70	716
Fam (C): 2 parents	−$58.44	$7.80	4,780	$29.92	$12.86	4,780	$31.37	$15.96	4,780	$25.69	$32.67	4,780
Fam (C): 1 parent	−$58.38	$4.90	3,163	$29.42	$10.03	3,163	$12.31	$11.59	3,163	−$2.34	$20.48	3,163
Fam (C): single	−$58.54	$6.73	3,848	$21.79	$7.90	3,848	$35.80	$14.28	3,848	−$0.60	$20.14	3,848
Married (C)	−$58.94	$7.59	2,036	$23.92	$13.88	2,036	−$4.15	$23.15	2,036	$28.25	$33.82	2,036
Not married (C)	−$58.79	$4.23	9,726	$24.37	$6.19	9,726	$28.93	$9.58	9,726	−$0.85	$13.90	9,726
Has kids (C)	−$58.46	$4.63	7,943	$29.32	$8.13	7,943	$22.02	$9.87	7,943	$13.10	$19.24	7,943
No kids (C)	−$57.18	$6.15	4,873	$19.68	$6.61	4,873	$25.04	$15.24	4,873	−$11.24	$20.79	4,873
Spouse Jul 2014(D): yes	−$48.82	$5.39	2,709	$11.20	$11.15	2,709	$20.85	$11.48	2,709	$32.69	$23.46	2,709
Spouse Jul 2014(D): no	−$61.25	$3.43	15,883	$31.09	$4.97	15,883	$22.40	$8.29	15,883	−$7.76	$8.40	15,883
Condition (M): int	−$47.67	$13.60	3,018	$24.31	$19.09	3,018	$30.14	$30.53	3,018	−$30.05	$44.93	3,018
Condition (M): mus	−$64.13	$5.55	1,605	$20.07	$9.74	1,605	$6.33	$12.96	1,605	−$40.58	$24.37	1,605
Condition (M): psy	−$56.38	$4.78	9,296	$28.12	$6.90	9,296	$24.40	$8.85	9,296	−$1.02	$15.79	9,296
Condition (M): oth	−$63.73	$7.34	3,112	$41.90	$11.96	3,112	$18.96	$20.17	3,112	$39.76	$32.24	3,112
Condition (M): not mus & not psy	−$57.11	$5.84	7,713	$28.90	$8.79	7,713	$28.22	$13.91	7,713	$22.43	$23.62	7,713
Condition (M): not psy & not int	−$61.23	$4.57	6,282	$24.90	$7.12	6,282	$16.69	$11.03	6,282	−$1.84	$19.42	6,282
Max imp rating (M): ≥20	−$57.24	$3.26	15,913	$26.36	$5.04	15,913	$20.09	$6.60	15,913	−$5.70	$12.24	15,913
Max imp rating (M): ≥30	−$74.41	$10.57	3,521	$26.92	$14.60	3,521	$41.62	$18.20	3,521	−$7.61	$31.81	3,521
Max imp rating (M): <30	−$53.40	$3.26	13,227	$24.86	$5.04	13,227	$15.46	$6.85	13,227	−$13.12	$12.50	13,227
Max imp rating (M): missing	−$59.71	$20.63	1,844	$12.21	$20.77	1,844	$63.49	$45.38	1,844	$50.47	$77.69	1,844
Sum imp rating (M): ≥25	−$61.49	$5.49	6,919	$30.36	$8.08	6,919	$31.76	$10.26	6,919	$8.60	$18.84	6,919
Sum imp rating (M): <25	−$53.02	$3.91	9,829	$24.01	$6.11	9,829	$11.86	$8.36	9,829	−$21.38	$15.25	9,829
Sum imp rating (M): ≥35	−$68.28	$7.95	2,983	$42.80	$12.77	2,983	$25.79	$15.48	2,983	$38.83	$29.99	2,983
Sum imp rating (M): <35	−$53.60	$3.48	13,765	$24.67	$5.29	13,765	$17.56	$7.16	13,765	−$16.35	$12.94	13,765
Sum imp rating (M): missing	−$59.71	$20.63	1,844	$12.21	$20.77	1,844	$63.49	$45.38	1,844	$50.47	$77.69	1,844
Work cap w/o (M): 0	−$51.29	$4.70	7,614	$18.90	$6.76	7,614	$22.32	$9.18	7,614	−$8.29	$17.66	7,614
Work cap w/o int (M): >0	−$60.86	$4.40	9,685	$33.14	$7.03	9,685	$18.72	$8.93	9,685	−$11.41	$16.14	9,685
Work cap w/o int (M): missing	−$70.68	$21.50	1,293	$10.34	$17.18	1,293	$88.63	$54.30	1,293	$105.24	$85.82	1,293
Work cap w/int (M): missing	−$63.33	$19.34	1,381	$11.50	$16.07	1,381	$82.76	$49.18	1,381	$84.79	$75.81	1,381
Rx spending 2013 (PB): >median	−$52.54	$5.64	9,941	$20.57	$7.91	9,941	$12.85	$12.30	9,941	−$12.42	$20.66	9,941
Rx spending 2013 (PB): <median	−$60.76	$3.65	8,537	$30.55	$5.91	8,537	$26.52	$8.16	8,537	$0.32	$14.54	8,537
Pain med. 2013 (PB): >0	−$66.21	$6.26	5,377	$29.50	$10.01	5,377	$16.27	$11.05	5,377	$21.69	$23.55	5,377
Pain med. 2013 (PB): none	−$53.50	$3.80	13,101	$23.08	$5.28	13,101	$24.01	$8.75	13,101	−$19.24	$14.33	13,101
Labor force (T): pre-DSP earn = 0	−$53.68	$4.06	10,427	$23.46	$6.83	10,427	$14.25	$6.67	10,427	−$11.89	$15.58	10,427
Labor force (T): pre-DSP earn >0	−$62.73	$5.23	8,165	$29.02	$7.11	8,165	$27.40	$13.27	8,165	$7.85	$20.31	8,165
Labor force (T): pre-reform earn = 0	−$56.78	$3.79	14,288	$31.82	$6.20	14,288	$9.30	$6.14	14,288	−$3.97	$14.08	14,288
Labor force (T): pre-reform earn >0	−$57.98	$5.92	4,304	$11.37	$6.87	4,304	$53.47	$16.48	4,304	−$3.09	$23.21	4,304
Med spending 2013 (MB): >median	−$56.36	$4.39	9,939	$25.06	$6.86	9,939	$21.91	$9.18	9,939	−$6.37	$16.83	9,939
Med spending 2013 (MB): <median	−$58.84	$4.67	8,539	$25.68	$6.25	8,539	$20.41	$10.67	8,539	−$5.35	$17.01	8,539

