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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 opportunistic behaviour.

JEL classification: H53, J26, J01

Keywords: Welfare substitution, retirement, aging population

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 (aged 65 and over) 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, born in the two decades following World War II, move into their retirement years. While governments are taking action on a number of fronts, a common response to alleviate fiscal pressures is to increases the minimum age at which people can qualify for publicly-funded retirement benefits.[1] To date, evidence on the impacts of increasing retirement age has focused mainly on labour market outcomes (Hanel and Riphahn, 2010; Mastrobouni, 2009; Staubli and Zweimüller 2013; Lalive and Staubi 2014; Atalay and Barrett, 2015) with relatively little on fiscal impacts.

In this study, we improve the understanding of fiscal impacts by shedding light on the importance of behavioral responses — substitution into alternative welfare programs by those affected and spillover effects on the welfare receipt of their partners. Substitution effects, by increasing reliance on other welfare programs, have the potential to offset fiscal savings from delaying retirement benefit eligibility; whereas the direction of spillover effects on fiscal savings is unclear. On the one hand, because couples tend to co-ordinate the timing of retirement (Gustman and Steinmeier 2000; Blau and Gilleskie 2006), delaying access to female retirement benefits can reduce the welfare receipt of the partner. On the other hand, to the extent that delaying eligibility increases female attachment to work, any resulting positive household income effect may reduce the partner's attachment to work.

We gauge the importance of these behavioral responses by estimating their magnitude under female eligibility age increases introduced in Australia under the *Social Security Amendment Act 1993*. These reforms provide a unique opportunity to observe the pure effects of eligibility age increases because, unlike similar reforms elsewhere, they were not

[1]For example, in the United States, the 1983 Social Security Amendments increased the normal minimum retirement age incrementally (by 2 months a year) from 65 to 67. In the United Kingdom, from 2010 to 2018, the retirement age for women is being gradually increased from 60 to 65 to bring it into line with the retirement age of men, after which the retirement age is set to rise to 68 by no later than 2046.

accompanied by other benefit changes to further induce delays in accessing benefits.[2] Impacts are estimated by exploiting differences in the Age Pension eligibility age brought about by the reforms among women from similar birth cohorts, using longitudinal administrative welfare data.

We make two important contributions to the literature. First, we discriminate between substitution effects from within and from outside the welfare system, termed 'mechanical' and 'active' substitution respectively. Mechanical substitution occurs when existing welfare recipients close to eligibility age bridge the delay to retirement benefits by extending time on existing payments. In contrast, active substitution occurs when those outside of the welfare system who plan to retire on benefits at (or shortly after) eligibility age, avoid delaying retirement by entering welfare through alternative programs. This distinction is important because the fiscal implications of active substitution are far greater. For all intents and purposes, people on benefits close to retirement age, such as disability benefit recipients, have already retired on welfare so that delays in eligibility for retirement benefits are not likely to induce changes in welfare receipt, only substitution in payment types. Therefore, fiscal savings from mechanical substitution is limited to differences in payment levels between existing and retirement benefits. In contrast, active substitution represents a behavioral response of people who are outside of the welfare system, so that movements into alternative payments offsets any fiscal savings that would have occurred from the shortening of retirement benefit duration.

By distinguishing between the two types of substitution, our study puts into context studies by Atalay and Barrett (2015) and Staubli and Zweimüller (2013), which found large 'overall' substitution effects.[3] Because we examine the same Australian reforms, this paper is

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[2] For example, eligibility age increases in the United States, Switzerland and Austria, which have been the focus in previous studies, have all included increases in penalties for accessing retirement benefits early. In the case of Switzerland, the reforms introduced the ability of women to retire early, but at a penalty to their benefit size.

[3] Atalay and Barrett (2015) estimate a 13-23 percentage point increase in the receipt of disability benefits, depending on the age cohort, for every one-year increase in the female retirement age (between 60 and 65) in Australia. Staubli and Zweimüller (2013) estimate a 12 percentage point increase in the rate of unemployment benefits, but minimal increases in disability insurance receipt, associated with pension reforms in Austria that included, among other things, increases in the retirement age of 60 to 62 for men and 55 to 58.2 for women.

particularly relevant in identifying the sources of substitution estimated in Atalay and Barrett (2015). Unlike Atalay and Barrett (2015) who use repeated cross-sectional survey data, we are able to distinguish between the sources of substitution by using longitudinal administrative data. The use of administrative over survey data also allows us to avoid the problem of misreporting of welfare receipt (Bruckmeier, Müller and Riphahn 2014 and Wallace et al 2008) and, through the use of date of birth, precisely identify treatment and control groups.

