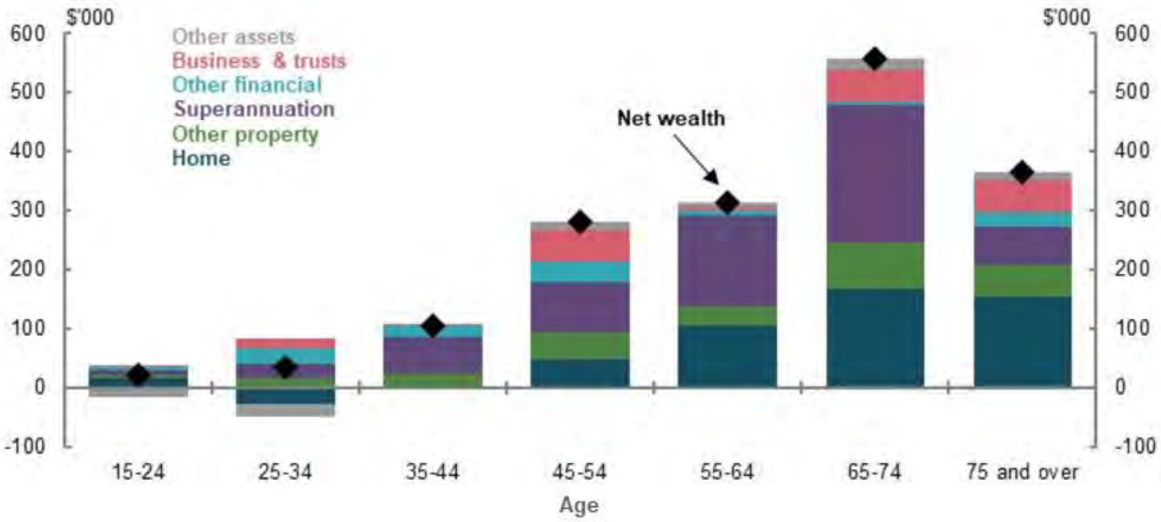
- **Continued increases in residential property values** — In February 2020, residential property values in Australia's capital cities were around 45 per cent higher than in 2012 (CoreLogic, 2020). The large asset price gains for home owners have primarily been received by current older people (Chart 3H-4). If the strong gains in residential property values are not repeated, younger home owners may not have the same opportunity to accumulate housing wealth as current older Australians.

  In addition, if the trend of falling home ownership rates continues, (see *1D. The changing Australian landscape*), some current young people will need to rely on other assets, such as superannuation or equities, as voluntary retirement savings. These people will forgo the benefits of home ownership in retirement, including the ability to age in a place of tenure. They may be unable to achieve the same retirement outcomes as current home owner retirees.

Chart 3H-4 Change in average wealth per household in 2015-16, compared to households of the same age in 2003-04



Note: Age group is the age of the household's reference person. 'Other financial assets' include bank accounts, shares, and the outstanding value of loans made to other households or businesses. 'Other assets' include car, home contents, silent partnerships and assets not covered elsewhere. Source: Replication of (Wood, et al., 2019), which is derived from (ABS, 2018f).

- **Expanded coverage and increases in the rate of the SG** — Current younger generations will benefit in retirement from contributing to superannuation throughout their working life and at the higher SG rate. As such, on average, they are projected to have higher superannuation balances at retirement than current older Australians.

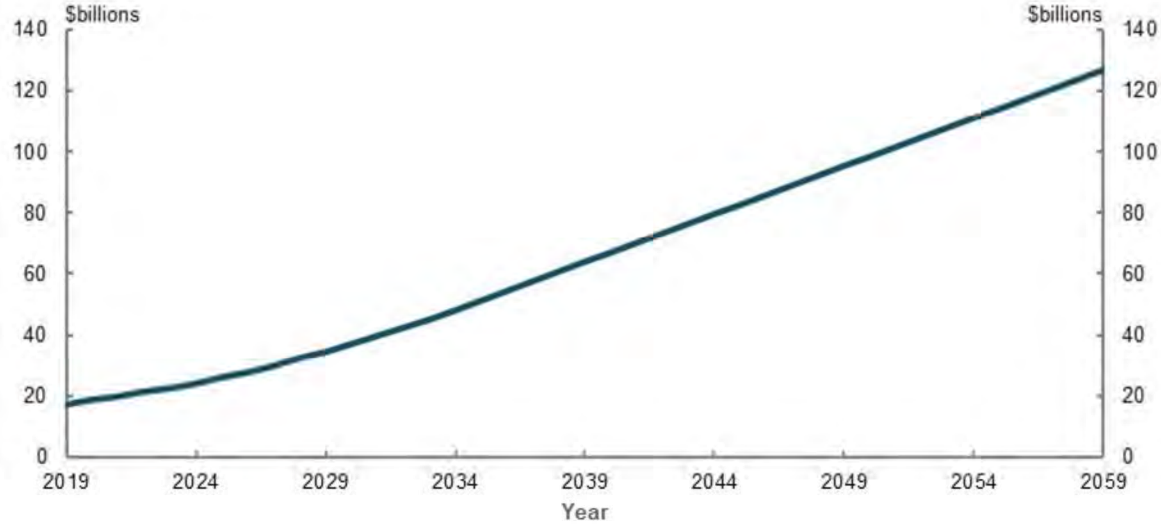
Inheritances

Inheritances can help rebalance intergenerational differences in opportunities to save for, and outcomes in, retirement. However, inheritances can be ineffective at *equalising* opportunities and outcomes between generations, as their size and timing are not guaranteed.

Most people die with the majority of the wealth they had when they retired (see *5A. Cohesion*). If this continues, inheritances will increase as the superannuation system matures. For example, assuming no change in how retirees draw down their superannuation balances, superannuation death benefits are projected to increase from around $17 billion in 2019 to just under $130 billion in 2059 (Chart 3H-5).[235]

[235] Analysis of Rice Warner estimates for the review.

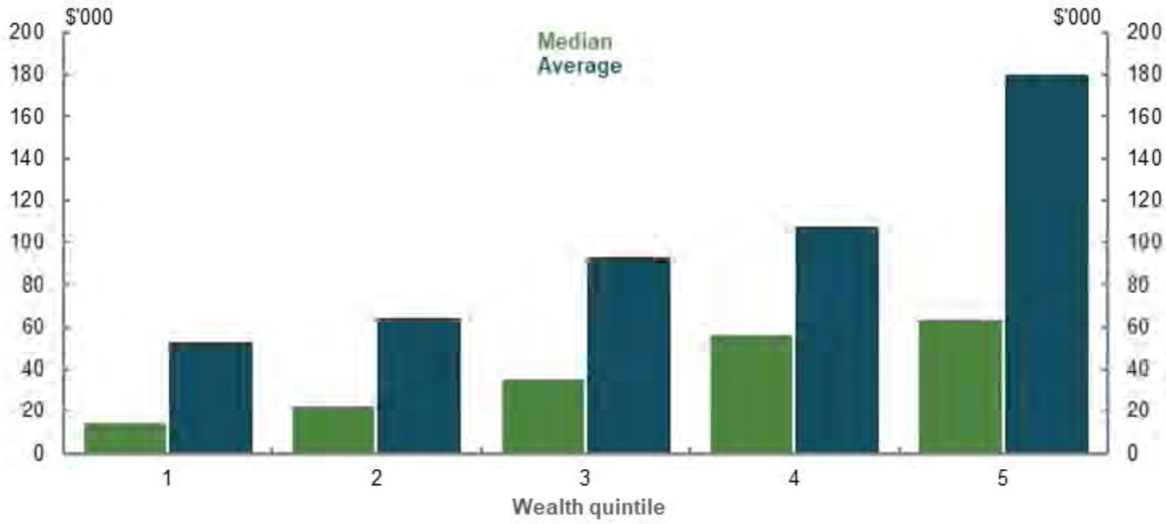
Chart 3H-5 Projected value of superannuation death benefits



Note: In 2018-19 dollars. Superannuation death benefits include insurance payouts due to death. Source: Analysis of Rice Warner estimates for the review.

Although inheritances can help people to prepare for retirement, they are distributed unequally, with wealthier people tending to receive larger inheritances than those with lower wealth (Chart 3H-6). Inheritances therefore increase intragenerational inequity and do not help all people to prepare for retirement.

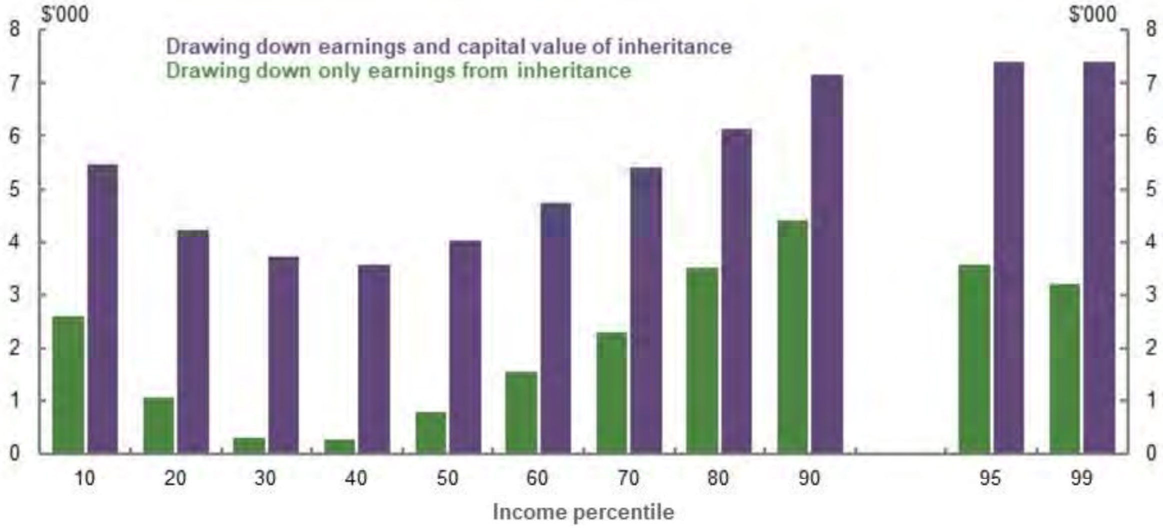
Chart 3H-6 Size of inheritances, by wealth quintile



Note: In 2017-18 dollars. Median and average calculated by size of inheritance where one was received. Self-reported inheritances are captured in all HILDA Surveys between 2001 and 2017, while wealth is only captured in the 2002, 2006, 2010, and 2014 HILDA Surveys. As a result, wealth quintile is based on most recently captured wealth information for an individual. Individuals are allotted to a wealth quintile across all survey respondents. Source: Replication of (Wood, et al., 2019), which is derived from HILDA Survey data (Waves 2-17).

Receiving an inheritance at the point of retirement boosts the annual retirement income of higher-income earners by more than lower-income earners, for the same size inheritance (Chart 3H-7). This is because receiving an inheritance increases a person's assets and income and therefore reduces any Age Pension payments as they do not have the same need for Government support. Higher-income earners are the least affected by the assets test as, even without an inheritance, they qualify for minimal or no Age Pension in retirement.

Chart 3H-7 Projected change in annual retirement income from a $250,000 inheritance at retirement



Note: Values are in 2019-20 dollars, deflated using the review's mixed deflator. 'Drawing down earnings and capital value of inheritance' strategy assumes the inheritance is contributed to superannuation and drawn down consistently with other superannuation assets (see *Appendix 6A. Detailed modelling methods and assumptions*). Inheritance size of $250,000 is inflated by CPI and is based on the median value of a final estate of $480,000 from 2016 Victorian probate data (Wood, et al., 2019). As the fertility rate has been 1.9 births per woman since the late 1970s (Commonwealth of Australia, 2015), the inheritance is roughly split between two children. For simplicity, the inheritance is received at the point of retirement. The average size of inheritances is significantly higher in probate data than in HILDA (see Chart 3H-6). The difference may be due to the HILDA Survey relying on people self-reporting inheritance amounts and excluding some people living in aged care, and probate data excluding some small estates that do not require a probate. Probate data excludes superannuation death benefits, jointly owned assets and family trusts. Source: Cameo modelling undertaken for the review.

Most inheritances go to people over age 50 (Wood, et al., 2019, p. 42). As the timing and size of inheritances is uncertain, this makes it difficult for working-age people to plan optimally for retirement and to avoid over-saving. With life expectancy at birth projected to increase in the future (see *1D. The changing Australian landscape*), inheritances are expected to increasingly go to even older Australians.

Inheritances and gifts have generally been tax-free in Australia since the late 1970s (The Sydney Morning Herald, 2018). However, superannuation death benefits are taxed in some cases, including the taxable component of lump sum benefits paid to non-dependants and income stream benefits paid to dependants (ATO, 2020d).[236] In 2017, Australia was one of eight OECD countries without any inheritance, estate or gift taxes (OECD, 2020b).

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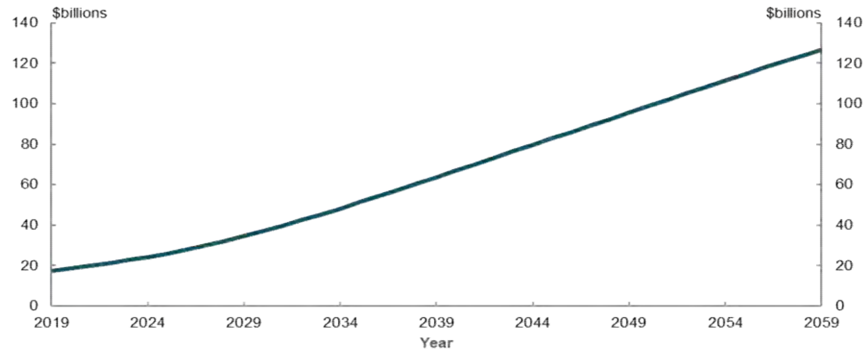
[236] The tax rate for lump sum benefits paid to non-dependants varies based on whether the benefit is from a taxed or untaxed source. The tax rate for income stream benefits paid to dependants varies based on the age of the deceased person at the time of death, the age of the beneficiary and whether the benefit is from a taxed or untaxed source.

Section: 3H
Chart: 5
Title: Projected value of superannuation death benefits
Source: Analysis of Rice Warner estimates for the review.

Year	Superannuation death benefits
2019	17,400,000,000
2020	18,500,000,000
2021	19,800,000,000
2022	21,200,000,000
2023	22,600,000,000
2024	24,200,000,000
2025	26,000,000,000
2026	27,900,000,000
2027	30,000,000,000
2028	32,200,000,000
2029	34,500,000,000
2030	37,000,000,000
2031	39,600,000,000
2032	42,400,000,000
2033	45,300,000,000
2034	48,200,000,000
2035	51,200,000,000
2036	54,300,000,000
2037	57,500,000,000
2038	60,600,000,000
2039	63,800,000,000
2040	66,900,000,000
2041	70,100,000,000
2042	73,300,000,000
2043	76,500,000,000
2044	79,700,000,000
2045	82,800,000,000
2046	86,000,000,000
2047	89,200,000,000
2048	92,400,000,000
2049	95,500,000,000
2050	98,700,000,000
2051	101,900,000,000
2052	105,100,000,000
2053	108,300,000,000
2054	111,400,000,000
2055	114,600,000,000
2056	117,700,000,000
2057	120,800,000,000
2058	123,800,000,000
2059	126,800,000,000



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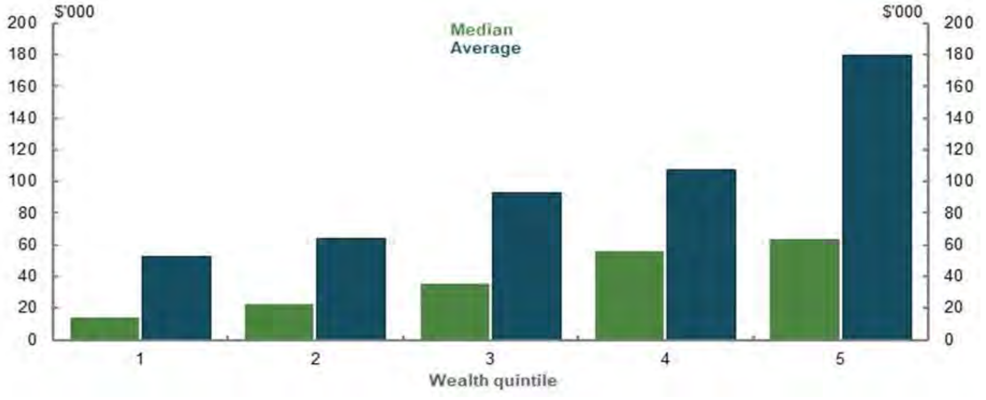
Document 3

Section: 3H
Chart: 6
Title: Size of inheritances, by wealth quintile
Source: [Generation Gap: ensuring a fair go for younger Australians]

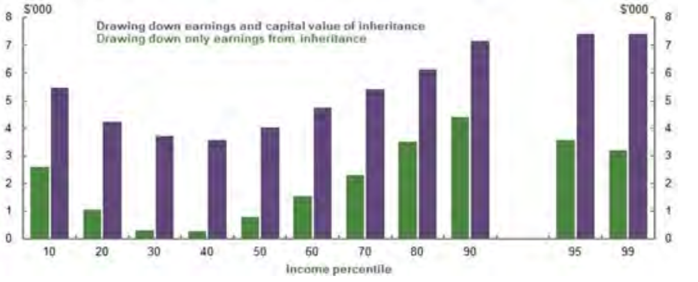
Wealth quintile	Median	Average
1	13,700	52,400
2	22,700	63,900
3	35,300	92,700
4	56,100	107,000
5	63,500	180,000



FOI 2980
Document 4

Section: 3H
Chart: 7
Title: Projected change in annual retirement income from a $250,000 inheritance at retirement
Source: Cameo modelling undertaken for the review.

Income decile	Drawing down only earnings from inheritance	Drawing down earnings and capital value of inheritance
10	2,600	5,500
20	1,100	4,200
30	300	3,700
40	300	3,600
50	800	4,000
60	1,500	4,800
70	2,300	5,400
80	3,500	6,100
90	4,400	7,200
95	3,600	7,400
99	3,200	7,400



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Document 5

GRATTAN Institute

August 2019

Generation Gap

Ensuring a fair go for younger Australians

Danielle Wood and Kate Griffiths

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Silver Chain

Urbis

Woodside

Grattan Institute Report No. 2019-07, August 2019

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Overview

Australians aspire to leave the world a better place for future generations. And previous generations have largely succeeded in doing so. Australia's population is healthier, wealthier and better housed than 100 or even 20 years ago. Generation-on-generation economic progress has been the norm for the past century.

But continuing progress is not guaranteed. Older Australians today have substantially greater wealth, income and expenditure than older Australians three decades ago, but living standards have improved far less for younger Australians.

The wealth of households under 35 has barely moved since 2004. Poorer young Australians have less wealth than their predecessors and are far less likely to own a home. In contrast, older households' wealth has grown by more than 50 per cent over the same period because of the housing boom and growth in superannuation assets.

There is no evidence that young people's spending habits are to blame for their stagnating wealth – this is not a problem caused by avocado brunches or too many lattes. In fact, younger people are spending less on non-essential items such as alcohol, clothing and personal care, and more on necessities such as housing, than three decades ago.

Economic pressures on the young have been exacerbated by recent wage stagnation and rising under-employment. Older households are better cushioned from low wage growth because they are more likely to have other sources of income. If low wage growth and fewer working hours is the 'new normal', then we could have a generation emerge from young adulthood with lower incomes than the one before it. This has already happened in the US and UK.

Young Australians will also bear the brunt of growing pressures on government budgets. The ageing of the population means higher government spending on health, aged care and pensions. But there will be fewer working-age people for every person over 65 to pay for it.

Governments have supercharged these demographic pressures by introducing generous tax concessions for older people. The share of households over 65 paying tax has halved over the past two decades. And average income tax paid has barely changed for people over 65 despite strong growth in their incomes and wealth. Working-age Australians are underwriting the living standards of older Australians to a much greater extent than the Baby Boomers did for their forebears, straining the 'generational bargain' to breaking point.

Inheritances will not fix the problem. Instead, they exacerbate inequality, because the biggest inheritances tend to go to people who are already wealthy.

Policy change is required. Boosting economic growth and improving the structural budget position are wins for all, but especially for the young. Changes to planning rules to encourage higher-density living in established city suburbs would make housing more affordable. And a fair go for younger people means reducing or eliminating age-based tax breaks that are pushing a growing tax burden on to working Australians.

Just as policy changes have contributed to pressures on young people, they can help redress them. The time for action is now: none of us wants the legacy of a generation left behind.

Recommendations

Recommendation	$ value / impact	Implementation challenge	Political challenge
Economic growth			
Improve the efficiency of taxation · Land tax/stamp duty swap · Make the tax treatment of savings more consistent · Company tax reform · GST/income tax swap	High	Hard (broad structural changes)	Hard
Improve labour force participation and productivity · Increase pension age and superannuation preservation age · Increase childcare rebates to reduce income traps · Education reforms	High	Medium (mainly straight-forward)	Medium
Make strategic investments in infrastructure · Reduce the role of politics in project selection · Require published independent assessment of all proposed projects	High	Easy (straight-forward policy)	Medium
Housing affordability			
Boost housing supply by changing planning rules to allow more homes in the inner and middle rings of capital cities	Medium-High	Medium (complex policy)	Hard
Reduce the capital gains tax discount to 25 per cent and wind back negative gearing	$5.5-6 billion p.a.	Easy (straight-forward policy)	Medium
Age-based tax breaks			
Tax superannuation earnings in retirement at 15 per cent	$2 billion + p.a.	Easy (straight-forward policy)	Medium-Hard
Wind back the Seniors and Pensioners Tax Offset (SAPTO) and match the Medicare levy for senior Australians to that of working-age Australians	$700 million p.a.	Easy (straight-forward policy)	Medium
Match the private health insurance rebate rates for seniors to those of working-age Australians	$250 million p.a.	Easy (straight-forward policy)	Medium
Intergenerational transfers			
IGTT/income tax swap	Medium	Medium-Hard (structural)	Very Hard
Broaden the super death benefits tax	Low-Medium	Easy (straight-forward policy)	Medium
Keep the Superannuation Guarantee at 9.5 per cent	$2-2.5 billion p.a.	Easy (straight-forward policy)	Medium
Include the family home in the Age Pension assets test	$1-2 billion p.a.	Easy (straight-forward policy)	Medium-Hard

Table of contents

1 Introduction

Australia's recent history has been characterised by remarkable economic progress. Strong economic growth has produced growing wealth and incomes for much of the past century. And with that progress, each generation of Australians has enjoyed a better material standard of living than the one that came before it.

But younger Australians – Millennials and Gen Z (see Box 1) – are not making the same economic gains as their predecessors.

This report examines their stalled progress and what governments can do to help. It reviews indicators of financial wellbeing – wealth, income, employment, expenditure, and government taxes and spending – for people of different ages and how they have changed over time.

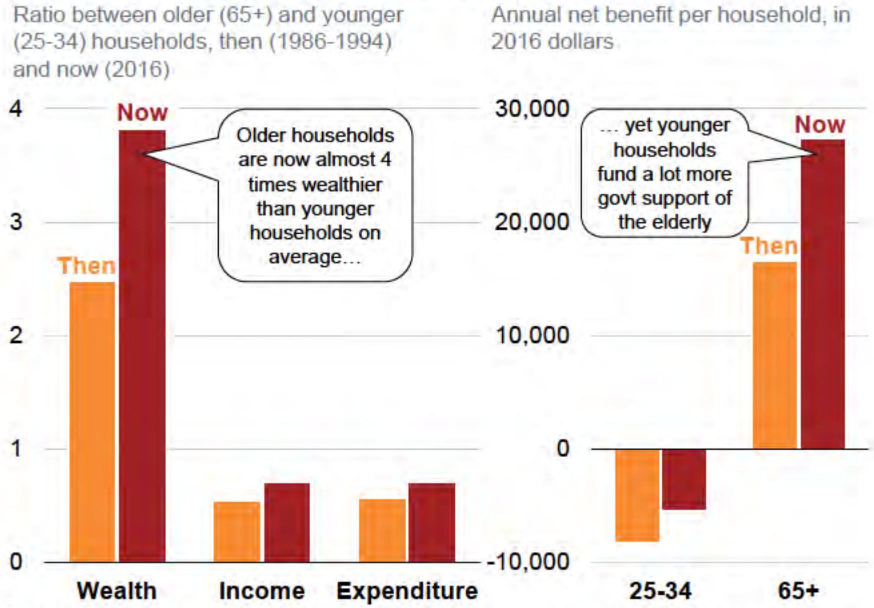
The report identifies policy settings that have contributed to differences in outcomes across generations. And it looks ahead to what an ageing population might mean for the economic future of today's young.

1.1 The economic gap between old and young has widened

Older Australians today have substantially greater wealth, income and expenditure than older Australians three decades ago. Younger Australians have not made the same progress.

Yet over the same three decades the tax and transfer system has become increasingly generous to older Australians (Figure 1.1). The sheer size of these transfers exacerbates the costs of an ageing population, leaving younger Australians to carry the burden and threatening the sustainability of the 'generational bargain'.

Figure 1.1: Older Australians have made large gains in wealth, income, expenditure and government benefits relative to younger Australians



Notes: The starting point ('then') reflects the first survey available, which was 1986 for income, 1989 for expenditure, taxes and benefits, and 1994 for wealth data. The end point ('now') refers to 2016. The ratio is the difference between the average household aged 65+ and the average household aged 25-34. Age group is the age of the household reference person. Wealth is net of liabilities; Income is equivalised disposable income; Expenditure is equivalised and after-tax; Net benefits are cash and in-kind social assistance, net of income tax and indirect taxes (equivalised). Later chapters in this report examine the trends in greater depth and for all age groups.

Sources: ABS (2018a) and ABS (2018b).

1.2 The generational bargain is under threat

The generational bargain is an implicit contract between generations. It is underpinned by a recognition of the obligation of one generation to another.[1]

The bargain is evident in the private sphere, most obviously in families – where people of different ages provide financial and care-giving support to others at different points in their lives.

But this intergenerational dependence is also evident in society more broadly.[2]

In public finances, working-age families pay more in taxes than they receive in benefits. This helps support older Australians who are no longer in the workforce. Working-age Australians expect that when they reach retirement, the next group of working-age Australians will support them.

Many public investments – such as infrastructure and national parks – are long-lived and are motivated by the benefit to future and not just current generations.

This society-wide bargain is sustained by a sense of fairness and even generosity between generations: most people aspire to leave the world a better place for future generations.[3]

1. Collard (2000).
2. Weiss (1992); and Intergenerational Commission (2018, p. 8).
3. An ABS survey of aspirations found 'Australians aspire to an economy that sustains or enhances living standards into the future' and 'Australians aspire to manage the environment sustainably for future generations': ABS (2013). A survey by the UK Intergenerational Commission found strong support for the statements 'The success of our society is measured by how well we provide for older generations' and 'Each generation should have a higher standard of living than the one that came before it': Intergenerational Commission (2018, p. 8).

Box 1: Talking about the generations

Generational cohorts are defined (loosely) by birth year. Generations are shorthand for groups with similar experiences because of the economics, culture and events of certain periods.

In this report, we refer loosely to generations to communicate the age group we are talking about. The age breakdown of the generations is outlined below:

- Gen Z, iGen, or Centennials: Born 1996 – TBD (under 24)
- Millennials or Gen Y: Born 1981-ish – 1995 (24 to 38-ish)
- Generation X: Born 1965 – 1980-ish (39-ish to 54)
- Baby Boomers: Born 1946 – 1964 (55 to 73)
- Traditionalists or Silent Generation: Born 1945 or before (74+)

But if this sense of fairness breaks down, the bargain can come under threat. A sense that one generation is drawing down more than is sustainable or constraining opportunities for subsequent generations can undermine the compact.

Growing wealth disparities and government transfers between young and old are straining the bargain in Australia. This strain has emerged partly because of economic and demographic shifts but also because of policy choices – particularly housing and tax policies. Both the young and old have a stake in responding to these challenges.

1.3 Why we focus on economic wellbeing

This report focuses on the current and future economic position of Australians of different ages.

There are of course many other contributors to wellbeing. The environment, health, social interactions, freedom and agency are all important to quality of life.[4] In most of these areas, life has substantially improved over the past 50 years.[5]

But there are also future risks.[6] Most obviously, climate change is a substantial and growing threat to the health, safety and economic position of today's young people and their children.[7]

Focusing on economic wellbeing keeps the discussion tractable and picks up a lot of what we care about. Money isn't everything, but incomes are well-correlated with overall welfare.[8] This is partly because greater resources can support improvements in other things we care about such as health and environmental sustainability.

1.4 How we assess economic wellbeing

Comparing outcomes across generations requires an assessment of lifetime economic wellbeing – that is, consumption opportunities across the lifecycle. The long-term economic position of households depends on a number of factors:

- net wealth – the store of resources that can be spent in future – which depends on past savings, plus appreciation in asset values;
- future income;
- future government spending and its incidence by age;
- future taxes – which depend on future government spending, plus interest on accumulated government debt; and
- future inheritances and gifts.

Unfortunately the data to comprehensively assess lifetime economic outcomes for each generation is limited. This report draws on ABS surveys that provide a picture of the financial wellbeing of households over three to four decades (see Box 2).[9] This is a substantial period, but still not long enough to assess a generation's financial position over its full lifecycle.

4. Treasury (2012); and Sen (1994).
5. Sternberg (2019).
6. CSIRO Futures looked holistically at what kind of country Australia could be in 2060 – economically, socially and environmentally – and mapped out two plausible but very different paths depending on the choices we as a nation make between now and then: CSIRO (2019).
7. CSIRO and BOM (2018); Garnaut (2011); and Morrissey et al. (2015).
8. Wellbeing rises with income, whether comparing people of different incomes within a country, across countries, or comparing the economic growth (GDP) of countries: Stevenson and Wolfers (2008) and Stevenson and Wolfers (2013).
9. Regular surveys of household income and expenditure have been running since the 1980s (ABS Survey of Income and Housing and Household Expenditure Survey), and household wealth has been measured since the 1990s (ABS Survey of Household Income and Wealth).

An important part of the story is yet to come. The economic future of Millennials, Gen Z and subsequent generations will depend on the future course of productivity and income growth. Strong per-person economic growth almost inevitably leaves a generation better off than the one that came before it. But continued high levels of growth are not guaranteed. There are real fears that lower growth may be the 'new normal' for the rich world, including Australia.[10]

We shouldn't just assume that future strong growth will resolve the pressures highlighted in this report. To do so is to transfer the entire risk of low growth onto today's young. Policy settings can help (Chapter 7).

1.5 Intergenerational inequality exacerbates broader inequality

This report compares outcomes between generations. It does not focus on issues of *intra*-generational fairness or inequality more generally; other reports have explored this issue in detail (Box 3).

Considering the average (and median) outcomes for different age groups conceals a huge amount of variability within each age group. The wealth of some young people has grown rapidly, just as some older people struggle to make ends meet.

But intergenerational inequality and intragenerational inequality are linked.[11]

If a generation does relatively badly, opportunity and mobility for the poor of that generation may be particularly restricted. Indeed, people today who are both young and poor are probably the most financially

10. Minifie et al. (2017, Chapter 1).
11. The Productivity Commission found that countries with higher income inequality tend to have low intergenerational mobility, that is, an individual's income depends more on their parents' income: PC (2018a, Chapter 5).

Box 2: Data sources used in this report

- ABS surveys of household wealth, income, expenditure, taxes, and government benefits over time. We use Confidentialised Unit Record Files (CURFs) from the Survey of Income and Housing, the Household Expenditure Survey, the Survey of Household Income and Wealth, and the Fiscal Incidence Study. We use equivalisation methods, where appropriate, to standardise for households of different sizes (see Appendix A).
- The Household, Income and Labour Dynamics in Australia (HILDA) Survey, which includes information on gifts and inheritances (see Chapter 6).
- Probate records from the Victorian Public Records Office, which include information on inheritances (see Chapter 6 and Appendix B).

vulnerable group in society.[12] On the flip side, if a generation does relatively well, the inheritances they leave to their children actually increase inequality in subsequent generations (see Chapter 6).

The reforms we propose in Chapter 7 to reduce intergenerational inequality are likely to reduce intragenerational inequality too.

This report is structured as follows:

Chapter 2 highlights the growing wealth gap between older and younger Australians.

Chapter 3 examines differences in income growth and employment across age groups, including the effects of recent wage stagnation.

Chapter 4 shows how people's spending patterns have changed over time.

Chapter 5 highlights how current tax and transfer policies are exacerbating budget pressures caused by the ageing of the population.

Chapter 6 shows why inheritances cannot be relied on to reduce intergenerational inequality.

Chapter 7 recommends a range of policy reforms to improve economic opportunity for younger Australians and future generations.

12. Younger Australians are more likely to suffer financial stress than older Australians (see Section 4.2). Financial comfort is particularly low among students, renters, single parents with young children, the unemployed, and casual workers (ME Bank (2019)) – groups that all tend to be younger.

Box 3: Inequality in Australia

The Productivity Commission (PC) recently reviewed the evidence on inequality, poverty and disadvantage in Australia.[a] It found that wealth inequality had increased over the past 15 years – with the richest 10 per cent enjoying faster growth in wealth than others.

In contrast, income and consumption inequality in Australia rose only slightly over the past three decades (and not at all according to some measures).[b] Grattan analysis suggests that disposable income after housing costs became more unequal over the past decade.[c]

Income mobility is relatively high in Australia compared to other countries, but some households still face entrenched disadvantage. Persistent and recurrent poverty affects a small but significant proportion of the population.[d]

a. PC (2018a).
b. Income inequality, as measured by the Gini coefficient, increased a little in the mid-2000s, from 0.31 in 2004, to peak at 0.34 just before the GFC. Since then the Gini coefficient has oscillated between 0.32 and just above 0.33 (based on household equivalised disposable income): Wood et al. (2018, pp. 32-33).
c. Coates (2019a, Slide 7).
d. PC (2018a).

2 Australia's growing generational wealth gap

Australian household wealth has grown strongly over the past 30 years. Real net wealth has more than tripled, from $2.8 trillion in 1990 to $10.3 trillion in 2018.[13]

But the wealth bonanza has been far from equally spread. Most of the increase in wealth has been accumulated by older households,[14] who benefited most from the housing boom and growth in superannuation assets.

For younger Australians, wealth has barely shifted in the past decade. And poorer younger Australians today have even less wealth than their predecessors. Younger Australians are less likely to own a home than their parents at the same age, and those who do are taking on a lot more debt.

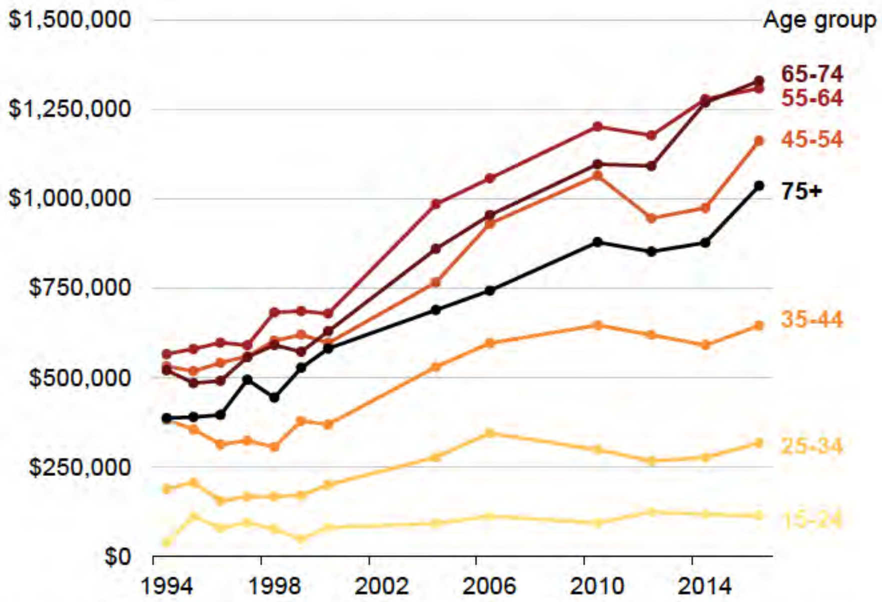
The conditions that precipitated the rapid growth in wealth for older Australians are unlikely to be repeated.[15]

2.1 The wealth gap between young and old is growing

There is a growing gap in wealth between older and younger Australians (Figure 2.1).[16]

Figure 2.1: The wealth gap between young and old is growing

Average household net wealth by age of head of household, 1994 to 2016, in 2016 dollars



Notes: ABS summary data was not available for the 75+ age group in 2004 and 2006, so microdata was used instead. In all other missing years no survey took place. Age group is the age of the household reference person. Net wealth is not equivalised. See Figure 2.2 for equivalised net wealth.

Sources: ABS (2017a) and ABS (2002).

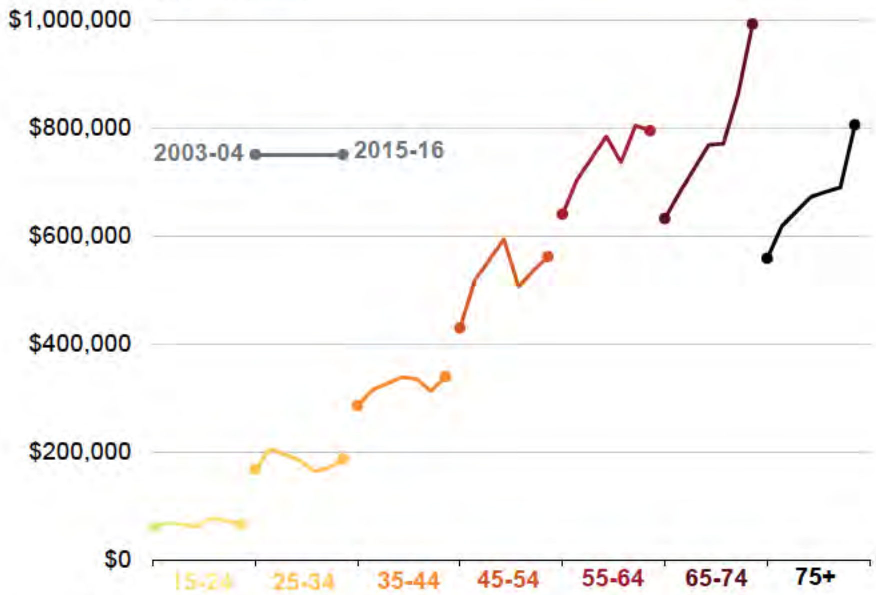
13. Figures reported in 2018 dollars: ABS (2019a).
14. Two-thirds of the real increase in average wealth between 1994 and 2016 was among households over 55 (and 86 per cent was among households over 45).
15. Daley et al. (2018a, Section 10.1) and Chapter 7.
16. Our analysis of wealth uses the ABS Survey of Household Income and Wealth, which includes demographic information about households. Total household wealth in this survey is about 10 per cent less than in the National Accounts. The survey appears to underestimate wealth because very-high-wealth households are rare and unlikely to be sampled. Nonetheless, this survey remains the best available source of information because National Accounts data do not include any breakdown by age. Our estimates are therefore likely to *underestimate* the wealth

The average household headed by someone aged 65-74 now has more than $1.3 million in net assets, up from $530,000 in real terms for a household of the same age in 1994.[17] Wealth for an average household headed by someone aged 25-34 increased only modestly – from an average of $190,000 in net assets in 1994 to $300,000 today.[18] Over the past decade, wealth for younger households has barely shifted.

Households typically are at their wealthiest between ages 55 and 74. The peak has more than doubled in two decades – from an average of about $0.5 million in net assets per household in 1994, to more than $1.3 million in 2016.[19]

The trends are the same in 'equivalised' terms – which takes into account household size and estimates the net wealth equivalent to a single-adult household (Figure 2.2).[20] Average net wealth is naturally lower in equivalised terms. Households headed by someone aged 65-74 have an average equivalised net wealth of $1 million today, up from about $600,000 just 12 years ago. Meanwhile younger households have made barely any gains compared to a household of the same age 12 years ago.[21]

Figure 2.2: The net wealth of older households has grown substantially
Average equivalised net wealth by age of head of household, 2003-04 to 2015-16, in 2015-16 dollars



Notes: Equivalised net wealth accounts for households of different sizes. Microdata enabling equivalisation was only available from 2003-04. Age group is the age of the household reference person.

Source: ABS (2018a).

gap between young and old, because most very-high-wealth households will be older.

17. For the median household headed by someone aged 65-74, net wealth was $800,000 in 2016, up from $300,000 in 1994, in real terms.
18. For the median household headed by someone aged 25-34, net wealth was $160,000 in 2016, up from $90,000 in 1994, in real terms.
19. Figures reported in 2016 dollars. Median net wealth for households headed by someone aged 55-74 was about $300,000 in 1994, compared to more than $800,000 in 2016.
20. 'Equivalised' net wealth is household net wealth adjusted by an equivalence scale to facilitate comparisons between households of differing size and composition. See Footnote 36 on page 19 and Appendix A.
21. Households headed by someone aged 25-34 had an average equivalised net wealth of $190,000 in 2016, compared to $170,000 in 2004, in real terms.

2.2 Housing and superannuation were the big wealth drivers

Most of the growth in household wealth is in property and superannuation assets (Figure 2.3). Booming property prices since the turn of the century have made many long-term property owners unexpected millionaires.

Alongside the housing boom, compulsory superannuation contributions[22] and tax benefits encouraging further contributions[23] have substantially increased the nest eggs of households nearing retirement.

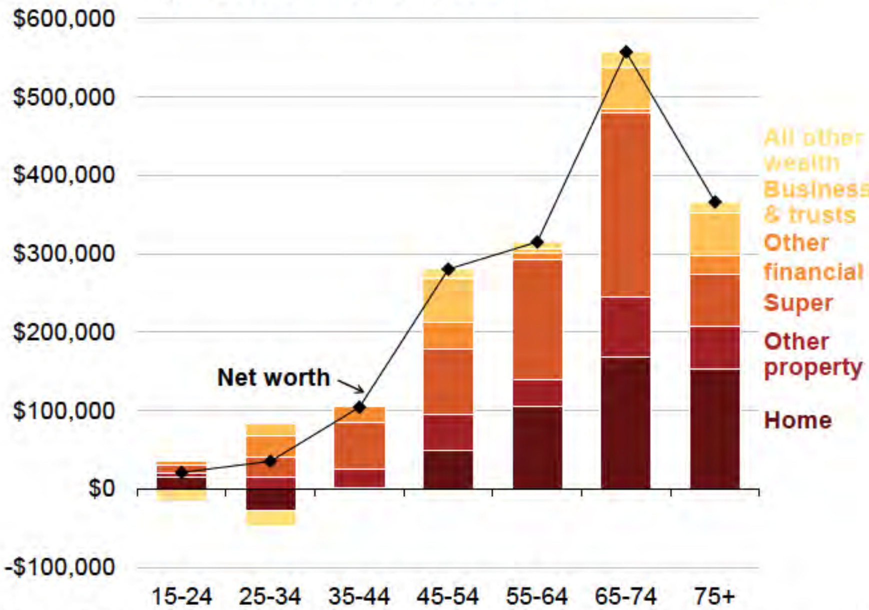
2.3 Generational gains in wealth are not guaranteed

For most of the 20th century, each generation was wealthier than the one before it at the same age.

