

Impacts from delaying access to retirement benefits on welfare receipt and expenditure: Evidence from a natural experiment

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ABSTRACT

Governments are responding to fiscal pressures associated with aging populations by increasing the eligibility age for publicly-funded retirement benefits. However, recent studies show large resulting increases in the receipt of disability and unemployment benefits, which raises concern that welfare savings are offset by increased inflows into alternative payments. Using administrative data to examine the impacts of female eligibility age increases in Australia, we find little evidence of this. Instead, most of the increase is because the delay mechanically extends the receipt time of people already on alternative payments. The implication is that fiscal savings are not jeopardized by welfare substitution.

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DATA STATEMENT

Due to the conditions of the agreement for accessing this data, we cannot make it available for replication as part of the publication process. However, the data may be accessed via application to the Department of Social Services <https://www.dss.gov.au/contact/contact-the-department>.

DECLARATIONS OF INTEREST

The authors claim no conflicts of interest in the preparation or publication of this study.

1. INTRODUCTION

In developed countries, declining fertility rates coupled with longer life expectancy is contributing to the aging of the population. The ratio of working-age to retirement-age individuals is expected to fall from around five to one in 2015 to around two to one by 2050 (United Nations 2013). These changes pose fiscal challenges, especially as the the large “baby boomer” generation move into their retirement years. While governments are acting on many fronts, a common response is to increase the minimum age at which people can qualify for publicly-funded retirement benefits.¹

In this study, we shed light on the fiscal implications of increases in public pension eligibility age by quantifying the reduction in public pension reliance, resulting welfare savings and the extent of two behavioral responses that can counteract welfare savings — welfare substitution and spillover effects. Welfare substitution occurs when people respond to delayed access to the pension by increasing reliance on alternative welfare payments, such as unemployment and disability benefits. Spillover effects occur if any increased household income from any extended time in work induces the partners of affected people to leave employment early and enter welfare.

We quantify the welfare savings and these behavioral responses by exploiting a natural experiment, the 1993 Australian Age Pension Reform, which increased the public pension eligibility age of women every two years by 6 monthly increments, thereby creating exogenous variation in the eligibility age of cohorts born close in time. For each incremental increase, our

¹For example, in the United States, the 1983 Social Security Amendments increased the normal retirement age incrementally from 65 to 67. In the United Kingdom, the retirement age for women is being gradually increased from 60 to 65 to bring it into line with the retirement age of men.

estimation approach compares rates of welfare receipt of birth cohorts affected by the increase (e.g. treatment groups) and those who were not (e.g. comparison groups). We then compare welfare receipts of the control and treatment groups to estimate overall impact of the policy and potentially negating effects of the behavioral responses.

Our main contribution is to add to knowledge on the nature of substitution effects from age pension increases by decomposing them into two sources. The first source is from people who respond to delayed pension access by entering welfare through alternative payments to the Age Pension. The second source is from people already on welfare in the lead-up to pension age who respond by extending their time on existing benefits. We call these two sources ‘mechanical’ and ‘active’ substitution respectively. These two sources are behaviorally very different, and they have different implications for policy. As the name suggests, mechanical substitution is a passive response that is predictably a function of a country’s pre-existing welfare load that is hard to avoid without fundamentally changing the rules of welfare eligibility.² In contrast, the magnitude of active substitution is more uncertain, more generalizable across countries and has more scope for targeted policy intervention.³ Quantifying the magnitude of active substitution is vital to help governments understand how to respond to the large substitution effects estimated in previous

² It is relatively predictable because increases in the age-pension age do not incentivise an exit from welfare receipt.

³ Measures to address active substitution may include incentives to continue employment, such as tax credits, for people who work beyond their former retirement age. Incentives for extending time in work are embedded in pension rules of many countries, including the United States.

studies, including in an Australian study by Atalay and Barrett (2015).⁴ Given that further pension-age increases are in-train in Australia and elsewhere, this study provides timely evidence.⁵

Compared to the previous Australian study by Atalay and Barrett (2015), who used cross-sectional survey data from the Income and Housing Costs Survey, our study has the advantage of using administrative population welfare data aggregated by birth-month and tracked monthly. Studies have shown that the misreporting of welfare receipt in survey data can be a serious problem. For example, in the German Panel Study of Labour Market and Social Security (PASS), Brukmeier et al (2014) reports that around 10 percent of respondents under-report their welfare receipt, and that this misreporting is correlated with observed characteristics such as family structure and labour force attachment. Similarly, in the U.S. Survey of Income and Program Participation, Bollinger and David (1997) find that Food Stamp program participation is under reported by 22 percent. There is also evidence that survey respondents make errors in timing, continuity and names of specific benefits (Sears, J. and Rupp, K. 2003). Given that welfare substitution is the focus of our paper, the use of longitudinal administrative data is an important advantage.

⁴ Atalay and Barrett (2015) estimated a 21 percentage point increase in the receipt rate of alternative payments on average across all affected cohorts affected by the increase in pension age from 60 to 65 (that is, 60-64 year-olds). An Austrian study by Staubli and Zweimüller (2013) estimated around a 12 percentage point increase in the rate of unemployment benefits, but minimal increases in disability insurance receipt.

⁵ From 1 July 2019, the pension age for males and females is being increased from 65 by six months every two years from until it reaches 67 on 1 July 2023.

Finally, this paper is the first to measure spillover effects where the retirement pension is means-tested. The only study to date by Lalive and Staubi (2014) found insignificant spillover effects, but under conditions where benefits were not means-tested. Means-testing of couples, as is conducted in Australia, may induce greater spillover effects because any increase in income from extended female work participation will increase the rate at which the partner's available welfare income is penalised with earnings. This tends to increase the opportunity cost of work for the partner, which reduces their incentive to work. Although spillover effects estimated in this study are not generalizable outside of Australia, given that welfare payments are typically not means-tested, spillover effect estimates under these conditions are still important to inform the debate on the merits of means-testing welfare. Means-testing is an often-proposed way to make benefits better-targeted and less costly (Sefton et al. 2008; Tran and Woodland 2014), but critics argue that it creates perverse incentives that can counter-act welfare savings (St. John and Willmore 2001). Results from this study provide direct evidence on perverse incentives of means-testing in relation to spillover effects.

Our findings provide comfort to policy makers that fiscal savings from pension-age increases are not being thwarted by active substitution and spillover effects. We estimate a 39-percentage point increase in the rate of receipt of alternative welfare payments among affected-age females, but only 4.3 percentage points is active substitution, the rest is mechanical. Despite forewarning, we find no evidence that people actively substituted ahead of affected ages. Analysis conducted across sub-groups suggests that active substitution was no higher among groups with greater opportunities or incentives to substitute. Spillover effects are similarly small, with the rate of welfare receipt of partners of affected females falling by an estimated 1.2 percentage points. After

accounting for program substitution and spillover effects, we estimate an annual 18% reduction in welfare expenditure for a one-year increase in eligibility on average over the affected ages.

In the following sections, we outline the Australian retirement system, the Age Pension reform and alternative welfare programs; describe the data and empirical strategy; discuss the results and conclude with implications of our findings.

2. POLICY BACKGROUND

The Australian retirement benefit system consists of private sources — mandatory superannuation and voluntary saving — and the Age Pension, which provides a benefit for those who are not able to rely on private sources to fully support themselves in retirement. Mandatory superannuation is compulsory employer contributions to government approved employee retirement funds and was introduced in Australia in 1992. Prior to this, superannuation coverage was limited to public sector employees and employees of some large firms. Despite the increasing importance of private benefits in recent years, there is still a heavy reliance on the Age Pension to fund retirement in Australia.

A feature of the Australian Age Pension is that it is a non-contributory scheme — eligibility and benefit size depend on current income and assets and not employment history. To be eligible, as well as meeting residence rules, applicants must be of eligible age and have (joint for couples) income and assets, excluding the value of the family home, below maximum thresholds. For those who meet eligibility criteria, the size of the payment is also dependent on their assets and income. The full pension is indexed against a percentage of male total average weekly earnings — around 42% combined for couples and around 28% for singles after adjusting for inflation — and is paid

to those whose assets and earnings are below the full-pension threshold.⁶ As assets or income increase beyond the full-pension threshold and up to the maximum threshold, payments are tapered and are called ‘part-pensions’.⁷

In 2013, 68% of the male retirement-age population and 73% of the female retirement-age population received the Age Pension, with 43% of the male recipients and 39% of the female recipients receiving part-pensions.⁸

2.1 Age Pension Reform

In this study, we focus on examining the impacts of the Age Pension reform enacted under the *Social Security Legislation Amendment Act 1994*, which was announced in the 1993-94 federal

⁶ As retirees solely reliant on the Age Pension pay no income tax, this translates to a net of tax replacement rate of 37 per cent (Bateman and Piggott 2001). In the 2nd quarter 2016, the single and partnered full pension was A\$794 and A\$1,198 per fortnight.

⁷ At the time of writing, (2nd quarter 2016), the full-pension and maximum asset thresholds were A\$354,500-937,250 for singles and A\$440,500-1,319,000 for couples (for those who own their own home, the thresholds are around A\$150,000 less) and fortnightly income thresholds were A\$162-1,910 for singles and A\$258-2,923 for couples. Income taper rates were A\$0.50 per dollar over the full-pension threshold for singles and A\$0.25 for couples and the asset taper rates was A\$1.50 per \$1,000 of assets over the full-pension threshold.