Notes: Table presents IV estimates for the combined Start Date/Birth Date RDs i.e. β_4 from equation 4 for various subgroups. Dollar amounts are in 1000s of AUD.

Appendix Table A.6: RD estimates using "rdrobust" package

	Start					Birth				
	Standard		Bias-corrected		Start	Standard		Bias-corrected		Birth
Variable	Pt Est	Std Err	Pt Est	Std Err	N	Pt Est	Std Err	Pt Est	Std Err	N
Received medical review between 2014-17	0.404	0.024	0.404	0.028	90,212	0.640	0.011	0.642	0.013	143,313
Lost DSP between 2014-17	0.118	0.016	0.118	0.019	90,212	0.161	0.012	0.158	0.014	143,313
Individual DSP payments 2016-18	−$7.56	$1.13	−$7.65	$1.34	90,212	−$9.53	$0.84	−$9.28	$0.98	143,313
Individual non-DSP payments 2016-18	$3.17	$0.98	$3.11	$1.16	90,212	$4.32	$0.76	$4.14	$0.89	143,313
Individual DSP and non-DSP payments 2016-18	−$4.28	$0.99	−$4.46	$1.17	90,212	−$5.54	$0.78	−$5.47	$0.93	143,313
Individual earnings 2016-18	$1.16	$0.96	$0.92	$1.16	90,212	$3.29	$0.98	$3.59	$1.14	143,313
Individual income 2016-18	−$2.59	$1.20	−$2.66	$1.47	90,212	−$2.08	$1.07	−$1.69	$1.22	143,313
Individual DSP payments 2016-20	−$11.76	$1.98	−$11.91	$2.34	90,212	−$16.04	$1.47	−$15.68	$1.73	143,313
Individual non-DSP payments 2016-20	$5.36	$1.65	$5.19	$1.96	90,212	$7.91	$1.27	$7.51	$1.47	143,313
Individual earnings 2016-20	$1.51	$1.89	$1.03	$2.26	90,212	$5.87	$1.74	$6.41	$2.01	143,313
Individual income 2016-20	−$3.58	$2.00	−$3.64	$2.45	90,212	−$2.54	$1.75	−$1.97	$2.02	143,313
Medicare Schedule fees: 2016-18	−$0.10	$0.18	−$0.07	$0.21	89,700	$0.07	$0.16	$0.00	$0.18	142,494
Prescriptions: total value 2016-18	$1.80	$0.62	$2.03	$0.70	89,700	$0.01	$0.65	$0.22	$0.75	142,494
Prescriptions: benefit amount 2016-18	$1.76	$0.61	$1.99	$0.70	89,700	$0.00	$0.65	$0.22	$0.74	142,494
Prescriptions: total benefit for pain 2016-18	$0.03	$0.04	$0.03	$0.05	89,700	$0.04	$0.04	$0.06	$0.05	142,494