Second, we provide a more comprehensive analysis of active substitution than previously undertaken. Evidence to date on active substitution (Duggan, Singleton and Song 2007; Li and Maestas 2008; Coe and Havestick 2010 and Lalive and Staubli 2014) is mixed and provides only a limited picture of its potential effects for two reasons. First, these studies only examine active substitution into select payments, namely disability benefits (Duggan, Singleton and Song 2007; Li and Maestas 2008; Coe and Havestick 2010) or disability and unemployment benefits (Lalive and Staubli 2014). Second, they are all undertaken in countries where the incentives to substitute is weakened by the contributory nature of their publicly-funded retirement schemes. More precisely, the contributory nature of benefits blunts the incentive to substitute by reducing the accrual of retirement benefits. In this study, we examine inflows into 'all' welfare payments in a country where there are accessible and time-unlimited opportunities for people to retire early on welfare without impacting on the eligibility and size of their retirement benefit. If active substitution does threaten to offset welfare savings from delaying eligibility to retirement benefits, then we should observe it under conditions examined in this study.

We find that the increase in the female Age Pension eligibility from 61 to 64.5 reduced the female welfare receipt rate by 12.6 percentage points on average across affected ages. 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. Importantly, we estimate a 39 percentage point increase in the rate of receipt of alternative welfare payments among affected females, but only 4.3 percentage points is active substitution, the rest is mechanical. We find no evidence that active substitution occurs prior to the affected ages, nor do we find evidence that its rate is higher among groups with greater opportunities or incentives to substitute (single mothers with additional welfare entitlements and older women respectively). Spillover effects are similarly small, with the rate of welfare receipt of partners of affected females falling by an estimated 1.2 percentage points. There

are two important implications of our findings. First, welfare savings from delaying eligibility does not appear to be threatened by opportunistic behavior, even under the conducive conditions examined in this study. Second, increases in eligibility age alone can be effective in reducing welfare reliance without the need for other accompanying measures, but encouraging labor force participation well ahead retirement age should also be a focus to alleviate fiscal pressure on publicly-funded retirement benefits.

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. The Australian Age Pension

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. In 2013, 68% of the male retirement age population and 73% of the female retirement age population received the Age Pension.[4]

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, applicants must be of eligible age and have (joint for couples) income and assets, excluding the value of the family home, below maximum thresholds.[5] For people who are at

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[4] 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).

[5] In 2016, the asset thresholds were A$937,250 for singles and A$1,319,000 for couples. For those who own their own home, these thresholds are around A$150,000 less. Fortnightly income thresholds in 2016 were A$1,910 for singles and A$2,923 for couples.

eligibility age and whose income and assets are below the maximum thresholds, the size of the benefit received is tapered according to their asset and income levels. Those whose income and assets are below a minimum threshold receive the full pension, which is legislated to be at least 27.7% of male average earnings for single claimants and 41.76% for couples after adjusting for inflation.[6]

2.1 Age Pension Reform

In this study, we focus on examining the impacts of Age Pension reforms that were enacted under the *Social Security Legislation Amendment Act 1993*. This reform, announced in June 1992, aimed to harmonise the Age Pension eligibility age of men and women by increasing the eligibility age of women from 60 to 65, introduced as 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 reform is outside our observation window and is not examined in this study.

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[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 2016, the single and partnered full pension was A$794 and A$1,198 per fortnight.

2.2 Alternative Welfare Programs

A feature of the Australian welfare system is that there are a number of alternative means-tested, non-contributory and time unlimited welfare payments that can be substituted in response to delays in Age Pension eligibility. The most relevant alternative payments are disability and unemployment benefits, known as the Disability Support Pension (DSP) and Newstart Allowance respectively. 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 makes them unable to work for at least 15 hours per week in the next two years. 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, but more stringent income test requirements, than those for DSP and the Age Pension.[7] As part of mutual obligations, Newstart Allowance requires recipients aged 55 and over to spend at least 30 hours in part-time work, voluntary work or a combination of the two, per fortnight. Another relevant program is Carer Payments, which subject to income and asset tests, are paid for caring for a family member with a long-term health condition.

There are also welfare payments designed especially for women without recent work experience. The 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 for partnered women who have not worked in the past year and whose partner receives welfare benefits. 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,

[7] In 2016, the income thresholds are A$934 for each partnered person and A$1021 for singles fortnightly.

gender, marital status and date of birth. For each recipient with a partner, we also observe any welfare payment information of their spouse, along with their spouse's birth date. 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 restrict the analysis to women who are age 60 to 64.99 from the extracted RED records.[8] This interval represents all the ages that are affected by the incremental eligibility age increases from 60 to 65 that are legislated under the Social Security Legislation Amendment Act 1993.[9]

The main outcome variable of interest is welfare receipt rate. To measure welfare receipt for affected cohorts we collapse individual records into monthly birth cohorts and take the ratio of the count of welfare recipients from RED to the population count derived from Australian Bureau Statistics (2013).[10] 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 welfare receipt rate of each birth cohort is tracked on a monthly basis between July 1998 and May 2013.