⁸ These are the authors own estimates based on the number of Age Pension recipients reported by the Department of Social Services (2015) and population estimates by single-year of age from the Australian Bureau of Statistics (2015).

budget on August 3 1993. This reform aimed to harmonise the Age Pension eligibility age of men and women by increasing the eligibility age of women from 60 to 65 through six-month increases every two years from July 1 1995. These changes affected women born after July 1 1935. A unique feature of the Australian reforms is that they were not accompanied by other measures that also aimed to induce delays in accessing retirement benefits. Increases in retirement benefit eligibility ages in the United States, Austria and Switzerland, that have been the focus of previous studies, have all been accompanied by new measures that increase benefits for delaying entry. Thus, impacts estimated in this study represent pure effects of eligibility age increases.

To the best of our knowledge, there were no other major reforms to the Age Pension over the period of analysis, July 1998 to May 2013. One minor change was an increase in the maximum allowable assets to qualify for the Age Pension from September 2007. This is likely to have increased the proportion of our affected group who are eligible for the Age Pension, which would tend to increase the effect of delaying eligibility, but only for younger cohorts who were affected by this change. By estimating variation in the effects across cohorts, we provide some insight into whether these changes impacted our results. Another change was the announcement in May 2009 of further gradual increases in the eligibility age for both men and women from 65 to 67 from July 1 2017. This change does not affect the eligibility age of groups affected by the initial reforms that are the focus of this study.

2.2 Alternative Welfare Programs

A feature of the Australian welfare system is that in response to delayed access to the Age Pension, there are many means-tested, non-contributory and time unlimited welfare payments that people

can use to replace their loss of Age Pension income, but only prior to pension eligibility, not after.⁹ At any one time, individuals cannot receive more than one of these alternative payments. The most relevant of these alternative payments are disability and unemployment benefits, known as the Disability Support Pension (DSP) and Newstart Allowance.

DSP is paid at the same rate as the Age Pension and is subject to the same income and asset tests. To qualify, people must be assessed to have a medical impairment (illness, injury or disability) that limits their ability to work. Since July 2006, an impairment has been deemed to limit an individual's ability to work if it restricts their capacity to less than 15 hours of work per week. Prior to this, eligibility was based on having a limitation that restricted work to less than 30 hours per week. Once a DSP recipient reaches retirement age, they are entitled to switch to the Age Pension.

Newstart Allowance is available for unemployed people aged 22 and over who are not at Age Pension eligibility age and meet the same asset requirements. However, Newstart applicants are subject to more stringent income tests and recipients must meet activity requirements.¹⁰ For those aged 55, activity requirements mean spending at least 30 hours in part-time work, voluntary work or a combination of the two, per fortnight.

⁹ Substitution to alternative payments is only relevant for the treated group who experience a delay in their pension eligibility, not the control group who are already at their pension eligibility age.

¹⁰ In 2016, the income thresholds are A\$934 for each partnered person and A\$1021 for singles fortnightly.

Other relevant payments are Carer Payments, Widow Allowance and Partner Allowance. Carer Payments are paid for caring for a family member with a long-term health condition. Widow Allowance is for single women born on or before July 1955 who have become widowed, divorced or separated since turning 40 and have limited employment experience in the 12 months immediately before claiming. Partner Allowance is available to women born on or before July 1955 who are partners of welfare recipients and have not worked in the past year before claiming. Since September 2003, the Australian Government has closed new entrants to Partner Allowance, although the entitlement has remained for existing participants.

3. DATA

Our main data source is the Research and Evaluation Database (RED), an administrative longitudinal database of the population of welfare recipients in Australia maintained by the Australian Department of Social Services. It includes rich information on individual recipients' payment type, payment amount, date of entry into and date of exit from payments, gender, marital status and date of birth. A feature of the data is information on each recipient's partner, including information on their date of birth and welfare payments. For this study we extract all records available in RED at the time of analysis, which is from July 1998 through to May 2013. While we take a full extract, information on payment amounts is only available from July 2005. To examine the impacts of changes in Age Pension eligibility, we extract records of all women aged 60 to 64.99 from RED.¹¹ This interval represents all the ages that are affected by the incremental

¹¹ We present age categories in decimals, calculated as age in months divided by 12 and rounded to two decimal places.

eligibility age increases from 60 to 65 that are legislated under the Social Security Legislation Amendment Act 1993.¹²

To make results using administrative data easily interpretable, we convert individual welfare records into birth-month cohort data using information on date of birth. Grouping data into monthly, instead of more aggregate birth cohorts, allows us to control for cohort effects within groups who face the same eligibility age. The outcome variables are monthly population welfare receipt rates (all welfare, Age Pension, alternative payments to the Age Pension, disability benefits and unemployment benefits); inflow rates into alternative payments (active substitution), defined as the commencement of any payment (except the Age Pension) after being out of the welfare system for at least 6 months¹³; partner welfare receipt rates of partnered women (spillover) and welfare expenditure rates (from all welfare payments in 2012 Australian dollars).

For each female birth-month cohort, these outcomes are generated by dividing the monthly welfare data from RED by the monthly cohort population count estimates. An exception is partner receipt rates of partnered women. In this case, we divide monthly partner welfare receipt data from RED by the monthly count of partnered women in each birth-month cohort (the derivation of the latter is discussed in appendix A). Partnered receipt in RED is identified from the welfare records of

¹² For the ease of the exposition, we exclude 66 observations of those born from July 1952 onward as they were subject to another increase in age pension age. Our results are robust to the inclusions of these observations.

¹³ Our main findings are the same if we choose a 3-month rule, results are available upon request from the corresponding author.

males whose female partner is born within the bounds of a specific birth-month cohort, regardless of their welfare status.

We derive monthly cohort population count estimates using a two-step procedure. First, we impute birth-month populations at the time of collection (June) of single-year age population estimates from the Australian Bureau of Statistics (ABS), assuming a uniform distribution of timing of birth.¹⁴ Second, we impute the monthly data points in between collection periods using linear interpolation (refer to appendix A for more details of the imputation process).

Table 1 provides the key features of the estimation sample. Due to the incremental nature of eligibility age increases, cohorts born close in time face different eligibility ages depending on their month of birth. For example, those who were born in December 1939 could start claiming Age Pension at the age of 61.5, however, those who were born one month later in January 1940 had to wait 6 months longer. For a given affected age in Table 1 associated with a given incremental pension increase, impacts are generated by comparing outcomes of those who are yet to reach eligibility age (NE in the column associated with the given affected age) to those who are unaffected because, due to the earlier timing of their birth, are at their eligibility age (E in the same column). This discontinuity in the relationship between timing of birth and pension eligibility allows us to separate impacts of eligibility age increases from age effects. It is important to note that once a cohort reaches its eligibility age, it switches status from treatment to control group (NE

¹⁴ We estimated models with month of birth dummies to control for differences in welfare eligibility (income and assets) that may be associated with season of birth effects (see for example, Buckles and Hungerman 2013). Results are almost identical and are available upon request from the corresponding author.

to E in Table 1), but for some younger cohorts (born from Jan 1949) and some older cohorts (born before July 1937), because of data truncation, their status is unchanged over the period of analysis.

Table 1. Age Pension eligibility status in the RED data extract (July 1998-May 2013)

Birth-month cohort	APE	APE dates	Affected ages ^a										
			60-60.49	60.5-60.99	61-61.49	61.5-61.99	62-62.49	62.5-62.99	63-63.49	63.5-63.99	64-64.49	64.5-64.99	
Aug33-Dec33	60	Pre-Jul95	-	-	-	-	-	-	-	-	-	-	E
Jan34 -Jun34	60	Pre-Jul95	-	-	-	-	-	-	-	-	-	E	E
Jul34-Dec34	60	Pre-Jul95	-	-	-	-	-	-	-	-	E	E	E
Jan35-Jun35	60	Pre-Jul 95	-	-	-	-	-	-	E	E	E	E	E
Jul35-Dec35	60.5	Jan96-Jun96	-	-	-	-	-	E	E	E	E	E	E
Jan36-Jun 36	60.5	Jul96-Dec96	-	-	-	-	E	E	E	E	E	E	E
Jul36- Dec36	60.5	Jan97-Jun97	-	-	-	E	E	E	E	E	E	E	E
Jan37-Jun 37	61	Jan98-Jun98	-	-	E	E	E	E	E	E	E	E	E
Jul37-Dec37	61	Jul98-Dec98	-	NE	E	E	E	E	E	E	E	E	E
Jan38-Jun 38	61	Jan99-Jun99	NE	NE	E	E	E	E	E	E	E	E	E
Jul38-Dec39	61.5	Jan00-Jul01	NE	NE	NE	E	E	E	E	E	E	E	E
Jan40-Jun41	62	Jan02-Jun03	NE	NE	NE	NE	E	E	E	E	E	E	E
Jul 41-Dec42	62.5	Jan04-Jun05	NE	NE	NE	NE	NE	E	E	E	E	E	E
Jan43-Jun44	63	Jan06-Jun07	NE	NE	NE	NE	NE	NE	E	E	E	E	E
Jul44-Dec45	63.5	Jan08-Jun09	NE	NE	NE	NE	NE	NE	NE	E	E	E	E
Jan46-Jun47	64	Jan10-Jun11	NE	NE	NE	NE	NE	NE	NE	NE	E	E	E
Jul47-Dec48	64.5	Jan12-Jun12	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
Jan48-Jun48	64.5	Jul12-Dec12	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
Jul48-Dec48	64.5	Jan13-Jun13	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
Jan49-Jun49	65	Jan14-Jun14	NE	NE	NE	NE	NE	NE	NE	NE	-	-	-