But in the US, UK and many European Union countries, Millennials have lower wealth than members of earlier generations at the same age.[24] There is a risk Australia could go down the same path (Figure 2.4).

Younger Australians are now less likely to own a home than young people were in the past.[25] In 2016, 45 per cent of 30-year-olds owned a home; in 1981, the figure was 67 per cent.[26] By contrast, older people are just as likely to own a home now as they were then – with about 80 per cent of 65-year-olds owning a home.

Figure 2.3: Housing and superannuation were the big wealth drivers
Change in mean wealth per household in 2015-16, compared to households of the same age in 2003-04, in 2015-16 dollars



Notes: Each asset type is net of liabilities. Change in equivalised wealth per household shows the same trends. Age group is the age of the household reference person.
Source: ABS (2018a).

22. A compulsory contribution by employers to employees' superannuation was introduced in 1986 at a level of 3 per cent. Between 1992 and 2002 compulsory contributions were progressively increased from 3 per cent to 9 per cent, and they were raised again in 2014, to 9.5 per cent. Under current legislation, compulsory contributions will rise progressively to 12 per cent between 2021 and 2025.
23. See Chapter 5.
24. Kurz et al. (2018); Intergenerational Commission (2018); and Hüttl et al. (2015).
25. Home ownership has also fallen among young people in the US and UK: Kurz et al. (2018) and Intergenerational Commission (2018).
26. ABS (2017b); and ABS (1983).

People who purchased homes in the 1980s faced higher interest rates, but the barriers to home ownership are much greater today (see Box 4 on page 18).

And younger Australians who do own a home are taking on a lot more debt. Average household debt has almost doubled for households headed by someone aged 35-44 – the age at which households typically carry the most debt (Figure 2.5). The average household headed by someone aged 55-64 is also carrying more debt than it used to, but this is largely because they are buying a second property.[27] Most households headed by someone over 65 have already paid off their mortgages.

2.4 The wealth gains of today's older Australians are unlikely to be repeated

Younger Australians purchasing homes or investing in other assets cannot expect to enjoy the same capital appreciation as people who purchased homes or invested in other assets two decades ago.

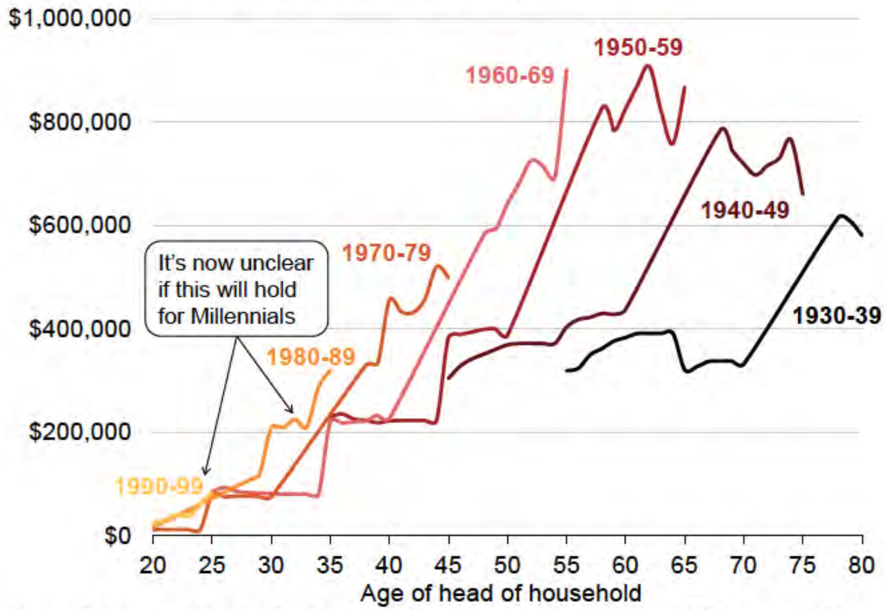
House prices and superannuation earnings have grown well above incomes for the past two decades (Figure 2.6). At the height of the boom, the average capital gain for a regular house in Sydney was higher than average annual earnings: for many workers their houses earned more than they did![28]

Falling interest rates have been a major contributor to the divergence between incomes and asset prices.[29]

27. Median household debt for this age group is only $16,000, indicating that at least 50 per cent of households headed by someone aged 55-64 have relatively little debt. And three-quarters of Australians aged 55-64 own a home: ABS (2017b).
28. For example, in the four years to December 2015, the median Sydney house increased in value from $579,000 to $915,000 (in 2015 dollars) – a $336,000 real increase. Average real earnings for a full-time worker in NSW over the same period were $322,000: ABS (2019b, Table 4) and ABS (2019c, Table 11A).
29. Saunders and Tulip (2019); and Kohler (2018).

Figure 2.4: Historically, each generation fared better than the last at the same age

Median net worth in 2015-16 dollars, by birth year

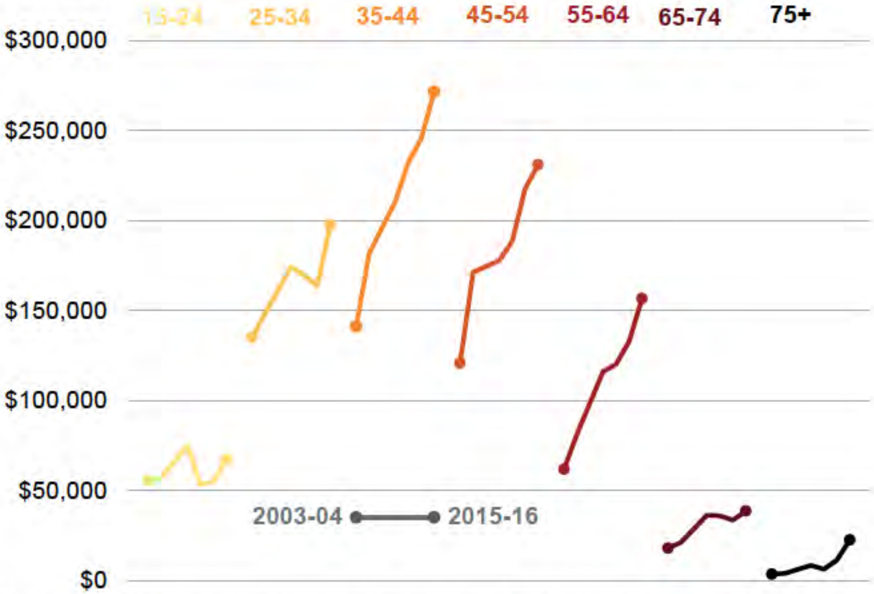


Notes: This 'quasi-longitudinal' analysis uses multiple waves of the ABS Survey of Income and Housing to infer changes in households' wealth. It is not a full longitudinal survey, because the households surveyed each time are different. But the households surveyed each time are drawn from more or less the same population of households, apart from deaths in the interim.

Sources: ABS (2017a) and ABS (2002).

Figure 2.5: Households aged 35-64 are taking on almost twice as much debt as they were in 2004

Average household debt by age of head of household, in 2015-16 dollars

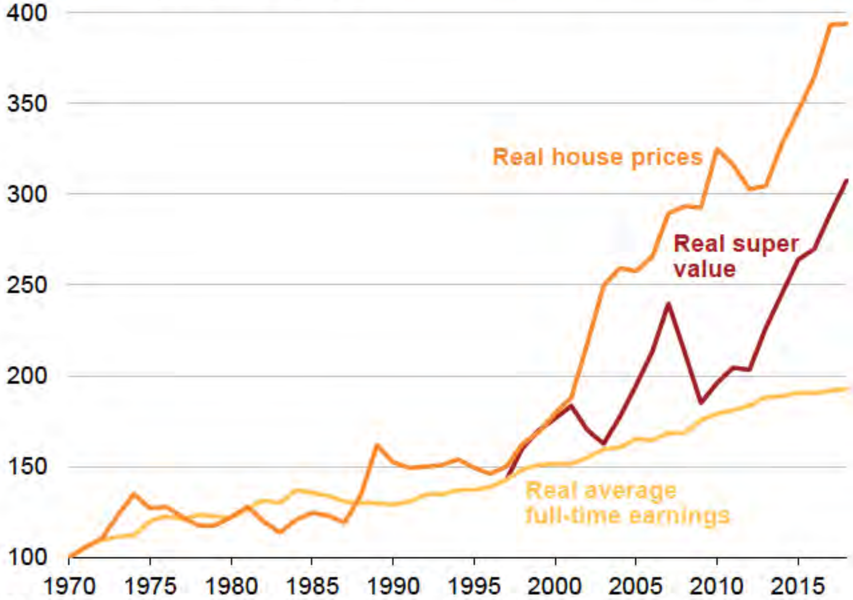


Notes: Debt includes mortgages, credit card debt, investment debt, student loans and other loans. Mortgage on the home is the main form of debt for all age groups, followed by rental property loans for older age groups and HECS/HELP liability for younger age groups. Younger households today have higher student debt than their predecessors, because of higher fees and participation rates. But these differences are small relative to mortgage debt: Daley et al. (2014, p. 9). Age group is the age of the household reference person.

Source: ABS (2018a).

Figure 2.6: Younger Australians are unlikely to enjoy the same windfall gains in asset prices

House prices, cumulative superannuation earnings, and average full-time weekly earnings, index: 1970 = 100



Notes: Superannuation index set equal to earnings index at 1997, because 1998 is the earliest date for which super returns are available. Superannuation index includes only APRA-regulated super funds. House price data for 1970 to 2010 is from Yates (2011). House price data from 2010 is six-monthly growth in the residential property price index from ABS (2019b), deflated by the CPI. Earnings data is full-time ordinary time earnings from ABS (2019c), deflated by the CPI.

Sources: Yates (2011, p. 263); Grattan analysis of ABS (2019b); ABS (2019c); PC (2018b, Figure 2.2,p. 117); Grattan analysis of APRA (2018).

For housing, other contributors were easier access to credit, construction of new dwellings not keeping pace with population growth in large cities,[30] and policy settings – including assistance for first-home buyers, and more generous tax concessions for property investors.[31]

Even if tight supply continues to keep house prices high, 20 years of average annual growth of 5 per cent above inflation is unlikely to be repeated.[32] Most observers[33] believe prices are unlikely to grow as quickly in future because income growth is likely to be slower, and official interest rates can't fall much further.[34]

For superannuation investments, generous tax concessions also played a role in boosting portfolio values. Some of the most generous tax concessions and contribution rules for superannuation have now been wound back, and it is likely there will be further tightening given the sizeable budget cost for very little policy benefit.[35]

2.5 Poorer young Australians are falling behind

All but the richest households headed by someone younger than 35 have *lower* real net wealth in 2016 than similar households in 2004 (Figure 2.7). And while well-off younger people in 2016 have more wealth than their counterparts in 2004, these gains are dwarfed by those of households over 65, right across the wealth spectrum.

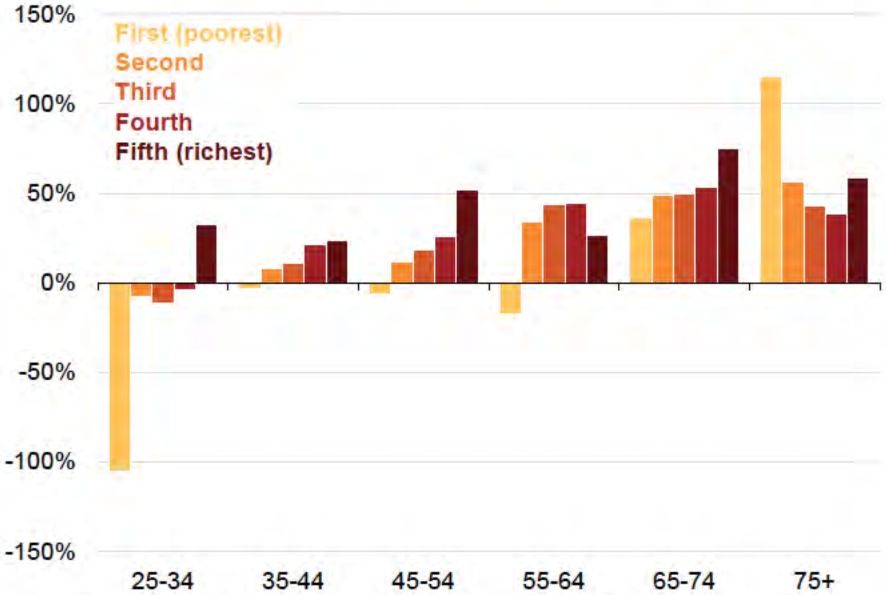
Home-ownership rates are also dropping fastest for the young and the poor (Figure 2.8). In 1981, 60 per cent of people in the lowest wealth quintile aged 25-34 owned a home. Today the figure is just 20 per cent.

In other words, wealth gaps are growing *within* most generations as well as *between* them, and the gaps within generations are particularly large for young people. The intergenerational transfer of wealth via inheritances will only exacerbate this problem (Chapter 6).

30. Daley et al. (2018b, pp. 29-35).
31. Negative gearing and the capital gains tax discount create an attractive tax environment for debt-financed property investment, particularly for high-income earners. The 50 per cent capital gains tax discount was introduced in 1999. Before then, real gains were taxed. But the discount has more than compensated investors for the effects of inflation: Daley et al. (2016a, p. 10). Since the discount was introduced, the number of negatively geared property investors has more than doubled: Daley et al. (Ibid., p. 25).
32. House prices grew 4.94 per cent per annum above inflation between 1997 and 2017: Yates (2011) and ABS (2019b).
33. Eslake (2014); Fox and Tulip (2014); Daley et al. (2018b); and CoreLogic (2019).
34. The RBA's cash rate target today is 1 per cent (August 2019) compared to 5-7 per cent before the boom began (1995-1997): RBA (2019a).
35. Daley et al. (2018a, pp. 97-100).

Figure 2.7: Richer young Australians are faring OK, but poorer young Australians are going backwards

Real change in average household net wealth, 2003-04 to 2015-16, by wealth quintile

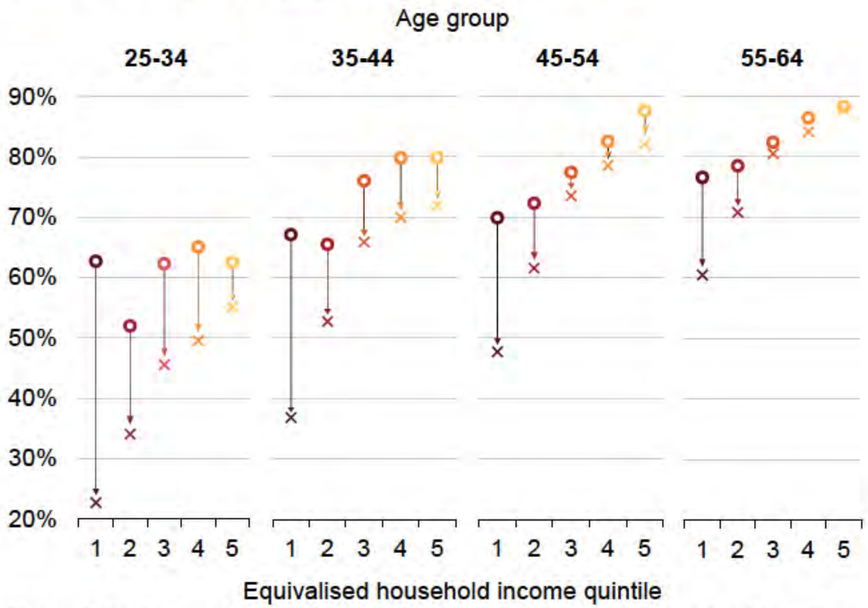


Notes: Compares households in 2015-16 to households of the same age in 2003-04. Quintiles are calculated for household net wealth at each age group. Age group is the age of the household reference person.

Source: ABS (2018a).

Figure 2.8: The young and the poor found it particularly difficult to buy a home

Home-ownership rates by age and income, 1981 and 2016



Notes: This chart updates Burke et al. (2014) using Census data obtained from the ABS. Difficulties in accurately calculating household incomes across time using Census data mean that changes in home-ownership rates by age and income are indicative and that small changes in ownership rates should be ignored. Excludes households with tenancy not stated (for 2016) and incomes not stated. Age group is the age of the household reference person.

Sources: ABS (2017b) and Burke et al. (2014).

Box 4: What about the high interest rates of the late 1980s?

Many older Australians bought their first home at a time when houses were cheaper, but interest rates were much higher. No doubt the interest rates of the 1980s – averaging 13 per cent over the decade and peaking around 1989 at 17 per cent[a] – were a scarring experience for many new homeowners.[b]

The initial ‘mortgage burden’[c] peaked for a brief period around 1989, but otherwise hasn’t changed much between 1980 and today.[d] Today, higher house prices offset lower interest rates.

But what has changed is that it is now harder to save a first home deposit, a first home loan now entails more risk, and borrowers live with that risk for longer.[e] These factors together are a significant additional barrier to home ownership that earlier generations did not face.

a. Koukoulas (2019).
b. Hughes (2019).
c. Defined as the proportion of mean household disposable income to service a new first home mortgage on an average residential dwelling at the interest rate of the time. See Daley et al. (2018b, pp. 21-23) for a fuller discussion.
d. Daley et al. (2018b, p. 21).
e. Ibid. (Chapter 2).

3 Stagnating incomes particularly affect the young

Incomes have grown across all age groups over the past three decades. But recent wage stagnation has hit young people particularly hard. Older households tend to be better cushioned from lower wage growth because they are more likely to have other sources of income.

If low wage growth is the 'new normal' then Australia could have a generation emerge from young adulthood with lower incomes than the one before. This has already happened in the US and UK.

Employment for young people is also of concern. Youth unemployment is higher than we would normally expect at this point in the economic cycle. And youth under-employment is much higher than in the past. More young people are choosing to study – which may help them earn more in future – but for now, a growing share of those studying are unsuccessfully seeking work.

3.1 Incomes of younger households have stalled

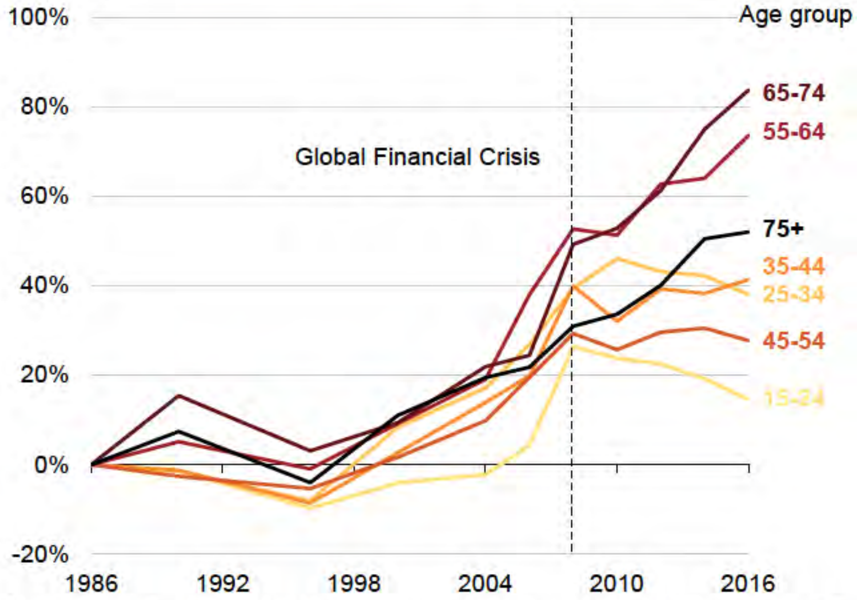
Households of all ages have higher average incomes than households of the same age 30 years ago. But incomes of older households are growing faster than incomes of younger households (Figure 3.1).[36]

Income trends of old and young have diverged since the Global Financial Crisis (GFC) (Figure 3.1). Incomes have continued to grow strongly for households headed by someone aged over 55, while

36. We focus on equivalised disposable income because this is the income available to households to spend or save. A larger household would normally need more income than a smaller household to achieve the same standard of living, so the OECD and ABS 'equivalise' income by taking account of other adults and children in the household. The primary adult is given an equivalence weight of 1, with each extra person aged 15 or older adding 0.5 and each person under 15 adding 0.3. For example, the equivalised income of a couple with two young children is their total income divided by 2.1: ABS (2016).

Figure 3.1: Incomes of younger Australians have slowed or gone backwards since the GFC

Cumulative change in median equivalised disposable income, real, 1986 to 2016



Notes: Equivalised household income accounts for households of different sizes. The ABS adjusted its measure of disposable income in 2007-08, so disposable income in earlier years is scaled-up to reflect this. Where the disposable income of a household was negative we have adjusted it to zero, as per the ABS's preferred method: ABS (2016). Age group is the age of the household reference person.

Source: ABS (2018a).

the income of younger households has stalled, or gone backwards. Households under 45 are still substantially ahead of where households of the same age were in the 1980s, but some of their income gains have been eliminated by recent declines.

In absolute terms, working-age households typically have higher incomes than retired households. But this does not necessarily translate to higher living standards (Box 5). Households aged 25-64 have the highest equivalised disposable income, though the gap between them and households over 65 has narrowed significantly since the GFC.[37]

It is not yet obvious that people born in the 1990s will leave young adulthood with higher incomes than people born 10 or 20 years earlier had at the same age (Figure 3.2). Indeed, if wages continue to stagnate, the well-established pattern of generation-on-generation progress in incomes may be under threat.

On the other hand, if real wage growth returns to long-run average levels, then lifetime incomes will be higher for younger generations. This is particularly likely if younger people today eventually enjoy improved health in their older years and are able to work for longer.

Young people are noticeably pessimistic about the chances of a turnaround. Only 32 per cent of Australia's 16-24 year-olds expect to have a better standard of living than their parents, compared with an average of 59 per cent across countries surveyed.[38]

37. Average annual equivalised disposable income in 2016 for households headed by someone aged 25-34 was $55,000, compared to $58,000 for 35-44, $56,000 for 45-54, $55,000 for 55-64, $43,000 for 65-74 and $33,000 for households over 75. Median incomes by age reveal a similar pattern.
38. International Youth Foundation (2017, p. 23).

Box 5: Retirees need less income than when they were working

Retirees need less income than when they were working to achieve the same standard of living. A generally-accepted benchmark for an adequate income in retirement is around 70 per cent of a person's pre-retirement income.[a] This is because most of life's expenses come down in retirement.

Retirees who own a home tend to have paid off their mortgage by the time they retire, and no longer need to spend money on children or work-related expenses. Pensioners also spend less because they get discounts on council rates, car registration, electricity and gas bills, public transport fares, and pharmaceuticals. Retirees' spending also tends to be lower because they have more time, and so cook at home more and eat out less.[b]

Medical costs normally go up in retirement, but these are largely borne by the taxpayer.[c]

And retirees' spending decreases further as they age. Retirees' spending is highest in early retirement when they are healthiest, and seek to enjoy a range of activities including international travel. But as health declines they spend less on recreation and travel. Spending tends to slow around the age of 70, and decreases rapidly after 80.[d]

a. Daley et al. (2018a, pp. 56-57).
b. Ibid. (pp. 28-30).
c. See Chapter 5.
d. Daley et al. (2018a, pp. 28-30).

3.2 Slow wage growth particularly hurts young people

Wage growth has been stagnant in Australia for more than five years.[39] The mining investment boom cushioned the impact of the GFC on wages, but more recently Australia has recorded the same low wage growth seen in other developed countries over an extended period.[40]

Slower wage growth particularly hurts young people. Unlike older people, they are less likely to have other sources of income (Section 3.3) and so rely more on wages.

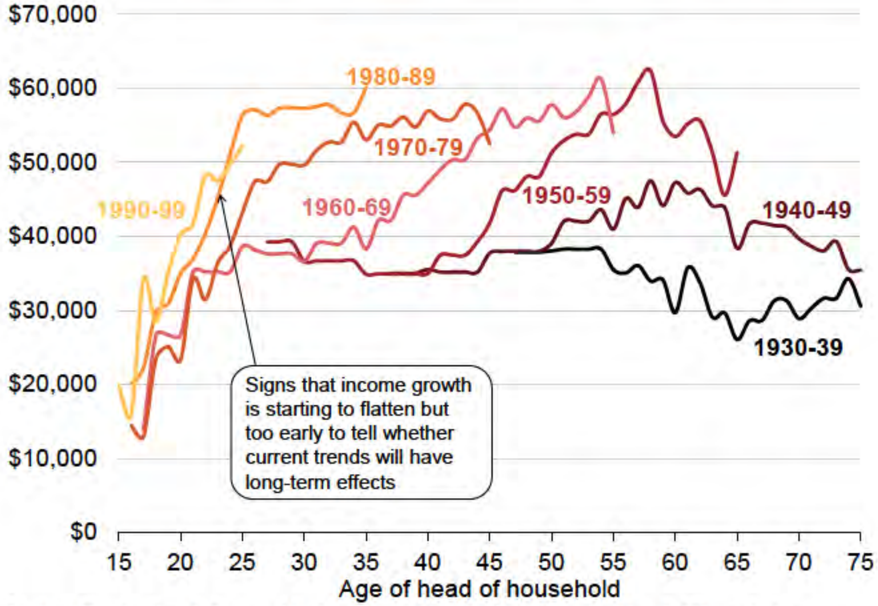
People who enter the workforce at a time of low wage growth are particularly hurt because they miss out on the stronger wage progress people normally make in their first decade in the workforce.[41]

Economists hotly debate whether this extended period of wage stagnation is just a longer than normal economic cycle or whether it is the 'new normal' for developed economies.[42] If low wage growth is simply a hangover from the mining boom then we would expect wages to bounce back on their own, or with the support of monetary policy. But several years on, poor wage growth persists and interest rates can't go much lower.[43]

The experience in other countries with extended periods of wage stagnation provides a cautionary tale. Income of Millennials in the UK is no higher than the income of people born 15 years before them at

Figure 3.2: Younger Australians are not making the same income gains as their predecessors

Average annual equivalised disposable income in 2015-16 dollars, by birth year



Notes: Equivalised disposable income accounts for households of different sizes. This 'quasi-longitudinal' analysis uses multiple waves of the ABS Survey of Income and Housing to infer changes in households' income. It is not a full longitudinal survey, because the households surveyed each time are different. But the households surveyed each time are drawn from more or less the same population of households, apart from deaths in the interim. The ABS adjusted its measure of disposable income in 2007-08, so disposable income in earlier years is scaled-up to reflect this.

Source: ABS (2018a).

39. Kalba and Meekes (2019) show wage growth has been falling since 2008, and particularly from 2013, even after controlling for individual, household and job characteristics. Wage growth has slowed in public and private sectors and all states and territories, and across all occupations, industries, and income levels: Treasury (2019a).
40. Bishop and Cassidy (2017) and Treasury (2019a, p. 23).
41. The Federal Reserve Bank of New York showed that earnings growth typically stagnates after the first 10 years of a career: Guvenen et al. (2015).
42. See Minifie et al. (2017).
43. Ellis (2019); and Dyer and Keane (2019).

the same age,[44] and in the US Millennials' incomes are lower.[45] The big question is whether these young people 'left behind' will ever catch up.

3.3 Older households have more diversified incomes and have benefited from rising female workforce participation

The incomes of older Australians are higher than previous cohorts enjoyed at the same age (Figure 3.1), despite low wage growth for all ages since the GFC.[46] There are three main contributing factors: superannuation income, the pension, and the increased workforce participation (Figure 3.3).

Superannuation and pension income have grown substantially above inflation over the decade, boosting the incomes of people over 65.

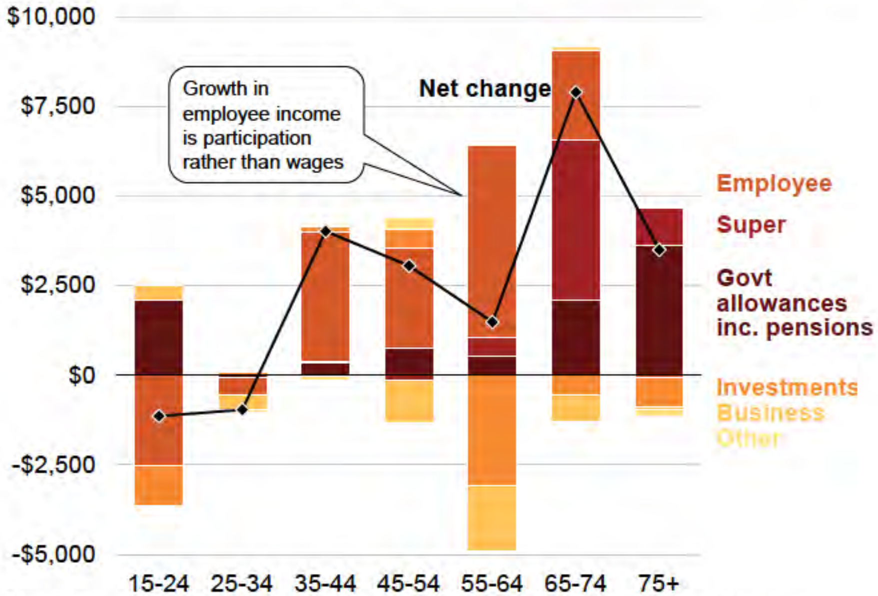
Rising female workforce participation has been a major contributor to the growth in household incomes across all age groups over the past three decades (Figure 3.4).

Over the past 20 years, growth in workforce participation of women aged 55-64 has been a standout[47] – accounting for much of the growth in the employee income for older households over this period. The proportion of over-65s in the workforce has also risen for both men and women.

The rise in female workforce participation is probably partly due to a culture shift and partly in response to policy change. In 1994 the Keating Government announced that the pension eligibility age for

Figure 3.3: Growth in superannuation and pensions has boosted older people's incomes

Real change in average annual equivalised income by source, 2007-08 to 2015-16, in 2015-16 dollars



Notes: Equivalised income accounts for households of different sizes. This chart compares households in 2015-16 to households of the same age in 2007-08. Age group is the age of the household reference person.

Source: ABS (2018a).

44. Intergenerational Commission (2018).
45. Kurz et al. (2018); and Duke (2016).
46. Grattan analysis of ABS (2014) and ABS (2018c).
47. This has occurred despite age-discrimination in the workplace making it difficult for many older Australians to find work: Betts (2014), ABS (2019d, Table 16) and COTA (2018).

women would be gradually increased from 60 to 65 (to align with the pension age for men).[48] The policy took full effect in 2014.[49]

3.4 Youth unemployment is rising

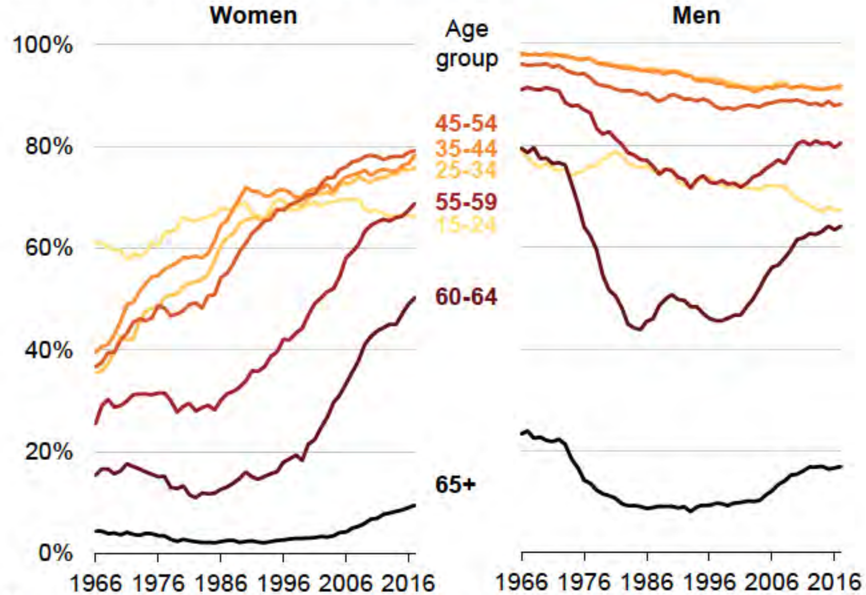
A lack of employment opportunities is also affecting the incomes of younger Australians. Both unemployment and *under*-employment are rising for young people (Figure 3.5 and Figure 3.6).

Overall unemployment in Australia has vacillated between 5 per cent and 6 per cent since the GFC. It is currently closer to 5 per cent, similar to the OECD average.[50]

But unemployment for 15-24 year-olds remains stubbornly high. Youth unemployment is always higher than general unemployment.[51] The gap tends to widen during economic downturns and narrow when employment markets are strong.[52]

Given the health of the general labour market, we would expect the gap between youth employment and 'prime age' employment to be relatively low. Instead, it has continued to increase since the GFC (Figure 3.5) and is now above the OECD average.[53]

Figure 3.4: Labour force participation is rising for older women
Labour force participation by age, 1966 to 2017

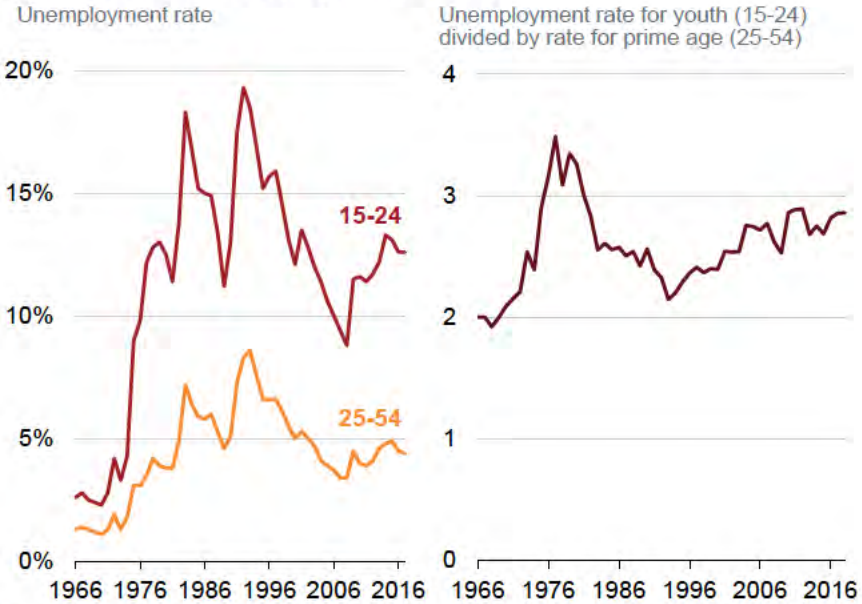


Notes: The decline in workforce participation of men aged 60-64 during the 1970s is partly explained by the earlier retirement age for servicemen (age 60), as well as higher incomes and wealth enabling some to retire at the same time as their wives: Jordan (2001).

Source: OECD (2017).

48. Nielson and Harris (2010); and Cowan (2016).
49. Women born in 1949 or later have the same retirement age as men, which was 65 until 2017, and is now being gradually increased to 67.
50. OECD (2017).
51. At any point in time, youth making the transition from education to work account for a disproportionate share of job-seekers: Borland (2015, p. 232). The main challenges for unemployed people aged 15-24 are 'insufficient work experience' and 'too many applicants for available jobs': ABS (2019d, Table 16).
52. The logic is that young people tend to be the marginal employees – when employment demand is soft, employers are more likely to keep their existing (older) employees and not hire the same number of new (younger) employees. See Borland (2015).
53. Post-GFC, Australia had low youth unemployment relative to other countries in the OECD. But while other countries have improved since, youth unemployment

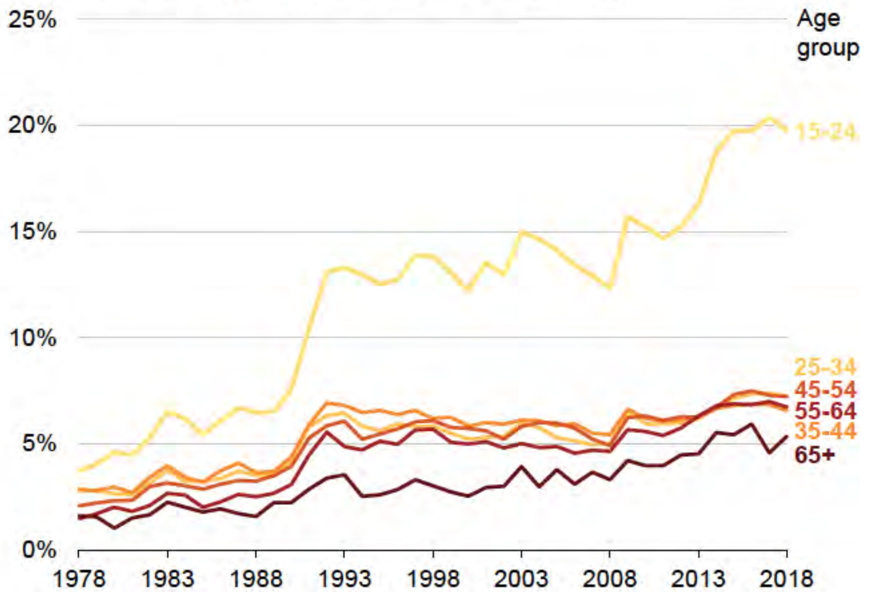
Figure 3.5: Youth unemployment is rising



Source: ABS (2019e).

Figure 3.6: A lot more young people are under-employed now than in the 1980s

Proportion of employed people who are under-employed



Source: ABS (ibid.).

Youth *under*-employment is also rising. The share of employed young people who are actively seeking (and available for) more work has grown from 12 per cent to 20 per cent over the past decade (Figure 3.6). Rising under-employment of under-25s accounts for much of the growth in under-employment overall.

The increase in under-employment is largely caused by more young people being in part-time employment. Young people are increasingly working in part-time jobs,[54] and in many cases those jobs do not give them the number of hours they'd like to work.[55]

A study comparing pre- and post-GFC cohorts of young people found that even among those who found employment, job quality was inferior for the post-GFC cohort in terms of job security, hours of work, and earnings.[56]

Various factors could be contributing to the deteriorating youth labour market: the weaker bargaining position of young workers post-GFC;[57] the changing nature of jobs towards more part-time and casual employment;[58] competition for entry-level work with temporary migrants;[59] fewer hours available as workforce participation rates among older households rises;[60] and more young people in education for longer.[61] The biggest concern is the potential for long-term damage to the health, wellbeing, and future earnings of young Australians – as young workers in Europe, Japan, the UK and US are already experiencing.[62]

3.5 More young people are choosing to study

More young people are finishing secondary school[63] and going on to higher education – partly because higher education has become more accessible in recent years, but probably also in response to the lack of employment opportunities for young people.

The proportion of young people in education has been growing, particularly since 2013 (Figure 3.7). In 2009 the Gillard Government announced it would introduce demand-driven funding for universities from 2012, sparking a substantial increase in university enrolments.[64] Young people are also studying for longer.[65]

The proportion of people aged 15-29 who are 'not in employment, education or training' (NEET) has been falling (Figure 3.7), because of the dramatic increase in the proportion of young people studying. The share of people in education who are actively seeking (and available for) work has grown from 4.5 per cent in 2008 to 6.2 per cent in 2017.[66]

The extra time spent in education by today's young people may be a factor driving relatively lower income growth (Section 3.1) and wealth accumulation (Section 2.1) to date for younger cohorts. People

in Australia has risen and overtook the OECD average in 2017: 12.6 per cent compared to 11.9 per cent: OECD (2017).

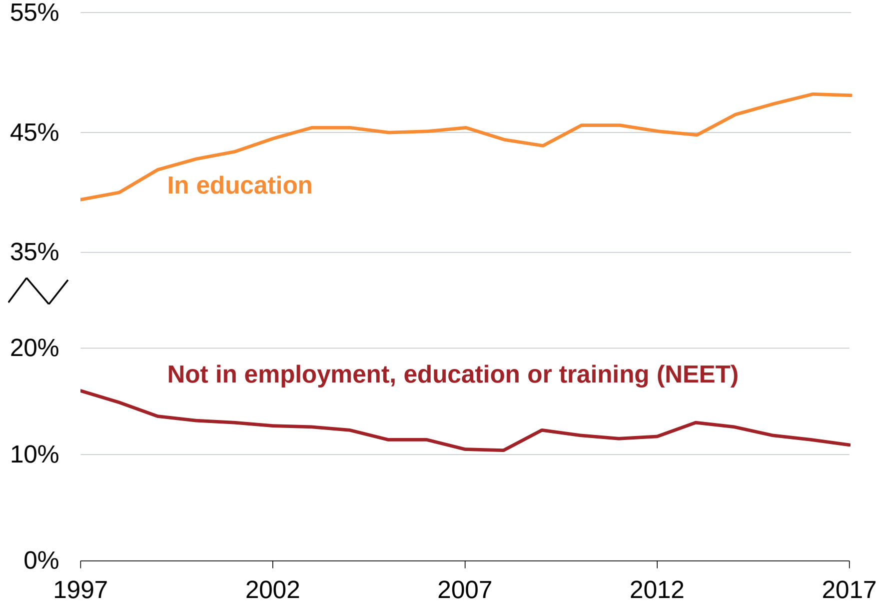
54. Brotherhood of St Laurence (2018); and Borland (2017).
55. Most under-employed people (at any age) are typically looking for up to 20 hours of additional work. A quarter of under-employed people under 35 are looking for more than 20 hours of work: ABS (2019d, Table 6).
56. Watson (2018).
57. Ibid.
58. Brotherhood of St Laurence (2018); and Dhillon and Cassidy (2018).
59. Australia's migration program has shifted towards younger migrants over the past decade (ABS (2017b)), many of whom are students, visitors, and working holiday visa-holders (ABS (2018d)), likely to be competing for entry-level work, particularly part-time and short-term work (Daley (2019) and McDonald (2017)).
60. See Figure 3.4.
61. Rozenbes and Farmakis-Gamboni (2018); and Dhillon and Cassidy (2018).
62. Sternberg (2019).
63. Year 12 completion rates increased from 64 per cent in 2009 to 79 per cent in 2017: ACARA (2018).
64. Norton et al. (2018a); and Norton (2018).
65. Largely because part-time university enrolments have increased: Norton et al. (2018b).
66. OECD (2017).

who are devoting time to studying will typically be working less and earning less than people who are not studying. And this effect may last after completion of studies. People who spend three or more years completing a university degree may not expect to earn significantly more in the early years after graduation than people who spent the same time gaining work experience.[67]

More education typically means a premium in earnings later – so the trend towards study could improve incomes in future. But the earnings premium for university graduates aged 25-34 was lower in 2016 than a decade earlier.[68] More early-career graduates are taking jobs that don't require a university degree (such as sales and service positions),[69] so a lower proportion of graduates are enjoying an earnings premium than in the past. This is yet another sign of the challenging job market for young people.

Figure 3.7: More young people are studying

Proportion of 15-29 year-olds



Notes: 'In education' includes secondary and tertiary education.

Source: OECD (2017).