Table 1 provides the key features of the estimation sample. Due to the incremental nature of eligibility age increases, individuals face different eligibility age 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. To estimate impacts of the eligibility age increases for a given age, we compare the outcomes of those who are impacted by delays in eligibility for the Age Pension (treatment) and those who are unaffected because, due to the earlier timing of their birth, are already at their eligibility age (control). It is important to note that once a cohort reaches its eligibility age, it switches status from treatment to control group (NE to E in Table 1), but for

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

[9] 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.

[10] Please see appendix A for further details.

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 cohort	APE	Affected age category[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	-	-	-	-	-	-	-	-	-	E
Jan34 -Jun34	60	-	-	-	-	-	-	-	-	E	E
Jul34-Dec34	60	-	-	-	-	-	-	-	E	E	E
Jan35-Jun35	60	-	-	-	-	-	-	E	E	E	E
Jul35-Dec35	60.5	-	-	-	-	-	E	E	E	E	E
Jan36-Jun 36	60.5	-	-	-	-	E	E	E	E	E	E
Jul36- Dec36	60.5	-	-	-	E	E	E	E	E	E	E
Jan37-Jun 37	61	-	-	E	E	E	E	E	E	E	E
Jul37-Dec37	61	-	NE	E	E	E	E	E	E	E	E
Jan38-Jun 38	61	NE	NE	E	E	E	E	E	E	E	E
Jul38-Dec39	61.5	NE	NE	NE	E	E	E	E	E	E	E
Jan40-Jun41	62	NE	NE	NE	NE	E	E	E	E	E	E
Jul 41-Dec42	62.5	NE	NE	NE	NE	NE	E	E	E	E	E
Jan43-Jun44	63	NE	NE	NE	NE	NE	NE	E	E	E	E
Jul44-Dec45	63.5	NE	NE	NE	NE	NE	NE	NE	E	E	E
Jan46-Jun47	64	NE	NE	NE	NE	NE	NE	NE	NE	E	E
Jul47-Dec48	64.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
Jan48-Jun48	64.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	E
Jul48-Dec48	64.5	NE	NE	NE	NE	NE	NE	NE	NE	NE	-
Jan49-Jun49	65	NE	NE	NE	NE	NE	NE	NE	NE	-	-
Jul49-Dec49	65	NE	NE	NE	NE	NE	NE	NE	-	-	-
Jan50-Jun50	65	NE	NE	NE	NE	NE	NE	-	-	-	-
Jul50-Dec50	65	NE	NE	NE	NE	NE	-	-	-	-	-
Jan51-Jun51	65	NE	NE	NE	NE	-	-	-	-	-	-
Jul51-Dec51	65	NE	NE	NE	-	-	-	-	-	-	-
Jan52-Jun52	65	NE	NE	-	-	-	-	-	-	-	-

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. [a]Age is expressed in decimals, calculated as age in months divided by 12 and rounded to two decimal places.

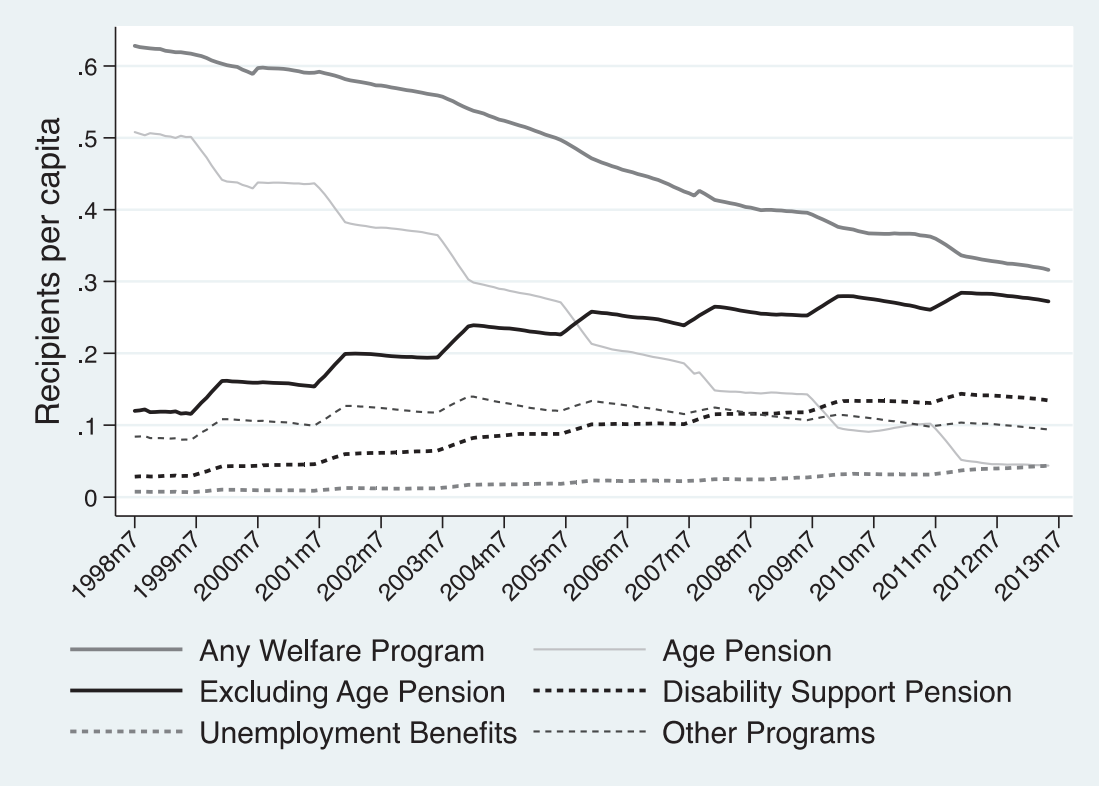
While we extract welfare information for all 60 to 64.99 recipients, we only estimate the effects of incremental increases from 61 to 64.5 for affected age categories 61 to 64.49. For those who faced incremental increases between 60 to 60.5 and 60.5 to 61, there are no treatment group observations because 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.