Jul49-Dec49	65	Jul14-Dec14	NE	NE	NE	NE	NE	NE	NE	NE	-	-	-
Jan50-Jun50	65	Jan15-Jun15	NE	NE	NE	NE	NE	NE	-	-	-	-	-
Jul50-Dec50	65	Jul15-Dec15	NE	NE	NE	NE	NE	-	-	-	-	-	-
Jan51-Jun51	65	Jan16-Jun16	NE	NE	NE	NE	-	-	-	-	-	-	-
Jul51-Dec51	65	Jul16-Dec16	NE	NE	NE	-	-	-	-	-	-	-	-
Jan52-Jun52	65	Jan17-Jun17	NE	NE	-	-	-	-	-	-	-	-	-

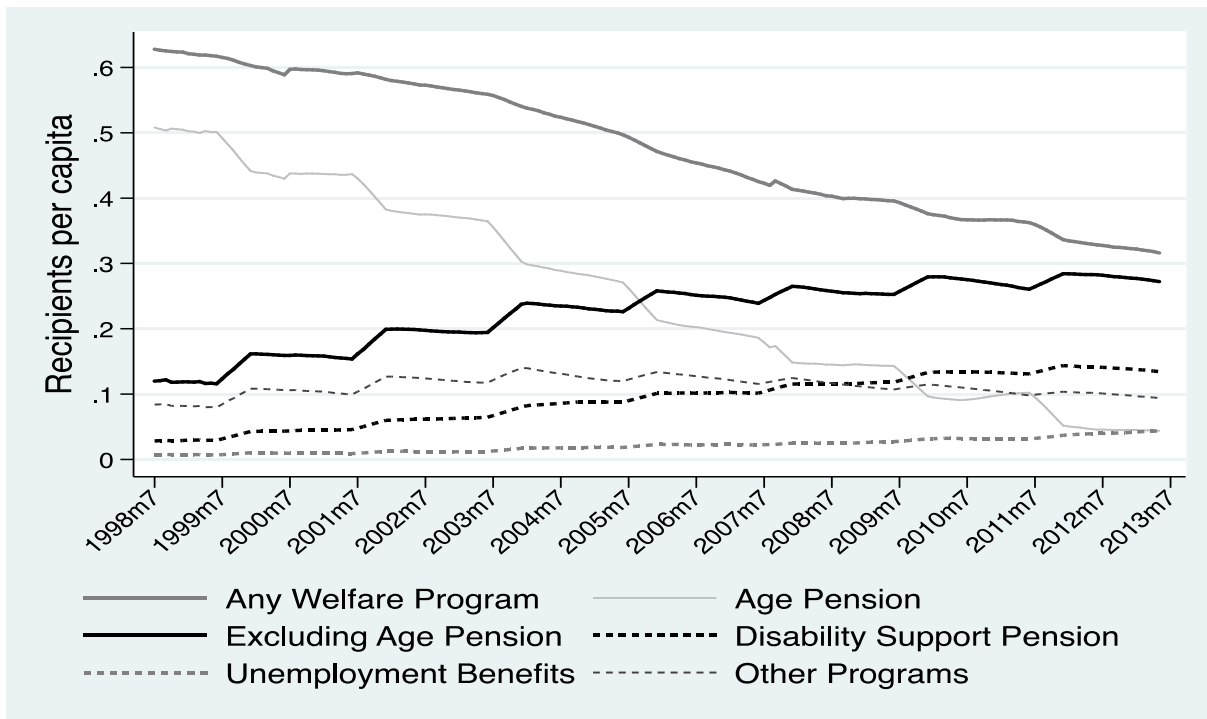
Notes: NE is less than age pension eligibility age and E is at or older than eligibility age. – cohort is not observed in this age category over the period of analysis. ^aAge is expressed in decimals, calculated as age in months divided by 12 and rounded to two decimal places. The modelling approach estimates impacts for each incremental increase in the pension age by comparing outcomes of those who are yet to reach eligibility age (NE in the column associated with the given affected age) to those who are unaffected because, due to the earlier timing of their birth, are at their eligibility age (E in the same column).

While we extract welfare information for all 60 to 64.99 recipients, we only estimate the effects of incremental increases from 61 to 64.5 for affected age categories 61 to 64.49 (see shaded area in Table 1). For those who faced incremental increases between 60 to 60.5 and 60.5 to 61, there are no treatment group observations because at the start of the observation period they were all at eligibility age (E in Table 1). Likewise, our data does not extend long enough to observe impacts beyond increases from 64 to 64.5 (no NE for age category 64.5-64.99 in Table1). For welfare expenditure, because data is only available from July 2005, we are only able to estimate impacts of eligibility age increases from 62.5 to 64.5.

3.1 Welfare receipt over time

In aggregate terms over the period of analysis, delaying female eligibility to retirement benefits is associated with a reduction in the rate of welfare receipt among females aged 60-64.99 from around 60% in July 1998 to around 30% in May 2013 (Figure 1).

Figure 1: Welfare receipt rates among females aged 60-64.99



Source: Own estimates based on welfare receipt information from RED and population count estimates from the Australian Bureau of Statistics Australian See: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015>.

However, increases in female eligibility age over this period coincided with increases in the receipt rate of disability and unemployment benefits, which suggests possible program substitution. This observation, the focus of Atalay and Barrett (2015) study, was first made by McVicar and Wilkins (2013) in a descriptive study.¹⁵

To provide insight into the importance of mechanical and active substitution in explaining the growth of alternative payments over this time, in Figure 2 we present changes in welfare receipt

¹⁵ McVicar and Wilkins (2013) note that the female pension changes are not likely to have been the sole driver, with male unemployment and disability benefits rates following a similar, albeit lower, pattern of growth since the 1990-91 recession in Australia.

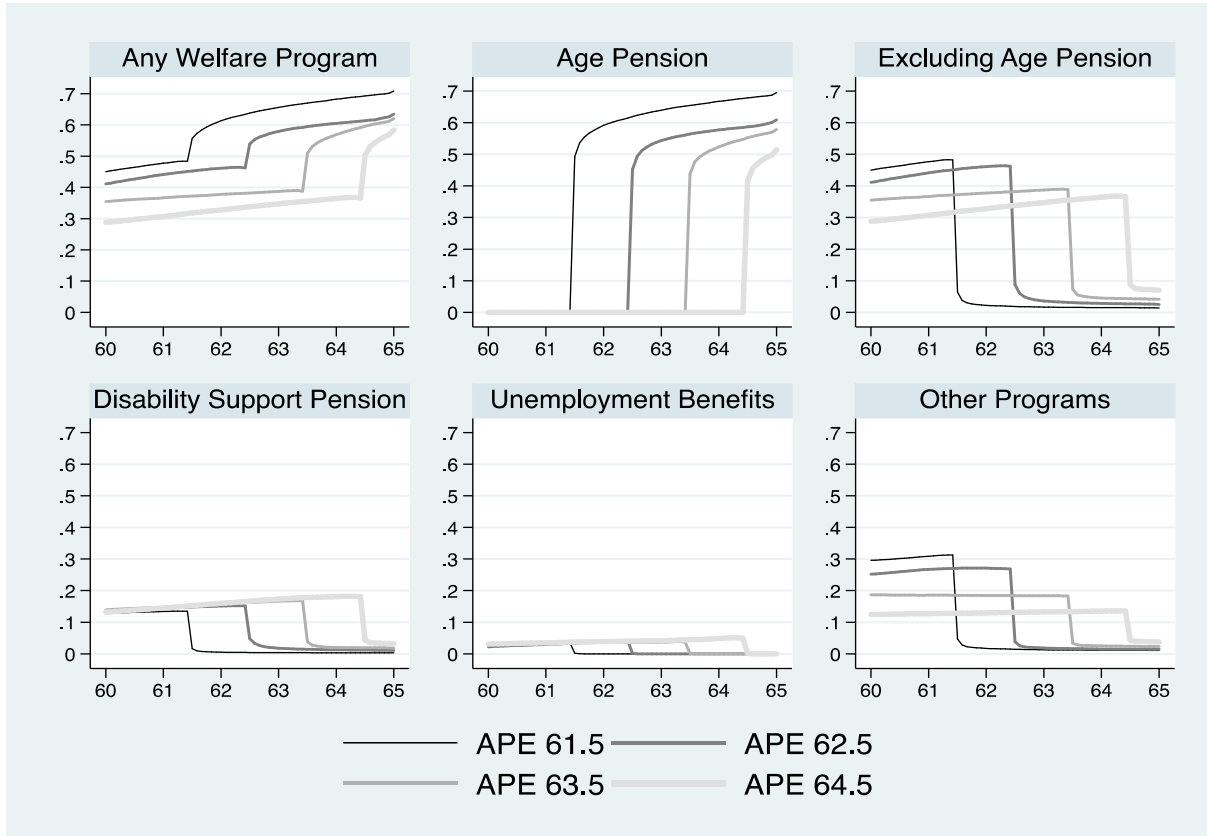
rates for cohorts that face the same select Age Pension eligibility (APE) ages.¹⁶ There are several key patterns of note. First, statistics presented in the top left panel suggest that prior to reaching eligible age, over a third of the female population was already on welfare, which may reflect opportunities available in Australia to retire early on welfare. Across the displayed cohorts, welfare receipt appears to be higher among earlier-born cohorts who face a lower eligibility age, which reflects lower expectations for women to work and related greater availability of welfare payments for dependent women. In particular, prior to July 1995, subject to means tests, dependent women with children were entitled to a Wife Allowance if their partner was an invalid or at Age Pension eligibility age. Differences in the Wife Allowance entitlement explains 10 percentage points of the 13.6 percentage point higher welfare receipt rate of women who face an eligibility age of 61.5 compared to 64.5 in Figure 2.