67. Wilkins (2016, Figure 4.7) suggests that, for men, the earning premium for a bachelor degree is the equivalent of about three-to-four years of extra work experience, for the first four years after graduation, then grows significantly. For women, the earning premium for a bachelor degree is the equivalent of about five years of extra work experience immediately after graduation.
68. Norton et al. (2018a, p. 93).
69. This narrows the income gap between early-career graduates and people who finished their education at Year 12: Norton et al. (Ibid., p. 93).

4 Spending and saving don't explain the wealth gap

The intergenerational wealth gap cannot be explained by too many avocado brunches. In fact, today's young people spend only a little more than young people three decades ago – and the higher spending is mostly on essentials, particularly housing.

Younger households are also saving more. They have made sacrifices to do this. Spending on non-essentials such as alcohol, clothing, personal care, and household services and furniture is lower for younger Australians today than three decades ago.

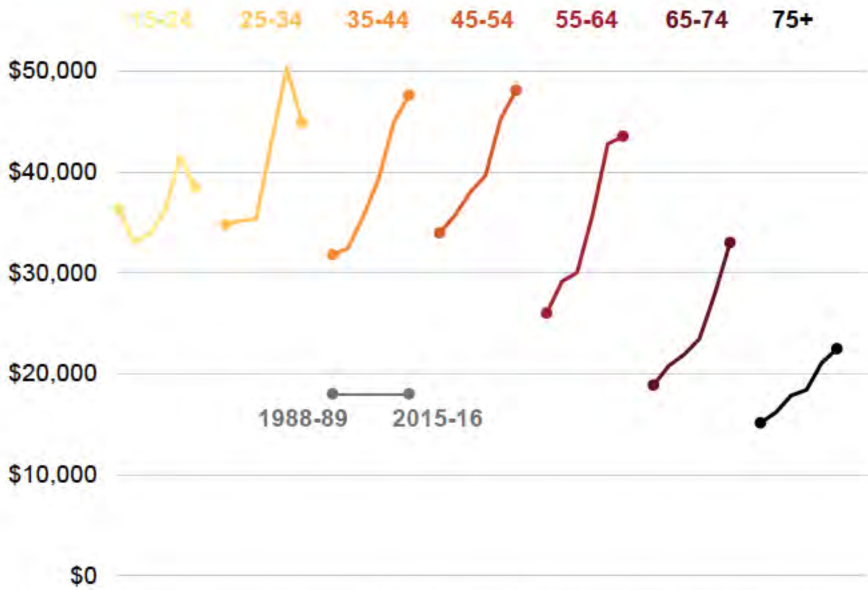
Older Australians are using their higher incomes to save *and* spend more. They spend considerably more than older Australians of three decades ago, including growing spending on non-essentials such as recreation. If current savings patterns continue, many older households will pass on substantial wealth to the next generation (Chapter 6).

4.1 Spending by older households is growing faster than younger households

Most households are spending more, in real terms. But spending by Australia's youngest households – those headed by someone under 35 – has gone backwards in the past six years (Figure 4.1).

In 2015-16, spending by households headed by someone aged 15-34 was only 10-to-30 per cent higher than that of a similar household in 1988-89 (in real terms). By contrast, spending by households headed by someone aged 55 or older was 50-to-80 per cent higher. The figure for households in the middle (headed by someone aged 35-54) was 40-to-50 per cent (Figure 4.2).

Figure 4.1: Younger households cut their spending in recent years
Median annual after-tax equivalised expenditure since 1988-89, in 2015-16 dollars



Notes: Equivalised household expenditure accounts for households of different sizes. Age group is the age of the household reference person.

Source: ABS (2017c).

4.2 Younger households are cutting back on non-essentials

Households of all ages are spending more than they used to on 'essentials' – housing, power, food, medical care, and transport (Figure 4.3). Housing costs have vastly outgrown other costs – spending on housing by the median household has grown almost 4 per cent per year above inflation over the past three decades.[70]

Meanwhile, younger households are cutting back on almost all 'non-essentials' – recreation, alcohol and tobacco, clothes and personal care, household services and furnishings (Figure 4.3). This suggests they are restricting their spending on 'luxuries' to accommodate the growing cost of essentials and to save and invest (see next section).[71]

Younger households are also more likely than older households to suffer financial stress. Half of households headed by someone younger than 35 have experienced one or more indicators of financial stress – such as skipping a meal or failing to pay a bill on time – in the past 12 months (Figure 4.4).

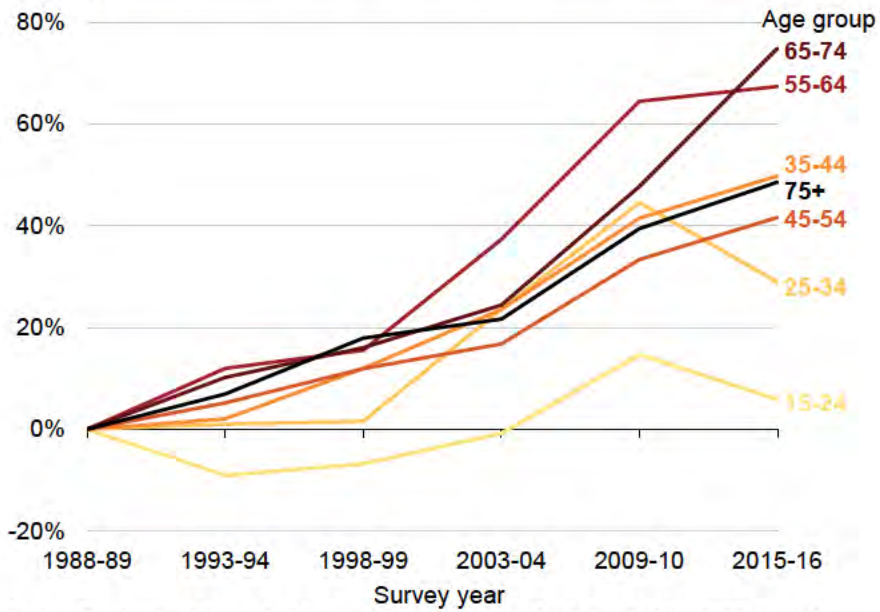
4.3 Most households are saving more than they used to

Households of all ages are saving more than they were in the early 2000s[72] – both in absolute terms and as a proportion of income

70. Equivalised expenditure on housing for the median household has grown from $2,780 per year in 1988-89 to $7,190 per year in 2015-16, in real terms.
71. Distinguishing between 'essential' and 'non-essential' expenditure is of course a generalisation. We assume that *most* of the expenditure in the 'essentials' categories is necessary to live and work. We deem all other categories 'non-essentials'. For example, we classify clothing among the 'non-essentials' even though some spending on clothing is 'essential'. And we classify transport as 'essential' even though some spending in this category is likely to be optional.
72. The RBA's household savings ratio was low in the decade before the GFC, picked up for several years after the GFC, and has been dropping back since 2015, although it remains above the levels of the early 2000s: RBA (2019b). Our measure of savings is the difference between disposable income and goods and

Figure 4.2: Spending by older households is growing faster than younger households

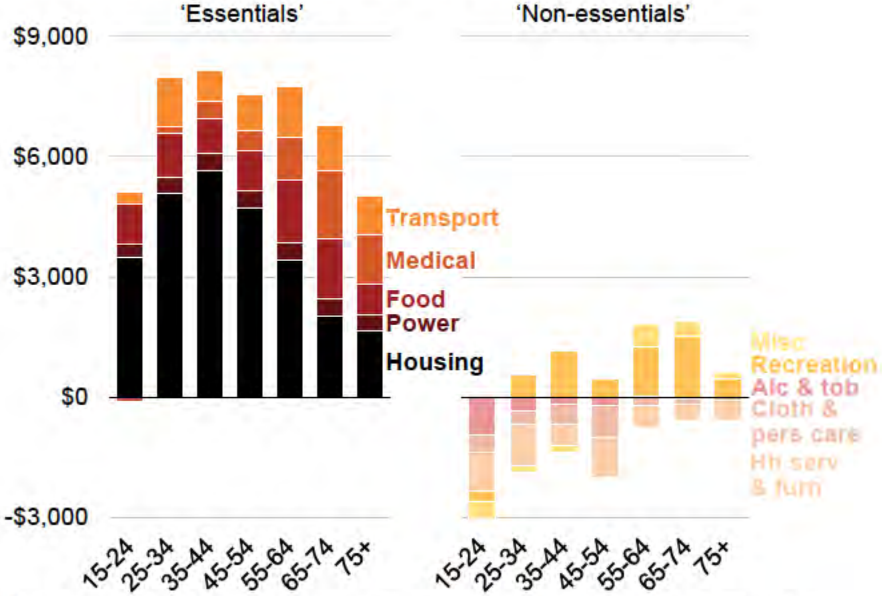
Cumulative real change in median after-tax equivalised expenditure since 1988-89



Notes: Equivalised household expenditure accounts for households of different sizes. Age group is the age of the household reference person.

Source: ABS (2017c).

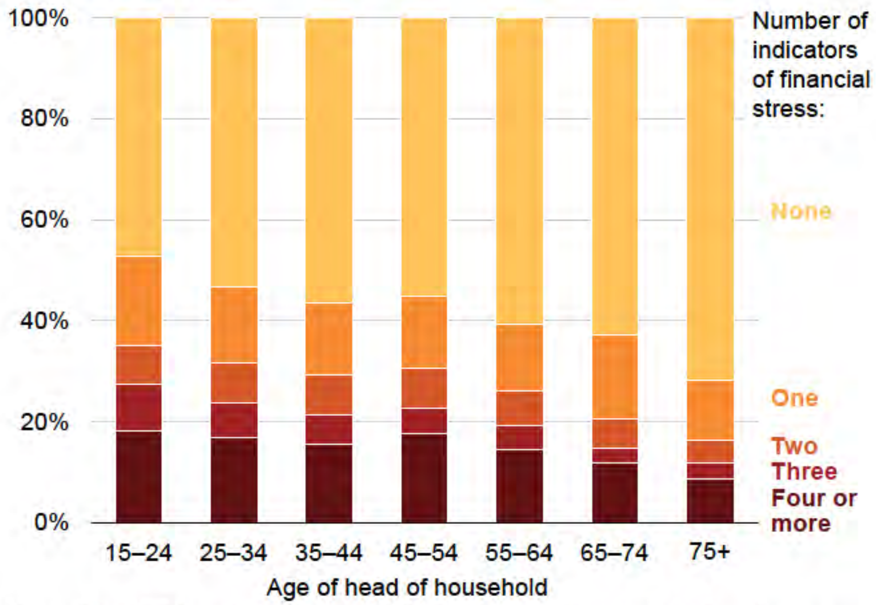
Figure 4.3: All households are spending more on 'essentials'; younger households are spending less on 'non-essentials'
Change in median annual household equivalised expenditure on goods and services, 1988-89 to 2015-16, in 2015-16 dollars



Notes: Equivalised household expenditure accounts for households of different sizes. The 'Misc' (miscellaneous) category includes a wide range of goods and services such as stationary, jewellery, donations, and fines. Housing includes rent or mortgage repayments (interest only) on the main home and other associated costs (e.g. insurance, rates, repairs). Age group is the age of the household reference person.

Source: ABS (2017c).

Figure 4.4: Younger households are more likely to suffer financial stress
Proportion of households experiencing indicators of financial stress in the past 12 months, 2015-16



Notes: The ABS has nine indicators of financial stress. They are whether, due to a shortage of money, a household: skipped meals; did not heat their home; failed to pay bills on time; failed to pay registration on time; spent more money than received; pawned or sold something; sought assistance from community organisations; sought financial help from friends or family; or would be unable to raise $2000 in a week for something important.

Source: ABS (2017a).

(Figure 4.5). In 2016, the typical (median) household saved at a fairly consistent rate across ages, except retirees who save a little more.[73]

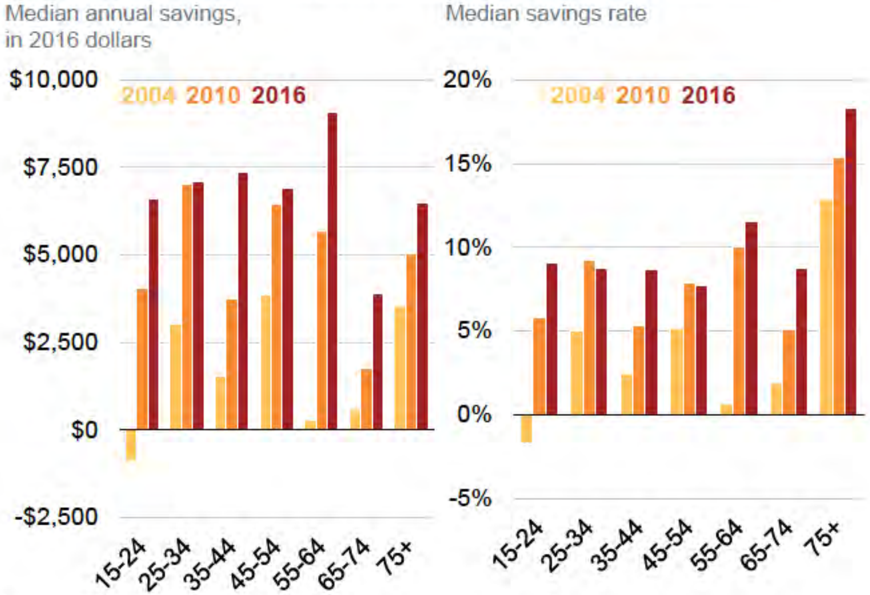
Households save for various reasons, including to make large purchases such as buying a house or car, to insure against unexpected loss of income, and to fund their retirement.[74]

Younger households are saving more despite spending more on essentials. Their incomes grew before the GFC (see Chapter 3), but the growth in their savings seems to be mainly due to cutting spending on non-essentials (Figure 4.3).

Older households are saving more despite also spending a lot more. They are able to do so because their incomes have grown substantially (Figure 4.6).

For households in the middle of the age distribution, income and expenditure have grown at similar rates. Most of these households are saving a little more than they used to, but households typically don't save much at this age when expenses and debt are highest (see Chapter 2).

Figure 4.5: Most households are saving more than they used to



Notes: Savings = disposable income minus total expenditure on goods and services, divided by household equivalisation factor. Savings rate = savings as a proportion of equivalised disposable income. Where the disposable income or expenditure of a household was negative we have adjusted it to zero, as per the ABS's preferred method: ABS (2016). Age group is the age of the household reference person.

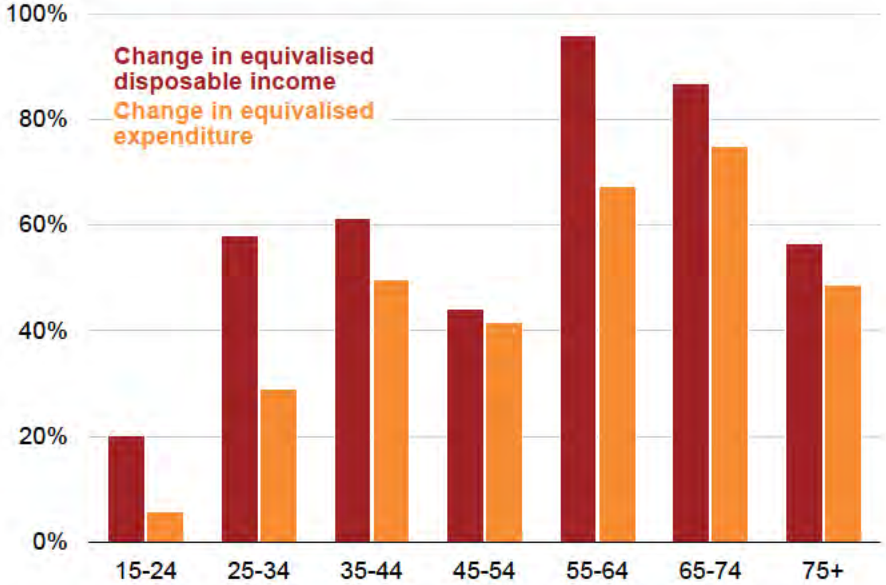
Source: ABS (2017c).

services expenditure. Employer contributions to superannuation are therefore additional, as are capital gains on the home, but mortgage repayments and voluntary super contributions after-tax are included.

73. Daley et al. (2018a).

74. See RBA (2016) for a discussion of changing attitudes towards saving.

Figure 4.6: Older households are both earning and spending a lot more
Real change in median household income and expenditure, 1988-89 to 2015-16



Notes: Equivalising household income and expenditure accounts for households of different sizes. Where the disposable income or expenditure of a household was negative we have adjusted it to zero, as per the ABS's preferred method: ABS (2016). Household expenditure includes investments such as mortgage and super payments, but excludes income tax. Age group is the age of the household reference person.

Source: ABS (2017c).

5 Tax policy and an ageing population exacerbate challenges for younger Australians

Current tax and spending policies are underwriting unprecedented transfers from younger households to older ones.

Net transfers to older generations have always been a feature of Australia's tax and transfer system, largely driven by health and Age Pension spending. But in the past two decades, policy decisions have boosted per-person spending on health and pensions for older Australians at the same time as cutting taxes for this group. Working-age Australians are underwriting the living standards of older Australians to a much greater extent than the Baby Boomers or earlier generations did for their forebears.

The increasing transfers to older households will supercharge the structural budget pressures already coming down the line from population ageing.

5.1 The generational bargain is under threat

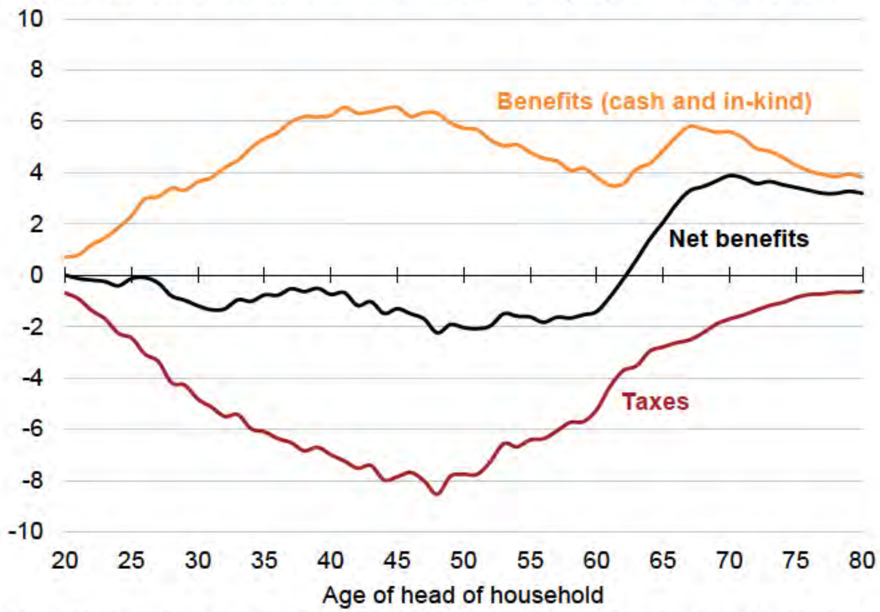
Australia's tax and welfare system supports an implicit generational bargain. Working-age Australians, as a group, are net contributors to the budget. Their contributions support older Australians, who take a lot more out in spending and pension payments than they contribute in taxes (Figure 5.1).[75]

Today's working-age Australians of course anticipate that the generation after them will support them in the same way as they age. But this long-standing bargain is under threat.

75. The highest level of benefits is typically between the ages of 35 and 44, when households have children attending school. Taxes are also relatively high for this group of households.

Figure 5.1: Young Australians are net contributors to the budget; older Australians are net drawers

Total household taxes, benefits, and net benefits by age in 2015-16, $ billions



Note: Net benefits refers to all tax paid minus all social transfers (cash and in-kind).

Source: ABS (2018b).

The ageing of the population will substantially increase the burden on current and future young Australians. And government policy has supercharged the demographic challenge.

5.1.1 Australia's population is ageing

Australia's population is ageing[76] and this increases pressure on health, aged care and pension costs.[77] It also erodes the tax base, because older households are less likely to be working (although some have substantial investment income).

The budget pressures from population ageing will become more acute over the next few decades. As the large Boomer generation reaches retirement and people live longer, there will be fewer working-age Australians for each person over 65.

This demographic shift is substantial. The number of working-age (15-64-year-old) Australians for every person aged 65 or older fell from 7.4 in the mid-1970s to 4.4 in 2014-15 and is projected to fall further to 3.2 in 2054-55 (Figure 5.2).[78]

Baby Boomers won the demographic lottery: the sheer number of Boomers meant their average contribution to support older generations was relatively small. And while it is fair and appropriate to make sure Baby Boomers are assisted in the same way as they age, Generation Xers and particularly Millennials and Gen Z will need to shoulder a greater burden per person to do so.

Demographic bad luck is one thing, but policy changes have made this burden heavier by substantially increasing net transfers to older households.

76. Australians are living longer, healthier lives, fertility rates remain below replacement rate, and the Baby Boomer generation has begun to retire. The net result is an ageing population: Treasury (2015) and PBO (2019).
77. PBO (2019).
78. This is the ABS median estimate: Treasury (2015, p. 12) and ABS (2018e).

Figure 5.2: Baby Boomers won the demographic lottery; Gen Z lost

Sources: Treasury (2015, p. 12) and ABS (2018e).

5.1.2 Government policies have increased transfers to older households

Net government benefits – benefits and spending minus taxes – are much higher *per household* for people over 65 than they were 30 years ago (Figure 5.3). And they grew particularly strongly in the past 15 years.

The increase in net government benefits is partly because of higher health and pensions spending per person (Section 5.2), but also because of the increasing generosity of tax concessions for older Australians (Section 5.3).

5.2 More health spending and higher pension payments account for most of the increased benefits for older Australians

Government spending increased for households of all ages over the past 30 years (Figure 5.4). But the increase was largest for households headed by someone aged 65 or older. The biggest components of this increase were strong growth in health spending and higher cash payments – mainly pensions.

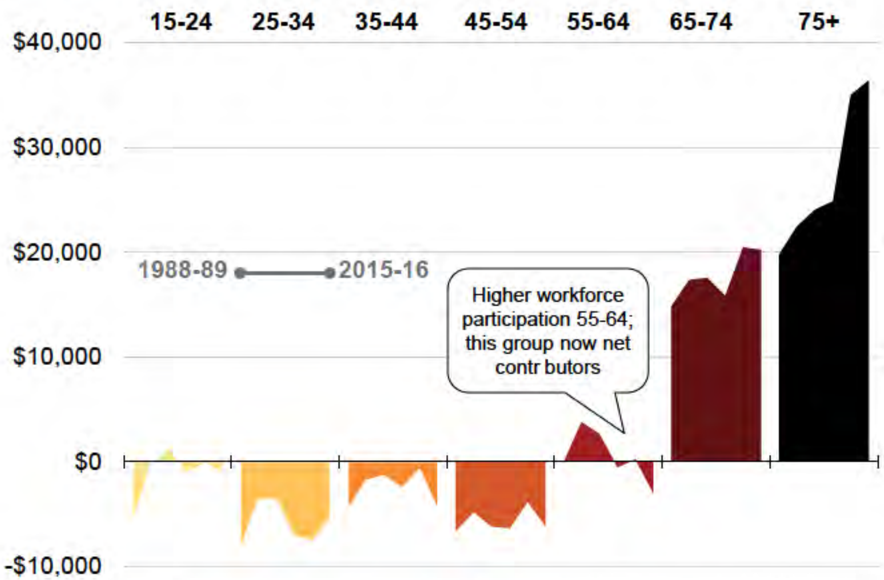
5.2.1 Pensions increased more than other benefits

Governments are spending more on cash payments – including family support payments, pensions and other welfare payments,– to all groups except 55-64 year-olds (because more of them are working rather than getting pension payments).[79]

Governments increased many payments – including the Age Pension and family tax benefits – during the 2000s when government revenues

79. Female workforce participation has grown substantially for 55-64 year-olds over the past two decades, partly due to the change in retirement age for women (see Section 3.3).

Figure 5.3: Net transfers to older households are increasing
Average annual net benefits per household (equivalised) in 2015-16 dollars, by age of head of household



Notes: Net benefits are social assistance benefits in cash plus support in kind minus income and sales taxes. Equivalisation accounts for households of different sizes. Age group is the age of the household reference person.

Source: ABS (2018b).

were growing strongly off the back of the mining boom and a strong economy.[80]

Unemployed working-age Australians were excluded from the largesse. Newstart has barely moved in real terms in more than 20 years (Figure 5.5). Unemployment benefits have fallen further behind pensions because of less-generous indexation and the absence of one-off boosts. People on Newstart now have to live on $40 a day, compared to $65 for full-rate pensioners.[81]

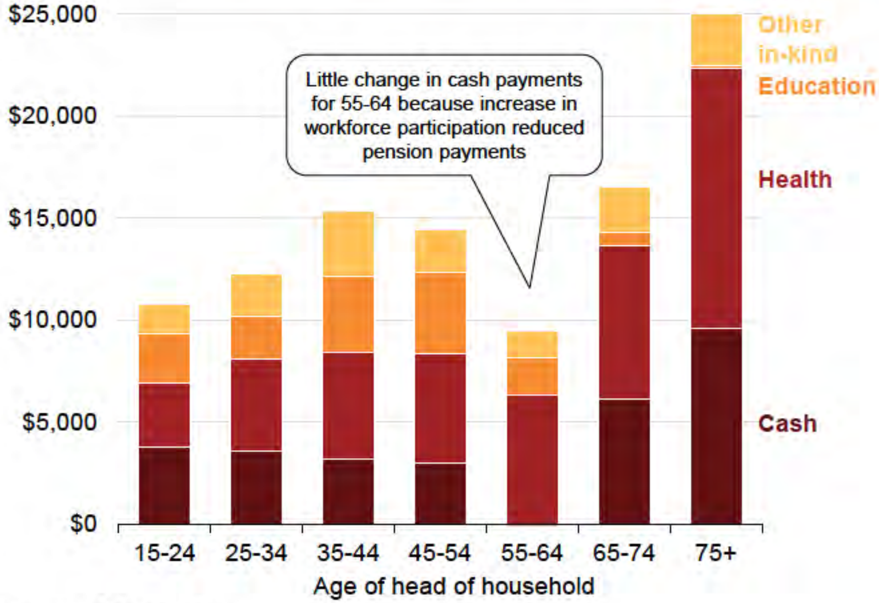
More recently, governments have sought to constrain the growth in transfer payments by tightening eligibility to various programs[82] and freezing the indexation of some benefits. These changes have mainly wound back benefits for working-age households rather than seniors.[83]

5.2.2 Rising health spending also contributed to greater spending on older households

Rising health spending has also been a major contributor to increases in government spending across all age groups, but particularly on older Australians (Figure 5.4).

Figure 5.4: Cash payments and health are the biggest contributors to higher spending on older Australians

Change in government benefits per household (1988-89 to 2015-16), in 2015-16 dollars



Source: ABS (2018b).

80. For example, there was a reduction in the taper rate of the Age Pension asset test in 2006-07, and the base rate of the pension was increased by more than 10 per cent in 2009. There was a further increase in the pension rate in 2010-11 to compensate for the introduction of the carbon price – and the increase stayed after the tax was repealed: see Daley et al. (2014, p. 24) and PBO (2018, p. 29). Family tax benefits were increased and their eligibility substantially expanded in 2000. A 'baby bonus' was introduced in 2004: see Redmond and Whiteford (2013).
81. Australian Government (2019a).
82. Examples include a doubling of the asset taper rate for the pension in 2017, and new assessment tables for work-related impairment for the disability support pension in 2012: Wood et al. (2019, p. 11).
83. Between 2010-11 and 2016-17, governments achieved savings of $7.1 billion through changes to family payments, compared to $3.2 billion saved through changes to the pension: Daley and Coates (2016).

More and better services per person has been the major driver of the growth in health spending over the past two decades.[84] Pressure on governments to subsidise new and better treatments is unlikely to go away. In every OECD country other than Iceland, health spending as a share of the economy has grown as countries have got richer.[85]

The payoffs from health spending – longer and healthier lives – are a wonderful thing. But services have to be paid for. In Australia 70 per cent of health spending is paid for by state and federal governments.[86] The combination of increasing costs per person for people in their 70s and 80s with a rising share of Australians in these age groups will exacerbate the pressures on government budgets.

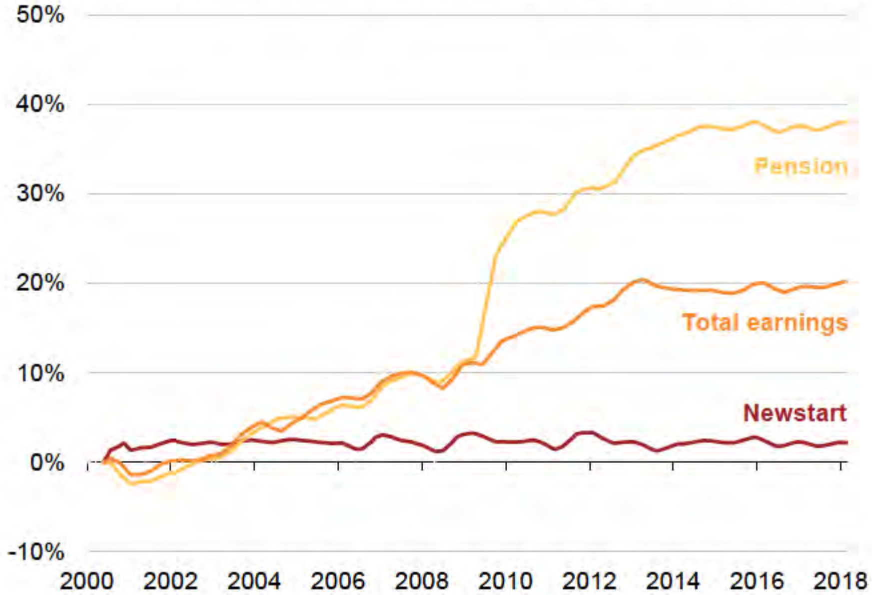
5.3 Tax changes have reduced the contributions from older households

Income taxes paid by households over 65 have risen only slightly in the past 30 years – far less than for households under 35. Yet incomes for over-65s have increased much more than incomes for under-35s over the same period (Figure 5.6). The share of households over 65 paying income tax has fallen from 27 per cent in the mid-1990s to 17 per cent today.[87]

A series of tax policy decisions over the past three decades – tax-free superannuation income in retirement, refundable franking credits, and special tax offsets for seniors – mean we now ask older Australians

Figure 5.5: The pension has grown significantly since the turn of the century, but Newstart has flat-lined

Cumulative real change in payment, Newstart and Age Pension, and earnings



Sources: ABS (2019c) and Australian Government (2019b, Table 6).

84. Daley et al. (2014, pp. 25-27).
85. Palmer and Jeyaratnam (2016).
86. Daley et al. (2019a, p. 92).
87. Grattan analysis of ATO (2019a) and ABS (2018f), 1994-95 to 2015-16. Calculated based on the number of taxable individuals over 65 compared to the total population over 65. Some of the taxable individuals may still pay net tax of zero.

to pay a lot less income tax than we once did.[88] These policies have typically benefited self-funded retirees.

Older Australians make more of a contribution through consumption taxes, because their spending has grown faster than other groups, but the overall increase in their tax burden is far less than for working-age households.[89]

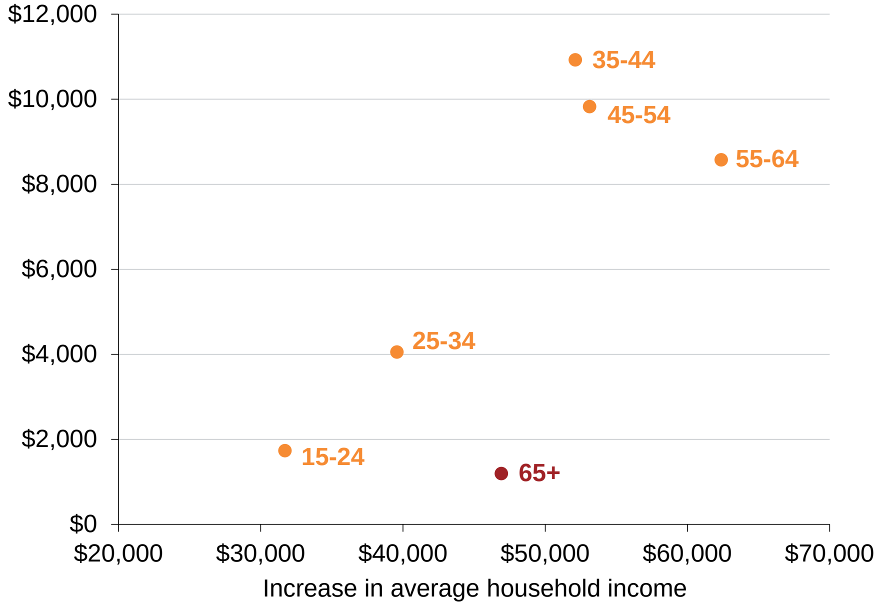
These and other changes have substantially reduced the amount of tax an older Australian pays compared to a younger Australian on the same income (Figure 5.7). An older household on $100,000 pays on average less than half the tax of a working-age household on the same amount. Or considered another way, an older household on $100,000 pays the same amount of tax as a working-age household on around $50,000.

Age trumps income in determining how much tax people pay. Thirty years ago, age played a smaller role – particularly at higher income levels. For example, in 1989, an average household with an income of around $100,000[90] paid 1.5x more tax if they were under 65 than if they were over 65. Today, it is 2.4x more tax if they are under 65 than if they are over 65.[91] There is simply no policy justification for this degree of age segregation.

Low taxation of older households combined with concessional taxation of some forms of wealth (Chapter 7) means that all but the most well-off older households are net recipients from government (Figure 5.8).

Figure 5.6: Income taxes increased only slightly for households aged 65+, despite their large increase in income

Increase in average income tax, 1988-89 to 2015-16, in 2015-16 dollars



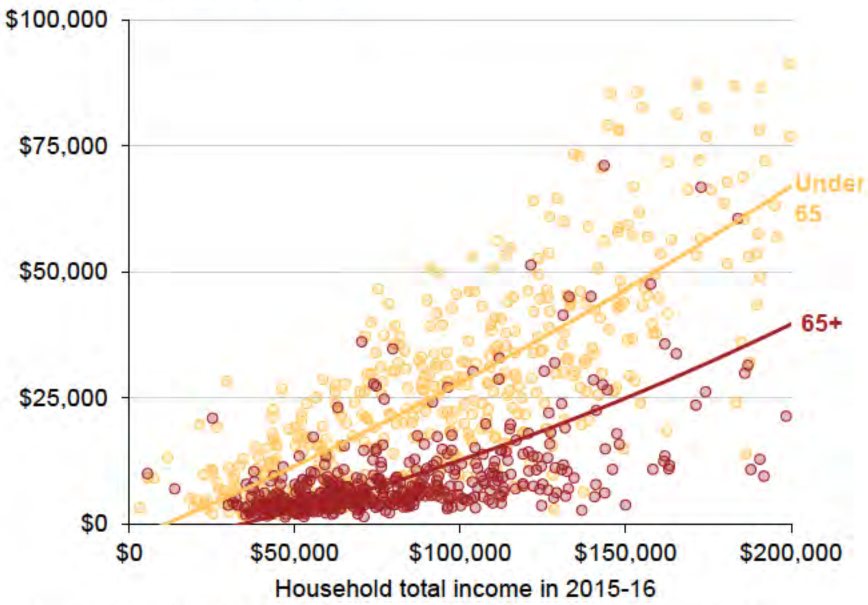
Note: Age group is the age of the household reference person.

Source: ABS (2018b).

88. For a full history of relevant tax policy changes, see Daley et al. (2016b, pp. 15-17).
89. Average annual income for households aged over 65 increased by $47,000 in real terms from 1988-89 to 2015-16, while total taxes increased by $5,400. Households aged under 35 had a lower increase in income ($38,000), but a higher increase in total tax ($5,800).
90. In today's terms.
91. Grattan analysis of ABS (2018b).

Figure 5.7: Older Australians pay far less tax than younger Australians on the same income

Household total tax in 2015-16

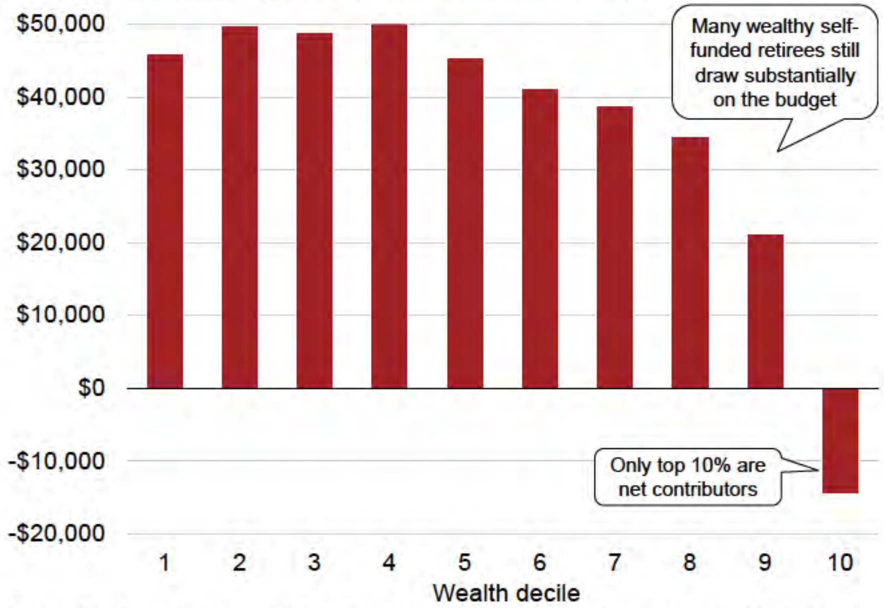


Notes: Total tax includes both direct and indirect taxes. Total income includes all sources. Figure shows a random sample of 500 households per age bracket. Households over 65 are by age of household reference person.

Source: ABS (2018b).

Figure 5.8: Even wealthy retirees draw on the budget

Average net benefits in 2016 for households over 65, by wealth decile



Notes: Net benefits are social assistance benefits in cash plus support in kind minus income and sales taxes. Households over 65 are by age of household reference person.

Source: ABS (ibid.).

5.4 Have older households paid their taxes?

One argument sometimes advanced to defend age-based tax breaks is that older Australians have 'paid their taxes'. The implication is that they paid enough tax over their working life to check out of the tax system for their final decades.

But this can only be sustained by pushing a growing tax burden onto younger Australians. Working-age households today are underwriting the standard of living of older households to a much greater extent than in the past.

When an average Baby Boomer born in the late 1940s turned 40, they were contributing $3,200 a year to support older Australians in retirement. An average Generation Xer at 40 today is contributing $7,300 – more than they are contributing to their own retirement through compulsory superannuation.[92] Under current policy settings, the child of today's 40-year-old will need to contribute about $11,700 a year by the time they turn 40 (Figure 5.9).[93]

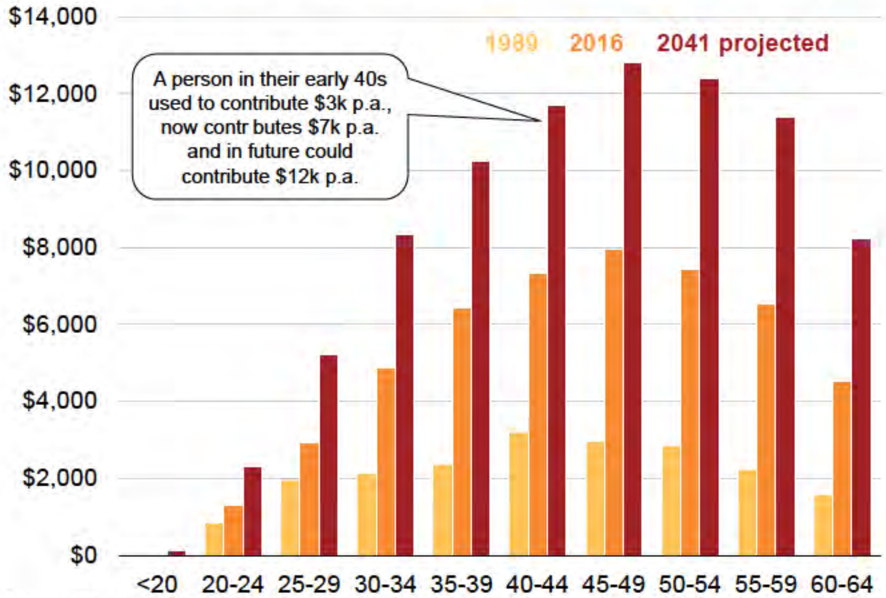
If the economy grows, it is possible to sustain a generational bargain where each cohort takes out more than they put in. But the sheer size of these transfers, combined with an ageing population, will put a growing strain on younger Australians – and the strain will be greater still on their children.

5.5 Business as usual is not an option

Budget policies have not yet caught up with these realities.

92. Average annual earnings in 2016 (all jobs) for people 35-44 was $71,200, and compulsory superannuation of 9.5 per cent means a contribution of about $6,800 each year towards their own retirement.
93. This figure is calculated using the ABS 'B series' population projection. The result is similar using higher population growth assumptions: under the higher 'A series' projection, the child of today's 40-year-old would need to contribute about $11,400 a year by the time they turn 40.

Figure 5.9: Today's 40-year-olds contribute twice as much to support older Australians than the Baby Boomers did at 40
Per person contribution by age to net benefits for all households aged 65+, 1989 vs. 2016 vs. 2041, in 2015-16 dollars



Notes: Net benefits for households 65+ include both cash and in-kind transfers minus taxes. The contribution of each age group to total net benefits for households 65+ is based on the proportion of tax paid by households in each age group. Projection factors in population growth, health cost growth (based on PC estimates) and pension cost projections (as per Intergenerational Report 2015 'currently legislated' scenario).

Sources: ABS (2018b), ABS (2018f) and ABS (2018e).

The Commonwealth budget has been in deficit for a decade. Net debt is forecast to reach a new high of 19.2 per cent of GDP in 2018-19. Treasury is forecasting a budget surplus and a fall in net debt in 2019-20,[94] although the recent downturn in economic conditions raises questions about whether this is the right time to contract the fiscal position.[95]

Projections in the 2015 Intergenerational Report suggest that without policy change, spending will continue to rise as share of GDP over the next decade and beyond because of structural pressures from population ageing. The Intergenerational Report's 'business as usual' scenario had budget deficits reaching 6 per cent of GDP and net debt ballooning to around 60 per cent of GDP by 2055.[96]

Recent Treasury budget projections are more optimistic. The 2019-20 Budget projected surpluses every year for the next decade. The hope springs from an upbeat assessment of the future path of economic growth and the capacity for government spending restraint.

On growth, estimates of potential GDP[97] assume labour productivity growth of 1.5 per cent a year, in line with its 30-year average. But this is substantially above the average of 1.3 per cent achieved over the past decade.[98] Lower productivity growth has become the norm across the developed world. Australia's budget projections ignore the risk that lower growth is the 'new normal'.

94. Commonwealth of Australia (2019).
95. Lowe (2019).
96. Treasury (2015, pp. xiv-xv).
97. 'Potential GDP' is the level of output that an economy can produce at a constant inflation rate: OECD (2019a). In practice, Treasury estimates potential GDP based on analysis of underlying trends for population, productivity, and participation, smoothing out business cycle fluctuations: Treasury (2019b).
98. Annual average increase in real GDP per hour worked between 2007-08 and 2017-18: ABS (2018g). Growth was even less between Q1 2009 and Q1 2019 (1.1 per cent): ABS (2019f).