Notes: Table presents "rdrobust" results 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 hours of work capacity with intervention". 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 hours of work capacity with intervention". "Standard" indicates the non-bias-corrected estimate given by "rdrobust", and "Bias-corrected" indicates the bias-corrected estimate given by "rdrobust".

Appendix Table A.7: Start Date RD: estimates using higher-order polynomials in running variable

	Linear		Quadratic		Cubic		Quartic		
Variable	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	N
Lost DSP between 2014-17	0.135	0.013	0.103	0.020	0.107	0.027	0.104	0.035	11,668
Individual DSP payments 2016-18	−$8.38	$0.95	−$6.44	$1.44	−$8.28	$1.93	−$8.70	$2.43	11,668
Individual non-DSP payments 2016-18	$3.26	$0.81	$3.28	$1.28	$5.50	$1.81	$4.14	$2.31	11,668
Individual DSP and non-DSP payments 2016-18	−$5.13	$1.04	−$3.16	$1.59	−$2.79	$2.16	−$4.56	$2.70	11,668
Individual earnings 2016-18	$2.93	$1.45	−$2.30	$2.37	−$2.56	$3.38	−$1.66	$4.28	11,668
Individual income 2016-18	−$2.19	$1.35	−$5.47	$2.26	−$5.35	$3.28	−$6.22	$4.20	11,668
Individual DSP payments 2016-20	−$13.37	$1.68	−$9.47	$2.55	−$13.36	$3.44	−$15.18	$4.35	11,668
Individual non-DSP payments 2016-20	$5.52	$1.37	$5.60	$2.17	$9.26	$3.06	$6.33	$3.92	11,668
Individual earnings 2016-20	$4.96	$2.69	−$3.95	$4.43	−$3.57	$6.39	−$2.81	$8.24	11,668
Individual income 2016-20	−$2.89	$2.39	−$7.82	$4.06	−$7.67	$5.98	−$11.67	$7.74	11,668
Medicare Schedule fees: 2016-18	−$0.06	$0.19	$0.13	$0.29	$0.21	$0.39	$1.05	$0.50	11,609
Prescriptions: total value 2016-18	$2.14	$0.63	$1.71	$0.95	$2.31	$1.17	$2.79	$1.34	11,609
Prescriptions: benefit amount 2016-18	$2.10	$0.63	$1.69	$0.94	$2.28	$1.15	$2.72	$1.33	11,609
Prescriptions: total benefit for pain 2016-18	$0.01	$0.05	−$0.02	$0.07	−$0.03	$0.10	−$0.01	$0.13	11,609

Notes: Table presents RD estimates for the Start Date sample with linear, quadratic, cubic and quartic running variables. Dollar amounts are in 1000s of AUD.