Given that a key motivation for this paper is to explore whether delaying retirement benefit eligibility leads to substitution into other welfare payments, we generate receipt measures for

all welfare payments and all welfare payments *less* the Age Pension. The former captures the net effect on welfare receipt and the latter captures the full extent of substitution effects. To examine substitution into specific payments, we generate separate measures for receipt of disability, unemployment and other welfare payments. For each of these categories we generate both stock and payment inflow measures, the latter is used to examine active substitution.

3.1 Welfare receipt over time

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



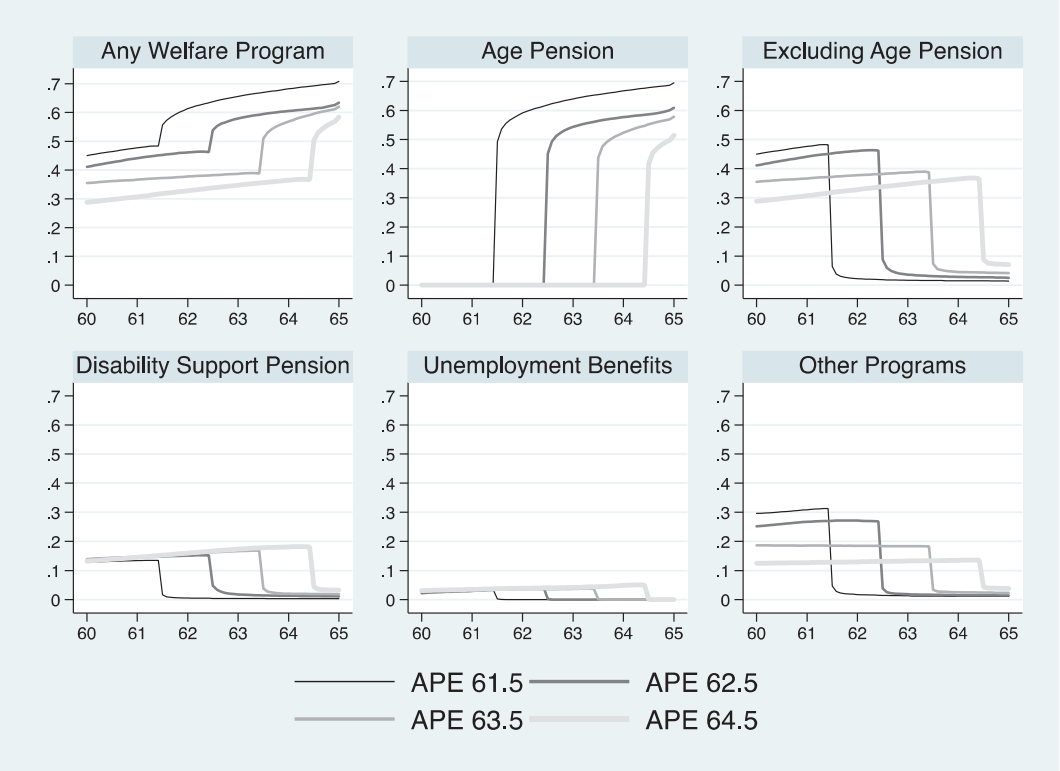
Source: Own estimates based on welfare receipt information from RED and population count estimates published by the Australian Bureau of Statistics Australian See: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015.

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). However, the incremental increases in female eligibility age over this period coincides with increases in receipt rate of disability and unemployment benefits, which suggest that the Australian Age Pension reform may have induced considerable program substitution. This observation was first made by McVicar and Wilkins (2013) and was a focus of Atalay and Barrett (2015).

To provide an insight into the importance of mechanical and active substitution, in Figure 2 we present changes in welfare receipt rates over time of select birth cohorts that face the same Age Pension eligibility (APE) age.[11] There are a number of 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 may reflect differences in labour market history. If uncontrolled for, such cohort differences may bias our estimates. Second, statistics presented in the top three panels suggest strong mechanical substitution effects. Focussing 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 (top right-hand panel). Third, from the bottom panels, there are no apparent jumps in the receipt of alternative welfare payments in the lead-up to eligibility age that may indicate active substitution. That said, it must be kept in mind that these statistics represent changes in the stock, which means that increases in inflows, which is suggestive of active substitution, may be masked by increases in exits. Also these observed changes do not account for differences in cohort or time effects. These issues are addressed in the econometric analysis, which we outline in the following section.