Second, statistics presented in the top three panels suggest mechanical substitution effects are much larger than active substitution effects. Focusing on the top middle panel first, for each of the displayed cohorts there is a large jump in Age Pension receipt rate as soon as they reach eligibility age. However, changes in the top left-hand panel show a more subdued jump in overall welfare receipt, which suggests that much of the increase in Age Pension receipt is due to a switch from other benefits, which is evident from the drop in alternative welfare receipt in the top right-hand panel, or mechanical substitution. Third, the growth in receipt of alternative payments in ages leading-up to eligibility age (top right-hand panel) is suggestive of active substitution, but its magnitude is far less than that for the drop in receipt at eligibility age (mechanical substitution).

¹⁶ For clarity, we do not include all cohorts.

In the section to follow, we move beyond descriptive analysis to tease-out the potentially causal effects of eligibility age changes on welfare receipt, including that of partners.

Figure 2. Female welfare receipt rates for cohorts facing the same Age Pension eligibility age



Source: Own estimates based on welfare receipt information from RED and population count estimates published by the Australian Bureau of Statistics Australian See: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015>.

4. ECONOMETRIC MODEL

In the econometric modelling outlined below, we use birth-month cohort data tracked monthly to estimate the impacts of delaying female eligibility for retirement benefits. In separate analyses,

we estimate impacts on: the population welfare receipt rates, inflow rates¹⁷, partner receipt rates, and per-capita welfare expenditure amount. To estimate the effect of each incremental increase in eligibility age, our estimation approach compares rates of welfare receipt of birth cohorts affected by the increase and those who are not, as depicted by NE and E respectively in Table 1. Using multiple birth cohort data tracked longitudinally allows us to separate impacts of eligibility age increases from the effects related to aging. Moreover, as illustrated in Figure 2, there is heterogeneity in welfare receipt among different birth cohorts and we address this by explicitly controlling for cohort by eligibility age fixed effects. In this way, our approach follows that used by Staubli and Zweimuller (2013), but is adapted for cohort-based analysis, drawing on the approach used by Duggan et al (2007):

$$y_{it} = \alpha + \lambda_t + \sum_k \delta_k k_{it} + \beta unemp_t + \sum_j \theta_j APE_{ij} + \gamma NE_{it} + \epsilon_{it} \quad (1)$$

where y_{it} is the outcome of interest for birth-month cohort i in month t ; λ_t is annual and calendar month time dummies; k_{it} is a vector of nine indicators for whether cohort i 's age in month t (age_{it}) is within six-month age interval k ($k = 60 - 60.49, 60.5 - 60.99, \dots 64.5 - 64.99$); $unemp_t$ is the prevailing monthly unemployment rate; APE_{ij} is a vector of eight indicators for whether cohort i faces Age Pension eligibility age of j ($j = 61, 61.5, \dots 64.5$); NE_{it} is a treatment indicator of whether cohort i is below their Age Pension eligibility age j , or $NE_{it} = 1(age_{it} < j)$, 0 otherwise, γ (the main coefficient of interest) is the average effect of delaying female retirement benefit

¹⁷ Our analysis focuses on the impacts on the inflows as the reform does not impact the outflows. In a separate analysis, we estimated the potential impact on the monthly exit rate to be only 0.003 percentage points (results are available upon request).

eligibility from 61 to 64.5 over affected ages (61-64.49) and ϵ_{it} is an error term. The inclusion of birth cohort dummies that have the same pension age (APE_{ij}) allows us to control for cohort differences that are independent of the increase in retirement age. An alternative modelling approach that exploits differences in welfare receipt rates of cohorts born in consecutive months with different eligibility ages, which more finely controls for cohort differences, yields very similar results (descriptive statistics and estimation results are presented in Tables B1 and B2 correspondingly).

We also estimate a more flexible version of equation (1) that includes a three-way interaction among k_{it} , NE_{it} and APE_{ij} , that allows us to examine whether impacts vary across incremental eligibility age increases and across affected cohorts. In the latter case, differences in impacts across affected cohorts may provide insight into whether our results are affected by Age Pension reforms that occurred in the second half of our analysis (2007) because they only affected cohorts facing higher eligibility ages (63.5 and above). This flexible interaction model is also used to estimate impacts on welfare expenditure. Although equation (1) does not capture active substitution ahead of affected ages, results from an alternative model suggests anticipation effects are negligible (this issue is addressed in detail in the results section).

5. RESULTS

Key results from the estimation of equation (1) are presented in Table 2. In each column, results are estimated using a different dependent variable. At this point, we remind the reader that disability and unemployment benefits are a subset of the category of any payment excluding the Age Pension.

Table 2. Effects of increasing the female Age Pension eligibility age from 61 to 64.5 on welfare receipt

	Any payment	Age Pension	Any payment excl. Age Pension	Disability benefits ^a	Unemployment benefits ^b
All women					
<i>Welfare receipt rate for affected ages (61-64.49)</i>					
γ	-0.1264*** (0.0009)	-	0.3930*** (0.0009)	0.1427*** (0.0003)	0.0392*** (0.0001)
R ²	0.9749	-	0.9837	0.9896	0.9775
<i>Monthly welfare inflow (active substitution) for affected ages (61-64.49)^c</i>					
γ	-	-	0.00242*** (0.00002)	0.00044*** (0.00001)	0.00096*** (0.00001)
R ²	-	-	0.8561	0.6512	0.8084
Partnered women					
<i>Welfare receipt rate for affected ages (61-64.49)</i>					
γ	-0.1564*** (0.0010)	-	0.3746*** (0.0003)	0.1055*** (0.0001)	0.0360*** (0.0010)
R ²	0.9792	-	0.9756	0.9823	0.9649
<i>Monthly welfare inflow (active substitution) for affected ages (61-64.49)^c</i>					
γ			0.00261*** (0.00003)	0.00048*** (0.00001)	0.00093*** (0.00001)
R ²			0.8015	0.5810	0.7268
<i>Partner welfare receipt rate (spillover effects) for partnered affected females (61-64.49)</i>					
γ	-0.0119*** (0.0009)	-0.0091*** (0.0008)	-0.0028*** (0.0004)	0.0005** (0.0003)	0.0016*** (0.0001)
R ²	0.9641	0.9762	0.9606	0.9491	0.9591
Single women					
<i>Welfare receipt rate for affected ages (61-64.49)</i>					
γ	-0.0776*** (0.0010)	-	0.4221*** (0.0009)	0.2066*** (0.0005)	0.0452*** (0.0002)
R ²	0.9311	-	0.9872	0.9868	0.9674
<i>Monthly welfare inflow (active substitution) for affected ages (61-64.49)^c</i>					
γ			0.00206*** (0.00003)	0.00036*** (0.00001)	0.00102*** (0.00002)
R ²			0.7500	0.3869	0.6494
N	10,674	10,674	10,674	10,674	10,674

Notes: *** p<0.01, ** p<0.05, * p<0.1. Control variables include age, monthly unemployment rate, age pension birth cohort and time fixed effects. ^aDisability Support Pension. ^bNew Start

Allowance. ^cThe coefficient for monthly inflow is not directly comparable to the change in stock of welfare receipt, including change in stock of partner receipt.

Overall, we estimate that incremental increases in the female Age Pension eligibility from 61 to 64.5 reduced the monthly welfare receipt rate by 12.6 percentage points on average across the affected ages between January 1998 and May 2013.

Compared to the size of the group that is potentially impacted by these eligibility increases (44% who are not already on welfare and who may meet means-test requirements), this can be considered a large effect.¹⁸ Underlying this net change in welfare receipt is a 39.3 percentage point increase in the receipt rate of other benefits (overall substitution), implying a 51.9 percentage point reduction in Age Pension receipt.¹⁹ By partner status (middle and bottom panels of Table 2), the fall in monthly receipt rate is larger for partnered women — 15.6 percentage points compared to 7.8 percentage points for single women. The fall in the welfare receipt rate of single women is lower mainly because of a higher overall substitution rate. A 50 percentage point reduction in Age Pension receipt among single women is mostly offset by a 42.2 percentage point increase in receipt of alternative payments (or 85% substitution rate). Around half of the substitution is into DSP. For partnered women, only 37.5 points out of the 53.1 percentage point reduction in Age Pension receipt is offset by substitution (70% substitution rate). Whether this represents active substitution is examined in the following sections.

¹⁸The 44% estimate is based on an estimate from Atalay and Barrett (2015) that 70% of the affected female population meets means-test requirements and that 37% of the affected female population (from RED) are not impacted because they are already on welfare at age 60.

¹⁹This can be interpreted as the predicted receipt rate in the absence of the reform. It also implies that 48.1% were unaffected by these changes and remained off welfare.

Compared to previous estimates by Atalay and Barrett (2015) for the same reforms, albeit using slightly different incremental increases in female eligibility age, we find that the impacts on the Age Pension receipt rate in this study are comparable (51.9 percentage points compared to 49 percentage points for the previous study).²⁰ However, our estimated net reduction in receipt rate of 12.6 percentage points is only around half of that estimated by Atalay and Barrett (2015), because our estimated substitution effects are much larger (39.3 versus 21 percentage point increases). While it is difficult to reconcile the estimates, one explanation is that the previous study may not have adequately dealt with cohort differences between treatment and control groups. Specifically, their control group was an older cohort of females who were born prior to July 1935.²¹ Because of differences in education and work history, this older-female cohort may have very different welfare receipt trajectories than younger cohorts. In our study, when we remove the controls for cohort differences, our results become closer to their estimates.²² Differences in the estimates may also be because they used repeated cross-sectional survey data that may under-report the receipt of disability and unemployment benefits.