Appendix Table A.8: Birth Date RD: estimates using higher-order polynomials in running variable

	Linear		Quadratic		Cubic		Quartic		
Variable	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	Pt Est	Std Err	N
Lost DSP between 2014-17	0.150	0.017	0.120	0.026	0.117	0.035	0.152	0.044	6,924
Individual DSP payments 2016-18	−$7.66	$1.25	−$7.13	$1.90	−$7.24	$2.57	−$8.78	$3.26	6,924
Individual non-DSP payments 2016-18	$4.05	$1.17	$4.00	$1.78	$6.24	$2.47	$7.23	$3.21	6,924
Individual DSP and non-DSP payments 2016-18	−$3.61	$1.39	−$3.13	$2.09	−$1.00	$2.83	−$1.55	$3.59	6,924
Individual earnings 2016-18	$3.15	$1.45	$3.96	$2.07	$1.40	$2.70	$1.55	$3.45	6,924
Individual income 2016-18	−$0.46	$1.59	$0.83	$2.35	$0.39	$3.09	$0.00	$3.88	6,924
Individual DSP payments 2016-20	−$13.36	$2.17	−$12.06	$3.29	−$11.42	$4.45	−$15.06	$5.65	6,924
Individual non-DSP payments 2016-20	$7.27	$1.89	$6.86	$2.89	$10.29	$4.02	$11.55	$5.23	6,924
Individual earnings 2016-20	$5.89	$2.56	$6.19	$3.73	$0.44	$4.95	$4.80	$6.28	6,924
Individual income 2016-20	−$0.21	$2.68	$0.99	$3.99	−$0.70	$5.30	$1.28	$6.63	6,924
Medicare Schedule fees: 2016-18	$0.30	$0.27	$0.33	$0.42	$0.85	$0.56	$0.51	$0.71	6,869
Prescriptions: total value 2016-18	$0.87	$0.97	$1.22	$1.36	$0.75	$1.77	$0.96	$2.13	6,869
Prescriptions: benefit amount 2016-18	$0.87	$0.97	$1.27	$1.35	$0.80	$1.76	$1.07	$2.11	6,869
Prescriptions: total benefit for pain 2016-18	−$0.03	$0.07	−$0.12	$0.11	−$0.02	$0.14	−$0.17	$0.17	6,869

Notes: Table presents RD estimates for the Birth Date sample with linear, quadratic, cubic and quartic running variables. Dollar amounts are in 1000s of AUD.

Appendix Table A.9: RD estimates with controls

	Start			Birth		
Variable	Pt Est	Std Err	N	Pt Est	Std Err	N
Received medical review between 2014-17	0.407	0.018	11,668	0.637	0.018	6,924
Lost DSP between 2014-17	0.134	0.013	11,668	0.149	0.017	6,924
Individual DSP payments 2016-18	−$8.56	$0.92	11,668	−$8.25	$1.17	6,924
Individual non-DSP payments 2016-18	$3.36	$0.74	11,668	$4.87	$1.04	6,924
Individual DSP and non-DSP payments 2016-18	−$5.20	$0.99	11,668	−$3.39	$1.31	6,924
Individual earnings 2016-18	$3.42	$1.34	11,668	$3.02	$1.32	6,924
Individual income 2016-18	−$1.78	$1.28	11,668	−$0.37	$1.51	6,924
Individual DSP payments 2016-20	−$13.68	$1.62	11,668	−$14.38	$2.05	6,924
Individual non-DSP payments 2016-20	$5.63	$1.26	11,668	$8.47	$1.70	6,924
Individual earnings 2016-20	$5.85	$2.49	11,668	$5.71	$2.36	6,924
Individual income 2016-20	−$2.19	$2.28	11,668	−$0.19	$2.54	6,924
Medicare Schedule fees: 2016-18	−$0.06	$0.17	11,609	$0.25	$0.24	6,869
Prescriptions: total value 2016-18	$1.93	$0.63	11,609	$0.64	$0.95	6,869
Prescriptions: benefit amount 2016-18	$1.90	$0.62	11,609	$0.64	$0.95	6,869
Prescriptions: total benefit for pain 2016-18	$0.01	$0.05	11,609	−$0.00	$0.07	6,869

Notes: Table presents RD estimates for the Start Date and Birth Date RDs i.e. β_1 and β_2 from equations 1 and 2 when using all the variables in the covariate balance tables as controls. Dollar amounts are in 1000s of AUD.