[11] For clarity, we do not include all cohorts.

Figure 2. Female welfare receipt by Age Pension eligibility age birth cohort



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

Using birth-month cohort data tracked monthly over the period of analysis, we estimate the impacts of delaying female eligibility for retirement benefits by exploiting differences in the eligibility age that was brought about by the reforms. This identification strategy is similar to the approach used by Staubli and Zweimuller (2013). More specifically, we estimate:

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

where y_{it} is welfare receipt, measured as the count of people of birth-month cohort i in month t in a payment category (all welfare payments; Age Pension receipt; all payments but the Age Pension; disability benefits and unemployment benefits) divided by the corresponding cohort population count; 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, … 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, … 64.5); NE_{it} is an 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 eligibility from 61 to 64.5 over affected ages and ϵ_{it} is an error term.

Importantly, the inclusion of time (λ_t) and birth cohort dummies (APE_{ij}) allows us to control for cohort differences that are independent of the increase in retirement age. As a test of robustness, we follow the approach used by Duggan et al. (2007) and estimate an alternative model that controls for differences across cohorts born in consecutive months, which due to differences in the timing of birth, face a six-month difference in their eligibility age. Results from this model (presented in Table B1, appendix B) are very close to results from equation (1) that are represented in the next section.

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, where the dependent variable is monthly welfare expenditure (from all welfare programs) per capita in 2012 Australian dollars for affected cohorts and their partners.

To estimate active substitution and spillover effects, we re-estimate equation (1), but with different dependent variables. When estimating total substitution effects, y_{it} is the receipt rate of any other welfare benefits besides the Age Pension. For estimating active substitution, y_{it} is the monthly per capita inflow into welfare, where inflow is the commencement of a new payment (excluding the Age Pension) after being out of the welfare system for at least 6 months. We also estimate models where we allow active substitution up to two years ahead of affected ages, but results from these models provide no evidence that such pre-emptive responses occurred (see Table B2, appendix B). When estimating spillover effects, we restrict the sample to married women and y_{it} becomes the receipt rate of partners in all welfare programs (including the Age Pension) for cohort *i*. Partner welfare receipt is generated using a welfare receipt identifier in RED and population census data on the number of women in cohort *i* who are partnered.

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.

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 have are not already on welfare and who may meet means-test requirements), this can be considered a large effect.[12] 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.[13] On face value, these results suggest that around 75% of the reduction in the Age Pension receipt rate is offset by substitution to alternative payments, with only around half due to substitution into disability and unemployment benefits. Whether or not this represents active substitution is examined in the following sections.

[12]The 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 population (from RED) are not impacted because they are already on welfare at age 60.

[13]This 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.

Table 2. Effects of increasing the female Age Pension eligibility age from 61 to 64.5 on welfare receipt (July 1998 - May 2013)

	Any payment	Age Pension	Any payment excl. Age Pension	Disability benefits[a]	Unemployment benefits[b]
Female welfare receipt rate for affected ages (61-64.49)					
γ	-0.1264***	-	0.3930***	0.1427***	0.0392***
	(0.0009)		(0.0009)	(0.0003)	(0.0001)
N	10,674	-	10,674	10,674	10,674
R^2	0.9749	-	0.9837	0.9896	0.9775
Partner welfare receipt rate (spillover effects) for affected females (61-64.49)					
γ	-0.0119***	-0.0091***	-0.0028***	0.0005**	0.0016***
	(0.0009)	(0.0008)	(0.0004)	(0.0003)	(0.0001)
N	10,674	10,722	10,722	10,722	10,722
R^2	0.9641	0.9762	0.9606	0.9491	0.9591
Monthly welfare inflow (active substitution) for affected females (61-64.49)[c]					
γ	-	-	0.00242***	0.00044***	0.00096***
			(0.00002)	(0.00001)	(0.00001)
N	-	-	10,674	10,674	10,674
R^2	-	-	0.857	0.651	0.808

*** p<0.01, ** p<0.05, * p<0.1. Control variables include age, monthly unemployment rate, age pension birth cohort and time fixed effects. [a]Disability Support Pension. [b]New Start Allowance respectively. [c]The coefficient for monthly inflow is not directly comparable to the change in stock of welfare receipt, including change in stock of partner receipt.

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).[14] 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 27 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

[14] They examined eligibility age increases from 60 to 64.

between treatment and control groups. Specifically, their control group was an older cohort of females who were born prior to July 1935.[15] 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.[16] 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.

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. There are two key messages from results presented in Figure 3. First, the differences in the effects across cohorts are minimal, which suggest that 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 estimated reduction in welfare receipt increases strongly 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.