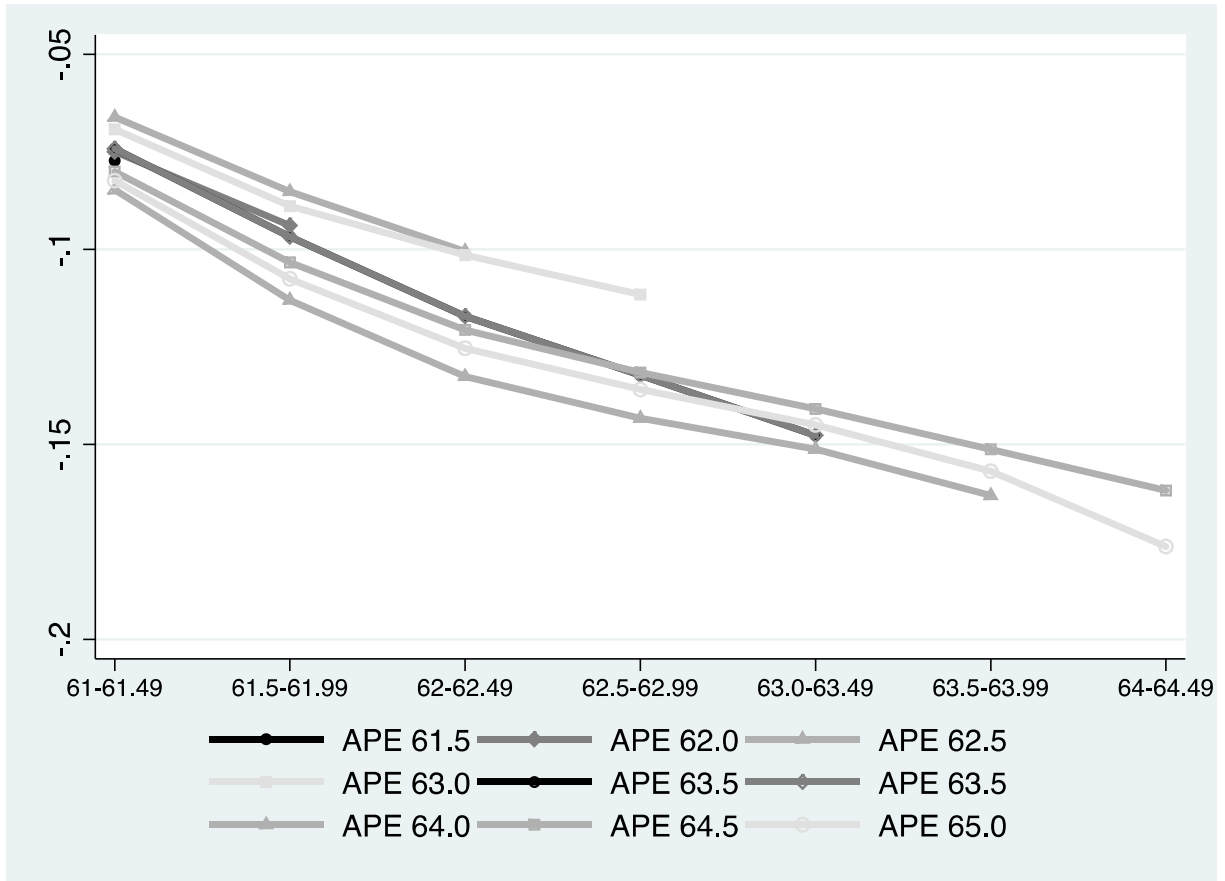
²⁰ They examined eligibility age increases from 60 to 64.

²¹For estimates on labour force participation, Atalay and Barrett (2015) use males of the same birth cohorts as control groups and hence they can control for the cohort differences using Age Pension age birth cohort dummies. They do not use males as control groups when examining income support receipt because of differences in trends in welfare receipt, and hence they are not able to control for the cohort differences in the same way.

²² The estimated increase in welfare receipt rate is 20 percentage points and the substitution effect is reduced to 35 percentage points.

Results from Table 2 are for a model where the effects of six-monthly incremental increases from 61 to 64.5 are restricted to be the same level. Results from a more flexible three-way interaction model where we allow the effects to vary by cohort and incremental increase are presented in

Figure 3. Estimated effects of female Age Pension eligibly age increases from 61 to 64.5 on welfare receipt rate by APE birth cohort



Notes: All estimates are significant at the 1% level. The coefficients are plotted at the mid-point of the six-month age categories.

Figure 3. There are two key messages from results presented in Figure 3. First, the differences in the effects across cohorts are minimal, which suggest that our results are robust to other policy changes, such as the 2007 changes in the treatment of assets, that may have affected some cohorts and not others. Second, the fall in welfare receipt increases with the ratcheting-up of eligibility age. For example, for cohorts of females who face an APE of 65, the estimated reduction in welfare

receipt increases from 8.24 percentage points for increases from 61 to 61.5 (affected age category 61-61.49) to 17.6 percentage points for increases from 64 to 64.5 (affected age category 64-64.49). The doubling of the impacts from the initial to the last incremental increase is because the proportion of people who would like to retire (if they were eligible for the Age Pension) increases with age. It follows that as the eligibility age is ratcheted-up, so is the proportion of the affected age groups who are impacted by the delay in eligibility.

5.1 Spillover effects

Estimates of impacts on the partner's welfare receipt are presented in the middle panel of Table 2. We find the first evidence of statistically significant counter-acting spillover effects for disability and unemployment benefits under a means-testing regime. However, these are very small effects and are more than offset by reductions in partner Age Pension receipt that (most likely) are brought about by couples synchronizing their retirement. Overall, we estimate that among affected females, increasing the Age Pension eligibility age from 61 to 64.5 reduced the welfare receipt of their partners by 1.2 percentage points per month on average over the period of analysis. These results contrast to those from Lalive and Staubli (2014), who find no spillover effects from similar increases in female eligibility age in Switzerland, but are still small compared to the estimated 15.6 percentage point net reduction in partnered female welfare receipt (middle panel of Table 2).

5.2 Active vs Mechanical Substitution

A key motivation of this study is to understand the nature of substitution effects, which from Table 2 are reported to be large —75% of the rate of reduction in the Age Pension is offset by increases in alternative payments (85% for single and 70% for partnered women).

Overall (top panel of Table 2), we estimate that increasing the female Age Pension eligibility age from 61 to 64.5 leads to a 0.24 percentage point increase in the per capita monthly welfare inflow rate of affected females.²³ Around half of the estimated active substitution effect is from increases in disability and unemployment benefit inflow (0.14 percentage points) and the rest is due to the increase in inflow into other payments, mainly increased inflow onto Partner Allowance among earlier-born cohorts.²⁴ To put the monthly inflow estimates on an equal footing with the impacts on the welfare receipt rate, we also estimate an equivalent model using the stock of recipients who entered welfare programs from the age of 61 onwards, which gives a 4.3 percentage point increase in welfare receipt rate. Thus, we can conclude that 35 of the 39.3 percentage point substitution effect (or around 90%) is mechanical substitution — people already on welfare at the age of 61 bridging the delay to Age Pension benefits by remaining on existing payments longer.

We estimate that the rate of active substitution varies little by partner status (second and third panels in Table 2). This result is despite single women having extra substitution options. In Australia, single women are eligible for a Widow Allowance, a means-tested, time unlimited payment for women without recent work experience who have divorced, widowed or separated since turning 40. Thus, our conclusion is that the higher rate of substitution of single women, compared to partnered women, is due to their higher mechanical substitution, reflecting greater dependence on welfare (especially DSP) in ages leading-up to pension age.

²³ This is relative to a base of zero — there is no inflow into alternative payments from people at pension eligibility age.

²⁴ Cohorts with eligibility ages 61-63. Later cohorts did not have the same access because new entrants to the program ceased in September 2003.

The active substitution estimates reported in Table 2 are averaged over all incremental pension-age increases, but it is possible that impacts may have ramped-up with incremental increases. Results from equation (1) model with three-way interactions (see Table D1 in the appendix) suggest no major ramping-up of active substitution estimates with incremental increases in the pension age.

Anticipation effects

The results presented above are estimated under the assumption that active substitution occurs only within the affected ages. If in practice people anticipated the changes in pension eligibility and responded ahead of time, then we may mistakenly have attributed active substitution as mechanical. To test for active substitution in anticipation of eligibility age changes, we extend equation (1) to allow for inflow at six-month intervals up until 9.5 years ahead of affected ages (or from age 55 to 64.49):²⁵

$$y_{it} = \alpha + \lambda_t + \sum_k \delta_k k + \beta unemp_t + \sum_j \theta_j APE_{ij} + \gamma NE_{it} + \sum_n \gamma_n I(age_{it} < j - n) + \epsilon_{it}. \quad (2)$$

Results from equation (2) are presented in Figure 4. They show that active substitution ahead of affected ages (x-axis values less than zero) is relatively small compared to at the affected age (zero on the x-axis).²⁶ However, a blind-spot of this approach is its inability to capture anticipation effects

²⁵ This is consistent with the approach of Staubli and Zweimüller (2013). Given our data starts in July 1998, 9.5 years is as far as we can observe anticipation effects.