On spending, the projections assume no new spending initiatives for the coming decade.[99] Under this assumption, spending as a share of GDP will fall steadily over the decade, from 24.9 per cent today to 23.6 per cent by 2029-30,[100] during a period when the ageing of the population will increase spending pressures.[101] This would require spending in 2029-30 to be more than $40 billion lower ($33 billion in today's dollars) than if spending stayed as a constant share of GDP.

This would require unprecedented spending restraint. Despite population ageing, and overall population growth,[102] real spending growth would need to average around 1.3 per cent per annum over the decade – or 1.8 per cent if the economy performs as strongly as Treasury projects. Either way, this is substantially lower than any previous government has achieved over the past 50 years. Any new spending commitments, such as responding to the growing calls for higher Newstart payments or an increase in aged care spending, would cut into projected surpluses.

One risk from optimistic projections is complacency about future budget pressures. This is already evident in the Government's decision to legislate sizeable income tax cuts in 2024-25, which it claims it will be able to deliver while also keeping the budget in surplus.[103]

In the absence of enduring economic good fortune and historically abnormal spending restraint, Australia will be left with growing structural budget deficits over the next decade. The intergenerational pressures built into the budget are coming home to roost.

99. It is long-standing Treasury practice to project government spending based on current policies for most expenditure categories. This is to avoid second-guessing future government decisions. But it means the spending projections are baseline estimates, rather than estimates of the likely 'future state of the world'.
100. Commonwealth of Australia (2019).
101. PBO (2019).
102. Rizvi (2019).
103. Wood et al. (2019).

6 Inheritances won't close the generation gap

Wealth is growing in Australia and is becoming more concentrated in the hands of older Australians (Chapter 2). Older households tend to save more than they consume, so we can expect much of the wealth being accumulated by older Australians will be passed on through gifts or inheritances.

These intergenerational wealth transfers partly address the concerns about today's young being left behind. But most inherited money is received by people over 55, so inheritances won't help young people when they most need the money. And inheritances tend to transmit wealth to people who are already well-off. A generation more reliant on inheritances for building wealth is therefore one in which wealth is less equally shared.

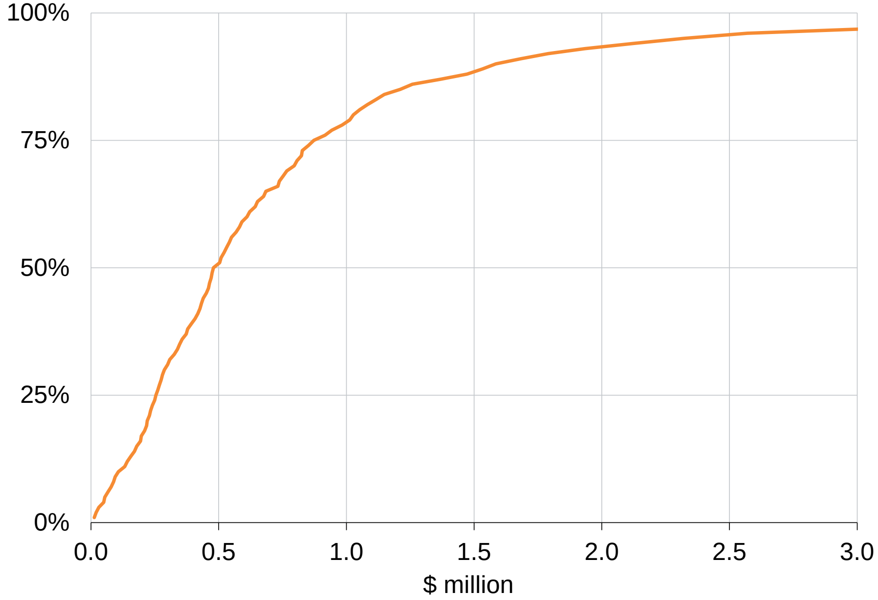
6.1 Inheritances in Australia are sizeable and growing

There is no national database of inheritances in Australia. But each state maintains records through their respective probate offices.

Analysis of probate data from Victoria focusing on 'final estates' – that is, estates without a surviving spouse – gives an indication of the size of current inheritances (see Appendix B for details). The size of estates in Victoria is not materially different from the national average.[104]

Our analysis suggests the typical (median) final estate size is $480,000, and the mean $773,000.[105] About 21 per cent of final estates are larger than $1 million, and 7 per cent are larger than $2 million (Figure 6.1).

Figure 6.1: About half of final estates are bigger than $500,000
Percentage of estates smaller than a given size



Notes: Includes only estates where no bequest was made to a spouse. This will almost always correspond to 'final estates'; that is, people without a surviving spouse.

Source: Grattan analysis of probate files, Victoria, 2016.

104. Grattan analysis of the data underlying Baker (2014) concluded that the average estate size in Victoria is about 3 per cent lower than the national average, so it is likely that conclusions drawn from a Victorian analysis are indicative of nationwide trends.
105. This is the total value of assets passed on by the deceased. Most final estates will have multiple beneficiaries, so individual inheritances will be smaller.

About three quarters of final estate money is received by children of the deceased. A further 11 per cent is transferred to other younger family members, such as nieces and nephews, or grandchildren. Only a very small proportion of estate money is left to people unrelated to the deceased (about 4 per cent), or to charities (about 2 per cent).

About half of the total value of final estates is in real estate.[106]

The size of inheritances grew by about 2 per cent above CPI over the past 15 years.[107] Given strong recent growth in wealth (Chapter 2) and the evidence that older households generally maintain and even increase their wealth in retirement (Box 6), the size of inheritances can be expected to grow even faster in future.

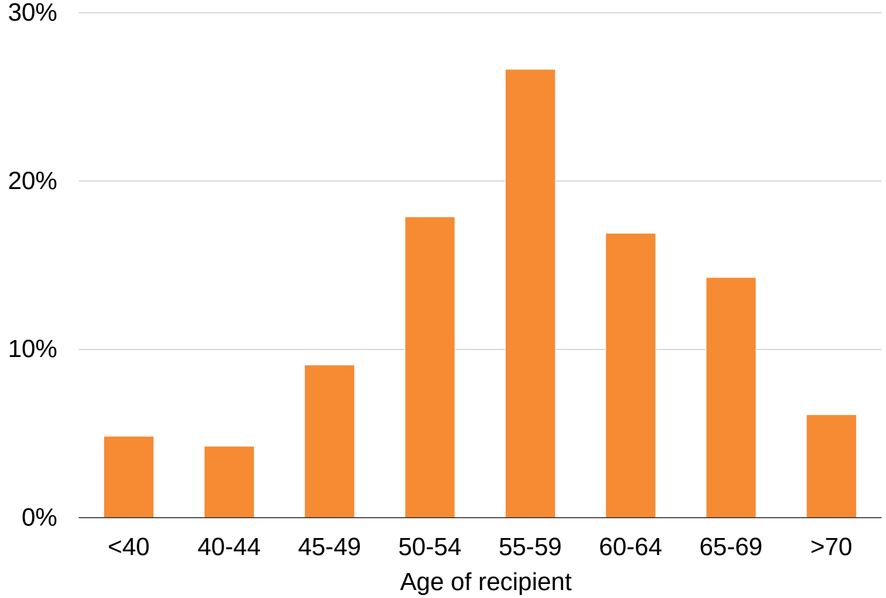
6.2 Most inheritances come later in life

Inherited wealth will boost the living standards of today's younger households in the future. But inheritances usually don't arrive at the stage of life when people need the money most – when they are saving for a first home deposit or raising a young family.

The most common age to receive an inheritance from parents is 55-59.[108] More than one quarter of estate wealth is transferred to people in this age bracket. More than 80 per cent is inherited by people 50 and over (Figure 6.2).

As life expectancy continues to increase, we would expect today's young people to inherit even later in life. This means that inheritances

Figure 6.2: Inheritance money largely flows to people over 50
Proportion of inheritance money



Notes: In probate data, the age of the recipient is only identifiable for children of the deceased, which represents three quarters of final estate money. Includes only estates where no bequest was made to a spouse. This will almost always correspond to 'final estates'; that is, people without a surviving spouse.

Source: Grattan analysis of probate files, Victoria, 2016.

106. It's likely some additional wealth was held in real estate shortly before death; for example, before a property was sold to fund an aged care bond.
107. Grattan estimates from Household, Income and Labour Dynamics in Australia (HILDA) survey: Melbourne Institute (2018). Differences between the HILDA inheritance data and the probate collections are outlined in Appendix B.
108. Bequests to grandchildren and other family members of younger generations are typically smaller.

are increasingly likely to supplement people's retirement savings rather than help young people into the housing market.

6.3 Inheritances tend to go to the already wealthy

Wealthier people are more likely to receive an inheritance[109] and when they do, it is likely to be larger. The mean inheritance for someone in the wealthiest 20 per cent is more than three times as big as the mean for someone in the poorest 20 per cent (Figure 6.3).

This is not just because people tend to be older and therefore richer when they inherit. The same trends are evident in the size of inheritances within age groups (Figure 6.4). The wealthiest 20 per cent of individuals of a given age receive 38 per cent of inheritance money, the poorest 20 per cent receive only 8 per cent.

If inheritances primarily transfer capital to wealthy people, they will not address concerns about intergenerational inequality for much of the population. Those most likely to be in need – the young and poor – are far less likely to benefit from these transfers.

On current trends, much of accumulated wealth in the hands of Baby Boomers will be handed down to the wealthiest Generation Xers, significantly exacerbating wealth inequality, and inequality of opportunity. Inheritances reinforce the advantages of having rich parents, such as better schooling, connections, and a greater ability to take risks because of a parental safety net.[110]

And if inheritances rather than lifetime earnings are the dominant route to wealth, there is less incentive for talented Australians to get ahead

109. The probability that someone in the wealthiest 20 per cent receives an inheritance in a given year (2 per cent) is more than double that for someone in the poorest 20 per cent: Grattan analysis of Melbourne Institute (2018).
110. Bowles and Gintis (2002); and Fagereng et al. (2015).

Box 6: Many older households are net savers in retirement

Most retirees do not draw down on their savings. Indeed, many are net savers through much of their retirement.

Grattan analysis of ABS wealth data for households over 60 found that that non-housing financial wealth increased for all retiree age cohorts over an 11-year period, which included the GFC.[a]

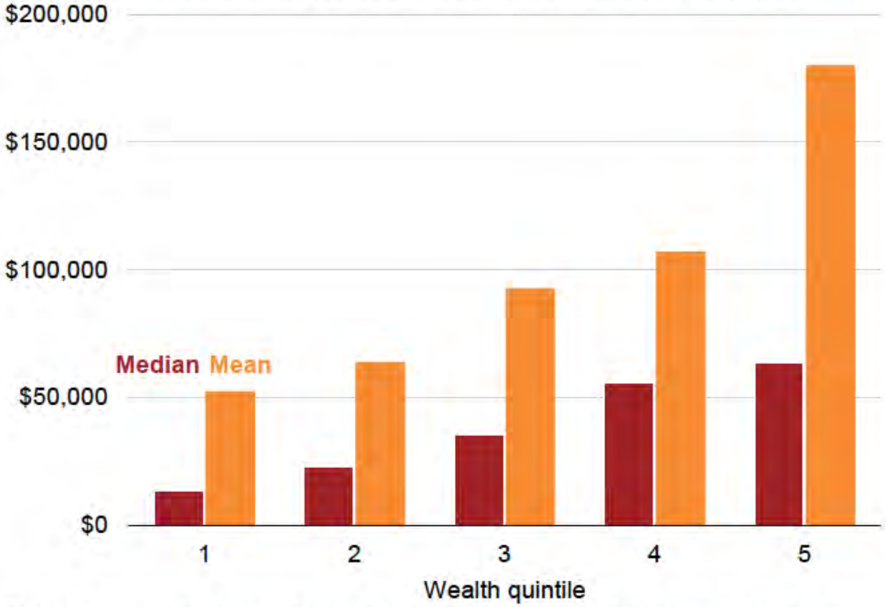
Other studies have similar findings. The Productivity Commission found that people aged 75-79 had a higher net worth on average than people aged 50-54.[b] International studies also find that retired households spend far less than their life expectancy would suggest.[c]

And it is not just the well-off who are preserving their assets. Australian Government data shows that less than half of all pensioners draw down on their assets, and more than 40 per cent are net savers.[d] Another recent study found that at death the median pensioner still had 90 per cent of their wealth as first observed.[e]

This is consistent with our analysis of probate records, which found that people over 70 leave significantly larger estates than people under 70.

a. Daley et al. (2018a).
b. PC (2015).
c. Love et al. (2009); and Banks et al. (1998).
d. Morrison (2015). About 45 per cent of pensioners were net savers in the first five years of receiving the Age Pension, while 43 per cent drew down their savings. In the final five years of receiving the pension, 43 per cent of pensioners were still net savers, while just a third drew down their savings.
e. Asher et al. (2017) find that age pensioners preserve financial and residential wealth and leave substantial bequests.

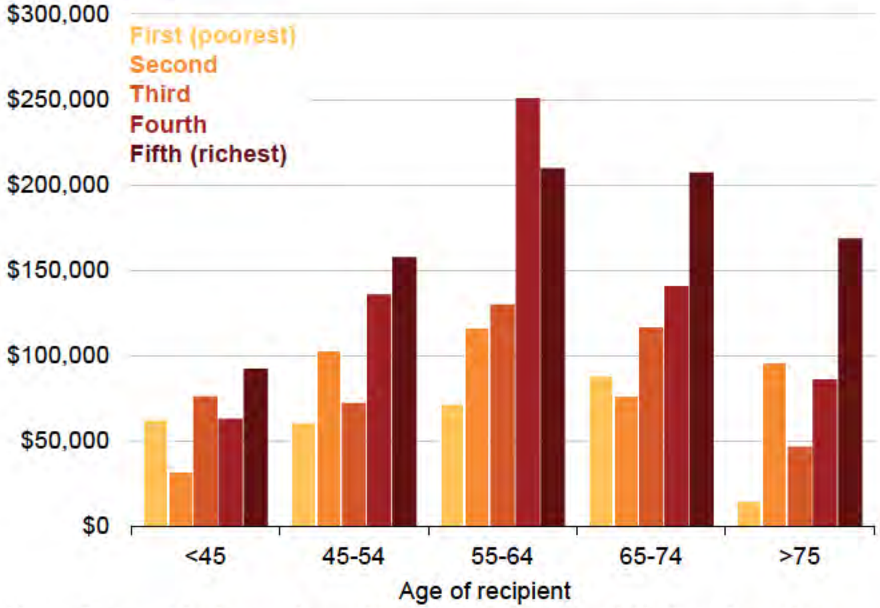
Figure 6.3: Wealthier people tend to get much larger inheritances
Average size of inheritance where one was received, in 2017-18 dollars



Notes: Data on inheritances by wealth of recipient is not available from the probate records, so we use data from HILDA on self-reported inheritances. We observe significantly lower average inheritances in HILDA than in the probate data, for reasons set out in Appendix B. Wealth captured only in 2002, 2006, 2010, and 2014 surveys. Wealth quintile based on most recently-captured wealth information for an individual. Individuals are allotted to a wealth quintile across all respondents.

Source: Melbourne Institute (2018).

Figure 6.4: Wealthy people of all ages tend to get larger inheritances
Average size of inheritance where one was received, by wealth quintile, in 2017-18 dollars



Notes: Data on inheritances by wealth of recipient is not available from the probate records, so we use data from HILDA on self-reported inheritances. We observe significantly lower average inheritances in HILDA than in the probate data, for reasons set out in Appendix B. Wealth captured only in 2002, 2006, 2010, and 2014 surveys. Wealth quintile based on most recently-captured wealth information for an individual prior to the inheritance. Individuals are allotted to a wealth quintile within their 5-year age band.

Source: Melbourne Institute (ibid.).

through individual endeavour – what Thomas Piketty described as the 'Jane Austen world'.[111]

6.4 Gifts to younger generations tend to be small

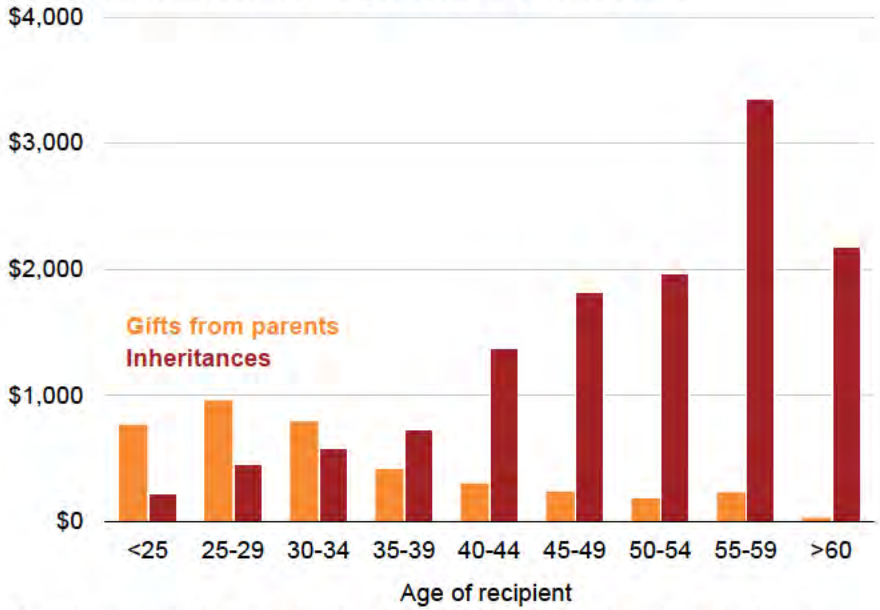
Bequests are not the only way wealth is transferred across generations. Parents might help their children by contributing to a house deposit or helping them with other purchases.[112]

People under 45 are more likely to report receiving a gift from parents than an inheritance in a given year. But gifts tend to be small – less than $1,000 a year on average (Figure 6.5). For the 16 years from 2002 to 2017, fewer than 3 per cent of people under 50 reported receiving gifts totalling more than $50,000.[113]

Substantially more money is transferred from older generations via inheritances than gifts (Figure 6.5). So gifts are unlikely to have much impact on closing the generation gaps outlined in this report.[114]

Figure 6.5: Young people are more likely to receive gifts, but the amounts tend to be small

Average amounts received in a given year, in 2017-18 dollars



Note: Averages include people who did not receive a gift or inheritance in that year.
Source: Melbourne Institute (2018).

111. Piketty (2014, p. 241).
112. The 'Bank of Mum and Dad' has played a much greater role in the past decade for people lucky enough to have this financial support, but fewer first homebuyers have been accessing this support in recent months: North (2019).
113. Includes only people surveyed across all 16 surveys from 2002 to 2017, under 50 at 2017.
114. Of course, monetary gifts are not the only form of generosity from older generations to younger generations. Many older Australians offer substantial in-kind assistance to their adult children, for example with childcare: Betts (2014).

7 What governments should do

Today's young are not making the same economic progress as previous generations. Wealth and income growth have stalled, home ownership rates are down and budget pressures loom.

There are no easy fixes, but policy changes could help restore the fair go. Past government decisions have contributed to the problems. The choices governments make today could help restore generation-on-generation progress.

Policies to boost economic growth benefit all Australians but particularly the young. Loosening restrictive planning laws would help younger Australians buy a home. And winding back some of the overly generous tax concessions for 'comfortably off' older Australians would ease the emerging budget pressures from an ageing population.

Older Australians are now wealthier than ever before, so given inheritances are likely to grow, governments should consider taxing intergenerational wealth transfers to fund income tax cuts. At a minimum, taxpayers should stop subsidising inheritances through superannuation tax concessions and exclusions from the Age Pension assets test.

7.1 Boost economic growth

Strong economic growth in the past has enabled each generation to do better than the generation before it. But economic growth has slowed in Australia and around the developed world in recent years.

Boosting long-term economic growth benefits everyone. It increases individuals' material living standards and enables societies to invest in the non-material assets that improve people's lives. Growth particularly benefits young people, because their employment and wages are more sensitive to the economic cycle (Chapter 3).

Labour productivity is the most important determinant of future growth.[115] A lot of the factors that affect productivity – including technological innovation and adaptation – are largely beyond the direct control of government. But government does have some levers to improve productivity over the long run.

Grattan's Commonwealth and State Orange Books include a range of recommendations for governments looking to improve the performance of the economy.[116] Some of the biggest are summarised below.

Increase the efficiency of taxation

Australia's tax system is a patchwork that includes some highly inefficient taxes. Improving the tax mix would reduce the overall drag of taxes on economic growth.

The biggest tax reform to boost productivity would be for state governments to abolish stamp duties and replace them with broad-based property taxes.

Other reforms that would improve the efficiency of taxation and increase people's incentives to work and invest include: making the tax treatment of savings more consistent; and broadening the GST base and/or increasing the GST rate, and using the proceeds to reduce income tax and boost welfare payments.[117]

115. The other determinants – terms of trade and participation rates – are projected to move from adding to growth rates to dragging on growth rates over the next decade: Commonwealth of Australia (2019, Budget Paper 1).
116. Daley et al. (2019a); Daley et al. (2018c); and Daley et al. (2012).
117. See Daley et al. (2019a, pp. 32-36) and Daley et al. (2018c, Chapter 9) for specific policy recommendations.

The business tax regime should also be improved. Moving from a profit-based tax to a (destination-based) cash-flow tax would boost incentives for investment.[118] A more incremental reform would be to lower effective company tax rates by introducing investment allowances or accelerated depreciation on new investment.[119]

Improve labour force participation and productivity

Increasing the share of the working-age population that is in work is one of the biggest 'bang for buck' economic levers governments have.[120] Australia can improve the workforce participation of women and older Australians.[121]

Increasing the age at which people can access the Age Pension – with appropriate carve-outs for people with poor health – would substantially boost older-age workforce participation. It would ease the structural budget pressures caused by population ageing (Chapter 5). And the economy would benefit from having experienced people stay longer in the workforce.

Increasing childcare rebates would reduce the income 'traps' facing second earners (mainly women) when they increase the number of days a week they work.[122]

Better education also boosts workforce participation, productivity, and living standards over the medium-to-long term. Grattan's Orange Books detail a range of policies governments could adopt to improve education.[123]

Make strategic investments in infrastructure

Investments in public infrastructure can boost productivity and economic growth. But this doesn't mean that all infrastructure spending is of benefit to future generations.

Poor project selection can reduce or eliminate the economic payoff from infrastructure spending. If governments use debt to fund projects with high costs and few benefits, future generations can be left with the bill. The Commonwealth Government has put more than $50 billion of infrastructure projects 'off budget' in the past decade, including the NBN, Inland Rail, Western Sydney Airport, and Snowy Hydro 2.0. Most of these are unlikely to generate the implied commercial returns, leaving future taxpayers on the hook for this spending.[124]

Reducing the impact of politics on project selection, and requiring published independent assessment of all proposed projects, would increase the likelihood that projects will ultimately benefit future generations.[125]

7.2 Improve housing affordability

One of the biggest contributors to the disparities in wealth accumulation between generations has been two decades of house prices growing faster than incomes. Young people – particularly poorer young people – now struggle to get into the housing market (Chapter 2).

118. Auerbach (2017). For an Australian discussion see Potter (2018) and Hamilton (2019).
119. Daley et al. (2019a, p. 35).
120. Daley et al. (2012).
121. Daley et al. (2019a, pp. 36-37) includes more detail about these policy recommendations.
122. Daley et al. (2019b).
123. See Daley et al. (2019a, Chapters 8 and 9) and Daley et al. (2018c, Chapter 6) for specific policy recommendations.
124. Terrill and Wood (2018).
125. Terrill et al. (2016a); and Terrill et al. (2016b).

Owning a home remains a core aspiration for most Australians. Home ownership supports financial and emotional security, a sense of belonging,[126] and the stability to take risks and innovate.[127]

The biggest lever governments have to improve housing affordability is to boost supply.[128] Building an extra 50,000 homes a year for a decade would leave Australian house prices 5-to-20 per cent lower than they would have been otherwise.[129]

These homes should not all be on city fringes. State governments should change planning rules to allow more homes in the inner and middle rings of our capital cities. Increasing density would produce economic dividends by enabling more people to live closer to the higher-productivity city centres.[130]

The Commonwealth Government could help improve housing affordability by reducing demand. Reducing the capital gains tax discount to 25 per cent and winding back negative gearing would improve housing affordability a little. And winding back these tax concessions would also improve the budget bottom line while making the housing market more stable.[131]

7.3 Wind back age-based tax breaks

A wealthy country such as Australia *should* offer excellent health and aged care services and a pension that affords a decent standard of living for its older citizens.

126. Sheppard et al. (2017).
127. Much small business borrowing is backed by security over property: Daley et al. (2018b, p. 72).
128. Several government, academic and private sector studies point to restrictive zoning as an important factor in Australia's high and rising housing prices: see Daley et al. (Ibid., pp. 57,112).
129. Ibid. (p. 3).
130. Ibid.
131. Daley et al. (2016a).

It is much harder to afford these benefits though when most people leave the tax system by age 65 regardless of their means. Many well-off retirees still draw substantially on government benefits – in fact only the wealthiest 10 per cent of households over 65 are net contributors to the budget on average.[132]

Tax breaks based on age rather than capacity to pay are hard to justify. As Sonia Arakkal neatly puts it, 'old age is no longer a proxy for the worthy poor'.[133]

To make budgets more sustainable and better align taxation policy with people's capacity to pay, governments should:

1. Tax all superannuation earnings in retirement at 15 per cent. This would align the tax treatment of super earnings of retirees with people of working age. Taxing long-term savings at a much lower rate than other income is justified, but the magnitude of the current concessions (zero for most super earnings in retirement) goes way beyond the purpose of superannuation to supplement or replace the Age Pension.[134] A 15 per cent tax on all super earnings would improve budget balances by about $2 billion a year today, and much more in future.[135]

2. Wind back the Seniors and Pensioners Tax Offset (SAPTO) and reduce the Medicare levy threshold for senior Australians. SAPTO and the higher Medicare levy threshold for seniors means older Australians pay less tax than younger Australians on the same income. One benefit of SAPTO is it keeps full-rate pensioners out of the tax net. SAPTO should be wound back to the point at which

132. Grattan analysis of ABS (2018b).
133. Sonia Arakkal is a co-founder of Think Forward, a lobby group for young Australians. She made the comment at a Grattan Institute / State Library Victoria event: Policy Pitch (2019).
134. See Daley et al. (2015).
135. Daley et al. (2018a, p. 99).

it just offsets tax for full-rate pensioners. Making this change, along with bringing down the Medicare levy threshold to the same level would boost the budget bottom line by about $700 million a year.[136]

3. Reduce private health insurance rebate rates for seniors to the same level as applies for working-age Australians. This would raise about $250 million a year.[137]

7.4 Consider whether intergenerational transfers should be taxed, or at least not subsidised

Australia's national wealth has grown from $2.8 trillion in 1990 to $10.3 trillion in 2018, despite the GFC.[138]

Much of this wealth is held by older Australians, particularly those who owned a property before the house price boom. Transfers of wealth across generations through inheritances or large gifts will reduce the wealth gap on average, but the wealth will be less equally shared (Chapter 6).

Young people without well-off parents are the losers from policies that favour a growing income tax burden over taxation of wealth transfers.

7.4.1 An intergenerational transfer tax (IGTT)?

Australians currently pay taxes on the income they earn from working, but money received via a bequest is tax free. If used to reduce income taxes, a relatively low intergenerational transfer tax (IGTT) – levied on sizeable gifts and inheritances – would yield some economic payoff as well as boosting disposable income for most young people.

136. See Daley et al. (2016b) for more detailed discussion of this proposed change.
137. Ibid.
138. Figures reported in 2018 dollars: ABS (2019a).

Taxes on intergenerational transfers drag on the economy less than most other taxes including income tax. This is because an IGTT has less impact on behaviour, particularly decisions to work.[139]

Indeed, an IGTT might even increase workforce participation. A recent German study showed that people expecting to receive a large inheritance work less, even before they receive the inheritance.[140]

The Henry Review of Australia's tax system noted that 'a bequest tax levied at a low flat rate, and designed to affect only large bequests, could be an efficient and equitable component of Australia's future tax system'.[141] Australia is one of only seven OECD countries that do not levy any inheritance, estate, or gift taxes.[142]

An IGTT/income tax swap could also boost disposable income for young people. For example, if all inheritances above $500,000 were taxed at 20 per cent, and the revenue was used to fund income tax cuts, most people under 50 would be ahead financially.[143]

Yet taxes on inheritances are deeply unpopular.[144] Estate taxes were abolished in Australia in the late 1970s and no government has touched them since.[145]

There is a strong economic case for levying some form of tax on unearned income. Identifying the right model and bringing the Australian people along will be no easy task though.

139. Henry et al. (2009a, pp. 137-140); OECD (2018, pp. 70-71); and Asprey (1975, p. 440).
140. Kindermann et al. (2018).
141. Henry et al. (2009a, pp. 137-140).
142. OECD (2019b). Based on 2016.
143. Grattan calculations based on Roach (2019).
144. Emslie and Wood (2019).
145. Wood (2018).

7.4.2 Wind back taxpayer subsidies of inheritances

Even if an IGTT proves a bridge too far for policy makers, it is hard to justify taxpayer subsidies that *increase* the size of inheritances.

Broaden super death benefits tax

Superannuation is concessionally taxed to encourage people to save for their retirement and take the pressure off the Age Pension system. But given that many older Australians do not draw down on their capital (Chapter 6), tax concessions also boost the size of bequests.

Super death benefits taxes are intended to claw back superannuation tax breaks when the money is passed on to non-dependents, so that the government is not subsidising inheritances. But they are only partly achieving this aim.[146]

Current super death benefits taxes are too low. A higher tax on super bequests paid to non-dependents would better capture the value of the super tax-breaks accumulated by the deceased over their life.[147]

Government should also lower the annual cap on post-tax contributions, or replace it with a lifetime cap. This would limit re-contribution strategies,[148] which provide a loophole whereby people can reduce the tax paid on inherited super.

Don't force people to over-save

Compulsory superannuation contributions are currently legislated to rise from 9.5 per cent to 12 per cent of wages between 2021 and 2025. This will reduce wages,[149] which will particularly hurt younger Australians, who rely more heavily on wage income (Chapter 3).

A previous Grattan report showed that increasing compulsory super as planned would effectively compel most people to save for a higher living standard in retirement than they enjoy during their working lives.[150] It would make the typical younger worker up to $30,000 poorer over their lifetimes, while doing little to boost the retirement incomes of many low- and middle-income Australians.[151]

Higher compulsory super contributions will also exacerbate the budgetary costs of an ageing population (Chapter 5). Lifting compulsory super to 12 per cent would cost the federal budget $2-2.5 billion a year today.[152] Treasury projections have shown that the tax breaks from 12 per cent compulsory super would dwarf any budget savings from lower Age Pension spending as far out as 2060.[153]

The Commonwealth Government should keep the Superannuation Guarantee at 9.5 per cent, rather than increasing it to 12 per cent, to avoid making younger Australians worse off over their lifetime.

146. Daley et al. (2018a, p. 20).
147. Super death benefits paid to dependants would remain tax-free.
148. Under re-contribution strategies, superannuation can be withdrawn tax-free and then contributed back to the same account as a 'post-tax contribution', up to the annual post-tax contributions cap. Funds re-contributed in this way are inherited tax-free: Daley et al. (2015, pp. 54-56).
149. Past increases in compulsory super contributions appear to have been passed through to workers in the form of lower wages: Coates (2019b).
150. Daley et al. (2018a, p. 87).
151. Coates and Emslie (2019).
152. Daley et al. (2018a, pp. 92-93).
153. Treasury (2013, Figure 2.1) estimated that the revenue foregone from superannuation tax breaks would exceed the budgetary savings from lower Age Pension spending by 0.4 per cent of GDP a year. Recent changes to curb super tax breaks and tighten the Age Pension assets test will reduce the annual budgetary cost of support for retirement incomes by around 0.1 per cent of GDP: Daley et al. (2018a, p. 93). The Henry Review also concluded higher compulsory super would cost the budget in the long term when it recommended against raising compulsory super beyond 9 per cent: Henry et al. (2009b).

Include the family home in the Age Pension assets test

The family home gets special treatment in the Age Pension means test. The actual value of the home is not counted in the assets test, but home-owners have a lower asset limit than non-home-owners before they begin losing their Age Pension entitlements.[154] This means many Age Pension payments are made to households that have substantial property assets. Half of the government's spending on Age Pensions goes to people with more than $500,000 in assets.[155] These people have enjoyed substantial support from taxpayers over many years, yet will pass on a significant amount of their wealth to their heirs.

The Government should change the Age Pension assets test to include the value of the family home above some threshold, such as $500,000. It should also allow other assets up to the same threshold so that non-homeowners are not disadvantaged.

Seniors who have little income but live in a high-value property should be allowed to borrow income up to the rate of the Age Pension against the security of their home, via the Pension Loans Scheme.[156] This will give them financial capacity to stay in their home if they choose to.

The threshold ensures that homeowners will still have substantial equity to pass on to their beneficiaries. But it does ask people with high levels of wealth that would otherwise be passed on to heirs to use some of this wealth to support themselves in retirement.

154. This approach in effect includes the first $210,500 of the home in the assets test irrespective of its actual value. Fixed asset test limits apply to home-owners and non-home-owners, see Department of Human Services (2019a).
155. Daley et al. (2019a, pp. 69-70).
156. Daley et al. (2018b) and Daley et al. (2018a). Changes to the Pension Loans Scheme commencing 1 July 2019 are a step in the right direction, and may result in more retirees drawing down on the value of their home: Department of Human Services (2019b).

7.5 Summing up

Economic, demographic, and policy changes have created a 'perfect storm' of challenges for today's young. These challenges could stretch the generational bargain to breaking point.

But a breaking of the bargain is not inevitable. Just as policy changes have contributed to pressures on young people, they can help redress them.

None of the policies we suggest are politically easy (reform rarely is). An ageing population means an ageing voter base.[157] But that doesn't mean older voters won't support a fair go for younger Australians.

Many older Australians care about the economic future of younger Australians and future generations.[158] Even at the 2019 federal election, where Labor planned to reduce franking credit refunds (mainly affecting non-pensioner retirees), electorates with the highest franking credit refunds swung towards Labor on average.[159]

The political challenge is therefore to explain to people of all ages that policy change is necessary so their children and grandchildren can enjoy the fruits of Australia's prosperity.

157. Wood and Percival (2019).
158. 'Australians aspire to an economy that sustains or enhances living standards into the future': ABS (2013).
159. Evershed (2019); and Chivers (2019).

Appendix A: The changing face of Australian households

This report draws on ABS survey data of households' wealth, income, and expenditure over time.[160] Households of course take various forms: from a single adult to many families living together.[161]

We use equivalisation methods, where appropriate, to standardise for households of different sizes. But we do not 'equivalise' for all changes in household composition over time – for example, a household of two adults is treated the same under equivalisation methods whether those two adults are a couple or individuals in a share house.

This appendix looks at how households have changed over time, and what implications this might have for our findings. Table A.1 defines the household classification we have used throughout this appendix.

A.1 There are not many households headed by someone aged 15-24

Throughout this report, age refers to the age of head of the household, or what the ABS calls the household reference person. That is usually the owner of the house, the bread-winner, or the oldest person.[162]

Table A.1: Classification of family composition within households

Category	Definition
Single	Single adult, no dependent children (with or without non-dependent children)
DINKS	One couple, no dependent children (with or without non-dependent children)
Young family	One couple with one or more dependent children (with or without non-dependent children)
Single parent	Single adult with one or more dependent children (with or without non-dependent children)
Share house	Two or more independent adults who identify as living in a 'group household'
Multi-family	More than one family sharing a home, with or without children
Other	Any other arrangement

Source: Grattan analysis of ABS SIH and HES 'family composition' categories.

160. The Survey of Income and Housing (SIH) and the Household Expenditure Survey (HES).
161. The ABS defines a household as 'one or more persons, at least one of whom is at least 15 years of age, usually resident in the same private dwelling': ABS (2016).
162. The ABS applies the following selection criteria (in order) to determine the household reference person: (1) the person with the highest tenure when ranked as follows: owner without a mortgage, owner with a mortgage, renter, other tenure; (2) one of the partners in a registered or de facto marriage, with dependent children; (3) one of the partners in a registered or de facto marriage, without dependent children; (4) a lone parent with dependent children; (5) the person with the highest income; (6) the eldest person: ABS (ibid.).

Only 9 per cent of people aged 15-24 are the head of their household, compared to 40 per cent of people aged 25-34 and about 50-to-60 per cent of older people.

It is unusual for someone aged 15-24 to be the head of their household because typically people of this age still live with their parents or an older relative. The experiences of 15-24 year-old *households* are therefore only a small subset of the experiences of all 15-24 year-old *people*.

This report compares how households of a given age fare today compared to households of the same age in the past. It is important to know, therefore, whether survey data has become more or less representative of households of a given age over time.

Figure A.1 shows that the proportion of young and old people who are head of their household has declined over time, although not dramatically so.

For young people, this probably reflects a trend towards moving out of home later. For older people, this reflects the fact that older households are now less likely than in the past to be single-person households and more likely to be couples (Appendix A.4).

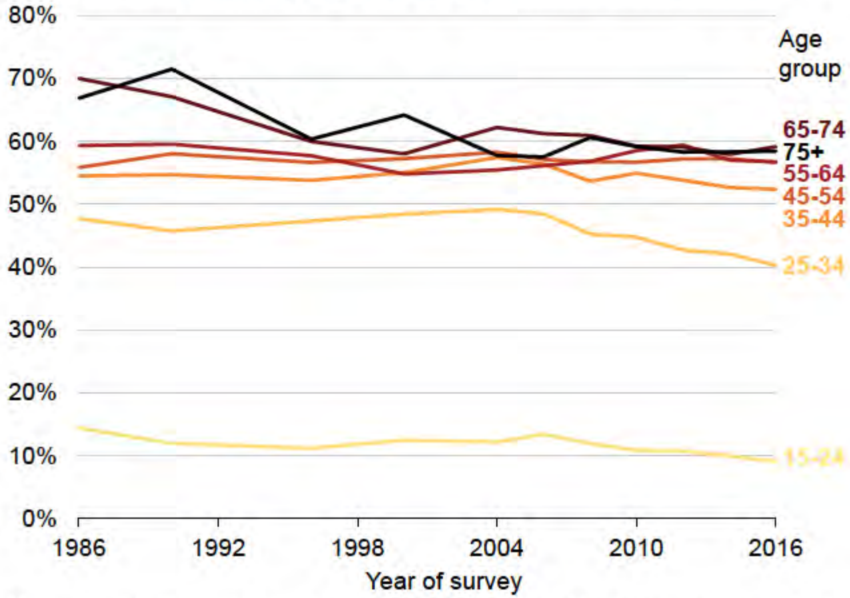
A.2 How young households have changed

Younger households in 2016 were less likely to have children than younger households in the mid-1990s (Figure A.2 and Figure A.3).

In 2016, households headed by someone aged 15-24 were typically single-person or couple-only households, whereas in 1995 households of this age were most likely to be share houses.

Young families are still the most common arrangement for households aged 25-34, but they are a declining share, with couple-only households on the rise.

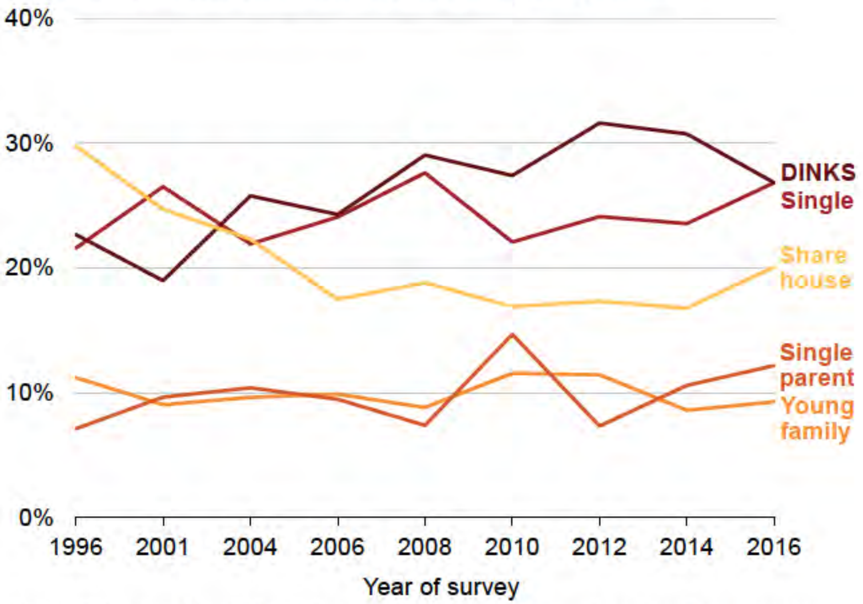
Figure A.1: Few people aged 15-24 are the head of their household
Proportion of population by age that are head of their household



Notes: 'Head of household' refers to the ABS's household reference person, who is usually the owner of the house, the bread-winner, or the oldest person. HES data shows similar trends.

Sources: ABS (2018a) and ABS (2018f).

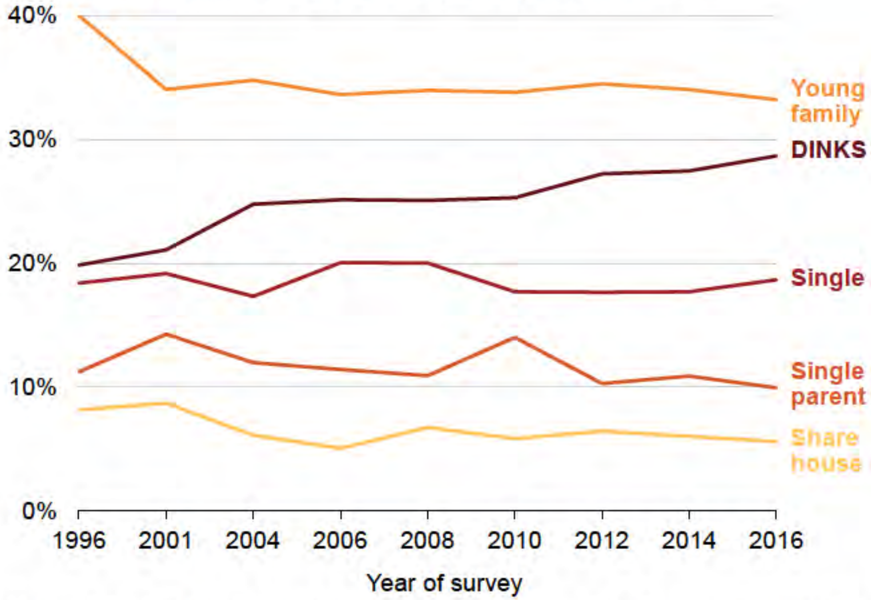
Figure A.2: Share housing has become less common over the past two decades for households aged 15-24
Proportion of households aged 15-24 by family composition



Notes: 'Other' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). DINKS = 'Dual-Income-No-Kids'. Only dependent children are counted towards the 'young family' and 'single parent' categories. Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (2018a).