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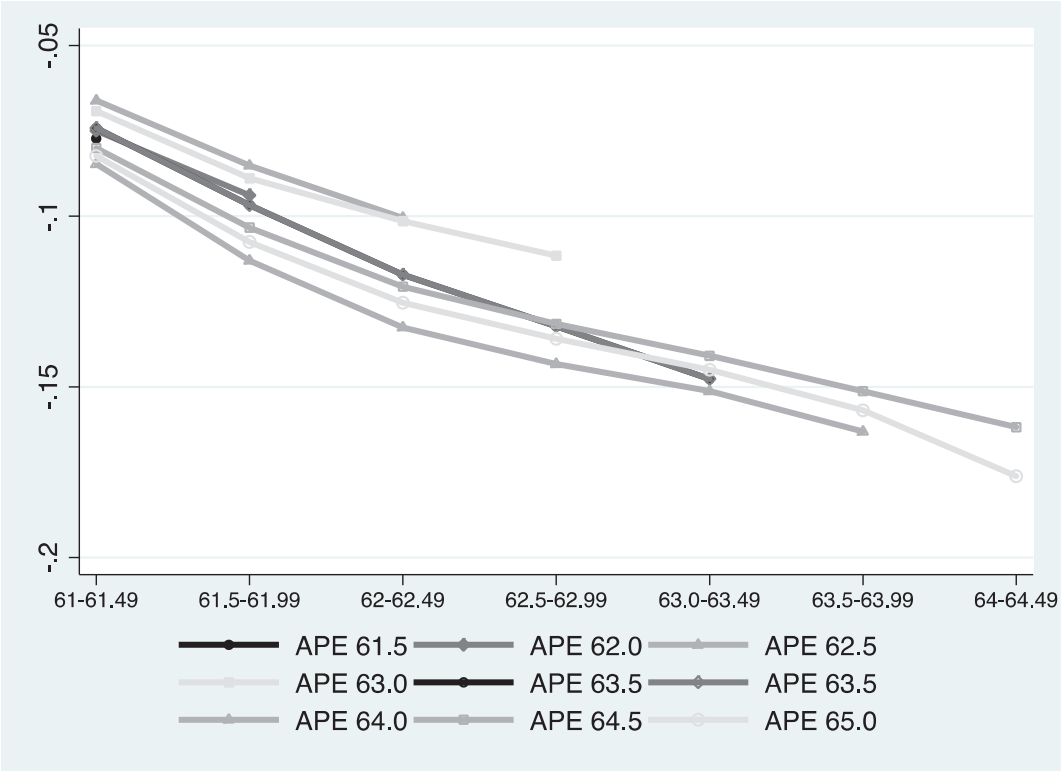
[15]For estimates on labour force participation, Atalay and Barrett (2015) use males of the same birth cohorts as control groups and hence they are able to control for the cohort differences using Age Pension age birth cohort dummies They do not use males as control groups when examining income support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

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

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



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

5.2 Spillover effects

Estimates of impacts on the partner's welfare receipt are presented in the middle panel of Table 2. 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 (2015), who find no spillover effects from similar increases in female eligibility age in Switzerland. Compared to the 15.6 percentage point net reduction in welfare receipt of partnered females (see Table C1 in the appendix C), the spillover effect on partner's welfare receipt is small. As evident in the estimated impacts by payment type, most of the reduction in the partner's rate of receipt is due to a reduction in Age Pension receipt, which is likely due to the tendency of couples to synchronize the timing of their retirement.

5.1 Active vs Mechanical Substitution

A key motivation for this study is to understand the nature of substitution effects. At first glance, the results presented in the top panel of Table 2 suggest that large substitution effects may potentially offset much of the fiscal savings from delaying pension eligibility — a 51

percentage point reduction in Age Pension receipt rate is accompanied by a 39.3 percentage point increase in the receipt rate of alternative payments. However, such large substitution effects are only likely to seriously threaten fiscal savings if they represent active substitution.

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 (second panel of Table 2). 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. 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.

While the overall estimates of active substitution are small, the extent of active substitution may vary markedly within the population. To test this, we estimate effects for specific groups that are more likely than average to actively substitute, namely single women who have extra substitution options and older women who may have lower capacity to continue working because of poorer health. 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. To estimate active substitution effects for single women we run our inflow model, but restrict the sample to those who were unmarried. To estimate differences in effects by age, we run the inflow model with three-way interactions to estimate effects for each incremental increase in the eligibility age by birth cohort.