²⁶ Data of inflow rates of birth cohorts affected by the announcement of subsequent increases in eligibility from 65 to 67 (in May 2009), compared to slightly older cohorts that were not affected, are also supportive of small anticipation effects (see Figure C2 in appendix C). The accumulated

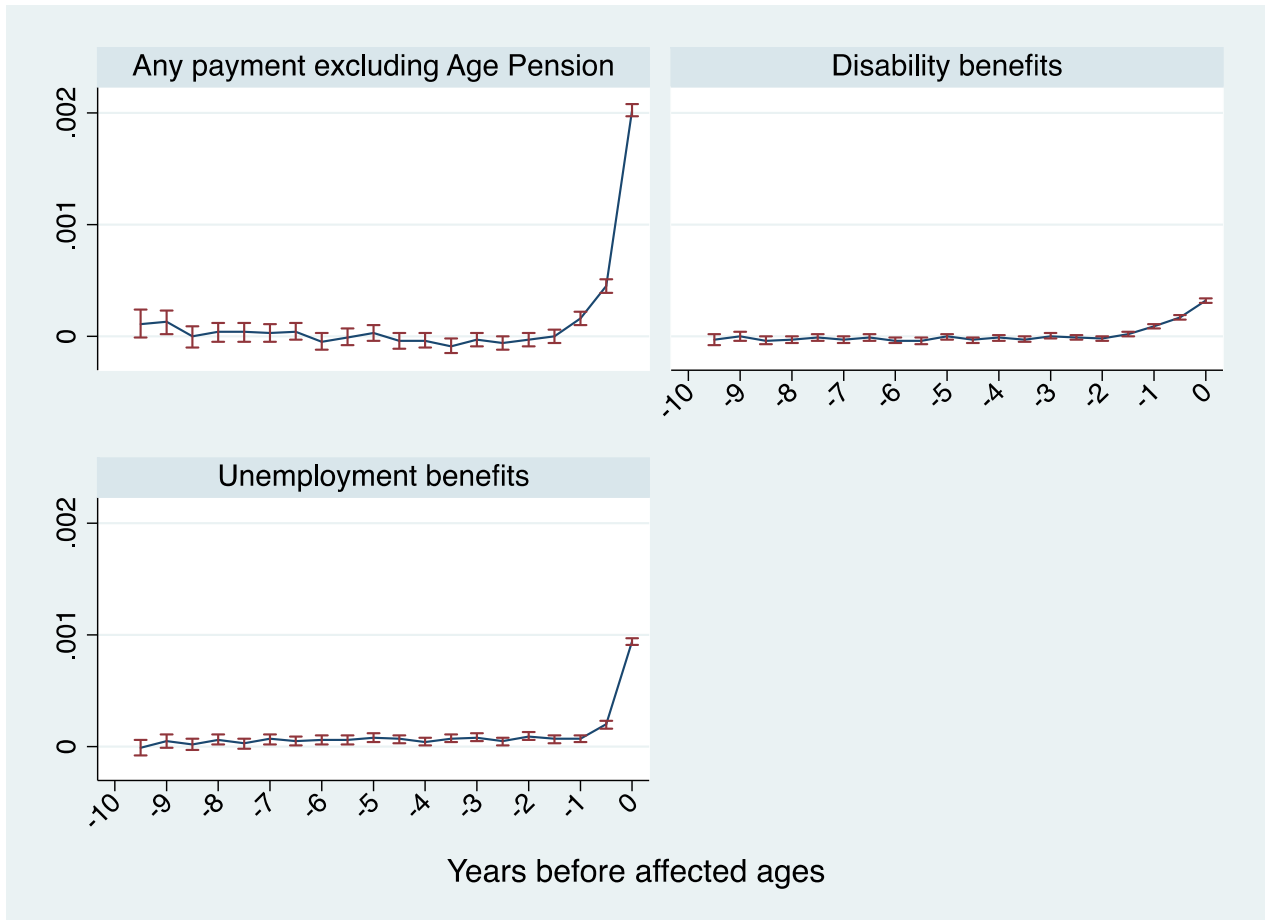
due to a preference to retire at the pre-reform eligibility age of 60, possibly because of status quo bias, which would be common across affected cohorts regardless of eligibility age.²⁷ This concern is not born-out in the data, with no apparent spike in the welfare inflow rate of females birth-month cohorts at age 60 (or equivalent male birth-month cohorts who were unaffected by the reforms) (see Figure C1 in appendix C).

The implication of these results is that the estimated dominance of mechanical substitution over active substitution among affected ages is not because of a failure to properly capture anticipation effects. The small anticipation effect in this context is not surprising given that eligibility age increases do not affect the size of the Age Pension. This is in contrast to contributory schemes where delays in accessing benefits reduce the incremental increase in the size of the public pension from working an extra year, which makes alternative payments more attractive (Duggan, Singleton and Song 2007).

anticipation effect, or sum of all the lead variable coefficients is 0.00021 or 0.021 percentage point increase from 9.5 years ahead of affected ages.

²⁷ Under status quo bias (Kahneman, Knetsch and Thaler 1991), because of loss aversion, people may prefer to retire at the pre-reform eligibility age because the loss leisure from delaying retirement weighs more heavily in their decision making than prospects of gain from working longer.

Figure 4: Active substitution in years ahead of the affected ages



Notes: the y-axis values are estimated coefficients from equation (2). Coefficient values at 0 on the x-axis represent active substitution at the affected ages. Range plots correspond to 95% confidence intervals.

5.3 Impacts on welfare expenditure

In Table 4 we present average monthly impacts on welfare expenditure for each of the six-month incremental increases that are captured in the payment data from 62.5 to 64.5 (top panel) and average monthly impacts across all incremental increases (bottom panel). These estimates are derived from the coefficients from a flexible version of equation (1) where the treatment effects,

via three-way interactions, can vary by incremental increase in eligibility and across cohorts facing the same eligibility age (all coefficients are presented in Table D2 in appendix D).

Table 4. Effects of increasing the female Age Pension eligibility age from 62.5 to 64.5 on monthly female welfare expenditure (A\$/per head of affected cohort)^a

<i>Impacts by incremental increases in eligibility age^b</i>	
62.5-63 (62.5-62.99)	-78.46*** (9.42)
63-63.5 (63-63.49)	-84.57*** (3.63)
63.5-64 (63.5-63.99)	-107.29*** (3.41)
64-64.5 (64-64.49)	-136.63*** (5.01)
<i>Average impacts across all incremental increases in eligibility age^c</i>	
	-101.74*** (3.23)
N	5,682
R ²	0.951

Notes: *** p<0.01, ** p<0.05, * p<0.1. Control variables include age, monthly unemployment rate, age pension birth cohort and time fixed effects. ^aExpenditure includes payments for the affected female's partner. ^bResults are estimated by averaging the coefficients from a three-way interaction model (see Table D2 in appendix D for a full set of results) over APE cohorts. The coefficients that are represented are averaged over the APE cohorts. The bracketed range is the six-month age categories that are affected by the incremental change.

Consistent with Figure 2, results in Table 4 show that the average monthly welfare savings increased as the eligibility age was ratcheted up. Specifically, the increase from 62.5 to 63 reduced monthly welfare expenditure by \$A78 per head of the affected population, whereas increases from 64 to 64.5 reduced monthly expenditure by \$A137 per head. On average across all incremental increases between 62.5 and 64.5, monthly welfare expenditure is estimated to fall by A\$101.7 per head of the affected female population. Given that on average there are 193,519 women per month in the affected age categories over the period of analysis,²⁸ this equates to an average saving of

²⁸ Population estimates are based on ABS demographic data, see appendix A for more detail.

around A\$19.7 million per month for the two-year delay in eligibility. Based on estimated welfare expenditure of A\$109.6 million per month in absence of any increase in eligibility age beyond 62.5, this represents an 18% average monthly reduction in welfare expenditure.²⁹

6. CONCLUSIONS

The aging population is a threat to the long-run fiscal sustainability of many OECD countries. A common response has been to increase the minimum age at which people can qualify for publicly-funded retirement benefits. However, the extent to which any fiscal savings is offset by active welfare responses by women and their partners, referred to as active substitution and spillover effects respectively, is unclear. In this study, we add to the understanding of these behavioral responses and their fiscal implications by using longitudinal administrative welfare data to exploit a natural experiment in Australia that incrementally increased the female retirement age in Australia.

An important contribution of this paper is to put previously estimated large substitution effects in Austria (Staubli and Zweimüller 2013) and Australia (Atalay and Barrett 2015) into perspective. We show that 90% of the ‘overall’ substitution observed in Australia is passive in nature (mechanical substitution), that is, it represents people already on welfare bridging the delay in retirement benefit eligibility by remaining on the existing payments. Wholesale restructuring of the welfare eligibility rules aside, tackling this form of substitution can only come about by reducing reliance on welfare ahead of retirement age. While this may be an objective of government policy, it is not one that should be motivated to reduce welfare substitution. Active

²⁹ This estimate is an estimate from the three-way interaction model.

substitution, which is more amenable to immediate policy action, is found to explain only around 10% of overall substitution — 4.3 percentage point increase out of a 39.3 percentage point total increase in the rate of receipt of alternative payments. Importantly, we show that the rate of active substitution for women changes little as the pension-age is ramped-up.

Our study also takes first steps in allaying concerns that means-testing creates perverse incentives that can counteract fiscal savings from pension age increases. We find that to the extent that joint means-testing increases the opportunity cost of partner's work, the resulting increase in their welfare reliance is very small and more than offset by lower pension reliance that may be associated with the synchronization of retirement.

There are some important implications of our findings. The small active substitution effects suggest that women whose retirement benefits are delayed do not appear to 'game the system' by entering alternative welfare programs to avoid delaying retirement. Instead, active substitution is likely to be driven more by a small number of affected women who, perhaps because of their life circumstances or weak attachment to the labor market, are unable to provide for themselves beyond their planned retirement age. This finding, combined with the finding that active substitution is insensitive to incremental increases (between 61 and 64.5), provides confidence that welfare savings from further pension-age increases currently in-train in Australia are not in jeopardy from active substitution, at least for females. The extent to which these results apply to men, who on average work in more physically demanding jobs, is the focus of future research, as are other responses that may counteract welfare savings from Pension Age increases, such as the greater run-down of assets.