Figure A.3: More households aged 25-34 are delaying a family
Proportion of households aged 25-34 by family composition



Notes: 'Other' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). DINKS = 'Dual-Income-No-Kids'. Only dependent children are counted towards the 'young family' and 'single parent' categories. Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (ibid.).

A.3 How middle-aged households have changed

Household composition has remained fairly steady over time for 35-44 year-olds, with young families dominating the mix (Figure A.4). But there have been substantial shifts for households aged 45-64 over the past two decades (Figure A.5 and Figure A.6).

For households aged 45-54, the share of young families has increased while the share of Dual-Income-No-Kids ('DINKS') has fallen. This probably reflects people having children later. Most households aged 55-64, are couple households, but the share of single households has been rising.

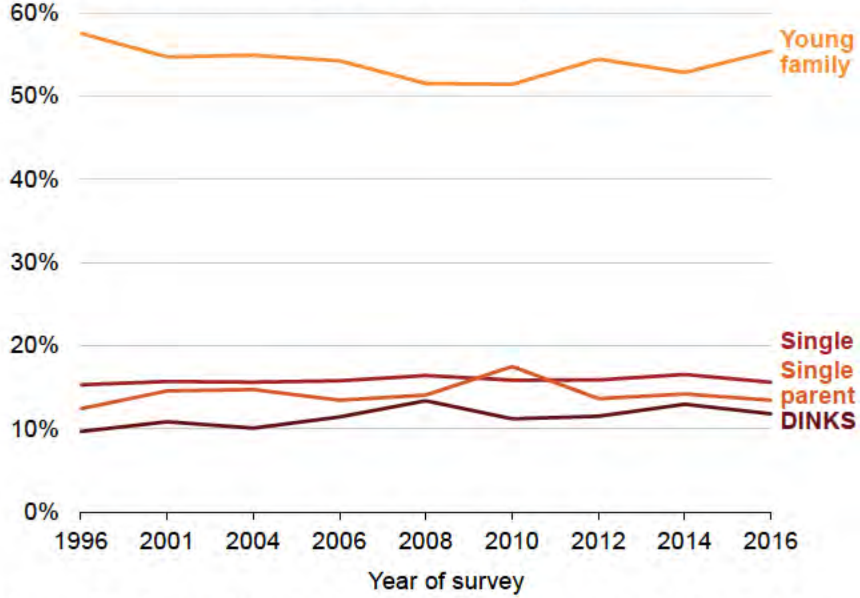
A.4 How older households have changed

Household composition has remained steady over time for 65-74 year-olds (Figure A.7). But households over 75 have changed. While they're still typically single-person households, the share of singles has been in decline since the mid-1990s, and the share of couples is on the rise (Figure A.8). This may reflect more people living longer and healthier lives in their own homes.

A.5 These compositional changes are unlikely to affect our findings

Differences in household composition over time are already largely accounted for through equivalisation methods. The ABS household equivalisation method, used in this report, applies a weighting for each adult and child in a household, so it accounts for changes in family size over time and the differences between single and couple households (see footnote 36 on page 19).

Figure A.4: Households aged 35-44 are typically young families
Proportion of households aged 35-44 by family composition

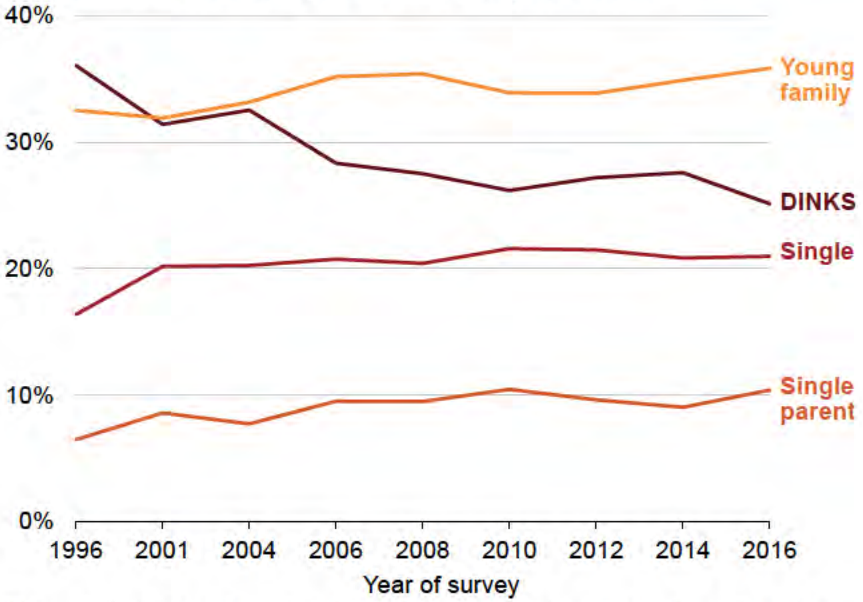


Notes: 'Other', 'share house' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). DINKS = 'Dual-Income-No-Kids'. Only dependent children are counted towards the 'young family' and 'single parent' categories. Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (2018a).

Figure A.5: More households aged 45-54 have young kids

Proportion of households aged 45-54 by family composition

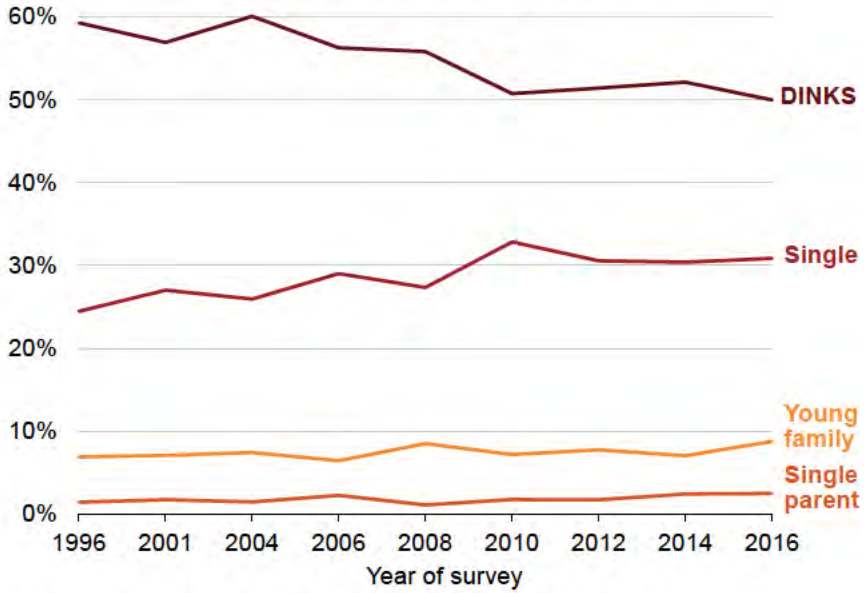


Notes: 'Other', 'share house' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). DINKS = 'Dual-Income-No-Kids'. Only dependent children are counted towards the 'young family' and 'single parent' categories. Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (2018a).

Figure A.6: More households aged 55-64 are single and fewer are couples

Proportion of households aged 55-64 by family composition

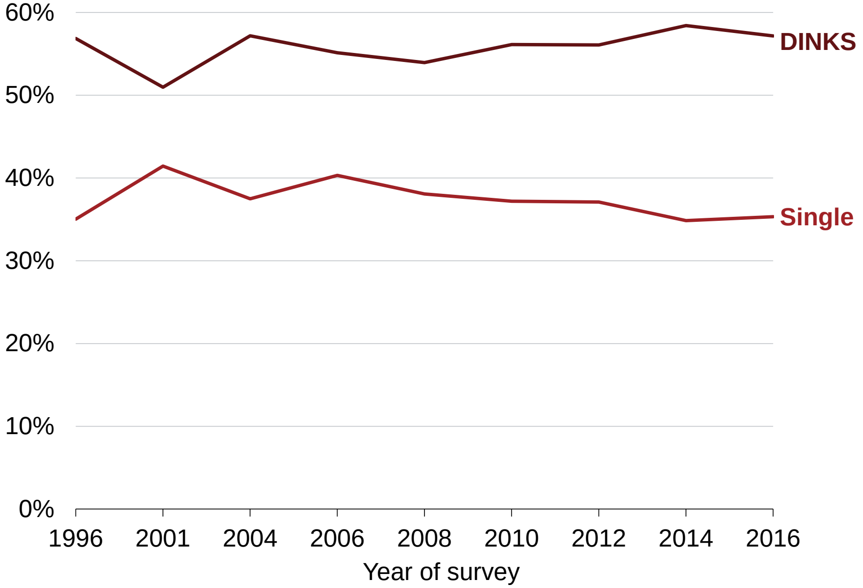


Notes: 'Other', 'share house' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). DINKS = 'Dual-Income-No-Kids'. Only dependent children are counted towards the 'young family' and 'single parent' categories. Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (ibid.).

Figure A.7: The composition of households aged 65-74 has been steady over time

Proportion of households aged 65-74 by family composition

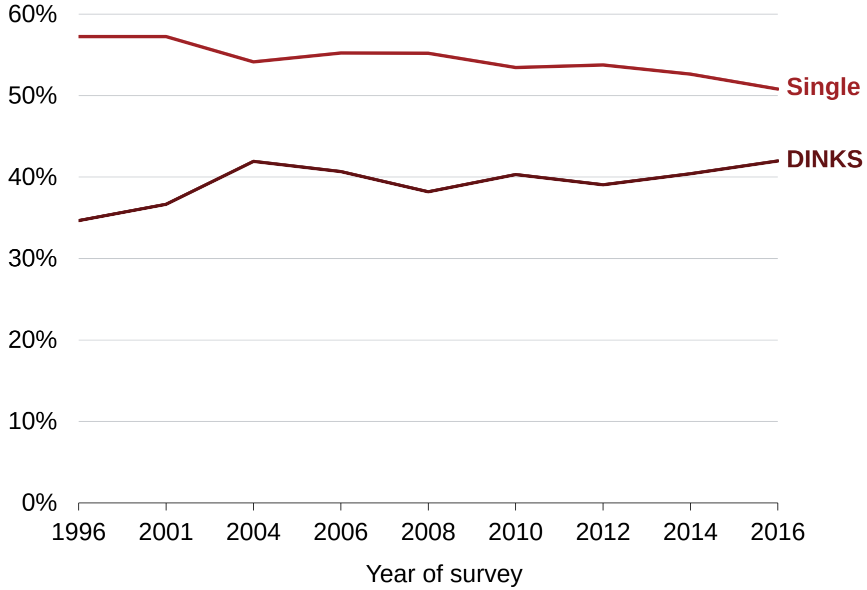


Notes: 'Other', 'young family', 'single parent', 'share house' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (2018a).

Figure A.8: Fewer households aged 75+ are singles

Proportion of households aged 75+ by family composition



Notes: 'Other', 'young family', 'single parent', 'share house' and 'multi-family' categories are not shown (together they represent less than 10 per cent of households). Age refers to the age of the household reference person. HES data shows similar trends.

Sources: ABS (ibid.).

But household equivalisation does not distinguish between families and share houses with the same number of adults. This could have two types of impacts (but is likely to affect only 15-24 year-olds, where group housing is common).

First, equivalising income for adults in a share house assumes they pool the same resources as a couple or family would – potentially more than they actually do. This could result in the income of a share house being overstated.

Given that group housing was more common in the past, equivalised income for households aged 15-24 may be *over*-stated in the past, relative to today. But this does not affect the key findings. Our report finds that the incomes of young people have stagnated or gone backwards since the GFC, and group housing levels have been steady or below 2016 levels over that period.

Second, change in the proportion of share houses compared to other types of households might indicate underlying differences in the population of people we compare over time. For example, if living in a share house was an indicator of lower income and the proportion of share housing has declined over time, then this might suggest today's sample of households would have higher incomes, all else being equal. If this were the case, then our findings of low income growth over time for households aged 15-24 would be conservative.

Appendix B: Inheritance data analysis

B.1 Probate data

When someone dies in Australia, assets they personally own form part of their estate. This will not include assets they jointly own (for example, with a spouse), superannuation balances, or family trusts.[163]

Assets in the estate are usually transferred to others according to the deceased's will. The transfer of part of the estate to an individual is referred to as an inheritance. In order for the assets of a deceased estate to be distributed, the executor of the estate needs to file an application to the Probate Office of the Supreme Court of the state or territory in which the person died.[164]

Once processed, probate files are publicly available at the Public Records Office in each state and territory. The documents generally contained within a probate file are shown in Table B.1.

To assess the size and distribution of inheritances, we analysed a sample of 534 probate files from Victoria in 2016. Our sample included randomly-selected boxes of probate files. Each box contains all probate files processed within a certain time, so our sample is a random cross-section of probate files in Victoria.

163. Assets can be jointly owned as 'joint tenants', meaning that when one owner dies, the remaining owners continue to own the property; or as 'tenants in common', where two or more individuals own a specific percentage of an asset, and the percentage an individual owns is theirs to leave in a will: ATO (2019b). Properties jointly owned by a married or de facto couple are most commonly owned as joint tenants.
164. Baker (2014, p. 9).

Table B.1: Our analysis used information from different documents within the probate file

Document	Information we collected
Motion for the grant of probate	Name of deceased Date of birth Date of death
Death certificate	Age of children of the deceased
Inventory of assets and liabilities	Total estate Division into real estate, personal estate, and liabilities Description and value of individual items
Last will and testament	Distribution of estate to individuals, and their relationship to the deceased

Not all asset transfers occurring at death are captured as part of probate:

- Money held within a superannuation fund does not generally form part of a will, and is distributed separately.[165] The trustee will pay out the amount of the account balance and any additional death benefits to the beneficiary of the superannuation fund, which may not be an inheritor of the estate.[166]
- Family trusts can be transferred to the remaining trustees upon the death of one trustee, without forming part of an estate.

In general, estates of less than about $10,000 will not require probate.[167] In practice, this will include many deaths where the

165. Department of Justice NSW (2019).
166. Andreyev Lawyers (2016).
167. Baker (2014, p. 10).

deceased had access to assets exceeding $10,000, but the bulk of these assets are jointly owned, or in family trusts. In Victoria, about half of all deaths result in a probate application.[168]

Thus, although probate does not capture all wealth that is transferred at the point of death, it does capture a significant portion.

Probate files separate assets into real estate, personal estate, and liabilities. 'Real estate' is often a family home, but can also include investment properties. 'Personal estate' can include bank accounts, shares, an aged care bond, cars and other chattels. 'Liabilities' can include a mortgage, a credit card, and small bills such as council rates.

B.1.1 Excluded estates

Estates were excluded from our dataset where it was not possible to determine a close approximation of the distribution of assets. In practice, this applied to a small number of intestate estates (where a person dies without making a will).

For some intestate estates, the distribution of assets is reasonably clear from the documents included in the probate file. That is, the deceased had either a spouse but no children (in which case, the full estate passes to the spouse), or children but no spouse (in which case, the estate is shared equally between the children).[169] Such estates were included in our dataset.

In the event that an intestate deceased had both a spouse and at least one child, the distribution of assets is more complicated. There were only eight such estates in our sample, and they were excluded from our dataset, leaving a total of 526 files for analysis.

168. Ibid. (p. 29).
169. Victorian Law Reform Commission (2019).

B.1.2 Allocation of liabilities to real estate / personal estate

The 'inventory of assets and liabilities' separates assets into real estate, personal estate, and liabilities. To allocate amounts to recipients, we first apportioned liabilities to either real estate or personal estate, and calculated a 'net' amount in each asset category.

If the liability was a mortgage, it was subtracted from the value of real estate.

Other liabilities were subtracted from the value of personal estate. If such liabilities exceeded the value of personal estate, they were subtracted first from the value of personal estate, then from the value of real estate. This method was applied even for home-owner-related expenses, such as council rates.

This methodology reflects likely practice, whereby we would expect the trustee to pay small debts out of available cash, before considering whether to sell real estate.

B.1.3 Allocation of real estate / personal estate to beneficiaries

In many wills, specified dollar amounts rather than specified items were bequeathed to individuals. We allocated such amounts first from personal estate, and then any remaining amounts from real estate.

A will also specifies the distribution of the remaining amount after specified bequests, known as the 'residual estate'. Where the residual estate was split proportionally between multiple recipients, both real estate value and personal estate value were allocated by the same proportions.

B.1.4 Approximations

Any funeral expenses or legal expenses were ignored in calculating the estate and the distribution. The will normally stipulates that these are paid first, before the residual estate is distributed. Without knowing the amount of such expenses, we have assumed they are immaterial.

Many wills specify the distribution of particular chattels, for example items of jewellery or furniture. We allocated dollar amounts for such items to a beneficiary only if the value of the item was listed in the inventory of assets. If the item was not listed individually in the inventory (or, as in most cases, chattels were not listed at all), no dollar amount was allocated.

B.1.5 Other assumptions

We assumed that the distribution of assets occurred as per a reasonable understanding of the terms of the will. Probate files contain no confirmation that this actually happened, or whether the terms of the will were disputed.

Many wills leave money in trust for children, to be conferred on them when they reach a specified age (often 25). We assumed children eventually attain the relevant age and inherit, and so we allocated money accordingly, in the same way as if they were to receive it immediately.

Some wills specify a dollar amount to be split between any grandchildren, or a dollar amount to be given to each grandchild. Many wills specify the grandchildren by name, some do not. Where the will does not name grandchildren, we generally assumed there to be one surviving grandchild. This is likely to be inaccurate, but, given the relatively small amounts typically allocated to grandchildren in this manner, immaterial.

Some wills specify that an asset is to be kept in trust for the use of a particular person during their lifetime, then passed to a specified ultimate beneficiary. This most often applies to a house (often for the use of the current resident, perhaps a spouse), but sometimes applies to a specified amount or specified portion of the residual estate (in this case, money is to be held in trust with the income only for a particular person's use). Where assets were treated this way in a will, we allocated the full amount to the *ultimate* recipient. A more accurate estimate of value would involve calculating the expected net present value of the cash flows each recipient would receive, but this would involve additional assumptions, additional complexity, and additional uncertainty. Our simpler methodology is unlikely to result in materially different findings.

B.2 HILDA data

Data on inheritances by wealth of recipient is not available from the probate records, so we use data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. HILDA contains information regarding self-reported inheritances received, and thus enables us to observe the prior wealth levels of people receiving inheritances.

We observe significantly lower average inheritances in HILDA data than in probate data. In HILDA data, the mean inheritance received in a given year (in 2016 dollars) is $107,000, and the mean inheritance received by a survey respondent across the full period they are tracked by the survey is $139,000. By comparison, the average inheritance received by individual recipients in probate data is $227,000.

Part of the difference may be due to inheritances from small estates, which do not require probate (Appendix B.1). Inheritances of this type may be captured in HILDA, but will not appear in probate data, and will invariably be smaller than average, bringing the observed HILDA average down.

But the exclusion of some small inheritances from probate data cannot fully explain the differences observed between the two datasets. HILDA data includes very few large inheritances (for example, over $1 million) compared to probate data, indicating that HILDA is systematically missing or under-reporting large inheritances. This could be because:

- Inheritance information in HILDA is self-reported, so may be less accurate than the amounts calculated in probate documents. Inheritance information in HILDA is captured via the question: 'How much did you receive from inheritances / bequests during the last financial year?'. It is unclear whether respondents will interpret this as including real estate and other non-cash assets, or whether they will accurately estimate the value of such assets.
- HILDA does not capture individuals who were living in aged care at its commencement in 2001, though it does capture people in its original sample who have since moved into aged care. It is likely that many spouses receiving inheritances are living in aged care when they receive an inheritance. Thus, the HILDA sample may be underweight in spouses receiving inheritances. Our analysis of probate files found that inheritances received by spouses are larger on average, since a surviving spouse typically receives the bulk of the total estate.

Data shortcomings may lead to an understatement of overall average amounts. But it is unlikely that biases in self-reporting will affect survey years differently, meaning trends we observe over time are unlikely to be distorted.

While it is possible that understatement of inheritances would be greater for wealthier individuals, this is unlikely to materially change the conclusions we have drawn regarding inheritance patterns for wealthier individuals.

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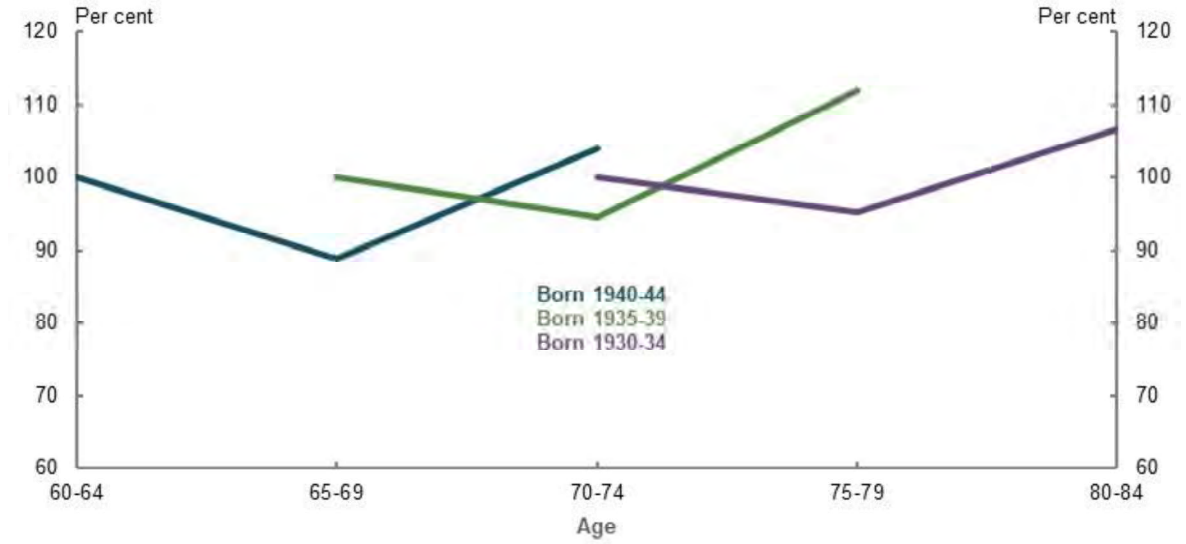
Current retirement outcomes

Consumption of assets

In general, retirees do not consume their retirement savings. Net financial wealth (including superannuation but not housing) grows in retirement, apart from a decline associated with the GFC (Chart 5A-10). For age pensioners, this is true across all asset types (including superannuation, housing and other savings), regardless of wealth levels and whether they recently started or finished their retirement (Asher, et al., 2017).[292] While this is a general trend, some age pensioners do consume more of their assets than others:

- Around 10 per cent of single age pensioners consumed 90 per cent of their assets in an eight-year period.[293] A small number of them exhausted all their assets (Asher, et al., 2017, p. 585).
- Long-term singles (those who entered retirement single) and non-home owners who receive the Age Pension tend to consume their assets faster than other households (Asher, et al., 2017, pp. 600-601).
- Younger, wealthier retirees have slightly higher rates of asset consumption, decreasing with age (Asher, et al., 2017, p. 585) (see *2C. Maintaining standards of living in retirement*).

Chart 5A-10 Household net financial wealth by age cohort, excluding the family home, relative to 2005



Note: Based on net financial wealth from the 2005-06, 2009-10 and 2015-16 iterations of the Survey of Income and Housing. Net financial wealth is total net wealth excluding the value of the principal place of residence (and related mortgage liabilities), personal effects and motor vehicles. Deflated by CPI. Source: (Daley, et al., 2018b).

As a result, when retirees die, most leave the majority of the wealth they had at retirement as a bequest (Daley, et al., 2018b, p. 32; Reeson, et al., 2016). Data provided by a large superannuation fund found members who died left 90 per cent of the balance they had at retirement. Another study found a similar result: at death, age pensioners leave around 90 per cent of the assessable assets they had at the point of retirement (Asher, et al., 2017, p. 585). This suggests that retirees tend to consume only the income derived from assets and not the assets themselves.

[292] Department of Social Services payment data.
[293] Asher et al. used a Department of Social Services random sample from 1999 to 2007.

The evidence suggests the Age Pension means test taper does not have a strong effect on people drawing down or consuming their assets. Department of Social Services administrative data shows age pensioners generally maintain their assessable assets well into their later years, with a large proportion increasing or maintaining their assets holdings.[294] This result occurred both when the assets test taper was reduced to $1.50 (from 2007 to 2016) and at its present rate of $3.

Consumer surveys and anecdotal material presented in submissions support these findings and reveal that Australian retirees are keen to preserve their savings throughout retirement.
One stakeholder noted:

> *'…retirees express concern or distress about the difficulty of living off the earnings from their retirement lump sums. The suggestion that they should be drawing down on the lump sum to improve their income is strongly resisted, even when they are of an advanced age and have a significant lump sum.'*
> *(COTA, 2020, p. 28)*

This lack of consumption of retirement assets is consistent with studies conducted in the US and the Netherlands (Ooijen, et al., 2015; Dynan, et al., 2004).

Draw down of superannuation assets

Maintenance or growth of balances in retirement occurs despite policy settings in the retirement phase that are designed to influence drawdown behaviour.

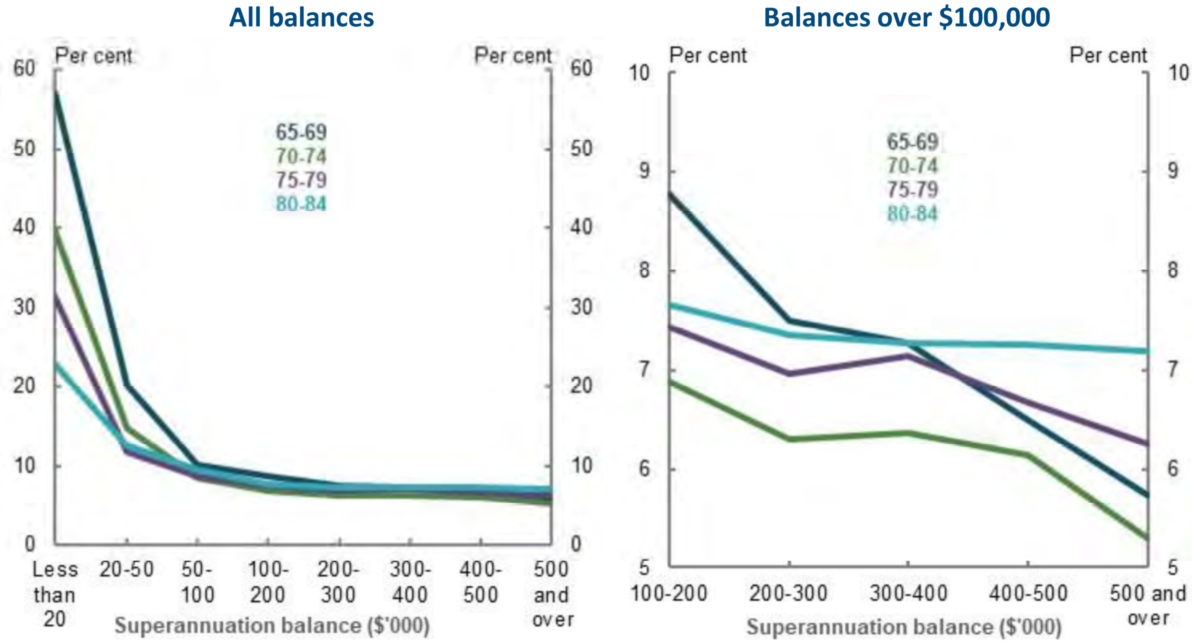
- **The Age Pension means test.** The test is designed to encourage people to use their own resources before 'calling on the Government for support' (Department of Social Services, 2015). This encourages use of assets in retirement by withdrawing support for people as their level of assets increase. Retirees affected by the assets test who draw down their superannuation and other financial assets more quickly receive increased Age Pension support over their retirement. Australia is unique in having two different Age Pension means tests: one based on assets and the other one is income (see *1B. Design of Australia's retirement income system*).
- **Superannuation drawdown rules.** Each year, people are required to withdraw a certain percentage of their superannuation, based on their age, to maintain their earnings tax exemption in retirement. The percentage that must be withdrawn each year increases with age. The purpose of these rules is to ensure that savings receiving the earnings tax exemption are used for retirement income purposes and not for estate planning purposes (The Treasury, 2016c, p. 3). The rules are not designed for people to optimise their retirement income.

The higher a person's superannuation balance, the more likely they are to draw down at the minimum rate (Chart 5A-11). Drawing down at the minimum rate is likely to leave a large balance at life expectancy (currently around 85). The Australian Government Actuary projected the nominal superannuation balance at death for someone who died at or before age 90, and drew down at the minimum rate, would be larger than their balance when starting retirement (Treasury 2016, p. 5).

People on lower balances draw down at much higher rates than those with higher balances across all ages in retirement. This is consistent with findings that most people who take a lump sum from superannuation have low balances (Productivity Commission, 2015b).

[294] Department of Social Services analysis of payment data, 31 December 2012 and 31 December 2017.

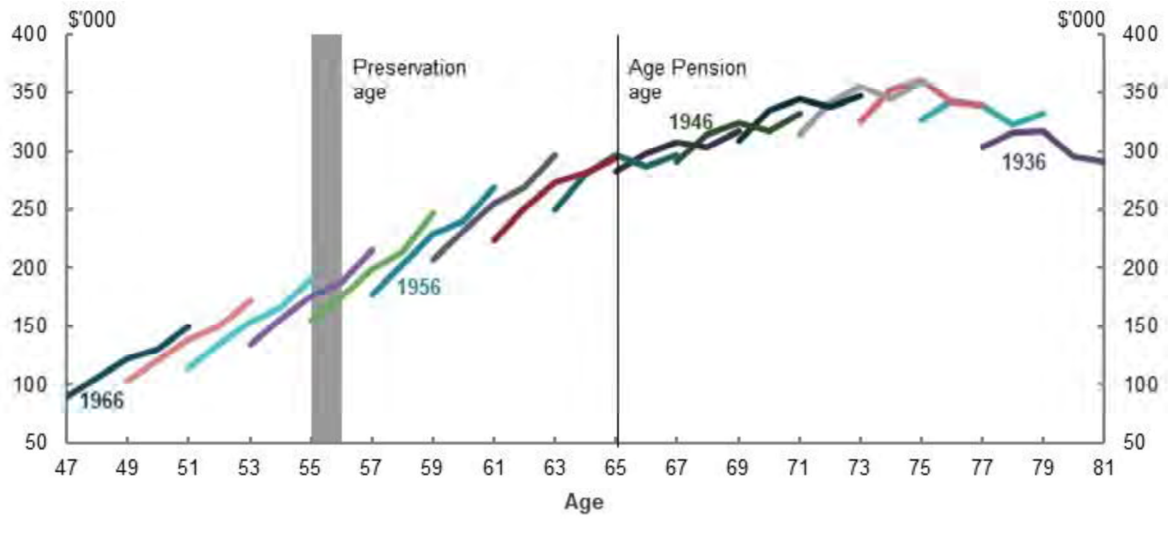
Chart 5A-11 Median superannuation drawdown rates, by age group and asset level



Source: Analysis of Rice Warner data, 2018.

Superannuation assets have tended to grow in retirement (Chart 5A-12), instead of declining as would be expected if assets were funding retirement. This means investments have tended to equal or exceed drawdown rates.

Chart 5A-12 Average superannuation balances, by age cohort



Note: Values are in 2017 dollars deflated by CPI. ALife data, 10 per cent sample. Data for 2013 to 2017, members with balances above zero dollars at 30 June 2013. Includes every second one-year birth cohort born 1936-66. Source: (Polidano, et al., 2020).

While the tax data shows a drop in the average superannuation balances of people in the oldest cohort born in 1936 (Chart 5A-12),[295] Department of Social Services analysis of payment data relating

[295] This group represents a very small portion of the retiree population: approximately 0.1 per cent of the population of those with superannuation balances were born in 1936. Analysis of Survey of Income and Housing 2017-18.

to age pensioners does not show any significant change in assessable assets in the five years before death.[296]

Low consumption of superannuation precludes higher living standards. People could have a higher standard of living, either in retirement (by consuming more) or during their working lives (by saving less).

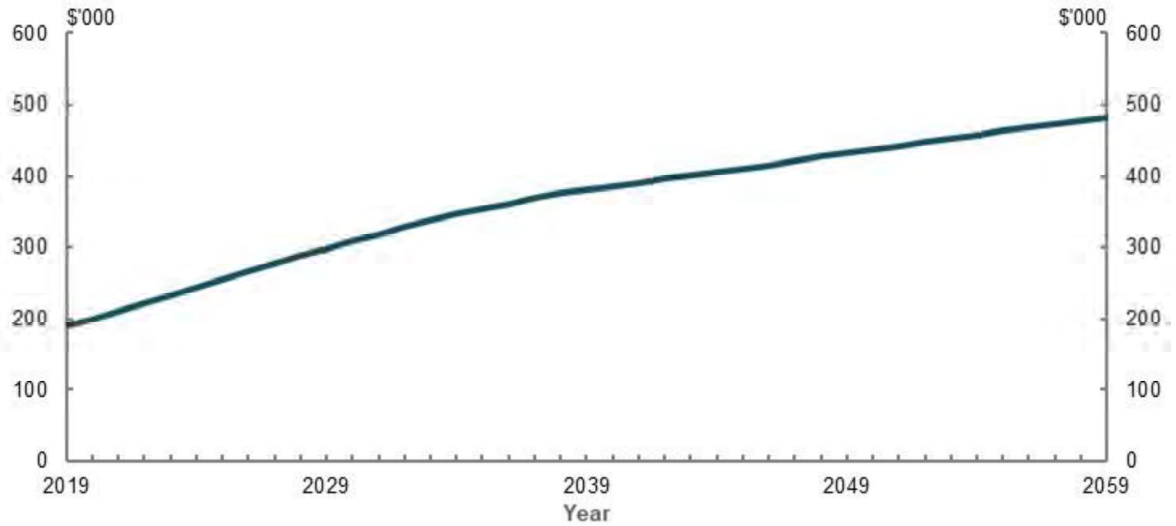
Reflecting the retirement income system's intent to generate income for retirement, most adequacy analysis assumes superannuation assets are used in full or large part in retirement (Australia's Future Tax System Review, 2009, p. 68; Dawkins, 1992; Grattan Institute, 2020; Rice Warner, 2019c; The Treasury, 2002)

If superannuation was consumed more efficiently in retirement, most people would have higher replacement rates. The median earner's replacement rate is up to 19 percentage points higher if they consume their superannuation assets in retirement, relative to drawing down at minimum rates (see Chart 2C-18 in *2C. Maintaining standards of living in retirement*).

Drawing down and consuming assets is the most effective way for people to achieve adequate retirement incomes. It is especially important during periods of significant economic shocks and financial market volatility, such as the COVID-19 Pandemic. With ultra-low interest rates and reduced dividend payments, returns alone cannot be expected to generate sufficient income; retirees will need to draw down savings. Drawing down must be combined with strategies to effectively manage investment and sequencing risks (see *2C. Maintaining standards of living in retirement*).

Without a change to retirees' drawdown behaviour, bequests from superannuation will grow. Rice Warner projections show average death benefits from superannuation for people aged 65 and over are expected to grow in real terms from an average of $190,000 in 2019 to more than $480,000 by 2059 (Chart 5A-13). Aggregate death benefits are projected to increase from around $1 of every $5 paid from the superannuation system in 2019 to around $1 of every $3 paid out by 2059. Bequests from housing assets will also increase if housing assets continue to grow and retirees avoid drawing on their housing wealth.

Chart 5A-13 Projected average superannuation death benefits for population aged 65 and over



Note: Values are in 2019 dollars, deflated by CPI. Source: Analysis of Rice Warner estimates for the review.

[296] Department of Social Services analysis of payment data, 31 December 2012 to 31 December 2017. Captures people who died in 2018.

Box 5A-4 Bequests and low consumption in retirement

Bequests do not appear to be a high priority for retirees. Despite the significant number of bequests, several surveys found 'leaving a bequest' is one of the least important retirement savings objectives for people (National Seniors Australia and Challenger, 2017; Alonso-Garcia, et al., Forthcoming; Hobman & Reeson, Forthcoming; Mercer, 2019a). One study found bequests ranked 18 out of 19 possible savings motives in retirement (Alonso-Garcia, et al., Forthcoming, p. 27). Similarly, bequests ranked last out of nine possible attributes for savings in a consumer group survey (National Seniors Australia and Challenger, 2017, p. 9). They ranked among the bottom three desired retirement income product features in another survey (Mercer, 2019a, p. 4).

The bequest motive may be different for the principal residence. Some researchers suggested the principal residence serves a dual purpose: allowing people to fund out-of-pocket aged care and health expenses as needed and, if not needed, leaving a bequest (CEPAR, 2019). In a Productivity Commission survey (2015a, p. 14), 71 per cent of respondents said they saw the family home as a safety net for adverse events, and 44 per cent said they wished to pass the family home on to their children.

Consumption of housing equity

Retirees tend to avoid using housing wealth to fund their retirement, despite it being their largest store of wealth (Whelan, et al., 2019). Yet, research shows Australians are increasingly likely to borrow against the value of their home for other purposes, such as purchasing investment property (Ong, et al., 2019).

The Government has two programs to encourage the use of housing equity to fund living costs in retirement (see *1B. Design of Australia's retirement income system*).

- **Pension Loans Scheme**. Take-up of this scheme, while increasing, remains low (Table 5A-2). Some stakeholders suggested the name of the scheme and the way eligibility for the scheme is described undermine take-up, as non-pensioners may not understand they are eligible.
- **Downsizer contribution scheme**. Between 1 July 2018 and 17 January 2020, more than 9,000 people made downsizer contributions, with an average contribution of $230,000.[297]

The existence of many 'asset rich, income poor' retirees on the Age Pension suggests home equity release has significant potential to help support retirement incomes (see *3C. Home ownership status*).

Table 5A-2 Use of the Pension Loans Scheme

	June 2018	March 2020
Participants	642	2,288
Number of new loans	80 (six months prior)	1,500 (nine months prior)
Average debt	$45,366	$18,884
Largest debt in scheme	$345,863	$423,250

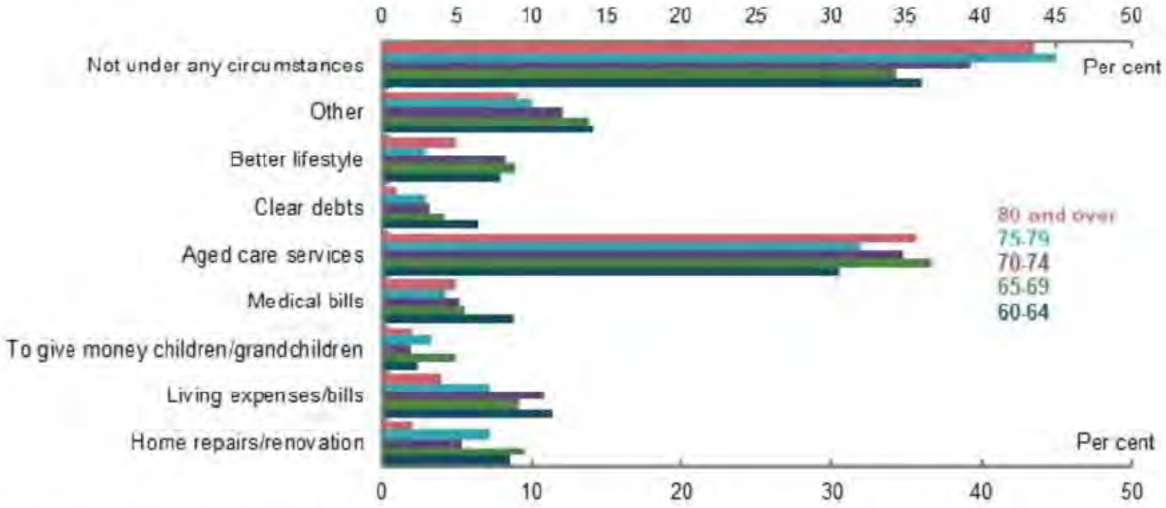
Source: Department of Social Services payment data.

Despite these Government initiatives, and the potential benefits of equity release products (Box 5A-5) especially for retirees who are asset rich and income poor, retirees still tend to draw less on home equity than other assets. This is because they:

[297] Data provided by the ATO for the review.

- Want to use their home equity to fund future expenses such as aged care services (Chart 5A-14) (Productivity Commission, 2015a)
- View mortgage equity products as inherently risky (Ong, et al., 2013, p. 2) and do not understand the nature of Government programs such as the Pension Loans Scheme (Davis, 2020)[298]
- Wish to 'age in place', lack suitable downsizing options or want to pass on their principal residence to heirs (CEPAR, 2019; Productivity Commission, 2015a, pp. 68-69)
- Are put off by transaction costs, such as stamp duty, and the difficulty of moving (Productivity Commission, 2015a)

Chart 5A-14 Circumstances in which retirees would draw down the equity in their home, by age



Source: (Productivity Commission, 2015a, p. 58).

Box 5A-5 The home equity release market

Retirees can access the equity stored in their home by downsizing or through different types of equity release products,[299] including:

- **Reverse mortgages**. The most common equity release product, where the capital accessed and accumulated interest are paid back when the owner sells the home (Productivity Commission, 2015a)
- **Home reversion**. Where a retiree sells a proportion of the future value of their principal residence while they continue to live there. The share is sold for a discounted portion of the market value. The household receives a lump sum and keeps the remaining proportion of the home equity (Moneysmart, 2020)
- **Home equity loans.** This is essentially a mortgage. Traditional home equity loans have a repayment term, just like regular conventional mortgages. People make regular, fixed payments covering both principal and interest. As with any mortgage, if the loan is not paid off, the property could be sold to satisfy the remaining debt

[298] In his submission to the review, Davis (2020) noted households generally do not understand there are no repayment obligations under the Pension Loans Scheme until the property is sold and suggested it would be more attractive to retirees if presented as cash outflows associated with repayment of a loan rather than 'pension and loan payments'.

[299] For more information on different products available see https://moneysmart.gov.au/retirement-income/reverse-mortgage-and-home-equity-release.

Table 5A-3 Factors constraining Australia's home equity release market

Demand factors	Supply factors
The value of the principal residence is excluded from the Age Pension means test. If accessing the equity released in the principal residence affects a retiree's Age Pension eligibility, this option is less attractive than drawing on other assets.	Lenders have high barriers to entry, including capital adequacy regulations, difficulties in obtaining wholesale funding and low interest rates squeezing profit margins (ASIC, 2018c, p. 53).
People generally have negative perceptions about home equity release products, believing they take advantage of vulnerable people or contribute to elder abuse (ASIC, 2018c).	Anecdotal evidence suggests potential providers are concerned about reputational risks if retirees release equity in their principal residence without informing beneficiaries.

The private market for home equity release is still relatively small compared to the 1.9 million home-owning households aged over 65 in 2017-18 (ABS, 2019n). At the end of 2014, reverse mortgages totalled around 40,000 (Productivity Commission, 2015a). Anecdotal evidence suggests the market may have since dropped to less than 30,000.[300] Australia has a limited number of reverse mortgage providers, with just two writing 80 per cent of new loans from 2013-2017 (ASIC, 2018c). Other private equity release products are available, including debt-free products such as fractional property investment, but these have even smaller take-up.