Table 3. Heterogeneous effects of increasing the female Age Pension eligibility age from 61 to 64.5 on active substitution[a]

	Any payment excl. Age Pension	Disability benefits[b]	Unemployment benefits[c]
Single female[d]			
γ	0.00206***	0.00036***	0.00102***
	(0.00003)	(0.00001)	(0.00002)
N	10,674	10,674	10,674
R^2	0.74997	0.38685	0.64938
Impacts by six-month incremental change in the eligibility age[e]			
61-61.5 (61.0-61.49)	0.00286***	0.00051***	0.00093***
	(0.00006)	(0.00002)	(0.00004)
61.5-62 (61.5-61.99)	0.00284***	0.00052***	0.00094***
	(0.00004)	(0.00002)	(0.00002)
62-62.5 (62.0-62.49)	0.00278***	0.00054***	0.00101***
	(0.00004)	(0.00001)	(0.00002)
62.5-63 (62.5-62.99)	0.00263***	0.00052***	0.00101***
	(0.00004)	(0.00001)	(0.00002)
63-63.5 (63-63.49)	0.00250***	0.00052***	0.00106***
	(0.00004)	(0.00001)	(0.00002)
63.5-64 (63.5-63.99)	0.00228***	0.00041***	0.00107***
	(0.00005)	(0.00002)	(0.00003)
64-64.5 (64-64.49)	0.00209***	0.00033***	0.00100***
	(0.00008)	(0.00003)	(0.00005)
N	10,674	10,674	10,674
R^2	0.8719	0.6822	0.8152

*** p<0.01, ** p<0.05, * p<0.1 [a]These results are generated for monthly inflow of welfare receipt. [b]Disability Support Pension. [c]New Start Allowance respectively. [d]Results are generated on a restricted sample of single females. [e] Results are generated from interacting affected age, APE cohort dummies and eligibility indicator. The coefficients above are averaged over APE cohorts. The bracketed range is the six-month age categories that are affected by the incremental change.

Heterogeneous active substitution effects are presented in Table 3. For both sets of results, we find no evidence to suggest that single or older women actively substitute in a way that is different to the average response in the affected population (from Table 2). These results do not support the hypothesis that there is a large group of opportunistic people who use alternative payments because they are unwilling to delay entry to welfare. Instead, these results suggest that there is a proportion of the affected female population who experience difficulty delaying access to benefits because of their life circumstances and/or employment history and turn to alternative welfare options to supplement their income.

5.3 Impacts on welfare expenditure

A key feature of our analysis is the use of longitudinal population administrative data on all welfare payments to estimate the impacts on total welfare expenditure, taking into account both spillover and substitution effects. 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, are allowed to vary by incremental increase in eligibility and across cohorts facing the same eligibility age (all coefficients are presented in Table C3 in appendix C).

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]

Impacts by incremental increases in eligibility age[b]	
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)
Average impacts across all incremental increases in eligibility age[c]	-101.74***
	(3.23)
N	5,682
R^2	0.951

*** p<0.01, ** p<0.05, * p<0.1. [a]Expenditure includes payments for the affected female's partner. [b]Results are estimated by averaging the coefficients from a three-way interaction model (see Table C3 in appendix C 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,[17] this equates to an average saving of 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, the average monthly reduction in welfare expenditure represents an 18% reduction.[18]

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 in which people can qualify for publicly-funded retirement benefits. However, the effectiveness of such reforms in alleviating any fiscal pressure is uncertain because of welfare claiming responses of affected women and their partners, referred to as substitution and spillover effects respectively. 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 much of the 'overall' substitution observed in Australia is mechanical in nature, that is, people already on welfare bridging the delay in retirement benefit eligibility by remaining on the existing payments. Active substitution, which poses a greater threat to any potential fiscal savings, is found to explain only around 10% of overall substitution. Given ample opportunities in Australia to retire early on welfare with minimal impacts on the accrual of retirement benefits, the small estimated active substitution effect may be considered an upper-bound of what may be found in other settings. We also show that magnitude of active substitution does not increase with affected age or with available substitution opportunities.

There are some important implications of our findings. The small active substitution effects suggest that women affected by delays in retirement benefit eligibility do not appear to 'game the system' because they are unwilling to delay access to welfare. Instead, active substitution

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

[18] This estimate is an estimate from the three-way interaction model.

is likely to be driven more by a small number of affected people 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. These findings allay concerns that welfare savings from delaying eligibility to retirement benefits are being offset by opportunism and provide confidence that further delays in eligibility may not invoke greater rates of active substitution. Our results also demonstrate that increases in the retirement benefit eligibility age alone can trigger large reductions in welfare reliance, perhaps because of its role in signaling the socially acceptable timing to retire on welfare. Finally, the large mechanical substitution effects estimated in this study point to the importance of other measures to encourage labor force participation well ahead of retirement age to reduce the reliance on publicly-funded retirement benefits.

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Appendix A: Imputing monthly population counts

We impute population count estimates by single month of birth for our sample for each month over the period of analysis (July 1998 through to May 2013) using population count by age data from the Australian Bureau of Statistics (ABS) that is collected in June every year.[19] This process involves two steps. The first step is to impute population counts by month of birth from the ABS single-year age estimates at June each year. To do this, we break the ABS single-year age counts into month of birth counts, assuming 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.