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APPENDIX A: IMPUTING BIRTH-MONTH POPULATION COUNTS

We impute birth-month population counts over the period of analysis (July 1998 through to May 2013) from single-year age population counts published in June each year as part of the Australian Demographic Statistics collection produced by the Australian Bureau of Statistics (ABS).³⁰ This process involves two steps. The first step is to impute birth-month counts from the ABS single-year population counts in June each year. To do this, we assume that the timing of birth follows a uniform distribution. The second step involves estimating birth-month counts for each subsequent month up to May the following year. This is done using linear interpolation between consecutive year ABS estimates.

When estimating results for sub-groups of birth-month cohorts, namely single and partnered women (for estimating heterogenous and spillover effects respectively) we follow the same process, but use a different dataset. Specifically, we use ABS census data because the Australian Demographic Statistics collection does not include information on marital status.³¹ In this case, we first impute birth-month counts of married and single women from single-year population counts at census time (August 1996, 2001, 2006, and 2011) by assuming birth follows a uniform distribution across months. In the second step, we use linear interpolation to estimate monthly counts between census periods.

³⁰Australian Demographic Statistics, catalogue no. 3101.0. See: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015>.

³¹ Australian Census, see: <http://www.abs.gov.au/websitedbs/censushome.nsf/home/census?opendocument&navpos=10>

APPENDIX B: ALTERNATIVE TREATMENT OF COHORT EFFECTS

In this section, we test the robustness of our results using an alternative model that better controls for cohort effects. Akin to the approach used by Duggan et al. (2007), we identify impacts among cohorts born in consecutive months, who because of their timing of birth, face a six-month difference in their eligibility age. Specifically, we estimate the following model using our month birth cohorts:

$$\Delta y_{at} = \alpha + \gamma \Delta NE_{at} + X_{at} B + \varepsilon_{at} \quad (2)$$

where for Δy_a is the difference in welfare receipt rate for consecutive cohorts i and $i - 1$ at age a ($\Delta y_{at} = y_{iat} - y_{i-1at-1}$); ΔNE_{at} measures the difference in eligibility between consecutive cohorts; γ is the estimated treatment effect from increased Age Pension eligibility age and X are a set of control variables that are similar to those included in our standard model (equation 1). In equation (2), ΔNE_{at} is equal to one during the 6 months where consecutive birth cohorts are the same age, but face differences in Age Pension eligibility and zero otherwise. For example, the cohort born in December 1939 could start claiming at age 61.5, but the cohort born one month later in January 1940 had to wait 6 months longer. Thus, ΔNE_{at} for these two consecutive cohorts is equal to one during for ages 61.5-61.99 and zero otherwise. Estimation is conducted on the full sample of 60 to 64.99 year-old females over the period of analysis (July 1998-May 2013).

Table B1. Mean differences in welfare receipt of consecutive birth month cohorts with different Pension eligibility age

	Age Pension		Any Payment		Excluding Age Pension	
	6-month before	at aff age	6-month before	at aff. age	6-month before	at aff. Age
Differences between monthly birth cohorts						
Jul 39 (APE61.5)- Jun38 (APE 61.0)	0.000	-0.509	0.034	-0.037	0.035	0.473
Jan 40(APE62.0)- Dec 39(APE61.5)	-0.001	-0.549	0.031	-0.067	0.032	0.482
Jul 41(APE62.5)- Jun 41(APE62.0)	0.000	-0.505	0.027	-0.057	0.028	0.448
Jan 43(APE 63.0)- Dec 42(APE62.5)	0.000	-0.483	0.037	-0.06	0.037	0.423
Jul 44(APE63.5)- Jun 44(APE 63.0)	0.000	-0.451	0.032	-0.084	0.032	0.367
Jan 46(APE64.0)- Dec 45(APE63.5)	0.000	-0.479	0.004	-0.153	0.004	0.326
Jul 47(APE64.5)- Jun 47(APE64.0)	0.000	-0.45	0.036	-0.122	0.036	0.327
Average	0.000	-0.489	0.029	-0.083	0.029	0.406

In Table B1 we compute, for each 6-month incremental increase in eligibility age, the mean differences in welfare receipt at the affected ages for consecutive birth month cohorts that have different eligibility ages (where the older cohort had reached eligibility age, but not the younger one). To have a sense of the differences in welfare receipt that are unrelated to the change in eligibility, we compute the differences in 6-month period just prior to the affected ages as well. Simple descriptive statistics for the affected ages in Table 1 are very close to those in the main

model (Table 2). Results in Table B2 from equation (2) and are also very close to those from Table 2, suggesting that our main results are not biased by a failure to properly control for cohort effects.

Table B2. Effects of increasing the female Age Pension eligibility age from 61 to 64.5 on welfare receipt, alternative treatment of cohort effects

	Any payment	Any payment excluding Age Pension	Disability benefits ^a	Unemployment benefits ^b
<i>Welfare receipt rate</i>				
γ	-0.1116*** (0.0022)	0.3914*** (0.0021)	0.1369*** (0.0010)	0.0405*** (0.0004)
N	10,614	10,614	10,614	10,614
R ²	0.7910	0.8284	0.7307	0.5793
<i>Monthly welfare inflow (active substitution)^c</i>				
γ	-	0.00232*** (0.00010)	0.00034*** (0.00004)	0.00086*** (0.00006)
N	-	10,614	10,614	10,614
R ²	-	0.10950	0.03018	0.05402

Notes: *** p<0.01, ** p<0.05, * p<0.1. ^aDisability Support Pension. ^bNew Start Allowance. ^cThe

coefficient for monthly inflow is not directly comparable to the change in stock of welfare receipt, including change in stock of partner receipt.

APPENDIX C: SUPPORTING EVIDENCE ON ANTICIPATION EFFECTS

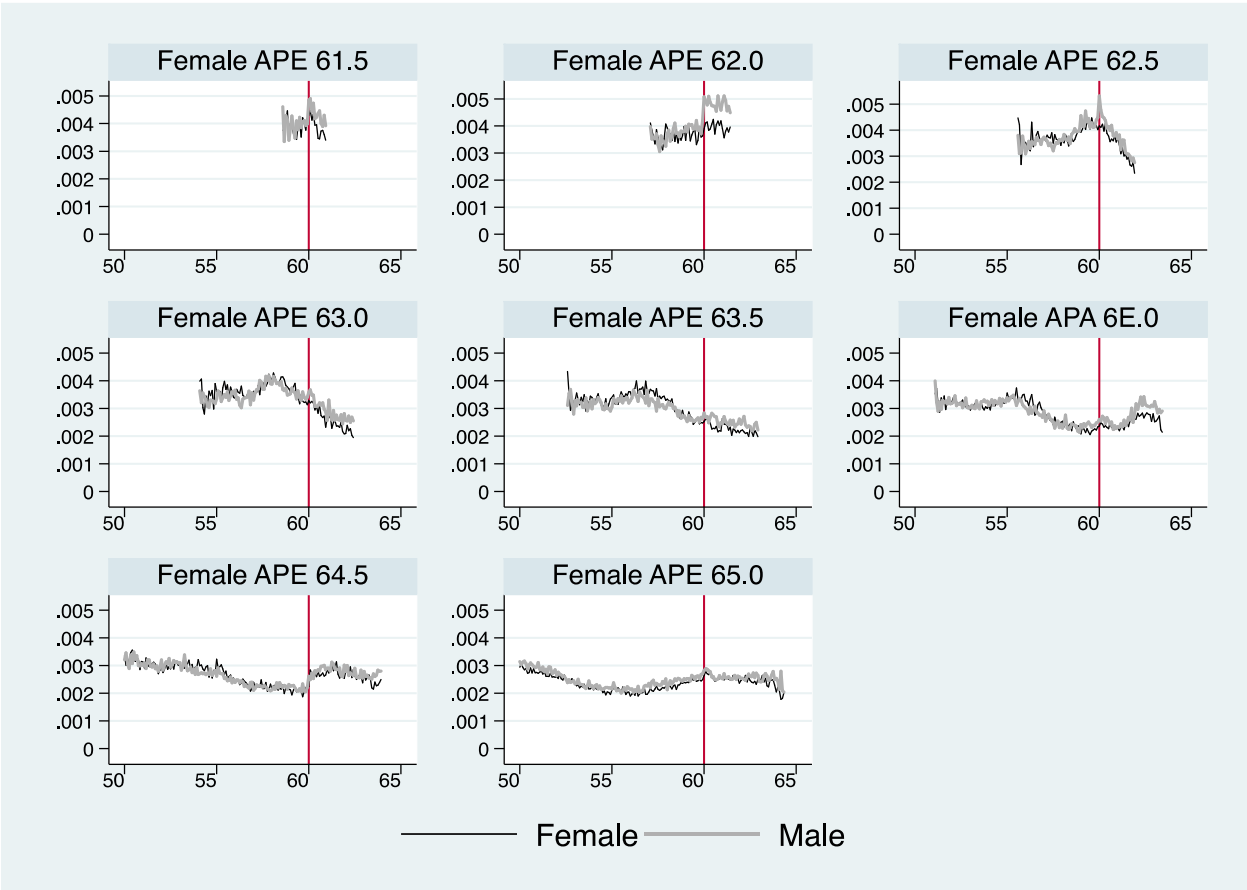
In the main analysis, we address the possibility for anticipation effects through the estimation of a lead model (equation (2)). In what follows, we examine anticipation effects related to the preference to retire at the pre-reform retirement age, possibly due to status quo bias, that would not be captured by the lead model and anticipation effects associated with the announcement of a subsequent reform that did not affect the study sample.