Other countries have seen stronger growth in the equity release market. In particular, the UK had rapid growth in equity release products across all regions (Equity Release Council, 2019), albeit off a low base. Market innovation has played a role in this development (Rozario, 2012), as well as policy initiatives. For example, in the UK an inheritance tax of 40 per cent of the value of an estate worth more than £325,000 (more than A$550,000) may encourage capital draw down.

Risk and uncertainty

Low consumption of assets in retirement is partly the result of people insuring themselves against risk and protecting themselves from uncertainty. Retirement involves complex risks and uncertainties, which people often struggle to understand:

- **Market risk**, including the risk of negative returns.
- **Longevity risk**. The risk of running outliving one's savings, which tends to increase if returns are invested conservatively to manage market risk.
- **Inflation risk**. The risk of living expenses increasing more than expected.
- **Sequencing risk**. The risk of converting assets to income during an economic shock, like the GFC or the COVID-19 Pandemic.

Choosing a suitable retirement income product and drawdown pattern involves understanding and trading off these risks, as well as future and present consumption. This sort of complex risk calculation is normally done by actuaries, who are trained in understanding and calculating complex risks. Many people overestimate their likely future spending on health and aged care because they do not know or understand the value of in-kind support the Government provides for these services (see *4. Sustainability*).

Longevity risk

Retirees want to be debt-free and feel financially secure in retirement (Orford Initiative, 2019).

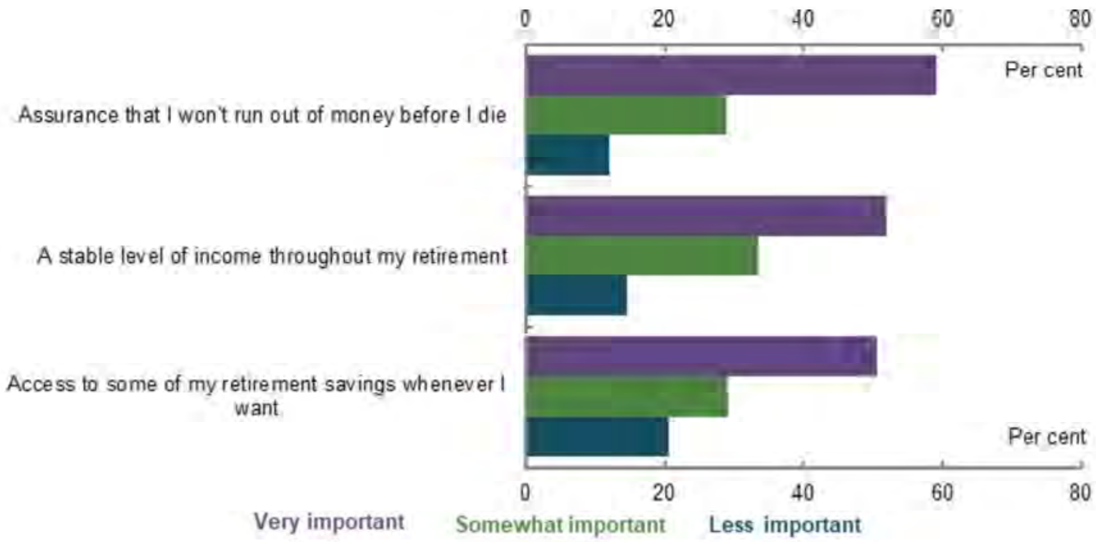
Many retirees are concerned they will run out of money before death (Rees, et al., 2018), even though most die with a substantial proportion of their wealth intact. This could be because people

[300] Department of Social Services.

misunderstand how compounding affects savings growth (savings invested in superannuation do not grow linearly, but exponentially) and do not take into account earnings when they consider their savings (McKenzie & Liersch, 2011). Emphasising that the Age Pension protects people from longevity risk could help to ease some of these concerns. However, many retirees are also concerned about the stability of Age Pension settings (see *Uncertainty and precautionary savings*, below).

Income streams that provide longevity risk management can be funded publicly (the Age Pension) or privately (annuitised products or defined benefit pensions). People aged 55 and over say they value longevity risk management features in retirement income products more than other retirement income product features (Chart 5A-15), but they generally do not invest in products that have these features.

Chart 5A-15 Importance of retirement income product features



Note: More than 1,000 survey respondents aged 55 and over. Source: (Mercer, 2019a, p. 3).

At June 2019, around 83 per cent of accounts in the pension phase were invested in account-based pensions that do not manage the risk of running out of money in retirement.[301] Most of the remaining assets are invested in term annuities, which only provide a guaranteed income stream for a limited period and therefore do not manage longevity risk beyond the term of the product.

Retirees may be self-insuring against longevity risk and only consuming the minimum necessary in order to avoid running out of savings (Financial System Inquiry, 2014, p. 120). Explanations for this behaviour include the current framing of annuities and their complexity, perceived lack of value for money, and the role of the Age Pension in providing a constant income stream (see Box 5A-15). Other contributing factors are the role of funds in only offering account-based pensions, as well as the incentives for financial advisers to recommend products that require regular monitoring and subsequent financial advice.

Longevity risk protection should encourage people to consume their other assets. However, evidence from the US suggests even people with guaranteed, constant income streams are unlikely to draw down their non-pension assets to generate income. Evidence from the US shows defined benefit recipients consume less of their non-pension assets than other retirees (Banerjee, 2018).

These findings suggest retirees are still reluctant to draw down their assets, even if they have a high degree of longevity risk protection. It appears retirees may be influenced by a desire not to spend

[301] Calculations using (Australian Prudential Regulation Authority, 2020a).

their assets (asset-framing bias). Concern about outliving savings is unlikely the sole driver of current drawdown behaviour.

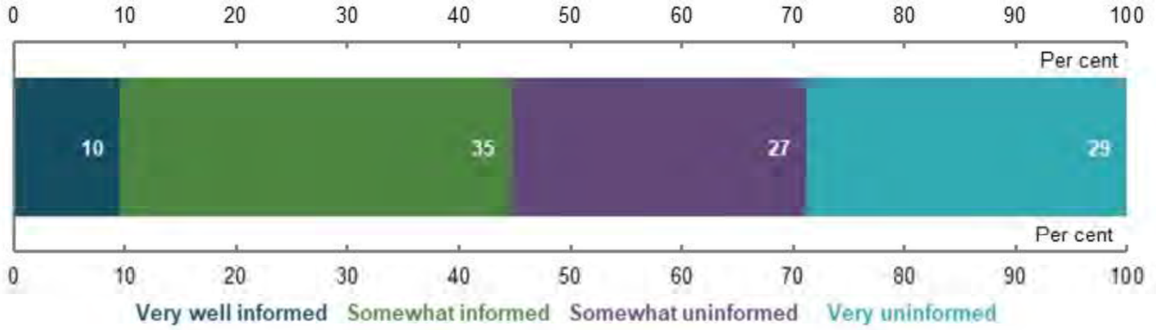
Uncertainty and precautionary saving

Retirees may also be managing the risk of the need to fund lump-sum expenditure by avoiding drawing on their retirement savings. Some academic literature and submissions suggest fears around aged care costs could hold retirees back from drawing down on their assets in retirement (Daley, et al., 2018b; Productivity Commission, 2015a; Actuaries Institute, 2019, p. 31; CEPAR, 2019; Asher, et al., 2017, p. 595). Retirees are more likely to draw down their savings in countries with greater public coverage of aged care and health care, than in countries like Australia, where retirees fund some of their own aged care costs (Daley, et al., 2018b, p. 33). However, it is unclear whether there is a causal link, or whether the difference in behaviour is a result of cultural or attitudinal factors, such as different attitudes towards relying on social security in different countries.

Health and aged care costs are heavily subsidised in Australia. Most people's expenditure on these items does not increase significantly during retirement (see *Appendix 6A. Detailed modelling methods and assumptions* and *4. Sustainability).* But households may not be aware of the extent of Government subsidies, especially given the complexity of aged care means-testing arrangements (Box 5A-6). Researchers have argued that many retirees do not realise the value of the aged care safety net (CEPAR, 2019, p. 34).

In contrast, aged care literacy and concern about aged care are low (Mercer, 2019a; Rees, et al., 2018; Aged Care Financing Authority, 2018, p. 35) (Chart 5A-16) and many people may not consider aged care costs when deciding whether to draw down their assets. Surveys suggest many people are not interested in finding out more to help them plan for retirement and would prefer not to think about aged care (Aged Care Financing Authority, 2018, pp. 32-33; McCallum, et al., 2019, p. 23). Another survey found only 25 per cent of respondents were concerned about covering aged care costs (Mercer, 2019a). This remained consistent even as people aged.

Chart 5A-16 How informed people feel they are about aged care costs and the steps involved



Note: Respondents aged over 40. Source: Investment Trends October 2019 Retirement Income Report.

People's confidence in their ability to fund aged care costs appears to be linked to household income and home ownership. Households with incomes above $50,000 were more likely than those with lower incomes to have confidence in their ability to pay aged care costs (Aged Care Financing Authority, 2018, p. 34). Home owners without a mortgage were more confident than those with a mortgage or renting (Aged Care Financing Authority, 2018, p. 34).

A National Seniors survey found that, for those who had considered how to fund aged care, their principal residence was the main source of funding (McCallum, et al., 2019, p. 23). However, only a minority of retirees said they would consider drawing on the principal residence for aged care or health expenses (Productivity Commission, 2015a). Aged care costs were the most reported reason a person would draw down home equity (almost 40 per cent) (Chart 5A-14). However, the same proportion said they would not draw down under any circumstances. Some retirees may sell the

principal residence to pay a Refundable Accommodation Deposit (or RAD) and/or to fund their aged care expenses (Box 5A-7).

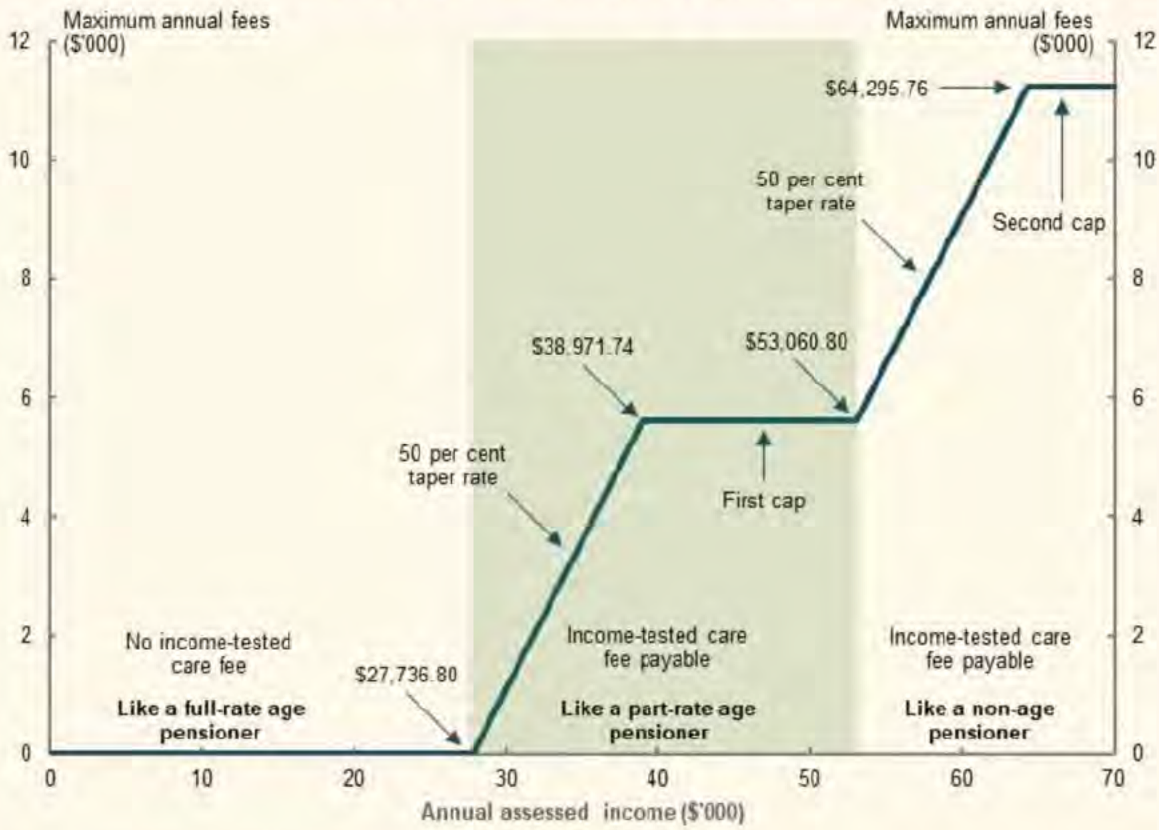
While aged care costs might explain some of the reticence to draw down on housing assets, it is unlikely to be a major driver of the low draw down of superannuation assets.

Box 5A-6 Aged care — types and means testing

Aged care services and costs depend on the care type retirees choose:[302]

- **Commonwealth Home Support Program**. Provides low-level support at home. Services include access to nursing, meals, home modification and transport. Care is not formally means tested. People may pay a co-contribution payment, which varies based on the services required and the fees set by providers.
- **Home Care Packages**. Provides higher-level home support for those with more complex care needs. Four levels of packages are available based on the person's care needs. Most people pay a basic daily fee, depending on their package level ($9.63 to $10.75 per day). Some are required to pay an income-tested care fee of up to $30.86 per day (Chart 5A-17).

Chart 5A-17 Income test for home care

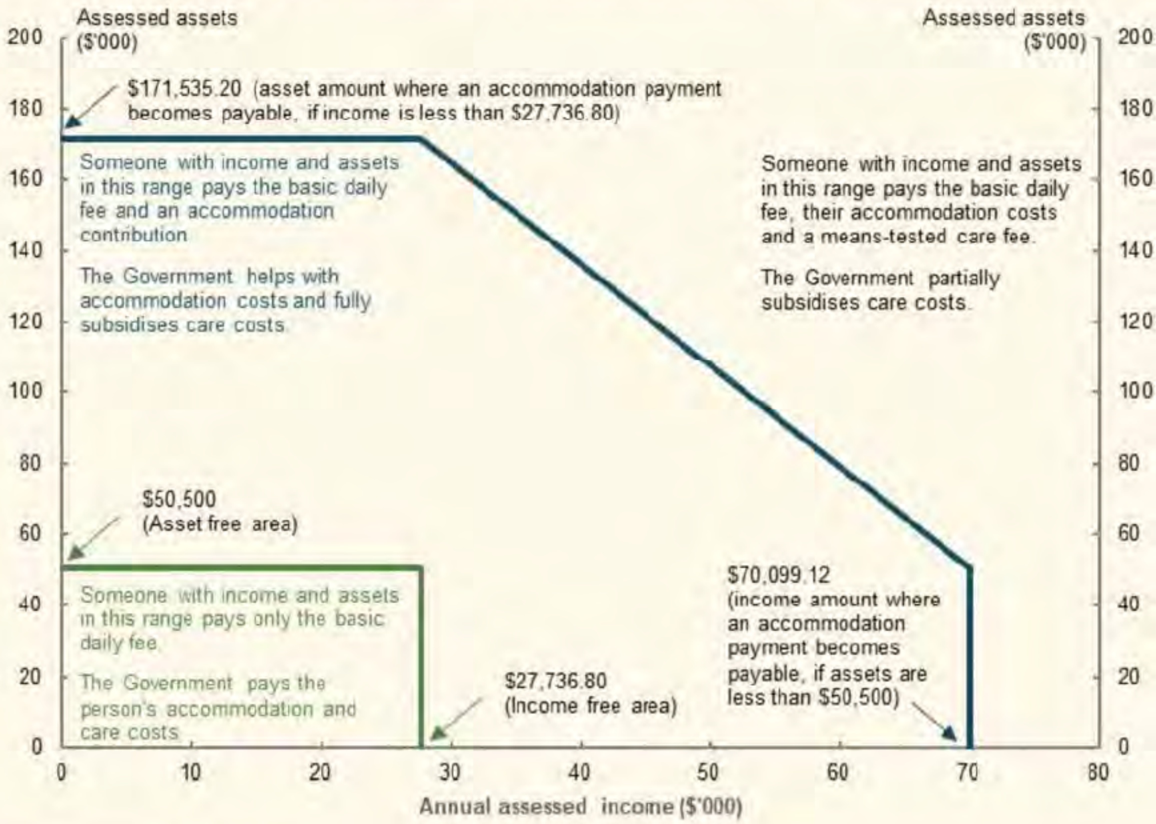


Source: Department of Health.

- **Residential care**. Provides full-time care and accommodation for people who are no longer able to live independently in their home. All residents pay the basic daily fee (set at 85 per cent of the single base rate of Age Pension) to cover daily living costs, such as meals, cleaning and laundry. People may also pay a means-tested care fee and/or fully or partly cover their accommodation costs (see Chart 5A-18). Many residential facilities also offer optional 'extra' or 'additional' services at a cost to the resident.

[302] All fees and caps correct as at 1 May 2020.

Chart 5A-18 Means test (assets and income) for residential care



Source: Department of Health.

To assess assets for means-tested care fees, the value of the principal residence is capped under the means test unless the property is:

- Occupied by a protected person (a partner, dependent child or eligible carer living in the home with the resident for at least two years), in which case the value is not included at all
- Sold, at which point the full value is included

Table 5A-4 Means testing of residential aged care

Annual income ($)	Assets ($)	Area in diagram above	Basic daily fee ($)	Means-tested care fee ($)	Accommodation payment
Below 27,737	Below 50,500	Inside green box	52.25	Nil	Nil
27,737 to 70,099 (50% taper)	50,500 to 171,535 (50 per cent taper)	Outside green box, inside blue line	52.25	Nil	Partial payment (Government subsidy available)
70,099 and above	171,535 and above	Outside blue line	52.25	Up to 259.15, up to an annual cap of 28,087.41 per year or lifetime cap of 67,409.85 home and residential care combined	Full cost payable

Source: (Department of Health, 2020a).

Fee caps

Annual ($28,087.41) and lifetime ($67,409.85) caps on combined means-tested care fees in home and residential care currently protect those who may require aged care services for long periods of time, from very high costs. These caps are a form of social insurance. Both the Aged Care Financing Authority and the *Legislated Review of Aged Care 2017* recommended the caps be removed (Aged Care Financing Authority, 2019; Tune, 2017).

Currently, only a small number of people (1.8 per cent of people in residential care, 2018-19) reach the annual cap, and even fewer reach the lifetime cap (0.8 per cent of people in home and residential care in 2018-19).[303]

Box 5A-7 Using retirement income and assets to cover aged care costs

The costs associated with residential care accommodation can be paid as a refundable lump-sum deposit (RAD), as a non-refundable ongoing Daily Accommodation Payment (DAP) or a combination of both. Residential aged care providers often prefer RADs because they can be used for capital financing. But providers can no longer *require* consumers to pay a RAD. Increasingly, people are choosing to pay their accommodation fees daily, rather than as a lump sum (Aged Care Financing Authority, 2019). In 2017-18, 73 per cent of the aged care population paid their accommodation fees by either a DAP or a combination of the DAP and RAD (Aged Care Financing Authority, 2019, p. 120).

People have a range of options for funding aged care, depending on their total means and how their assets are invested. Stakeholders considered equity release and private insurance were underutilised options that are likely to be more efficient than precautionary saving. Some academics are currently exploring the viability of long-term care insurance in Australia (National Seniors Australia, 2020; CEPAR, 2019, p. 32).

If people are able to meet all their aged care costs using regular payments, having a steady income stream may give them a greater degree of comfort that they can meet these costs. Private income streams can be created by drawing down financial assets (such as superannuation), using housing assets through equity release, or (if available) purchasing long-term care insurance.

However, most people in home and residential care are full-rate Age Pension recipients. In June 2016, 82 per cent of people in home care and 60 per cent of new residential care admissions were full-rate Age Pension recipients (Tune, 2017, p. 160). As the superannuation system matures and people retire with more savings, future generations may be better able to contribute to their aged care costs.

Complexity and defaults

As well as the risks and uncertainty already discussed, retirement involves multiple decisions and difficult trade-offs. At retirement, people face decisions around:

- **When to retire**
- **Whether to keep their money in the superannuation system**
- **How to invest their savings**
- **How to draw down their savings**
- **Their future need to meet any lumpy expenditure**

Retirees have very little opportunity to learn from past experience when making these decisions, and it may be some time for the consequences of decisions to be realised. This makes it almost

[303] Data provided by the Department of Health for the review.

impossible for retirees to determine an optimal retirement income strategy on their own (Box 5A-8). Very few people seek help when making decisions (see *Improving outcomes*, below).

Interactions with other systems make the retirement income system more complex. The retirement income system interacts with many other different systems and rules in complicated ways, including:

- **The aged care system.** Home support, home care and residential care each have a different means test, which is different again from the Age Pension means test (Box 5A-6)
- **Housing.** People may need to navigate the Age Pension means test, the Pension Loans Scheme and the downsizer contribution in addition to tax rules such as stamp duty, capital gains tax, land tax and other housing rules
- **Tax rules.** Many different tax rules apply, such as to Transition to Retirement Income Streams, offsets and rebates, contributions caps, different Medicare Levy thresholds and the tax-free parts of bona-fide redundancy and approved early retirement scheme payment limits.
- **The social security system**, including Commonwealth Rent Assistance, FTB, Mobility Allowance, Remote Area Allowance and concession cards.

Box 5A-8 Complexity leads to misunderstandings and misconceptions

The views below represent perspectives observed in press articles, surveys and some submissions. These concerns are real and affect how people behave. However, they are generally not supported by evidence.

Adequacy of retirement income/retirement expenditure needs

- 'I need to preserve my assets in case I get sick or need aged care.'
- 'I will need to pay for most of my health costs in retirement.'
- 'I need $1,000,000 in superannuation for an adequate retirement income.'

Retirement income products and investment strategies

- 'The best investment strategy in retirement is very low risk, such as cash.'
- 'Investing in real estate is a better investment strategy for retirement.'

Age Pension

- 'The Age Pension is earned during working life. Taxpayers "pre-pay" for it through their taxes.'
- 'The Age Pension will become unaffordable. Most people in the future won't receive it.'

Superannuation

- 'The minimum drawdown rate is what the Government recommends.'
- 'If I withdraw my money from superannuation, I must spend it.'
- 'I should only draw down the income earned on my assets — not the capital.'

In complex situations, people get cognitive or choice overload and disengage or rely on shortcuts to help them make decisions, instead of assessing the options to make the best decision (Productivity Commission, 2018a). In complex situations people tend to:

- Rely on heuristics (rules of thumb) and pick options they understand (Benartzi & Thaler, 2007)
- Stick with what they know
- Stick with the default option
- Follow others

- Procrastinate, disengage or avoid making the decision[304]
- Be prone to misleading advice (Reeson & Dunstall, 2009)

At retirement, in the face of complexity, people fall back on defaults, even if these defaults were not designed for the purpose people use them. For example, many people rely on 'easy' options such as selecting an account-based pension and withdrawing at minimum draw down rates, or withdrawing their superannuation and placing it in a bank account. Selecting a good option involves time, money and effort, and requires giving retirees more support. The behavioural biases particularly relevant to current decision-making in retirement are default bias, anchoring and asset or 'nest egg' framing.

Default bias and anchoring

Many decisions in retirement are explained by defaults and people's reliance on rules of thumb (Bateman, et al., 2017). Research indicates retirees are strongly influenced by the statutory minimum drawdown rules:

- When people were told about minimum drawdown rates, they reduced their intended draw down from superannuation (Hobman & Reeson, Forthcoming).[305]
- People were willing to change their spending to match minimum drawdown rates (Alonso-Garcia, et al., 2017). This is consistent with research showing decisions at retirement are influenced by defaults (Bateman, et al., 2017).
- More than half of retirees older than 65 draw down at the minimum rate (Rice Warner, 2019b), and the median withdrawal amount for all ages is just above the minimum. At age 60, drawdowns bunch around the minimum and maximum amounts (Balnozan, 2018).
- One large superannuation fund reported around half of its members on an income stream chose a fixed nominal amount above the minimum, while the other half selected the minimum drawdown amount. Studies using APRA data found a similar pattern (Balnozan, 2018).

This suggests the minimum draw down rules may be acting as a 'default' option for many people when they select a draw down amount. For some, it is the easiest option to pick. For others, it is an 'anchor'; a reference point that informs their final decision on a draw down amount. The exception is the significant majority of people with low balances who withdraw larger amounts than the minimum (Chart 5A-11).

In addition to the difficulty of managing complex risks and uncertainties, most households need to combine multiple income sources to generate their retirement income. A typical retiree couple household combines at least four different income sources: the Age Pension, two superannuation accounts and assets outside of superannuation. Evidence suggests people prefer to have a stable income stream in retirement (Mercer, 2019a). To plan a stable income, people need to consider and integrate all income sources.

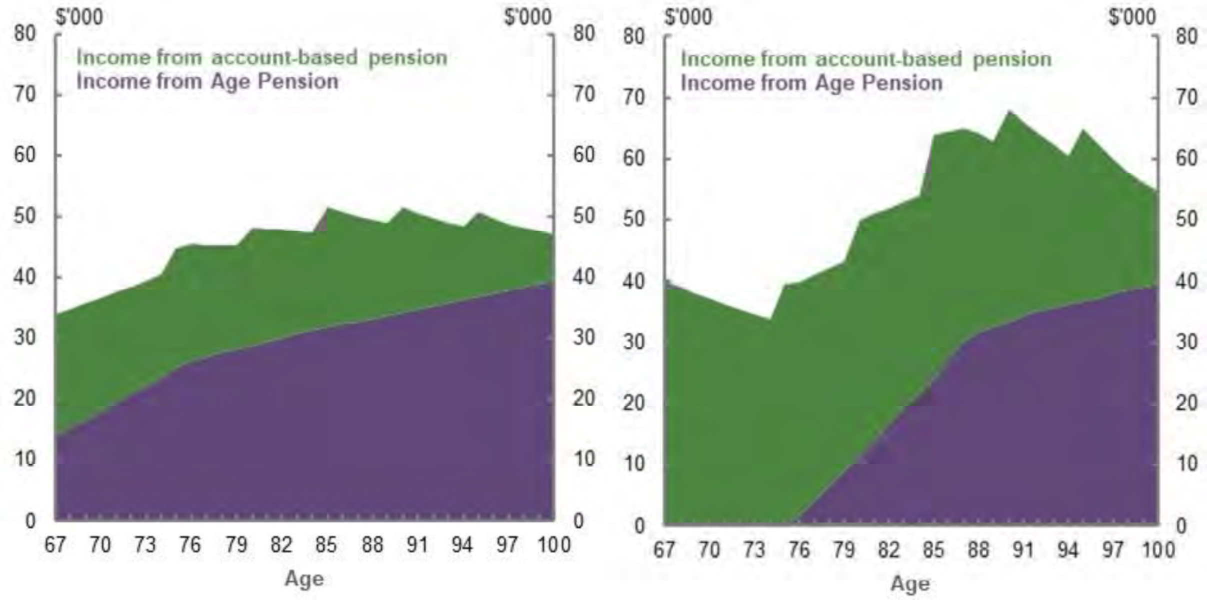
Current default settings in retirement contribute to income instability. The Age Pension means test, when coupled with minimum superannuation draw down requirements, does not lead to stable income for those affected by the assets test (Chart 5A-19). The income it delivers also tends to peak relatively late in retirement, at ages 85-90. This does not align with observed patterns of retiree consumption, which decline through retirement (see *Appendix 6A. Detailed modelling methods and assumptions*).

[304] Complex information makes it harder for people to react to bad outcomes, such as high fees (Thorp, et al., 2018). A large fund found some of its retired members are keeping assets in accumulation, despite the tax penalty. Willis (2017) argued some financial institutions deliberately design complex products to promote disengagement.

[305] However, people did not reduce their intended draw down when researchers focused them on the value of precautionary savings, or presented them with a scenario where people with children could leave a bequest.

Chart 5A-19 Annual retirement income if an account-based pension is drawn down at minimum drawdown rates, single home owner

$400,000 superannuation balance at retirement | **$800,000 superannuation balance at retirement**



Source: Cameo modelling undertaken for the review.

'Nest egg' framing

People are primed to save for retirement during their working lives, such as through compulsory superannuation. But, when they retire, they struggle with the concept that their savings are meant to be consumed to fund their retirement (Banerjee, 2015; Reeson, et al., 2016). People are primed to consider their savings are for saving, and not for spending. This 'savings mindset' is reinforced by the fact that superannuation is often described as a savings balance or even a 'nest egg', instead of in income terms (e.g. $500 a week). Evidence from the US suggests retirees are more reluctant to spend savings that they see as lump sums or investments, rather than as an income stream (Brown, et al., 2008; Madamba & Utkus, 2016).[306] Comments from an Australian consumer focus group support this finding:

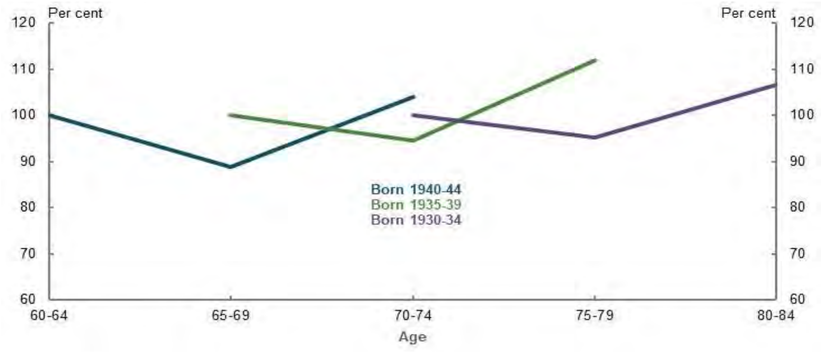
> *'At the moment I would be terrified to draw down on the super, I know we have a lot more super than most people, but we need it' (female, retired 20 years).*
>
> *'Big bills, I have an overdraft with the bank and pay for it out of that and then pay that back gradually over the year. Saves using the capital' (male, retired 22 years). (McCallum, et al., 2019, pp. 17-18)*

Another consumer focus group found people have three simple ideas to manage their finances in retirement: pay off the house, receive the Age Pension and hold on to all wealth (Orford Initiative, 2019, p. 13).

[306] The shift from defined benefit pensions towards lump-sum payouts in the US was accompanied by a decline in retirement asset consumption.

Section: 5A
Chart: 10
Title: Household net financial wealth by age cohort, excluding the family home, relative to 2005
Source: Grattan Institute (2018) Money in retirement: More than enough

Age	Born 1940-44	Born 1935-39	Born 1930-34
60-64	100.0		
65-69	88.8	100.0	
70-74	104.1	94.6	100 0
75-79		112.0	95.2
80-84			106.7



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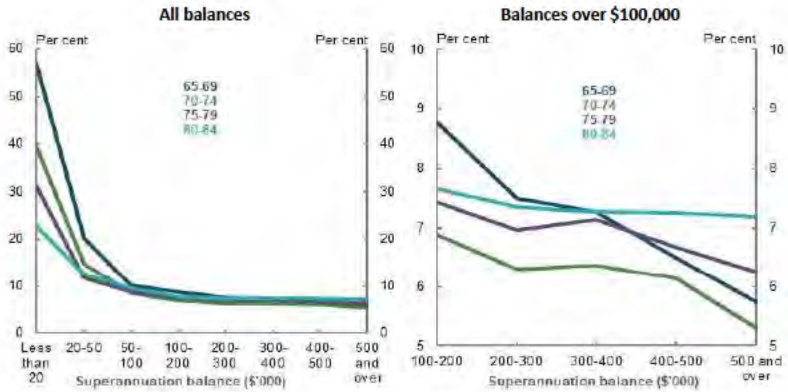
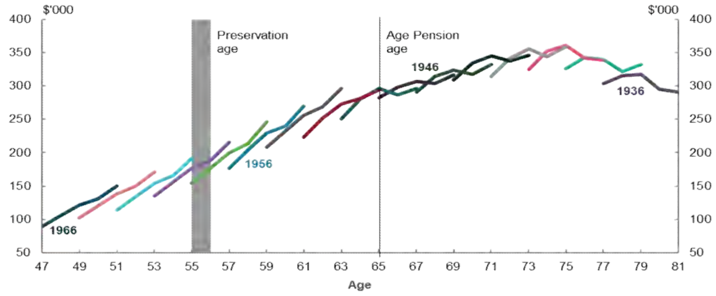
Section: 5A
Chart: 11
Title: Median superannuation drawdown rates, by age group and asset level
Source: Analysis of Rice Warner data, 2018.

Balance	65-69	70-74	75-79	80-84
Less than $20,000	57.0	39.6	31.3	22.8
$20,000 - $50,000	20.2	14.7	11.8	12.6
$50,000 - $100,000	10.2	8.4	8.8	9.5
$100,000 - $200,000	8.8	6.9	7.4	7.7
$200,000 - $300,000	7.5	6.3	7.0	7.4
$300,000 - $400,000	7.3	6.4	7.1	7.3
$400,000 - $500,000	6.5	6.1	6.7	7.3
$500,000 and over	5.7	5.3	6.3	7.2



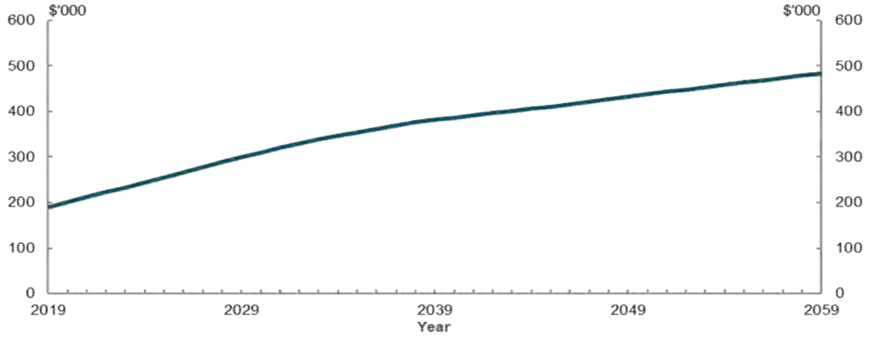
Section: 5A
Chart: 12
Title: Average superannuation balances, by age cohort
Source: Polidano et al. (2020) The ATO Longitudinal Information Files (ALife): A New Resource for Retirement Policy Research

Age	1936	1938	1940	1942	1944	1946	1948	1950	1952	1954	1956	1958	1960	1962	1964	1966
47																89.3
48																105.6
49															102.5	121.8
50															120.8	131.3
51														114.4	138.7	150.3
52														134.4	150.3	
53													135.3	154.2	171.6	
54													156.8	166.0		
55												154.7	176.4	191.3		
56												176.4	188.6			
57											176.8	199.6	215.9			
58											203.8	214.1				
59										208.0	229.5	246.5				
60										232.6	240.0					
61									223.5	255.9	269.7					
62									251.6	268.8						
63								250.4	273.4	296.6						
64								280.0	281.5							
65							282.7	295.9	294.1							
66							298.2	286.7								
67						290.9	307.2	296.0								
68						314.4	303.8									
69					308.5	323.9	316.7									
70					334.7	317.1										
71				314.6	344.8	332.9										
72				341.7	338.0											
73			324.8	356.2	346.6											
74			352.9	344.4												
75		326.3	360.5	359.3												
76		342.7	342.4													
77	303.6	339.7	339.2													
78	315.2	322.0														
79	317.3	332.1														
80	295.5															
81	290.7															



Section: 5A
Chart: 13
Title: Projected average superannuation death benefits for population aged 65 and over
Source: Analysis of Rice Warner estimates for the review.

Year	Death benefits
2019	190,000
2020	200,800
2021	211,700
2022	222,700
2023	233,500
2024	244,200
2025	254,800
2026	266,000
2027	277,400
2028	288,700
2029	299,300
2030	309,400
2031	319,500
2032	329,400
2033	338,800
2034	347,000
2035	354,400
2036	361,900
2037	369,100
2038	375,800
2039	381,500
2040	386,500
2041	391,300
2042	396,100
2043	401,100
2044	406,000
2045	411,000
2046	416,000
2047	421,600
2048	427,200
2049	432,400
2050	437,800
2051	442,900
2052	448,000
2053	453,400
2054	458,300
2055	463,500
2056	468,400
2057	473,300
2058	478,300
2059	483,100



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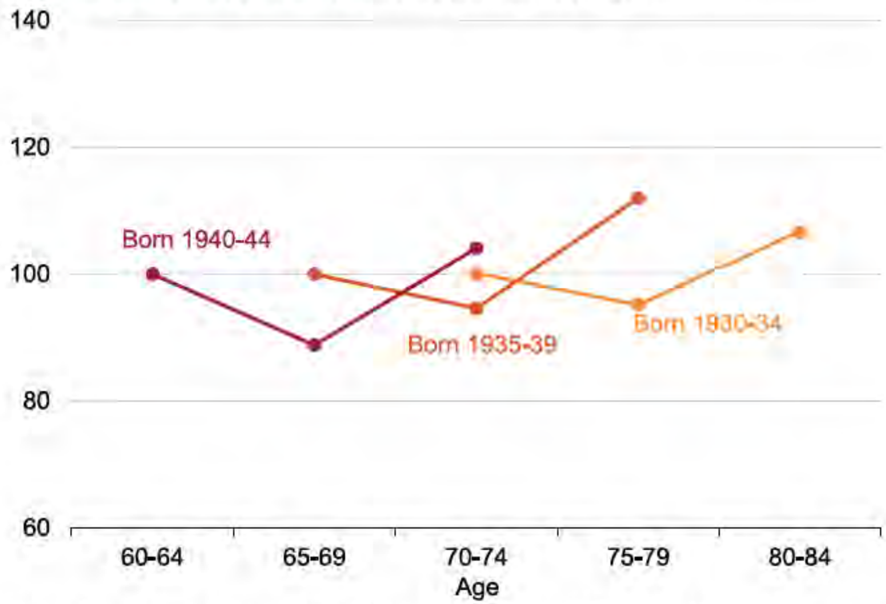
3.4.1 The extent of saving in retirement

Most retirees could afford to spend substantially more than they do, and choose not to do so. Not only do most retirees not drawdown on their savings, many are net savers through much of their retirement. Most retirees never spend a large part of the savings that they have on the day they retire. Many retirees seem reluctant to draw down on their capital, and instead live on the income their savings generate.

Our analysis of the Survey of Income and Housing produced by the ABS shows that retirees typically maintain their non-housing wealth through their retirement (Figure 3.8). Wealth appears to have dipped only because the Global Financial Crisis reduced capital values, rather than because retirees drew down on their savings. This is true for both high- and low-wealth households: the bottom third by wealth of the cohort born in 1930-34 (aged 70-74 in 2005) increased their non-housing wealth from $68,000 in 2005 to $122,000 in 2015.[99]

These findings are consistent with a range of other studies all showing that many pensioners don't draw down on their retirement savings. Australian Government data show that less than half of all pensioners draw down on their assets, and more than 40 per cent are net savers.[100] A recent study found that at death the median pensioner still had 90 per cent of their wealth as first observed.[101] While younger, wealthier retirees tend to draw down on their savings, and some households do draw down heavily, particularly after a divorce, most

Figure 3.8: Retirees generally don't spend their nest egg in retirement
Household net financial wealth by age cohort, excluding the family home, contents and vehicles, relative to 2005, $2015-16, per cent



Notes: Based on net financial wealth from the 2005-06, 2009-10 and 2015-16 iterations of the Survey of Income and Housing. Net financial wealth is total net wealth excluding the value of the principal place of residence (and related mortgage liabilities), personal effects and motor vehicles. Deflated by CPI.

Sources: Grattan analysis of ABS (various years).

99. Grattan analysis of ABS (2017a). This may overstate the increase in wealth because of survivorship bias: mortality is probably higher among those with lower wealth. See Clarke and Leigh (2011), Whiteford (2014) and Chomik (2018).
100. Morrison (2015a). Around 45 per cent of pensioners were net savers in the first five years of receiving the Age Pension, while 43 per cent drew down on their savings. In the final five years of receiving the pension, 43 per cent of pensioners were still net savers, while just a third drew down on their savings.
101. Asher et al. (2017) find that age pensioners preserve financial and residential wealth and leave substantial bequests.

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Saving Behavior and Portfolio Choice After Retirement

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Abstract This paper reviews the literature on saving behavior and portfolio choice after retirement and provides a descriptive analysis of this behavior by Dutch elderly households. Studying saving behavior in the Netherlands is informative because of the very different institutional background compared to the US, for which most of the empirical evidence is. In the Netherlands, the generous pension system and almost complete coverage of the public health- and long-term care insurance system makes precautionary saving less necessary. Using detailed administrative data, we present evidence on the extent to which the financial resources of retirees are affected by shocks such as the decease of a spouse or deteriorating health—similar to recent empirical studies by Poterba et al. (Explorations in the economics of aging. University of Chicago

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Press, Chicago, pp 23–69, 2011; Investigations in the economics of aging. University of Chicago Press, Chicago, pp 21–69, 2012; Discoveries in the economics of aging. University of Chicago Press, Chicago, pp 159–186, 2014) for the US. Moreover, we examine the extent to which retirees who do not experience any shocks are able to keep positive wealth at their disposal and sustain their consumption level during retirement. Our results show that the death of the spouse results in a significant reduction of household wealth compared to surviving couples—which is also found in the US—while health shocks result in higher household savings in old-age due to the almost complete coverage of health care expenditures. Although retirees in the Netherlands face limited uncertainty about health expenditures, our analysis shows that the elderly, on average, keep large amounts of assets even at a very old age. Our findings suggest that (1) the generous pension benefits are protective of household wealth, (2) illiquid housing wealth constrains the decumulation of household wealth, (3) bequests and transfers after the death of the first spouse are important.

Keywords Savings · Portfolio choice · Elderly

JEL Classification J14 · J26 · D14 · D31

1 Introduction

As the babyboomer generation has reached the statutory retirement age, public expenditures on state pensions and long-term care will increase progressively in the coming decades in the Netherlands, as in other West-European countries and the United States. This is due to the aging of the population and increasing life expectancy. In addition, the financial crisis has shown that the pension system is vulnerable to shocks in financial markets. Many Dutch pension funds have had difficulties achieving full indexation of accrued pension rights against inflation, and several pension funds have even had to cut pension benefits.

As a result, substantial reforms of the pension and long-term care insurance system have been announced or already have been implemented in order to ensure sustainability of public finances and the pension system. The pension reforms include a phased increase of the statutory retirement age to 67 years in 2024. After that, the retirement age will be linked to the rise in the life expectancy. In addition, there will be a substantial reduction in the tax-favored pension accrual rate and limited inflation-linking. This will further reduce pension benefits. Changes in the long-term care insurance system imply that only the major disabilities for which self-funding is impossible will be covered. The remainder of care has to be paid out-of-pocket, such as health expenses on social support and accommodation costs for persons who stay in a nursing home.

The proposed reforms thus demand that individuals take more responsibility to financially prepare for retirement and secure part of their resources for uncertain health expenses. From a policy perspective, it is therefore important to know the extent of financial resources available to current retirees; whether these resources are sufficient to support them in case of financial shocks such as adverse health events, widowhood or nursing home entry; and whether they will adjust their savings in response to the proposed policy reforms. Answering these questions requires a thorough understanding of saving decisions in retirement. Does a reduction in the provision of health insurance by the Government increase precautionary savings? Will a reduction in pension benefits increase the importance of private wealth holdings and result in smaller bequests? Will the elderly invest more in the stock market to have a larger return on their savings or will they reduce their holdings in risky stocks because of increased health expenditure risk?