For estimating impacts by marital status, we further divide the count estimates using female marital status information from the four most recent census collections — 1996, 2001, 2006, and 2011. Female marital status in census is for single-year of age at August in the survey year. Following a similar approach as discussed above, we first impute the count of single and married women for each month of birth cohort at the time of census. For months between census collections, we use linear interpolation.

[19] Australian Demographic Statistics, catalogue no. 3101.0. See: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015.

Appendix B: Sensitivity tests

Alternative model that better controls for cohort effects

For sensitivity, we estimate an alternative model that better controls for the differences across birth cohorts than the standard model (equation 1). Akin to the approach of 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:

$$\Delta y_a = \alpha + \gamma \Delta NE_a + XB + \varepsilon_a \quad (2)$$

where for Δy_a is the difference in welfare receipt rate for consecutive cohorts i and $i-1$ at age a ($\Delta y_a = y_{ia} - y_{i-1a}$); ΔNE_a 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_a 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_a 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).

Results for equation (2) are presented in Table B1 and are very close to those from Table 2, suggesting that our main results are not biased by a failure to property control for cohort effects.

Table B1. Effects of increasing the female APE from 61 to 64.5 on welfare receipt (July 1998-May 2013), alternative treatment of cohort effects

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

*** p<0.01, ** p<0.05, * p<0.1. Control variables include age, monthly unemployment rate, age pension birth cohort, calendar birth month and time fixed effects. [a]Disability Support Pension. [b]New Start Allowance respectively. [c]The coefficient for monthly inflow is not directly comparable to the change in stock of welfare receipt, including change in stock of partner receipt.

Alternative model for dealing with active substitution prior to affected ages

When estimating active substitution using our standard model (equation 1), we do not account for the possibility that people respond by entering welfare before the affected ages, which may occur if people are forward looking. To examine the extent of the response prior to the affected ages, we extend the standard model by incorporating a series of lead variables that capture the impacts on the inflows into welfare (excluding Age Pension) ahead of the period from which eligibility age is delayed:

$$y_{it} = \alpha + \lambda_t + \sum_k \delta_k\, k + \beta unemp_t + \sum_j \theta_j\, APE_{ij} + \gamma NE_{it} + \sum_n \gamma_n\, I(age_{it} < j - n) + \epsilon_{it} \quad (3)$$

where n=0.5, 1, 1.5, 2 years, and $I(age_{it} < j - n)$ is indicator for the being at least n years below eligibility age j. With these set of lead variables, we are able to examine the response to the increase in eligibility age up to 2 years prior to the affected ages.

Results from this model are presented in Table B2. We can see that the coefficients on the lead indicators are very small, suggesting only minor responses prior to the affected ages.

Table B2. Effects of increasing the female APE from 61 to 64.5 on entry into welfare (active substitution) up to two years ahead of affected ages (July 1998-May 2013)

	Any payment excl. Age Pension	Disability benefits[a]	Unemployment benefits[b]
γ_2	-0.00033***	-0.00003***	0.00015***
	(0.00003)	(0.00001)	(0.00001)
$\gamma_{1.5}$	-0.00007**	0.00003***	0.00004***
	(0.00003)	(0.00001)	(0.00002)
γ_1	0.00015***	0.00009***	0.00005***
	(0.00003)	(0.00001)	(0.00001)
$\gamma_{0.5}$	0.00046***	0.00018***	0.00017***
	(0.00003)	(0.00001)	(0.00001)
γ	0.00209***	0.00034***	0.00089***
	(0.00002)	(0.00001)	(0.00001)
N	10,674	10,674	10,674
R^2	0.84732	0.67284	0.80697

*** p<0.01, ** p<0.05, * p<0.1. Control variables include age, monthly unemployment rate, age pension birth cohort and time fixed effects. [a]Disability Support Pension. [b]New Start Allowance respectively. [c]The 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: Other model estimates

Table C1: Effects of increasing the APE of females from 61-64.5 on welfare receipt rate, married women

	Any payment	Any payment excluding Age Pension	Disability benefits	Unemployment benefits
γ	-0.1564***	0.3746***	0.1055***	0.0360***
	(0.0010)	(0.0010)	(0.0003)	(0.0001)
N	10,674	10,674	10,674	10,674
R^2	0.9792	0.9756	0.9823	0.9649

Notes: *** p<0.01, ** p<0.05, * p<0.1. Control variables include age and monthly unemployment rate, age pension age cohort and time fixed effects.

Table C2. Effects of increasing the APE of females from 61-64.5 on welfare receipt rate, single women

	Any payment	Any payment excluding Age Pension	Disability benefits	Unemployment benefits
γ	-0.0776***	0.4221***	0.2066***	0.0452***
	(0.0010)	(0.0009)	(0.0005)	(0.0002)
N	10,674	10,674	10,674	10,674
R^2	0.9311	0.9872	0.9868	0.9674

Notes: *** p<0.01, ** p<0.05, * p<0.1. Control variables include age and monthly unemployment rate, age pension age cohort and time fixed effects.

Table C3: Effects of increasing the female APE 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

*** 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.