C.1 Preference to retire at the pre-reform eligibility age

As discussed in the main text, identification of the lead model relies upon differences in eligibility age across cohorts affected by the reform, which will not capture anticipation effects associated with common preference across cohorts to retire at the pre-reform eligibility age of 60. If this is an issue, then we would expect to see a spike in welfare inflow rates of affected cohorts at around age 60. In Figure C1, we present available monthly welfare inflow rate data for affected birth cohorts leading up to their eligibility age. As a control, we also present inflow data for males from the same birth cohorts at the same ages.

For each of the affected cohorts examined, we observe little difference in inflow rates between males and females in the lead-up to their eligibility age, which suggests little in the way of anticipation effects. Importantly, in the context of examining possible evidence of anticipation effects related to status quo bias, we observe no spike in the inflow rate of females at around age 60 that would be indicative of status quo bias.

Figure C1: Monthly inflow rate for female birth cohorts affected by eligibility age increases, relative to inflow rates of males from the same birth cohorts who are unaffected



Note: welfare data is from RED and population counts from the Australian Bureau of Statistics from July 1998 to May 2013. Male inflow rates can be considered as a control group because their retirement age was unaffected during this period.

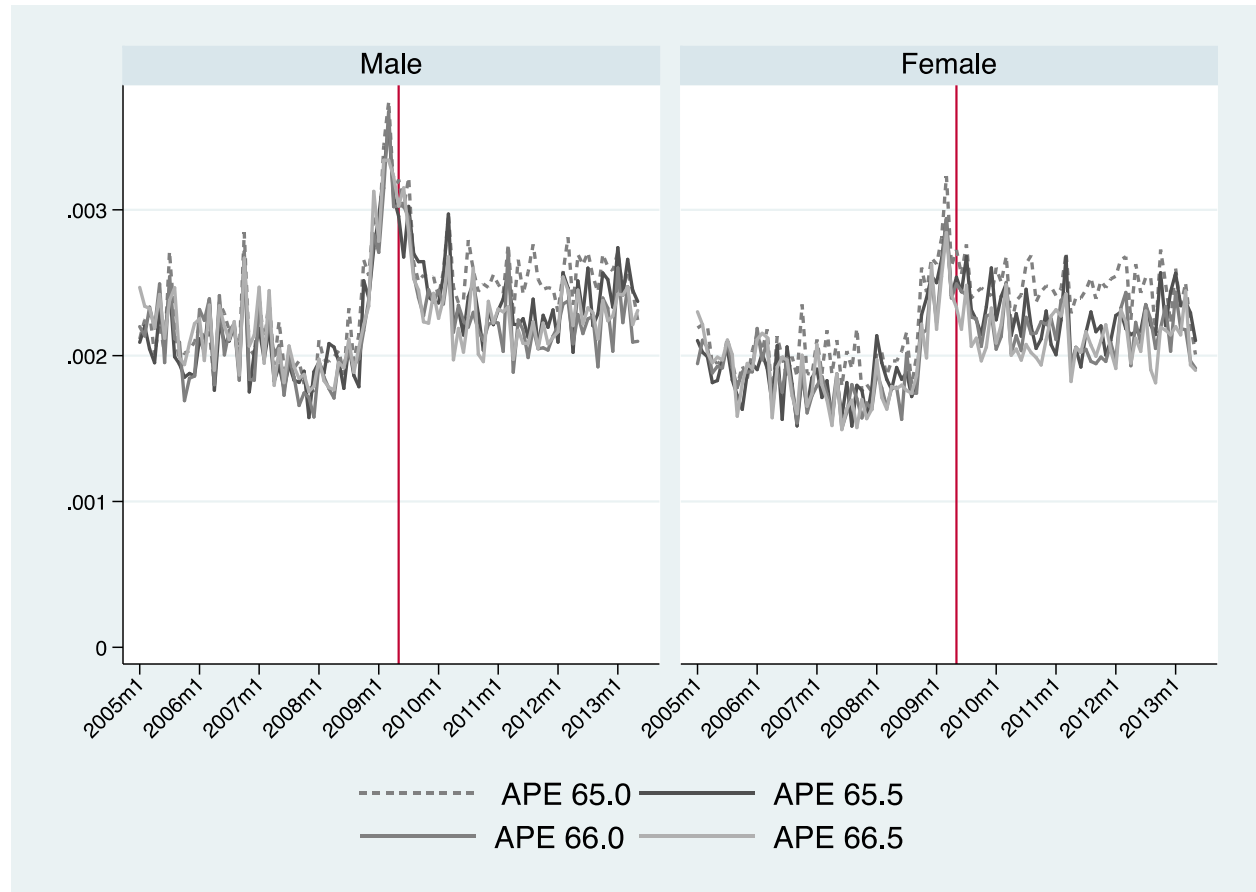
C.2 Anticipation effects of subsequent eligibility age increases

An announcement was made in May 2009 to increase the Age Pension eligibility age from 65 to 67 for both males and females, through six-month incremental increases every two years from July 1 2017 until July 1 2023. While this announcement did not affect the eligibility age of cohorts used in our main analysis, it does provide us with an opportunity to examine anticipation effects under alternative settings to those examined in the main text. Specifically, it allows us to examine

anticipation effects by gender and anticipation effects for cohorts born in more recent times different work experiences and policy settings.

Figure C2 contains monthly data for female and male birth cohorts facing the same eligibility age and is generated using the RED data extract and population count data. For both males and females, Figure C2 shows a clear spike in the welfare inflow rates of all cohorts, which reflects the impact of the global financial crisis, but no discernible spike in inflow around the month of announcement (red vertical bar) for affected cohorts (APE 65.5-66.5). Similarly, there is no clear evidence of anticipation effects in the years following announcement, with the rate of inflow among affected cohorts generally lower than for the slightly older cohort (APE 65) that was unaffected by the announcement.

Figure C2: Monthly inflow rates for cohorts affected by the announcement of subsequent increases in the eligibility age (APE 65.5 – 66.5), compared to cohorts who are not (APE 65)



Note: the red vertical line represents the announcement of subsequent reforms in May 2009. Welfare data is from RED and population counts from the Australian Bureau of Statistics. The cohort APE 65.0 are born before July 1 1952 and are unaffected the subsequent reforms; cohorts APE 65.5-66.5 are born 1 July 1952-31 December 1956 and are affected by the reforms.

APPENDIX D: OTHER MODEL ESTIMATES

Table D1: Heterogeneous effects of increasing the female Age Pension eligibility age from 61 to 64.5 on active substitution^a

	Any payment excluding Age Pension	Disability benefits ^b	Unemployment benefits ^c
<i>Impacts by six-month incremental change in the eligibility age^d</i>			
61-61.5 (61.0-61.49)	0.00286*** (0.00006)	0.00051*** (0.00002)	0.00093*** (0.00004)
61.5-62 (61.5-61.99)	0.00284*** (0.00004)	0.00052*** (0.00002)	0.00094*** (0.00002)
62-62.5 (62.0-62.49)	0.00278*** (0.00004)	0.00054*** (0.00001)	0.00101*** (0.00002)
62.5-63 (62.5-62.99)	0.00263*** (0.00004)	0.00052*** (0.00001)	0.00101*** (0.00002)
63-63.5 (63-63.49)	0.00250*** (0.00004)	0.00052*** (0.00001)	0.00106*** (0.00002)
63.5-64 (63.5-63.99)	0.00228*** (0.00005)	0.00041*** (0.00002)	0.00107*** (0.00003)
64-64.5 (64-64.49)	0.00209*** (0.00008)	0.00033*** (0.00003)	0.00100*** (0.00005)
N	10,674	10,674	10,674
R ²	0.8719	0.6822	0.8152

Notes: *** p<0.01, ** p<0.05, * p<0.1 Control variables include age, monthly unemployment rate, age pension birth cohort and time fixed effects. ^aThese results are generated for monthly inflow of welfare receipt. ^bDisability Support Pension. ^cNew Start Allowance. ^d Results are generated from interacting affected age, APE cohort dummies and eligibility indicator. The coefficients are averaged over APE cohorts. The bracketed range is the six-month age categories that are affected by the incremental change.

Table D2: Effects of increasing the female Age Pension eligibility age from 62.5 to 64.5 on monthly expenditure (A\$/per head of affected cohort), full interaction effects^a

Impacts by incremental increases in eligibility age^b

62.5-63 (62.5-62.99) for APE 63.0	-69.68*** (9.967)
62.5-63 (62.5-62.99) for APE 63.5	-76.98*** (9.980)
62.5-63 (62.5-62.99) for APE 64.0	-86.00*** (9.958)
62.5-63 (62.5-62.99) for APE 64.5	-77.36*** (10.010)
62.5-63 (62.5-62.99) for APE 65.0	-82.28*** (9.983)
63-63.5 (63.0, 63.49) for APE 63.5	-85.45*** (4.830)
63-63.5 (63.0, 63.49) for APE 64.0	-87.05*** (4.814)
63-63.5 (63.0, 63.49) for APE 64.5	-78.56*** (4.906)
63-63.5 (63.0, 63.49) for APE 65.0	-87.23*** (5.181)
63-63.5 (63.0, 63.49) for APE 64.0	-111.0*** (4.343)
63-63.5 (63.0, 63.49) for APE 64.5	-99.45*** (4.524)
63-63.5 (63.0, 63.49) for APE 65.0	-111.4*** (5.667)
64-64.5 (64.0-64.49) for APE 64.5	-122.2*** (4.362)
64-64.5 (64.0-64.49) for APE 65.0	-151.1*** (8.378)
N	5,682
R ²	0.951

Notes: *** p<0.01, ** p<0.05, * p<0.1. ^a Expenditure includes payments for the affected female's partner. ^b The bracketed range is the six-month age categories that are affected by the incremental change.