This paper reviews the theoretical and empirical literature about saving behavior and portfolio choice after retirement. Detailed administrative data are then used to provide descriptive evidence about saving behavior and portfolio choice of the elderly in the Netherlands. The linked administrative records contain information on assets, liabilities, pension income, health status and demographics for the period 2005–2010. To the best of our knowledge, we are the first to use these administrative records to investigate this topic. The advantage of our data is that we measure assets and also health status with a higher quality than survey data. In addition, rich and poor households are not underrepresented. Data quality problems such as measurement error, sample attrition and item-nonresponse are important concerns for longitudinal analysis such as saving behavior (Venti 2011; Card et al. 2010).

It is informative to study saving behavior in the Netherlands because of the very different institutional background compared to the US. The almost complete coverage of the health- and long-term care insurance system makes precautionary saving less necessary. Also in the future, saving for long-term care expenses will probably be limited, since the eligibility for public long-term care will depend on the level of wealth. This requires persons to first run down their assets to become eligible for long-term care and penalizes those who find it important to save for this purpose.

The outline is as follows. Section 2 surveys theoretical and empirical work on saving- and portfolio behavior after retirement. Section 3 describes the administrative data sources. Section 4 provides a descriptive analysis of the wealth distribution and portfolio choice of the Dutch elderly. In addition, we indicate how wealth holdings evolve during old-age. Section 5 examines how assets are affected by the death of a spouse. Section 6 investigates the relationship between health status and the savings and portfolio choices of the elderly. Section 7 investigates the trajectory of wealth in the last years of life. The final section draws conclusions and provides implications for public policy to facility the use of private savings in retirement.

2 Theory on Saving Behavior and Portfolio Choice After Retirement

A simple version of the life-cycle theory of consumption (Modigliani and Brumberg 1954) without uncertainty and a bequest motive predicts that people accumulate wealth during working life and draw down their savings after retirement to support consumption when income is low. This predicted pattern—that wealth should eventually decline with age—is, however, not found by many empirical studies for several Western countries. According to recent empirical research by Love et al. (2009) and Poterba et al. (2011), median wealth holdings rise in retirement for both single-person households and two-person households—although the rise in wealth tends to be limited among the oldest cohort of single elderly. Their data come from the 1992 to 2006 US Health and Retirement Survey (HRS). These findings hold for different measures of wealth including financial assets, housing equity and "annualized comprehensive wealth", which also includes the expected net present value of pension wealth as well as social security wealth. Similar findings are found in countries with very different institutional settings such as the Netherlands (Alessie et al. 1999) and Germany (Börsch-Supan 1992).

These results are different from earlier studies that report high rates of dissaving in the 1970s (e.g. Hurd 1987; Diamond and Hausman 1984). A possible explanation for the difference is that these studies use a cohort of relatively young retired households who might use their savings to finance involuntary early retirement. Another explanation are the relative high capital gains over the 1992–2006 period due to the rise in housing prices and stock prices. This may have caused the observed change in savings to differ from the planned change in savings. French et al. (2007) show that wealth holdings would have declined over the same period if the rates of return on assets were equal to historical rates. Hence, it is important to account for capital gains in the analysis of saving behavior.

All of the studies mentioned above also reported considerable heterogeneity in saving behavior. In particular, richer households and households with a higher level of education tend to save more (see also Hubbard et al. 1995; Dynan et al. 2004; De Nardi et al. 2010). The life-cycle model can be extended in several directions to account for these observations and to provide a more realistic description of the saving behavior of the elderly.

2.1 A Life-Cycle Model with Lifetime Uncertainty

If individuals are uncertain about their remaining lifetime, this might result in a slower decumulation of wealth, as was first shown by Yaari (1965) and Davies (1981). Risk-averse individuals seek to safeguard themselves from outliving their assets in case they become very old. However, the possibility of not getting old also induces individuals to consume more at the start of retirement and reduce consumption at the end of life, as the probability of surviving becomes smaller. In addition, the availability of annuity income, such as social security and pensions, insures individuals against longevity risk and reduces the need to slow down the decumulation of wealth.

In a life-cycle model with lifetime uncertainty, consumption and saving choices depend on two behavioral parameters: the subjective discount rate and the degree of relative risk aversion.[1] Individuals prefer a high level of consumption at the start of retirement if their discount rate is larger than the real interest rate. Frederick et al. (2002), using experimental data to estimate the discount rate, report that the discount rate surpasses the real interest rate—implying that individuals behave impatiently and that consumption declines with age. Mortality risk is an important determinant of

[1] The referred model assumes that persons have a utility function that is of the constant relative risk aversion (CRRA) form. This is widely used for modeling saving behavior under uncertainty, since it allows for the precautionary motive for saving.

saving because it increases the effective discount rate. Since mortality risk increases exponentially as individuals grow older, individuals prefer earlier consumption, and the level of consumption and wealth will further decline with age. The degree of relative risk aversion measures the willingness to alter consumption in response to a change in mortality risk. Risk-averse individuals respond more cautiously to variations in mortality risk. They consume less at the start of retirement and hold more wealth at every age against the risk of living very long—ending up with little more than their annuity income. Of course, with a sufficiently high annuity income there is less need to live frugally; also risk-averse individuals will deplete their wealth at an early age.

Mortality risk is usually measured by life-tables that report the probability of death for the entire population in the next year, for a given age and gender. These life-tables do not account for other important determinants of mortality risk such as socioeconomic status and health status. Differential mortality by socioeconomic status is observed in many studies; Attanasio and Hoynes (2000) and Hurd (2002) show, for example, that wealthier individuals have the tendency to live much longer than poor individuals in the US. Kalwij et al. (2013) show that differential mortality is also an important phenomenon in the Netherlands. As a result, it is impossible to understand saving behavior by observing wealth holdings in cross-section because wealth will increase artificially with age (as was first raised by Shorrocks 1975). Similarly, individuals born in different periods in time might have different levels of wealth due to productivity differences between cohorts or policy changes that affect specific cohorts. For example, Kapteyn et al. (2005) report the importance of the introduction of the old-age pension system in the Netherlands to explain wealth differences between cohorts.

To assess whether the elderly decumulate their wealth, you therefore need to follow the same households—that do not leave the sample due to death or a change in family situation—over a period of time. The change in wealth holdings within the same surviving households will be unaffected by differential mortality or cohort effects (see e.g. Hurd 2002). However, in case of differential mortality, the level of wealth holdings—among this selected sample of surviving households—will increase with age. By weighting the data using wealth-dependent mortality rates, the level of the wealth-age profile can be corrected. This approach applied by Attanasio and Hoynes (2000), is contingent on rather strong assumptions. An alternative solution is to stratify the sample by household wealth, as applied by Hurd (1987), for example.

2.2 A Life-Cycle Model with Bequests

Although a life-cycle model with mortality risk predicts a slow decumulation of wealth if individuals are risk averse, it does not explain why many elderly do not decumulate their assets at all—even at the end of life. A possible explanation is that parents derive utility from leaving a bequest. Hurd (1989) formulates a life-cycle model with intentional bequests. This contrasts with accidental bequests that arise in a model with mortality risk. An intentional bequest motive reduces consumption at the start of retirement and leads to a lower level of consumption in retirement such that more wealth is held at every age.

Hurd's model focuses on retired individuals, such that retirement choices do not have to be explained. Moreover, retirees face no risk of reduced income due to unemployment, which is an important risk factor for elderly workers close to retirement. Individuals receive a certain stream of annuity income and are not able to annuitize their wealth. This is consistent with the low ownership rate of private annuities in the US and in European countries, which is partly explained by the relative high importance of pension and social security wealth in the household portfolios of most retirees (see also the overview of Benartzi et al. 2011, for other compelling reasons). The model also assumes that borrowing is restricted, in the sense that individuals must always have a positive level of wealth. This implies that banks only provide loans that are secured against collateral such as a mortgage loan. Without imposing liquidity constraints, Mariger (1987) shows that individuals with a low degree of risk aversion, who do not plan to leave a bequest, desire to borrow against future pension income as the prospect of death increases.

The model considers single-person households. For a two-person household, uncertain lifetimes complicate the model considerably because consumption becomes conditional on the expected lifetime of the spouse. In addition, the income of the surviving spouse is most likely different from the income as a couple. In both cases, the couple has to secure sufficient resources for the surviving partner as well as for the planned bequest after the death of the surviving spouse. Another complexity is the existence of returns-to-scale in consumption for couples. If the couple shares many resources, the surviving spouse is, all else equal, worse-off if the partner dies. Hurd (1999) describes the optimal consumption path for elderly couples, which is computational burdensome: to derive the consumption path for elderly couples, the consumption path of the surviving spouse first has to be solved at every age and for each spouse separately. Browning (2000) uses an even more elaborate model in which both partners have independent preferences and have to agree on the level of consumption. The model builds upon the notion that wives are typically younger than their husbands and that they have a higher life expectancy. Therefore, wives have a stronger incentive to save than their husbands. Browning (2000) shows that the higher the relative income share of the wife, the higher the accumulated assets should be, all else equal. Because of the complexity of retirement saving behavior, most empirical studies examine it from the perspective of a single-person household. The work of Lillard and Weiss (1997) is an exception, however; they abstract from important sources of uncertainty which leads to somewhat unsatisfactory results.

In the model, Hurd (1989) further assumes that the marginal utility of leaving a bequest is constant. This assumption results in a closed-form solution of the utility function. This makes the model easier to solve, but leads to the somewhat unrealistic conclusion that bequests are not altruistic, in the sense that they are not motivated by the economic wellbeing of the children. The altruistic bequest motive predicts that the elderly plan to leave a bequest if they expect their children to be less well-off (Becker and Tomes 1979). Laitner and Juster (1996) provide empirical evidence that planned bequests are indeed larger for parents who have children with relative low lifetime earnings. Hurd justifies this assumption with the argument that bequests are typically a small fraction of the lifetime wealth of the children and therefore only result in a slight adjustment of the marginal utility of the children. It should be noted that this is also consistent with an egoistic bequest motive—in the sense that the accumulation of wealth provides utility by itself: for example, if people are thrifty or derive social status out of wealth.

Another drawback of the assumption of a constant marginal utility is that consumption is independent of the level of wealth at the start of retirement. As a result, wealthy persons bequeath all savings above a certain threshold level of initial wealth and do not increase consumption. For higher levels of initial wealth this might even result in rising wealth profiles. Carroll (2000) and De Nardi (2004) propose a less restrictive functional form of the bequest function where bequests are a luxury good such that wealthier persons devote a larger part of the wealth holdings to a bequest. In addition, there is a minimum level of wealth under which the household leaves no bequests. Whether or not the household leaves a bequest also depends on the degree of altruism. This functional form is widely used in the recent savings literature; see e.g. De Nardi et al. (2010), Ameriks et al. (2011), Lockwood (2012).

To test whether the bequest motive is prevalent, Hurd fits the life-cycle model to data from the Retirement History Survey (RHS) for the years 1969–1979. The model is, however, not able to distinguish between the wealth trajectory of a person with a bequest motive who has a low degree of risk aversion and a risk-averse person who does not plan to leave a bequest. Hurd assumes that only individuals with children have a bequest motive. As a measure of wealth, both net worth and net financial wealth (which excludes illiquid housing equity) are considered. The results support a life-cycle model with lifetime uncertainty, but there is no evidence that individuals with children behave according to a bequest motive.[2] The wealth profiles of individuals with and without children are very similar. Kopczuk and Lupton (2007) use a less stringent assumption to identify the bequest motive. They allow all households to have a bequest motive, independent of whether or not they have children, and show that many elderly households behave according to a bequest motive.

The evidence against the presence of a bequest motive by Hurd is only valid if bequests take place after the death of the surviving spouse. Most elderly singles have lost their partner and it is possible that some of the estate was already split between the surviving spouse and other heirs. For example, Poterba et al. (2011) show that widowhood results in a sharp drop in wealth holdings for the surviving spouse, and Hurd and Smith (2001) report that 80 % of the estate (which generally excludes the house) is transferred to the children upon widowhood. In addition, parents might prefer to transfer wealth during their lifetime to support their children when they need it most—for example, to alleviate borrowing constraints when they buy their first house or to support them in case of earnings loss. Empirical evidence by McGarry (1999) indicates that lifetime transfers are important for US families, while Ando and Guiso (1994) find no evidence for Italian households, who are known to have strong family ties.

[2] The estimated coefficient of relative risk aversion of 0.73 is considerably smaller compared to what is usually found in the literature, and predicts that retirees will exhaust their wealth at a relative early age. The estimated coefficient of the subjective discount rate of 0.05 is larger than the assumed interest rate of 0.03. This means that the elderly behave impatiently, which results in even faster decumulation of wealth. The exclusion of housing equity does not significantly alter the results.

The limited strength of the bequest motive is consistent with survey evidence about motives for saving. For example, Dynan et al. (2002) report that the vast majority of retired US households mention precautionary reasons, such as illness or emergencies, as a motive to save, while saving for a bequest is rarely mentioned. Very similar results are found for the Netherlands, even though saving for illness is less urgent because of the comprehensive coverage of the health insurance system (Alessie et al. 1999). Nevertheless, many people state that they expect to leave a bequest, and a significant portion of the children receives an inheritance (Hurd and Smith 2001). A possible explanation is that savings for precautionary reasons will ultimately be bequeathed if no unforeseen events occur (Dynan et al. 2002). Thus, savings serve a dual role and the importance of both motives cannot be distinguished without additional information. Ameriks et al. (2011) designed a survey question to measure the tradeoff between the size of the bequest and the amount spent on long-term care expenses—which is an important driver of precautionary saving in the US. Their result indicates that intended bequests are an important reason to save.

2.3 A Life-Cycle Model with Uncertain Health Expenses

As already mentioned, precautionary savings for illness is an important motive for retirees to save. This might also explain the slow rates of decumulation among the elderly. The amount of risk that the elderly face in case of illness depends on the coverage of health insurance and the availability of social insurance programs.

The importance of uncertain health expenses for saving in old-age was first examined by Kotlikoff (1989). Using a two-period savings model, Kotlikoff shows that partial insurance for severe health problems, such as a prolonged stay in nursing home, is an important reason for middle and upper income households to save. For low-income households, the relatively high costs of medical care in conjunction with the availability of social insurance programs such as Medicaid in the US reduce precautionary savings. These programs secure a subsistence level of consumption for individuals with high out-of-pocket medical expenses. The programs do require individuals to first run down assets, to become eligible. The existence of an asset-test further discourages saving among low-income households. Hubbard et al. (1995) show in a simulation study that the asset-tested safety-net is one of the main reasons why many low-income US households save so little, even close to retirement.

An important assumption in Kotlikoff's model is that the marginal utility of consumption declines in poor health, because individuals are no longer able to consume as much as they desire. This reduces both the level of savings and the desired coverage of health insurance. The direction of the effect can, however, also be positive; see e.g. Finkelstein et al. (2013). For example, the derived utility from hiring a housekeeper or investing in home adaptations will most likely increase in poor health. Finkelstein et al. (2013) provide empirical evidence that the marginal utility of consumption is lower among individuals with chronic diseases compared to their healthy counterparts. This is consistent with the empirical observation that wealth holdings of the elderly increase with age in countries with comprehensive health insurance coverage; see e.g. Börsch-Supan and Stahl (1991) and Alessie et al. (1999) for German and Dutch evidence on this issue. This is because consumption needs fall below the level of pension income when health deteriorates. Moreover, individuals are unable to borrow against future pension income at the start of retirement, when they have no health problems.

Properly understanding the importance of uncertain health expenses for saving behavior requires precise information about the incidence of large out-of-pocket expenses (similar to the necessity of life-tables to measure mortality risk). The probability distribution of health expenditures strongly depends on age and health status, but may be influenced as well by characteristics such as income and gender. Kotlikoff makes no attempt to precisely measure these risks. Feenberg and Skinner (1994) use information about medical deductions in a longitudinal dataset of US tax records from 1968 to 1973 to estimate the distribution and persistence of out-of-pocket health expenses. Their estimates indicate that health expenses are highly persistent, which reflects the risk of chronic conditions. They also find that health expenses represent a greater proportional risk to low-income households, which implies that they should save more in absence of a social insurance program. French and Jones (2004) use more recent data on out-of-pocket expenses from the HRS between 1992 and 2000. They construct an alternative econometric model that fits both the mean and the upper tail of the empirical distribution of health expenses to better measure the risk of catastrophic health expenses. The parameter estimates of the fitted model are used to simulate lifetime medical expenses. They find that the elderly run a large risk of excessive out-of-pocket health expenses. About 1 % of the elderly receive a health shock at retirement that results in a present value of lifetime health expenses of more than $43,500. This is substantially more risk than indicated by the model of Feenberg and Skinner (1994), and has important implications for the level of precautionary savings among the elderly. There are some concerns that self-reported health expenditures are overstated in the HRS, which increases the estimated health expenditure risk (Venti 2011).

Subsequent studies by Palumbo (1999) and De Nardi et al. (2010) examine the importance of out-of-pocket health expenditures for precautionary saving by incorporating the estimated health expenditure risk in a life-cycle consumption model. Their models are based on the retirement phase of the framework of Kotlikoff (1989) and Hubbard et al. (1995). They estimate the structural parameters (such as the coefficient of relative risk aversion, the discount rate, the bequest motive and the health state dependent utility) such that the predicted wealth-age profile of their simulated model closely resembles the empirical wealth-age profile. Palumbo uses data on consumption and health status from the Panel Study of Income Dynamics (PSID) for the years 1984 through 1986 and uses external data sources to measure health expenditure uncertainty. Palumbo argues that in particular the risk of a prolonged stay in a nursing home explains the limited decumulation of wealth in old-age. He does not find evidence for health state dependent utility.

De Nardi et al. (2010) extend the model by allowing for differences in saving behavior between the income-poor and the income-rich, and by accounting for wealth differences between cohorts and differential mortality. They accomplish this by simulating the life-cycle model for different cohorts (with different levels of initial wealth) and by matching the wealth-age profile for different permanent income quantiles and cohorts. The bias due to differential mortality is further reduced by not using population life-tables—and instead allowing mortality risk to differ by permanent income, gender and health status. The data stem from the HRS for the years 1996 through 2006. They use the method of French and Jones (2004) to measure health expenditure risk. Their measure of wealth includes both financial assets and illiquid housing equity. They match the median of wealth rather than means because medians are less sensitive to outliers. This implies that the behavioral parameters of ‘an average’ household are matched well. The model might be less successful in capturing the behavior of very wealthy households, who might save a large part of their wealth to leave a bequest.

De Nardi et al. (2010) neither find evidence in favor of a bequest motive nor health state dependent utility. The estimated coefficient for relative risk aversion is considerably larger than the one from the model of Hurd (1989). This suggests that health expenditure risk is an important driver of precautionary savings for the higher permanent income groups. Those who have a low permanent income have no incentives to save because they are relatively well protected by the government-provided (asset-tested) safety-net. In addition, out-of-pocket health expenditures are relatively low for the income-poor. The safety-net is also important for the income-rich because they face potential large out-of-pocket health expenditures late in life.

2.4 Housing and Portfolio Choice

While the theories discussed above can explain empirical deficiencies such as the flat wealth profiles, even until advanced ages, they do not account for the fact that the elderly keep a large amount of their wealth in the form of illiquid housing equity (see, among others, Sheiner and Weil 1992; Poterba et al. 2011). The evolution of housing wealth might be different from the evolution of other kinds of wealth, since a house is both an asset and a consumption good. If desired housing consumption is constant throughout retirement, this will cause housing wealth to decline more slowly than other kinds of wealth if the ability to extract housing equity is limited (Henderson and Ioannides 1983).

Households can disentangle the wealth part and consumption part of housing in different ways. First, households can borrow in the form of a second mortgage or take a reverse mortgage. A reverse mortgage allows the household to withdraw a lump sum or receive an annuity payment or a combination of both. The household is able to remain in their home as long as it is their permanent residence. They pay off the accumulated debt when the last household member dies or leaves the house permanently—for example, to go to a nursing home. The lender takes the loss if the value of the debt exceeds the value of the house (but also receives the appreciation in the house value). The demand for reverse mortgages is low among the elderly. This is usually explained by the existence of a bequest motive (e.g. Davidoff 2010; Lockwood 2012). This is puzzling, however, because borrowers are also able to withdraw only a part of their housing equity. The complexity of reverse mortgages and the relative high costs—partly to compensate the lender for the risk—are other possible reasons. As a result, households can extract relatively little housing wealth. Sinai and Souleles (2008) calculate that about half of the value of the house can be withdrawn as a lump sum for households at the beginning of retirement. This amount increases for older age groups.

Bridges et al. (2006) provide evidence that housing equity withdrawal nowadays occurs more often among elderly households. This might be related to financial innovations in the mortgage market over the last decade, such as the introduction of interest-only mortgages, which allow liquidity-constrained elderly households to better smooth consumption after a financial shock. The obvious concern is that increasing mortgage debt holdings make the elderly more vulnerable to housing price risks; see also Van Ooijen and Van Rooij (2014) for a discussion about mortgage risks.

Households can also extract housing equity by selling the house and becoming a renter or by purchasing a less expensive house. Relatively few households extract equity by moving to a less expensive house in later life, as documented by Sheiner and Weil (1992) and Venti and Wise (2000). This implies that a considerable amount of equity is not used for consumption purposes. There are several potential explanations for the low turnover rate among elderly people. First, the elderly might want to bequeath the house to their children. The evidence about the importance of a bequest motive is, however, not particularly strong. Second, households may use their housing wealth as a buffer against catastrophic shocks such as the death of the spouse or uncertain medical care at the end of life. They leave the remaining wealth as an incidental bequest. Suggestive evidence in favor of this explanation is provided in a recent study by Ameriks et al. (2011). Third, moving involves not only large monetary costs but also emotional costs of settling into a new environment. Venti and Wise (2000) use survey questions which indicate that the elderly are indeed very accustomed to their house and have no intention of moving to a smaller house. Rouwendal and Thomese (2013) show that homeowners are more attached to their house and are less likely to become institutionalized even if health deteriorates.

The issue of adjustment costs associated with housing wealth and consumption behavior was recently investigated by Chetty and Szeidl (2007). They develop a life-cycle model in which households derive utility from housing and non-housing consumption such as clothing and food. Households are unable to extract equity from the house or to adjust the size of the house without selling the house and incurring adjustment costs. Households are willing to incur the adjustment costs only when a large permanent shock occurs (such as death of the spouse or deteriorating health). As a result, they are more averse to smaller risks and keep a buffer of financial assets for incidental expenditures. When confronted with a small health shock, households first draw down their liquid assets before downsizing their home equity. Davidoff (2010) argues that since the desired level of housing consumption also declines after a large health shock, housing equity serves as an ideal saving device for out-of-pocket medical expenditures. Yogo (2009) provides a model with health investments and adjustment costs that also predicts that households primarily dissave in the form of housing equity after a large health shock.

There are a few recent studies that empirically explore the impact of health status on portfolio allocation of the elderly using data from the HRS, thereby explicitly taking into account the presence of illiquid housing wealth. For example, Berkowitz and Qiu (2006) and Coile and Milligan (2009) show that the onset of a new chronic condition leads to a much larger decline in financial wealth than in housing wealth. They do not consider, however, the long-run effect of a health shock. Medical expenses related to a chronic condition last for a long time, which gradually drains household savings.

Yogo (2009) finds that individuals primarily reduce housing equity in response to a large decline in self-reported health between two waves of the HRS.

Finally, Flavin and Yamashita (2002) and Chetty and Szeidl (2010) examine the effect of housing equity on portfolio choice. Their models predict that households will invest a larger share of their financial portfolio in risky assets, as their exposure to housing price risk declines. This implies that the portfolio share of risky assets increases with age, since people reduce their mortgage debt. Moreover, a smaller mortgage debt translates into lower monthly payments over the remaining term of the mortgage. These lower payments make households less vulnerable to financial shocks. Pelizzon and Weber (2009) test these predictions using Italian household data. They show that housing wealth plays a key role in financial portfolio choice.

3 Data Sources

We use linked administrative records from Statistics Netherlands to provide descriptive evidence about saving behavior and portfolio choice after retirement.

3.1 Dutch Income Panel

The Dutch Income Panel (IPO) contains detailed information on income, at both the individual and the household level, and on assets and liabilities at the household level. The data stem mainly from the National Tax register. It should be noted that the Dutch tax administration levies a wealth tax ('box 3 tax') if net financial wealth exceeds a certain threshold, which depends on marital status.[3] In order to check whether people report their financial wealth in a correct way, the tax authorities require banks and insurance companies to provide relevant data on financial wealth of all their clients (data on checking and savings account balances, and on their investment portfolio). Both income and assets are therefore accurately measured.

IPO started in 1989 and consists of about 90,000 households. The unit of observation is the "key person" of a household, which is drawn randomly from the Dutch population and is followed over the life course. The dataset contains information about the key person and all household members. When the key person moves to another household or drops out of the sample because of death or migration, we lose all information of the remaining household members. The IPO is linked to the Dutch population register, which includes demographic variables such as age, gender, marital status and country of birth. We also use the population register to obtain information about the number of children and whether an elderly person resides with an adult child.

Data on financial wealth holdings are available from 2005 onwards. Therefore, we only use the 2005–2010 waves of the IPO. Due to its administrative nature, the IPO data has many advantages above other survey datasets on income and asset holdings. First, it has a very low attrition rate (due only to migration) and includes individuals who are either under-represented or not represented in most surveys (such as the rich,

[3] €20,661 for single-person households and €41,322 for couples in 2010.

immigrants, single-person households, the elderly population, and individuals living in institutions). Another advantage of the data is that the observed wealth and income variables are measured with high accuracy, which is of crucial importance for studying wealth changes. In addition IPO measures precisely the following sources of pension income: social security payments (AOW), occupational pension benefits and third-pillar annuity income. The IPO does not make a distinction between occupational pension benefits and income from privately purchased annuities. It only records the sum of these two income components. Item non-response and misreporting of assets is a serious problem when using survey data to study saving behavior. For example, Venti (2011) reports that 80 % of US households who participate in the HRS misreport the ownership of bonds and more than 40 % of the households provide incorrect information about the ownership of private retirement savings. This leads to large artificial changes in asset ownership and asset holdings between survey waves.

In principle, year-end values of all asset and debt items are reported in the IPO. However, there are some problems with the valuation of the owner-occupied house. Statistics Netherlands mainly bases this valuation on the WOZ value. The WOZ value, which is determined by the government, is equal to the average value of similar houses in the neighborhood that are sold during the previous calendar year. The WOZ value can therefore be seen as a good proxy for the value at the beginning of year. Statistics Netherlands has used a nationwide house price index to inflate the WOZ value in order to proxy the year-end value of owner-occupied housing. This procedure works fine for all households except for those who were homeowner at the beginning of the year but moved to a rented accommodation during the calendar year. Statistics Netherlands incorrectly assumes that people in this group are still homeowners at the end of year, and that a year-end house value should be assigned to this group of households. Fortunately, the IPO dataset contains enough information to correct this; and we have done so.

3.2 LMR and CAK

To measure health status of IPO respondents, we merge information from the 1995 to 2010 hospital discharge register (LMR) into the IPO dataset. The LMR contains information about hospital admission and covers all general and university hospitals and most specialized hospitals. The information includes, among other things, the main diagnosis and medical treatment, date of admission and discharge, and whether the admission is acute. The diagnosis and treatment are based on the international classification of diseases (ICD-9).

We distinguish between three categories of health: major diseases, minor diseases and the remaining group with no health problems. In case of the first type, the key person or the partner entered the hospital because of a ‘severe illness’. We say that a person suffers from a ‘severe illness’ if they are diagnosed with cancer or cardiovascular diseases in the last three waves (i.e. wave t, $t-1$or $t-2$). Smith (2004) and Datta Gupta et al. (2011) identify severely ill people in a similar way. We define the second group of households to have a ‘minor health condition’ if neither the key person nor the partner are severely ill, but at least one of them is admitted to the hospital during the last three waves. The third group consists of the rest, who are not admitted to a hospital in the past waves.

Information about long-term care utilization is provided by the CAK institute, which executes financial compensation programs for long-term care users. The data contains information about the days spent in a nursing home and number of hours of nursing and personal care provided at home for the years 2004–2011.

3.3 Sample Selection

Our sample includes all households of which both the key person and the spouse are retired. Individuals are considered to be retired if they are at least 65 years old and receive pension income and not earnings or business income. We exclude retired individuals younger than the statutory retirement age of 65 from our sample, since early retirement might be endogenous with respect to wealth; see Van Ooijen et al. (2010) for evidence about the effect of wealth on early retirement for households in the Netherlands. We also exclude a few households that left the sample between 2005 and 2010 because of migration. We also remove those households whose key person resides with an adult child. We made this selection because IPO measures wealth at the household level. Consequently, we cannot disentangle the wealth of the parents and their adult children. For the same reason, we do not observe wealth of key persons who have permanently entered a nursing home. According to Statistics Netherlands, people living together in one nursing home form one composite household. Again, these observations are discarded. The prevalence of remarriage or divorce after retirement is very low in our sample. Moreover, in economic models explaining the saving behavior of retirees, it is typically assumed that individuals neither divorce nor (re)marry. Since we want to test the predictions of these models, we limit our sample to those households who do not change marital status other than widowhood, and thus exclude persons who remarry or divorce during the sample period. This leaves us with a sample containing 9,280 households in 2005. The sample consists of 5,047 married couples (of which 72 married couples live separately and apart because of nursing home entrance), 1,184 never-married persons and 3,049 widowed persons.

4 Saving Behavior and Portfolio Choice of the Dutch Elderly

4.1 Economic Resources After Retirement

Retired households have three important sources (of income and wealth) to support consumption during retirement. They depend on private savings and annuity income which they have built up during working life. In addition, they receive income from accumulated wealth holdings such as interest income, dividend payments and capital gains. Homeowners also receive implicit income from housing services, since they do not have to pay rent.

Annuity income consists of three components. In the Netherlands, all residents receive a state pension (AOW) at the statutory retirement age of 65. The benefit level is equal to the minimum wage for a two-person household, while a single-person household receives 70 % of the minimum wage. Unlike the US Social Security system, the benefits do not depend on the work history. As a result, the poverty rate is very low among the elderly. Less than 3 % of the Dutch retirees receive a state pension below the poverty line (Soede 2012), while Poterba et al. (2012) show that about one-third of single-person households in the US lives in poverty in the last year of life. In addition to social security, the large majority of retirees are covered by an occupational pension scheme (Bovenberg and Gradus 2008). Participation is mandatory when the employer offers a pension scheme. The pension scheme is predominantly of the defined-benefit type, and promises a replacement rate of 70 % of average earnings. The accrued pension rights depend on the years of work. In the Netherlands, pension funds do not offer the option to cash out pensions in the form of a lump-sum payment; also in countries such as the US and Switzerland, which offer the option of a lump-sum payment at retirement, the large majority of individuals choose not to cash out (Benartzi et al. 2011). Finally, retirees receive annuity benefits from privately purchased life insurance. The contributions are tax-deductible for individuals with income over which no pension rights are accumulated (such as the self-employed).

Because of the generous social security and pension benefits we consider not only private wealth, but also social security and pension wealth. The present discounted value of social security and pension wealth depends on the (joint) life expectancy of the household members, the assumed discount rate, and the ratio of the survivor benefits to couple benefits. In the Netherlands, the spouse usually receives 70 % of the couple benefits upon entering widowhood (Brown and Nijman 2011). This allows us to compare the relative importance of both private wealth and annuity income for the economic status of the elderly. We will not examine the evolution of pension and socials security wealth in retirement because this is in general out of control once the youngest household member retires. In the Netherlands, banks usually do not allow borrowing against future pension and social security income. However, banks usually provide loans that are secured against collateral such as an interest-only mortgage—also when borrowers are at an advanced age. Furthermore, other than the survival benefit, pensions are not bequeathable. The size of these wealth measures, therefore, declines mechanically with age as the mortality risk increases.[4]

We distinguish between three definitions of private wealth holdings: net worth, net financial assets and housing equity. Net worth of the household is defined as the value of all assets less the value of all debts; see Wolff (1998) for a definition of household wealth. Total assets are defined as the sum of the values of the owner-occupied house, other real estate, checking and savings accounts,[5] risky assets (i.e. stocks, bonds and mutual funds), business wealth and other assets such as cash in hand and loans to family members. Total debts are defined as the sum of mortgage debt, business debt

[4] We use the formulas of Alessie et al. (1997) for the computation of pension and social security wealth. We use cohort-specific life-tables from Statistics Netherlands. We assume that the remaining lifetimes of the key person and spouse are independent. The discount rate is 3 % and survivor benefits equal 70 % of the couple benefits. The maximum lifespan is 110 years.

[5] Financial institutions are not obliged to report to the tax administration bank account balances less than 500 euro. Consequently, IPO slightly underestimates ownership of bank accounts at the household level.

and other debt.[6] Housing equity is equal to the value of the owner-occupied house minus the remaining mortgage debt. Net financial wealth equals net worth minus housing equity. These measures do not include durable goods (such as cars) or the cash value of privately bought life insurances.

In the Netherlands, mortgages are commonly linked to a life-insurance policy: so-called endowment mortgages. For these products, the mortgage debt remains constant over the term of the mortgage loan, in order to take advantage of the generous tax-deductibility of the mortgage interest. The owner pays interest over the mortgage principal and an insurance premium to a life-insurance policy which covers the mortgage principal at the end of the loan. Since the cash value of the life-insurance policy is not observed in the data, housing equity is underestimated for these households. The ownership rate of endowment mortgages is, however, very low among elderly homeowners; see Van Ooijen and Van Rooij (2014). The most common mortgage among elderly homeowners is an interest-only mortgage where the borrower pays interest but does not repay the principal.

4.2 Household Wealth Holdings in 2005

We first examine the economic status of households after retirement in 2005. This is well before the stock markets reached rock bottom in September 2008 after the bankruptcy of Lehman Brothers, which led to the financial crisis. Table 1 reports on the distribution of household wealth across different age groups and marital status of the key person at the end of 2005. We distinguish between married couples, widowed persons and non-married persons (i.e. never married or divorced).

We first look at married couples. The average net worth of married couples in their early retirement years (age 65–69) is equal to €267,400. Not surprisingly, the distribution of wealth holdings is skewed to the right: mean net worth equals somewhat more than one and a half times median net worth. This implies that a large fraction of net worth is owned by the very rich. Notice also that median net worth declines with age from about €159,000 for the 65–69 age group to about €67,000 for the 85+ group. At the same time, mean net worth remains fairly constant with age. This indicates that wealth inequality increases with age. Housing equity is the most important component of the household portfolio for married couples at the start of retirement: its average value is equal to €149,000. About 55 % of the couples in the sample own a house in their early retirement years. This is a sharp increase compared to the ownership rate in the beginning of the 1990s. Alessie et al. (1995) document that approximately 23 % of the 65–69 age group own a house in 1991. Nevertheless, the homeownership rate is still considerably lower than that of the US, where more than 90 % of the just-retired couples own a house (Poterba et al. 2011). The low homeownership rate is still prevalent among the older generation of retirees. Approximately 30 % of the married couples age 85 and older own a

[6] Other debt is only known for those households who pay wealth tax ('box 3 tax'). Consequently, the debt ownership is underestimated. However, data from the DNB Household Survey (DHS) indicate that the overwhelming majority of the 65+ households do not hold any form of consumer credit; see Alessie et al. (2002).

Table 1 Household wealth in 2005 by marital status (cross section)

Wealth and age group	Married couple				Widowed				Never-married			
	N	Own	Mean	Median	N	Own	Mean	Median	N	Own	Mean	Median
Net worth												
Age 65–69	1331	96.7	267.4	158.6	369	91.6	193.6	41.6	390	84.6	139.1	13.7
Age 70–74	1591	97.9	242.8	136.7	569	90.7	150.5	24.9	321	91.6	184.0	20.0
Age 75–79	1226	98.4	235.3	99.8	777	93.3	142.2	24.9	217	93.1	188.2	24.3
Age 80–84	687	98.7	248.0	87.5	734	94.8	168.9	24.9	159	96.2	283.8	62.1
Age 85+	212	98.6	239.1	66.7	600	94.5	156.5	24.9	97	92.8	207.8	24.9
Net financial wealth												
Age 65–69	1331	95.9	118.8	30.1	369	88.9	78.1	17.2	390	84.4	69.0	9.5
Age 70–74	1591	97.0	108.5	33.1	569	89.1	52.9	16.2	321	91.9	101.8	17.7
Age 75–79	1226	97.9	107.3	37.2	777	91.6	68.1	20.2	217	92.2	111.8	15.5
Age 80–84	687	97.7	128.1	42.5	734	94.0	94.2	20.2	159	96.2	198.7	35.9
Age 85+	212	98.6	147.1	46.0	600	93.8	99.6	22.0	97	92.8	146.3	24.9
Housing equity												
Age 65–69	1331	54.9	148.6	103.0	369	40.9	115.4	0.0	390	28.5	70.1	0.0
Age 70–74	1591	48.0	134.3	0.0	569	35.0	97.6	0.0	321	27.7	82.2	0.0
Age 75–79	1226	42.7	128.0	0.0	777	27.0	74.1	0.0	217	24.4	76.4	0.0
Age 80–84	687	38.4	119.9	0.0	734	24.5	74.7	0.0	159	25.8	85.2	0.0
Age 85+	212	30.2	92.0	0.0	600	18.2	56.9	0.0	97	19.6	61.5	0.0
Social security wealth												
Age 65–69	1331	100.0	225.0	232.0	369	94.9	154.9	169.1	390	99.7	142.4	150.7
Age 70–74	1591	100.0	196.5	197.5	569	100.0	134.3	135.4	321	99.7	127.3	128.8
Age 75–79	1226	99.9	158.3	158.0	777	100.0	103.3	102.9	217	100.0	98.9	97.6
Age 80–84	687	100.0	120.3	119.6	734	100.0	75.8	78.5	159	100.0	75.7	78.5
Age 85+	212	100.0	85.0	86.6	600	100.0	45.8	48.0	97	100.0	47.7	50.0
Pension wealth												
Age 65–69	1331	96.2	231.8	157.5	369	90.2	113.5	65.3	390	74.9	96.2	47.4
Age 70–74	1591	93.8	156.7	107.0	569	88.6	84.8	45.2	321	75.4	76.9	36.2
Age 75–79	1226	90.1	116.1	70.7	777	88.3	64.5	37.6	217	72.4	55.5	24.9
Age 80–84	687	90.1	86.6	47.2	734	83.8	45.6	22.9	159	71.1	46.3	25.4
Age 85+	212	87.7	58.5	31.4	600	80.2	24.6	9.0	97	60.8	27.2	10.2

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator
Own: ownership rate (%)

house. This does not so much reflect the draw-down of housing equity as people age but the cohort differences, which is also documented by Van Der Schors et al. (2007). Wealth holdings are less equally distributed when housing equity is excluded. Median financial wealth amounts to about € 30,100, while mean financial wealth equals € 118,800; this is almost four times as high as the median. For all but the youngest cohort, the mean level of net financial wealth among older cohorts is higher.

Social security and pension wealth represent an important part of total wealth holdings. Together they account for more than 60 % of total household wealth for the age group 65–69. This percentage was even higher in the early 1990s (Alessie et al. 1995). Almost all married couples receive occupational pension benefits on top of social security wealth. We see that the older age groups less often receive occupational pensions. Among the individuals who receive occupational pensions, there is considerable variation in pension wealth: for couples, mean pension wealth (€ 231,800) is twice as large as median pension wealth (€ 157,500). This reflects differences in lifetime income. The skewness is similar to the distribution of net worth.

Wealth holdings of single-person households are considerably lower than those of married couples. The table shows that mean net worth of married couples for the age group 65–69 is about 40 % higher than for widowed persons (€ 193,600) and almost twice as high for non-married persons (€ 139,100). The wealth distribution of single person-households is also more dispersed compared to married couples. For widowed persons (age 65–69) mean net worth is almost five times as high as the median (€ 41,600). Net worth is even more unequally distributed among non-married persons. A typical (median) non-married person in the age group 65–69 has only € 13,700 in net worth and € 9,500 in liquid financial assets for immediate consumption. This inequality in net worth is again partly explained by differences in homeownership, which is about 15 percentage points lower among widowed persons in the age group 65–69 (40.9 %) than it is among married couples. The homeownership rate is even lower among non-married persons; only 28.5 % own a house between age 65 and 69, and the homeownership rate is less than 20 % for persons age 85+. The difference in both median net worth and the homeownership rate between widowed and unmarried households disappears at older ages.

Most single-person households at the bottom half of the wealth distribution thus highly rely on social security and pension wealth in retirement. The ownership of pension wealth is slightly higher among married couples than among widowed persons for all age groups. This implies that the vast majority of widowed persons receive a survivor pension. The ownership rate is, however, substantially lower among non-married persons: about 75 % receive an occupational pension in the age group 65–69, with the figure dropping to only 60 % of the persons age 85 and above. These results suggest that the economic status of non-married households in the age group 65–69 is lower than that of widowed persons in the same age group; for older age groups, the economic status of non-married persons increases. In the subsequent sections we will focus only on married couples and widowed persons.

4.3 Evolution of Household Wealth Between 2005 and 2010

The described cross-sectional distribution of wealth compounds age- and cohort-effects. The panel dimension of the dataset allows us to follow the same household over time. We can therefore distinguish between true age effects and cohort-time effects.[7] Furthermore, we are able to account for differential mortality. We therefore restrict the sample to all households that remain intact to the end of the panel. This implies that we exclude all households where one of the members dies between 2005 and 2010 and keep a balanced panel.

Table 2 shows the evolution of wealth between 2005 and 2010 for married and widowed persons in their early retirement years for the balanced panel. These households are between 65 and 69 years of age in 2005 and between 71 and 75 years of age in 2010.

Note that mean and median wealth holdings for both married couples and widowed persons in 2005 are slightly higher compared to the same statistics in Table 1. Households with a lower level of net worth thus have higher mortality risk. The table shows that the evolution of net worth between 2005 and 2010 is largely affected by developments in the housing market and the stock market. Between 2005 and 2007, the average net worth of married couples increased by 6 %: from € 276,100 to € 293,600. This is in particular due to the rise in housing prices in the years before the financial crisis: the mean level of housing equity rose by 7.5 % between 2005 and 2007. Wealth held in financial assets did not grow as fast over the same period: mean financial wealth rose by about 4.5 % between 2005 and 2007, while the Dutch stock market index doubled over the same period. This observation that the level of financial assets remained fairly constant between 2005 and 2007 is reasonable, since risky assets are not an important component of most household portfolios. There is a large decline in net worth in the years after the economic crisis, particularly because a substantial amount of the wealth holdings of the elderly is tied up in housing equity. The wealth holdings of the elderly are thus sensitive to the volatility of housing prices in the studied period. During the financial crisis, the mean housing equity of couples declined by 15.4 %—from € 166,300 to € 140,700. As we will show below, mortgage debt is limited among the retirees. This makes a decline in housing prices less critical for the elderly, compared to younger generations who usually have a larger mortgage debt compared to the value of their property. The decline in the prices of houses mainly affects elderly homeowners who move home during the downturn—because of deteriorating health, for example, or death of the partner. For individuals who move to another owner-occupied house, the net reduction in housing equity is limited, however, since the purchase price of the new house declined as well (Sinai and Souleles 2005). The data shows that elderly couples in the age-group 65–69 do not seem to move. The homeownership rate remains fairly constant between the years 2005 and 2010.

Mean financial wealth declined by more than 11 % between 2007 and 2010, while median financial wealth declined only slightly over the same period. Apparently, net financial wealth of a typical household is not affected by the downturn of the financial markets,[8] either because households sold their stocks in the first phase of the financial

[7] We could not disentangle either age or time and cohort effects without making additional assumptions such as done in e.g. Deaton and Paxson (1994). This is because the age of an individual is perfectly identified by the year of birth (cohort) at a specific time.

[8] In 2008 the Dutch stock market exchange lost about half of its value.

Table 2 Household wealth by marital status between 2005 and 2010 for households aged 65–69 in 2005 (balanced panel)

	2005	2006	2007	2008	2009	2010	%Δ ’05–’07	%Δ ’07–’10
Married (N = 1074)								
Net worth								
Mean	276.1	289.1	293.6	270.9	261.1	253.3	6.3	−13.7
Median	171.0	184.3	188.4	182.6	179.8	163.5	10.2	−13.2
Mean share net worth[a]	29.1	29.9	30.5	29.8	30.5	30.6		
Net financial wealth								
Mean	121.8	127.5	127.3	110.2	115.0	112.5	4.5	−11.6
Median	31.1	30.8	32.8	32.2	34.5	32.3	5.5	−1.5
Mean share fin wealth	11.4	11.6	11.8	11.5	12.4	12.7		
Housing equity								
Mean	154.3	161.6	166.3	160.6	146.1	140.7	7.8	−15.4
Homeownership rate	57.1	57.6	57.4	57.1	56.8	56.6	0.5	−1.4
Mean share housing eq.	17.7	18.3	18.7	18.3	18.1	17.9		
Widowed (N = 320)								
Net worth								
Mean	199.4	207.2	212.3	192.6	178.7	177.1	6.5	−16.6
Median	46.5	44.3	40.1	35.1	31.9	28.6	−13.8	−28.7
Mean share net worth	28.1	28.0	28.2	27.5	27.0	23.5		
Net financial wealth								
Mean	82.4	83.1	87.1	76.3	72.0	74.8	5.7	−14.1
Median	17.7	17.3	18.7	17.6	16.0	16.0	5.6	−14.4
Mean share fin wealth	11.6	10.9	11.0	10.2	10.4	6.3		
Housing equity								
Mean	117.0	124.1	125.2	116.3	106.7	102.3	7.0	−18.3
Homeownership rate	42.2	41.9	41.9	41.3	41.6	41.3	−0.7	−1.4
Mean share housing eq.	16.5	17.1	17.2	17.3	16.6	17.2		

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator. In this table we consider a balanced panel: i.e. the same households are followed over time for which the marital status does not change between 2005 and 2010

[a] Mean share of total wealth (%): total wealth is equal to the sum of net worth, social security wealth and pension wealth

crisis when prices started to fall, or because of the limited importance of risky assets in the average financial portfolio. In the next section we show that households already reduced stockownership 2 years before the financial crisis.

For widowed households we observe a similar profile for net worth, both before and after the financial crisis. The level of net worth is considerably lower compared to married couples. The median net worth profile is remarkably flat among widows because of the relative low homeownership rate. The median level of financial wealth is just below the threshold for the exemption of wealth taxation for single households, which is a finding we also have for married couples.

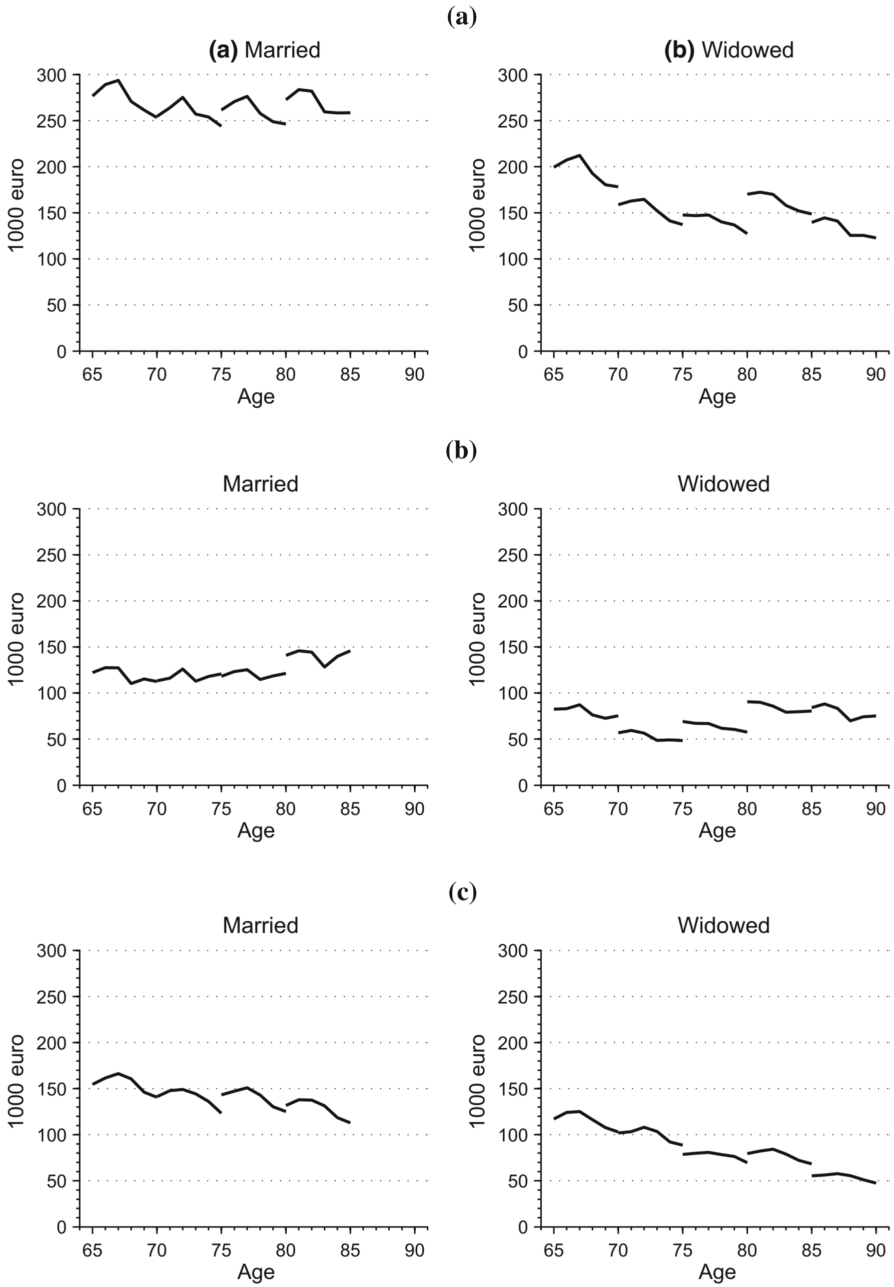

Fig. 1 Wealth profiles (mean) by cohort and age of the key person of household (balanced panel). **a** Net worth (mean), **b** net financial wealth (mean), **c** housing equity (mean)

Figure 1 also presents the mean wealth-age patterns for the older cohorts. In the figure, each 'cohort line' is composed out of households born in five consecutive years. The first line matches the cohort as displayed in Table 2. For married couples we use four cohorts, where the oldest cohort is 80 years and older in 2005. For widowed households we use five cohorts, where the oldest cohort is age 85 and older in 2005. Since a person's year of birth is perfectly identified by his age at a specific date in time, we cannot distinguish between age and time effects without making additional assumptions. If we assume that each cohort is affected in a similar way by time effects such as developments of the stock market and housing price developments (which is not unreasonable to assume), we can discriminate between both effects by comparing the shape of the wealth-age profile of different cohorts.

We first look at the wealth-age profiles of married couples. For all cohorts we observe that net financial wealth rises slightly in the years before the financial crisis and significantly declines thereafter. For all cohorts, net financial wealth rises slightly in the wake of the financial crisis when stock markets recover. The shape of the wealth-age profiles of the different cohorts is thus very similar. This suggests that time-effects dominate the picture and that age-effects are limited. There seems no evidence that married couples run down their financial wealth as they get older. Even the oldest cohort (aged 80 to 85+ in 2005) retains their financial assets. This finding seems to be at odds with the prediction of a simple life-cycle model which says that retirees should eventually deplete their wealth holdings.

Median net financial wealth holdings are significantly lower compared to the mean (see Fig. 2). Notice also that the median level of financial wealth among the oldest cohorts is even higher compared to the youngest cohort. This might reflect differential mortality, or differences in portfolio composition between cohorts (because of the lower homeownership rate among the older cohorts). For all cohorts, median financial wealth does not decline over time and seems not affected by the financial downturn of the stock market because of the limited stock ownership in the bottom half of the wealth distribution. The pattern suggests that a typical household behaves as a buffer stock saver. They keep a target level of liquid savings for precautionary reasons—for example, in case they become ill, to replace durable goods or to support their adult children with financial strain. Households will increase savings after a financial shock until they reach the target; see Carroll (2001).

Figure 2 shows that the homeownership rate is substantially lower among the older cohorts. The jumps between the lines indicate that cohort effects are important. As households age, we observe a slight decline in the homeownership rate for all but the youngest cohort. The cohort differences in homeownership explain the differences in the shape of the median net worth profiles for couples.

For widowed persons, the profile of mean net worth is very similar compared to married couples. However, the level of net worth is significantly lower for all cohorts. For widows, we also observe for most cohorts a slight decline in the homeownership rate over time. This, reduction is not large enough to explain the level difference in homeownership between widows and married couples. In Sect. 5 we show that widowhood explains part of the difference in the level of both housing equity and net financial wealth between widowed persons and couples. The median net worth profile is very flat among widows because of the low homeownership rate. The median level of financial wealth approaches the threshold for the exemption of wealth taxation for all cohorts. It thus seems important to take account of the tax system in order to understand the saving behavior of households.

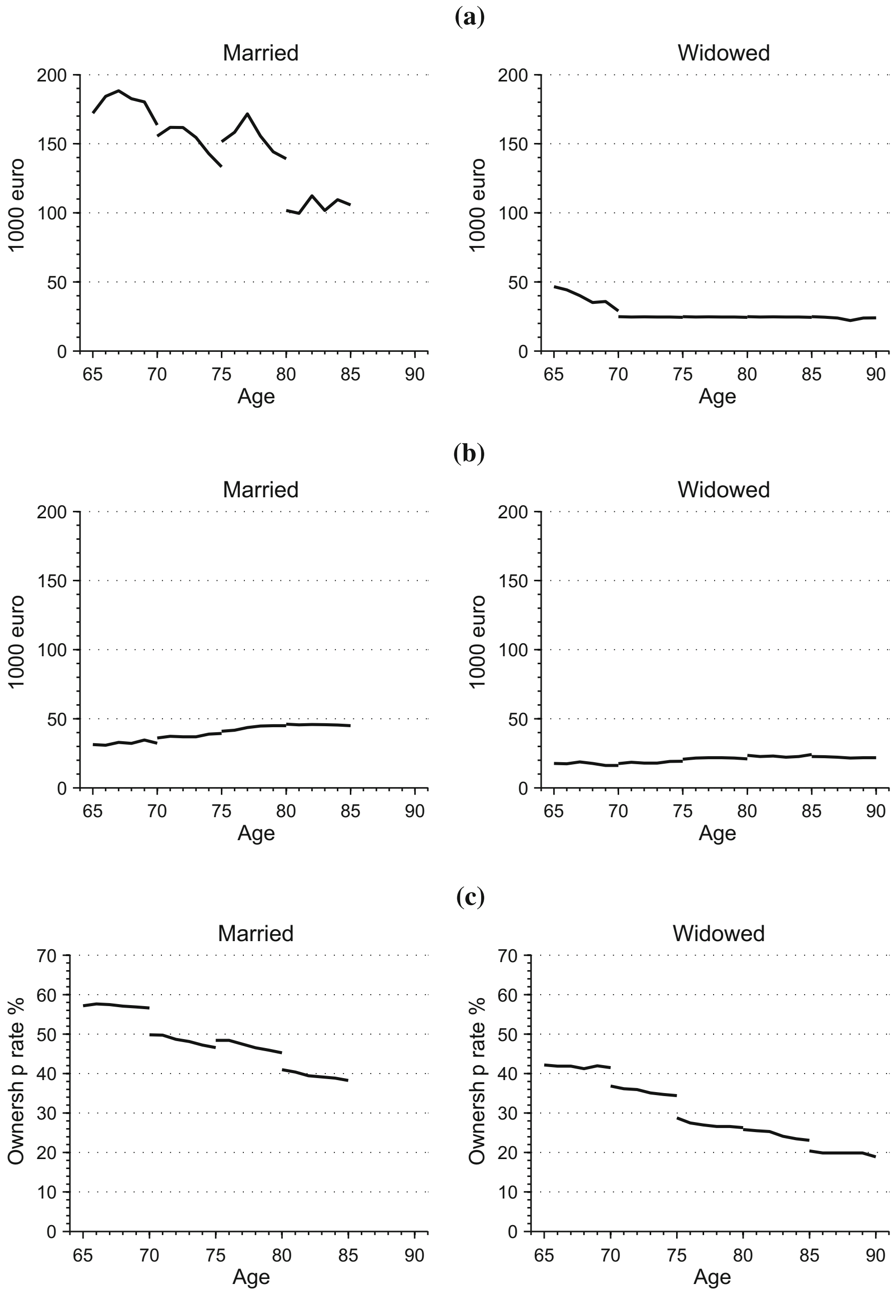

Fig. 2 Wealth profiles (median) by cohort and age of the key person of household (balanced panel). **a** Net worth (median), **b** net financial wealth (median), **c** housing equity (ownership rate)

4.4 Financial Household Portfolios in 2005

Table 3 summarizes the composition of the financial portfolio for both married couples and widowed persons in 2005. For each asset and debt item, the table presents the mean value, the ownership rate and the mean portfolio share. The mean portfolio share of an asset or debt item is defined as the ratio of its value over the sum of total assets. We add together other real estate, business wealth and other assets in a single asset item. We also combine other debt and business debt in a single debt item. We refer to these portfolio components as ‘other assets’ and ‘other debts’, respectively.

Once again, the importance of housing in the composition of wealth becomes apparent. Housing is a very important wealth component especially for younger retired couples (age 65–69): 56 % of those couples own a house and its mean portfolio share is equal to 44 % of total assets. Interestingly, the majority of those younger retired homeowners (36 % out of the 56 %) still have a considerable mortgage outstanding: the average loan-to-value ratio (among those who have mortgage outstanding) equals 18.3 %. Both the fraction of homeowners with an outstanding mortgage loan, as well as the size of the mortgage loan, are substantially lower among older age groups.

Checking and savings accounts comprise the second-most important item in the portfolio of retired couples, and this item becomes the most important component at older ages. For couples aged 65–69 these accounts represent 47 % of portfolio holdings; this fraction increases to almost 70 % of total assets for couples aged 85 and older. About 30 % of the couples in the age range 65–69 invest in risky assets such as stocks, bonds and/or mutual funds. The ownership rate is only slightly lower among the older age groups.

Couples in the age group 85+ invest on average 9 % of their total assets in risky assets. This is a larger share than younger retired couples, who invest about 5 % of their financial portfolio in risky assets. This finding can be partly explained by differential mortality; the life-cycle model with uncertainty predicts that wealthier individuals invest a larger share of their assets in risky assets; see e.g. Gollier (2002). Another explanation by Flavin and Yamashita (2002) is that since the portfolio of the elderly is less dominated by risky housing equity, they can allocate a larger share of their liquid assets to stocks and mutual funds. Coile and Milligan (2009) find very similar patterns for US households with respect to the share and ownership of risky assets. The ownership rate of risky assets (excluding individual retirement accounts) is slightly higher: approximately 40 % of US households in the age group 65–69 invest in stocks and bonds in 2002.[9]

Table 3 also presents the composition of wealth holdings among widowed persons. Homeownership is less common for widowed persons than for couples: the homeownership rate is almost 15 percentage-points lower among all age groups. In addition, widowed persons hold less mortgage debt: the loan-to-value ratio is about 14 % for younger retirees and less than 2 % at age 85+. The main part of total assets is kept in checking and savings accounts. Risky assets are of minor importance: between ages 65 and 70, the ownership rate of risky assets is about 21 %, reducing to about 14 %

[9] Information about dividends and capital gains in IPO (for households who pay wealth tax) indicates that among all age groups the ownership rate of risky assets was substantially higher in 2002.

Table 3 Household portfolios by marital status and age in 2005

Asset (debt) item	Married couple				Widowed person			
	N	Mean	Own (%)[a]	Share (%)[b]	N	Mean	Own	Share (%)
Age 65–69								
Checking/savings accounts	1331	51.4	96.2	47.0	369	35.4	89.7	56.7
Risky assets		50.2	29.5	5.5		21.4	21.4	5.0
House		179.7	55.6	44.2		132.5	41.2	34.8
Other assets		24.1	14.2	3.3		27.5	11.9	3.5
Mortgage		31.1	35.7	8.5		17.1	24.9	4.8
Other debts		6.9	7.5	1.8		6.1	7.9	1.1
Loan-to-value ratio[c]		18.3				13.9		
Age 70–74								
Checking/savings accounts	1591	53.2	97.5	54.0	569	30.3	89.6	62.1
Risky assets		39.4	26.6	5.5		18.4	18.3	4.8
House		152.7	48.6	37.6		109.4	35.1	31.2
Other assets		19.4	14.2	2.9		8.5	7.9	1.9
Mortgage		18.4	26.5	4.9		11.9	19.5	3.4
Other debts		3.6	6.1	1.3		4.3	4.7	0.7
Loan-to-value ratio		12.6				10.6		
Age 75–79								
Checking/savings accounts	1226	54.8	97.9	57.9	777	35.4	91.8	68.9
Risky assets		37.5	26.3	7.1		22.2	16.9	5.1
House		140.5	42.9	32.1		81.0	27.0	22.3
Other assets		18.4	13.4	2.8		14.5	10.0	3.7
Mortgage		12.5	18.5	3.5		6.9	10.8	2.1
Other debts		3.4	4.3	0.4		4.0	4.4	1.0
Loan-to-value ratio		9.7				8.7		
Age 80–84								
Checking/savings accounts	687	65.3	97.8	63.0	734	46.5	94.1	72.2
Risky assets		50.9	25.0	7.1		33.9	16.9	6.2
House		129.4	38.7	27.2		78.2	24.7	18.9
Other assets		15.3	14.1	2.7		18.2	10.6	2.7
Mortgage		9.5	13.4	2.4		3.5	6.8	1.3
Other debts		3.4	4.7	0.5		4.3	4.1	0.8
Loan-to-value ratio		8.3				5.8		
Age 85+								
Checking/savings accounts	212	79.7	98.6	68.3	600	49.1	94.0	77.3
Risky assets		50.5	25.5	9.0		40.5	13.7	6.0

Table 3 continued

Asset (debt) item	Married couple				Widowed person			
	N	Mean	Own (%)[a]	Share (%)[b]	N	Mean	Own	Share (%)
House		96.9	30.2	19.2		57.6	18.2	13.1
Other assets		18.7	15.6	3.5		15.6	11.0	3.6
Mortgage		4.8	7.1	1.4		0.8	2.5	0.2
Other debts		1.8	6.1	0.3		5.6	4.3	0.7
Loan-to-value ratio		6.3				1.3		

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator
[a] The column 'Own (%)' reports the ownership rate of the asset (debt) item
[b] The column 'share (%)' reports the average portfolio share of each asset (debt) item in 'total assets'. Total assets is the sum of checking and savings accounts, risky assets, the value of the primary residence (house) and other assets
[c] The rows headed 'loan-to-value' report the average of the loan-to-value ratio

above age 85. Risky assets comprise between 5 and 6 % of total assets for all age groups, which is slightly lower compared to couples. The fact that widowed persons hold less risky portfolios (with respect to both assets and debts) compared to couples might be because they possess less wealth holdings. An alternative explanation might be that the majority of widowed persons are female. Females are more risk averse and less experienced in making financial decisions regarding stock ownership; Van Rooij et al. (2011).

Table 4 shows that there is indeed a clear association between wealth and the composition of the financial portfolio. The presented information is similar to that in the previous table but the results are stratified by net worth quartile for both married couples and widowed persons (for each age group separately). For couples in the top wealth quartile, assets in checking and savings accounts are of minor importance. They hold a relatively large share of their wealth holdings in risky assets and housing wealth. The share of risky assets increases with age while housing wealth becomes less important: 66 % of the younger retired couples own risky assets and 96 % own a house. The homeownership rate declines to 81 % among the oldest retirees in the top wealth quartile, while the ownership rate of risky assets is slightly lower (about 60 %).

For couples in the third wealth quartile we also see that housing is the dominant asset in the portfolio. The homeownership rate is more than 95 % at the start of retirement and is about 40 % for surviving couples who reached age 85. The ownership of risky assets is significantly lower compared to couples in the top net worth quartile: about 27 % of the younger couples own risky assets and the share of risky assets to total assets is less than 3 %. We again observe a shift, as individuals grow older, from housing wealth to risky assets. For the second wealth quartile we observe that housing equity is of minor importance: only 28 % of the younger retirees own a house, and for the oldest age group all retirees in the second wealth quartile rent a house. Risky assets are relatively important among younger retired couples in the second wealth quartile: the ownership rate is around 21 % between age 65 and age 70, and declines to 7.5 % for couples aged 85 and above. The share of risky assets is somewhat higher for the

Table 4 Household portfolios by net worth quartiles and age in 2005—married couples

Asset (debt) item	Ownership rate (%)				Portfolio share (%)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Age 65–69								
Checking/savings accounts	88.6	99.1	97.6	99.7	96.1	67.8	13.9	15.6
Risky assets	3.6	21.3	27.0	66.3	1.3	5.6	2.4	12.1
House	2.4	28.2	95.5	96.4	2.4	25.3	81.0	63.4
Other assets	0.9	3.0	10.8	42.2	0.1	1.3	2.7	8.9
Mortgage	2.7	25.8	66.7	47.6	3.1	11.1	12.8	6.2
Other debts	1.5	4.8	7.8	16.0	4.7	0.9	0.9	1.1
Age 70–74								
Checking/savings accounts	92.0	99.7	98.7	99.7	97.5	84.2	19.7	17.9
Risky assets	4.3	17.3	25.1	59.7	1.5	4.9	4.2	10.9
House	1.0	10.8	86.9	95.7	0.9	9.8	72.7	64.2
Other assets	0.5	4.3	12.8	39.3	0.0	1.1	3.4	7.0
Mortgage	1.0	10.3	56.0	38.8	1.2	4.4	8.8	5.1
Other debts	0.8	1.3	6.3	16.1	3.4	0.3	0.6	0.9
Age 75–79								
Checking/savings accounts	93.8	99.3	98.7	99.7	97.7	89.0	29.1	18.3
Risky assets	3.9	17.0	27.4	56.9	1.9	7.1	6.5	12.6
House	0.3	3.3	73.6	94.4	0.3	2.9	61.6	61.8
Other assets	0.0	2.3	12.4	38.9	0.0	1.0	2.8	7.3
Mortgage	0.3	2.6	42.0	29.1	0.4	1.5	9.0	2.8
Other debts	0.3	1.6	3.3	12.1	0.0	0.4	0.3	0.8
Age 80–84								
Checking/savings accounts	94.8	99.4	97.7	99.4	99.6	95.2	38.4	20.3
Risky assets	1.7	12.8	27.3	58.5	0.3	4.2	8.0	15.7
House	0.0	0.0	62.2	93.0	0.0	0.0	49.9	57.8
Other assets	0.6	2.3	14.0	39.8	0.1	0.6	3.7	6.2
Mortgage	0.0	0.0	32.0	21.6	0.0	0.0	7.0	2.3
Other debts	0.0	0.6	4.7	13.5	0.0	0.1	0.8	1.0
Age 85+								
Checking/savings accounts	94.3	100.0	100.0	100.0	99.4	93.4	55.3	26.8
Risky assets	0.0	7.5	34.0	60.4	0.0	4.5	10.0	21.1
House	0.0	0.0	39.6	81.1	0.0	0.0	30.3	45.2
Other assets	1.9	3.8	17.0	39.6	0.6	2.1	4.4	6.9
Mortgage	0.0	0.0	17.0	11.3	0.0	0.0	4.7	0.8
Other debts	0.0	1.9	3.8	18.9	0.0	0.1	0.1	0.9

The left-hand panel of this table reports the ownership rates (%) of each asset (debt) item; the right-hand panel of this table reports the average portfolio share of each asset (debt) item in ‘total assets’. Total assets is the sum of checking and savings accounts, risky assets, the value of the primary residence (house) and other assets younger age groups compared to the third net worth quartile (between 5 and 7 %). Couples in the bottom wealth quartile have hardly any assets other than checking and savings accounts.

For widows we also see the importance of housing wealth in the portfolios of the top wealth quartiles at the start of retirement (Table 5). However, the homeownership rate is almost zero for the oldest age group in the third wealth quartile. For the other wealth quartiles checking and savings accounts are the dominant asset category. We observe a shift from housing assets to risky assets among the older age groups in the top of the wealth distribution. The ownership rate and portfolio share of risky assets is much lower compared to couples for all wealth quartiles, which we already observed in Table 3.

4.5 Evolution in Household Portfolios Between 2005 and 2010

As we explained above, to distinguish between age, time and cohort effects we have to follow the asset holdings of the same cohort of households over time. Table 6 reports the participation rate in different asset classes for the cohort aged 65–69 in 2005. We follow the same cohort for 6 years. Consider first the ownership rate of risky assets among married couples: in 2005, slightly more than 31 % participate in the stock market. Subsequently, this declines to 28 % in 2007, and drops further during the financial crisis to a little less than 24 % in 2010. The decline in the participation rate thus already set in 2 years before the large drop in asset prices after the bankruptcy of Lehman Brothers. It is unclear whether this decline can be fully attributed to a time trend or whether age-effects explain this profile (as predicted by the life-cycle model).

Figure 3 also shows the evolution of asset classes for older cohorts spaced at 5-year intervals. The older cohorts also experience a decline in the ownership rate of risky assets over the same period. This suggests that time-effects are important and that there is little evidence that the elderly exit the stock market as they age. This is, however, inconclusive; a longer time series is necessary to make a decisive statement. Table 6 also reports the evolution of the risky assets share of total assets, which we refer to as the portfolio share of risky assets. The portfolio share of risky assets reduces only slightly as people age and seems to follow the participation profile. At the same time, the portfolio share of checking and savings accounts increases. Thus, the data suggest that the elderly rebalance their portfolio away from risky assets due to the increased uncertainty about the economic environment.

As already mentioned, the stock market participation rate among widowed persons is about 10 percentage-points lower compared to married couples in the 65–69 cohort. A comparison of the risky asset-profile among different cohorts shows that the decline in ownership slows down for the older cohorts. For the 85+ cohort, the ownership rate stays constant at about 15 % between 2005 and 2010. A possible explanation for the limited liquidation of risky assets is that the elderly start managing their portfolio more passively as their cognition declines; another explanation is that their time horizon increases due to a bequest motive.

Next, we examine the evolution of the ownership of mortgage debt and housing. For the 65–69 cohort of married couples, the homeownership rate in 2005 is about

Table 5 Household portfolios by net worth quartiles and age in 2005—widowed persons

Asset (debt) items	Ownership rate (%)				Portfolio share (%)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Age 65–69								
Checking/savings accounts	66.7	100.0	93.5	98.9	100.0	97.4	29.2	14.3
Risky assets	0.0	7.6	30.4	47.8	0.0	2.6	7.0	8.7
House	0.0	0.0	68.5	96.7	0.0	0.0	59.1	68.8
Other assets	0.0	0.0	14.1	33.7	0.0	0.0	4.7	8.2
Mortgage	0.0	0.0	51.1	48.9	0.0	0.0	12.0	5.5
Other debts	0.0	0.0	9.8	21.7	0.0	0.0	2.1	2.0
Age 70–74								
Checking/savings accounts	62.9	100.0	96.8	98.6	100.0	97.7	42.8	14.7
Risky assets	0.0	6.3	21.8	47.2	0.0	2.3	7.5	8.5
House	0.0	0.0	52.4	95.1	0.0	0.0	46.9	72.3
Other assets	0.0	0.0	9.7	23.2	0.0	0.0	2.8	4.5
Mortgage	0.0	0.0	41.1	42.3	0.0	0.0	8.5	5.1
Other debts	0.0	0.0	5.6	14.1	0.0	0.0	1.1	1.7
Age 75–79								
Checking/savings accounts	73.3	100.0	95.9	97.4	99.5	98.6	66.3	15.4
Risky assets	0.5	4.6	27.1	38.1	0.5	1.4	9.2	9.2
House	0.0	0.0	21.2	89.7	0.0	0.0	18.6	66.9
Other assets	0.0	0.0	12.9	28.9	0.0	0.0	6.0	8.5
Mortgage	0.0	0.0	15.3	29.9	0.0	0.0	4.1	4.3
Other debts	0.0	0.5	4.1	13.4	0.0	0.2	1.4	2.2
Age 80–84								
Checking/savings accounts	79.3	100.0	100.0	97.3	99.4	97.0	69.6	21.5
Risky assets	0.0	6.6	22.5	42.6	0.0	3.0	9.5	12.7
House	0.5	0.0	17.4	85.2	0.6	0.0	15.5	59.7
Other assets	0.0	0.0	15.2	31.1	0.0	0.0	5.5	6.1
Mortgage	0.5	0.0	10.1	19.1	0.9	0.0	3.1	1.9
Other debts	0.5	0.0	7.2	10.4	0.5	0.0	2.0	1.3
Age 85+								
Checking/savings accounts	78.0	100.0	100.0	98.0	99.8	99.3	83.0	25.9
Risky assets	0.7	3.4	10.8	42.7	0.2	0.7	5.9	17.9
House	0.0	0.0	1.1	72.0	0.0	0.0	0.9	49.1
Other assets	0.0	0.5	20.4	30.7	0.0	0.0	10.2	7.1
Mortgage	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.7
Other debts	0.0	0.5	3.2	14.7	0.0	0.2	0.4	2.3

The left-hand panel of this table reports the ownership rates (%) of each asset (debt) item; the right-hand panel of this table reports the average portfolio share of each asset (debt) item in 'total assets'. Total assets is the sum of checking and savings accounts, risky assets, the value of the primary residence (house), and other assets

Table 6 Household portfolios between 2005 and 2010, age 65–69 in 2005, balanced panel

	2005	2006	2007	2008	2009	2010	Δ '05–'07	Δ '07–'10
Married (N = 1074)								
Ownership rate (%)								
Checking/savings accounts	96.9	96.0	98.1	97.3	98.6	97.9	1.2	−0.2
Risky assets	31.5	29.7	27.8	25.6	25.2	23.7	−13.3	−14.7
House	57.9	58.2	57.8	57.7	57.5	57.5	−0.2	−0.5
Other assets	14.6	14.9	14.2	13.7	14.5	12.8	−2.8	−9.9
Mortgage	37.7	37.8	37.2	36.3	35.2	34.2	−1.3	−8.1
Other debts	7.7	7.2	7.7	7.2	7.2	7.0	0.0	−9.1
Loan-to-value ratio	19.1	19.0	18.0	18.6	19.5	20.0	−6.1	11.1
Mean portfolio share (%)[a]								
Checking/savings accounts	55.0	56.0	56.9	56.8	59.1	59.9	3.3	5.3
Risky assets	5.6	5.5	5.0	4.2	4.2	3.5	−12.0	−30.0
House	36.1	35.4	35.1	35.7	33.8	34.0	−2.8	−3.1
Other assets	3.4	3.2	2.9	3.4	2.9	2.7	−17.2	−6.9
Mortgage	4.9	4.4	4.5	4.6	4.7	4.7	−8.9	4.4
Other debts	1.0	0.9	0.7	1.0	1.6	1.1	−42.9	57.1
Widowed (N = 320)								
Ownership rate (%)								
Checking/savings accounts	89.1	91.6	93.1	90.6	94.1	93.1	4.3	0.0
Risky assets	22.2	22.5	19.4	18.4	17.2	15.6	−14.4	−19.6
House	42.5	42.2	42.2	41.6	41.6	41.3	−0.7	−2.1
Other assets	11.9	10.6	10.0	9.4	8.1	8.1	−19.0	−19.0
Mortgage	25.6	24.1	24.4	22.8	21.9	20.9	−4.9	−14.3
Other debts	7.8	8.4	5.6	5.0	7.2	5.3	−39.3	−5.4
Loan-to-value ratio	13.8	13.0	12.4	12.4	13.3	13.2	−11.3	6.5
Mean portfolio share (%)								
Checking/savings accounts	45.0	44.1	46.0	46.6	47.8	48.3	2.2	5.0
Risky assets	5.9	5.9	5.2	3.9	3.9	3.7	−13.5	−28.8
House	46.0	46.7	45.6	46.2	44.4	44.3	−0.9	−2.9
Other assets	3.2	3.3	3.2	3.3	3.8	3.6	0.0	12.5
Mortgage	9.2	9.6	10.3	9.2	9.0	9.4	10.7	−8.7
Other debts	2.0	2.4	10.5	18.4	21.8	7.0	81.0	−33.3

In this table we consider a balanced panel: i.e. the same households are followed over time for which the marital status does not change between 2005 and 2010

[a] 'Mean portfolio share (%)' reports the average portfolio share of each asset (debt) item in 'total assets'. Total assets is the sum of checking and savings accounts, risky assets, the value of the primary residence (house) and other assets

60 %, and about two-thirds of the homeowners still have a mortgage outstanding. The homeownership profile stays very flat over the years. In addition, it appears that this group of young retirees redeems their mortgage at a very slow pace: mortgage ownership declines from 37.7 to 34.4 % in 2010. Similarly, the average portfolio share

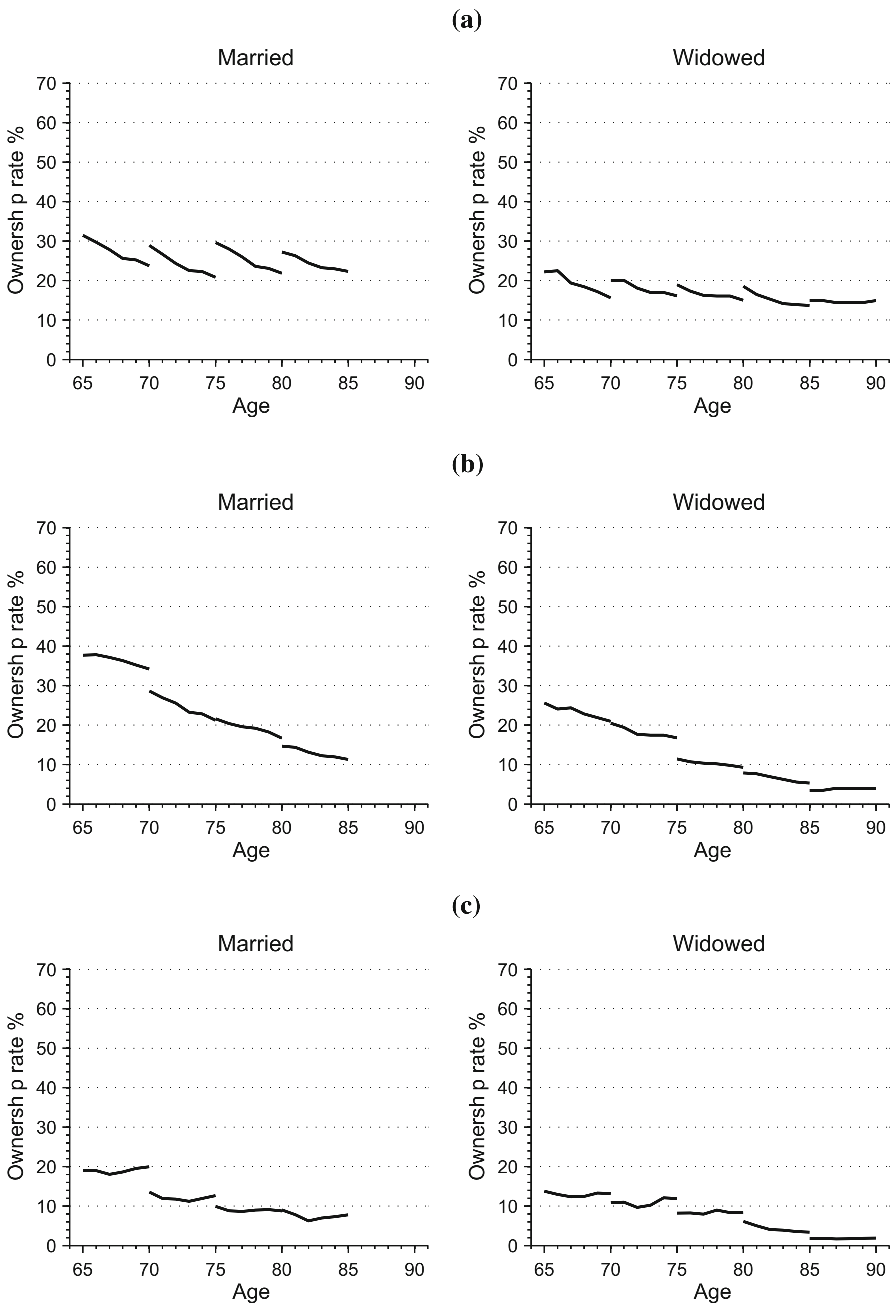

Fig. 3 Asset ownership by cohort and age of the key person of household (balanced panel). **a** Risky assets (ownership rate), **b** mortgage (ownership rate), **c** loan-to-value ratio (mean)

of mortgage debt stays fairly constant over the years (around 4.7 % of total assets). This is different from the behavior of US households, which seem to reduce mortgage debt after 2007 (Dynan et al. 2012). The decline in mortgage debt is mainly caused by borrowers who default on their mortgage loan. Mortgage defaults occur less often in the Netherlands and do not result in a decline of household debt. This is because mortgage loans in the Netherlands are with recourse, which means that the borrower is liable for the deficiency in case of default. Another reason for the low number of mortgage defaults is that lenders judge the affordability of mortgage payments when applying for a loan.

Figure 3 reports a more rapid decline in mortgage ownership among the older cohorts. Nevertheless, among all cohorts the loan-to-value ratios decline only slightly in the years before the financial crisis, and increase slightly after 2007 when house prices decline. This reflects the importance of interest-only mortgages for the elderly. The elderly do not pay off the mortgage principal before the end of the loan. Among the oldest cohort of couples (age 80+ in 2005), about a quarter of all homeowners still have a mortgage outstanding (10 %), with an average value of about 10 % of the value of their house. This stresses the potentially important role of interest-only loans to extract housing equity for the elderly. The provision of home equity loans to elderly persons is relatively riskless for financial institutions, since the loan-to-value ratios are relatively low.

4.6 Wealth Holdings, Financial Portfolios and Pension Income

As shown above, a large fraction of the elderly has accumulated significant savings mainly in the form of housing equity. This holds in particular for the younger cohorts. For the bottom part of the net worth distribution and for the older cohorts, housing equity is less important: they essentially keep all of their savings in a bank account. At the median, we observe that the elderly have accumulated a decent buffer of financial wealth, high enough to cover small unexpected expenses but too small to significantly increase consumption in retirement. These households depend mainly on social security and pension income to support retirement consumption.

Table 7 shows the cross-sectional wealth distribution in 2005 by age and lifetime income tertile. We formulate lifetime income tertiles for both widows and married couples among age groups. We take the average of the sum of pension and social security income between 2005 and 2010 as a measure of lifetime income. This is a good indicator of lifetime income, since it reflects average earnings during working life.[10] First of all, it is evident that wealth and lifetime income are strongly correlated. Among all age groups, couples with a higher lifetime income have accumulated disproportionally more wealth compared to individuals with a low lifetime income. Married couples between the ages 65 and 69 in the bottom income tertile have on average € 96,200 in net worth, the middle quantile has € 172,900 in net worth, while the upper tertile has € 533,700 in mean net worth. At older ages, the difference between

[10] The replacement rate for low-income groups is, however, somewhat higher compared to high-income groups.

Table 7 Household wealth in 2005 by age, marital status and by tertiles of the permanent income distribution[a]

Age-group and assets	Married						Widowed					
	Mean			Median			Mean			Median		
	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3
Net worth												
65–69	96.2	172.9	533.7	19.6	117.8	372.7	137.2	115.3	328.2	7.8	20.3	244.6
70–74	116.6	158.4	453.6	24.1	53.5	326.7	86.8	75.9	289.5	12.9	15.6	211.0
75–79	146.5	145.4	414.4	39.4	44.5	307.5	76.5	77.5	272.7	16.2	21.1	152.2
80–85	122.7	139.5	481.9	39.4	40.1	357.0	83.4	80.8	343.4	14.2	17.6	182.0
85+	134.9	125.4	460.3	25.5	46.0	291.0	48.4	70.7	350.3	15.1	21.2	109.3
Net financial wealth												
65–69	32.2	52.8	271.9	10.2	28.4	92.4	77.5	40.9	116.1	6.0	12.9	39.3
70–74	46.4	55.7	223.6	15.8	27.9	79.5	30.7	24.7	103.7	7.7	13.7	34.7
75–79	68.5	65.4	188.2	21.2	29.4	80.0	41.6	34.4	128.3	12.3	17.4	35.5
80–85	59.9	60.8	263.7	26.4	32.9	120.5	49.5	38.0	195.6	12.4	16.7	45.7
85+	72.5	72.7	298.3	25.0	44.6	135.3	35.4	30.7	232.7	14.5	20.1	50.6
Housing equity												
65–69	64.0	120.2	261.8	0.0	51.8	255.6	59.8	74.4	212.2	0.0	0.0	185.8
70–74	70.2	102.7	230.1	0.0	0.0	222.7	56.1	51.2	185.8	0.0	0.0	162.3
75–79	78.1	79.9	226.2	0.0	0.0	206.7	34.9	43.0	144.4	0.0	0.0	0.0
80–85	62.7	78.7	218.2	0.0	0.0	211.1	33.8	42.8	147.8	0.0	0.0	0.0
85+	62.4	52.7	162.0	0.0	0.0	0.0	13.0	40.0	117.6	0.0	0.0	0.0

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator

[a] Permanent income is defined as the average of the sum of pension and social security income between 2005 and 2010. We formulate permanent income quantiles for both widows and married couples among age groups

the lowest two income tertiles disappears. For widowed persons, we observe very similar patterns as for couples. Households with a low lifetime income presumably have limited possibilities to save, which results in lower levels of wealth in retirement. There is, however, considerable heterogeneity in savings within all lifetime income tertiles. We find that net worth is unequally distributed particularly among households in the lower income quartiles, for all age groups. Consider, for example, married couples aged 70 to 74 and in the highest income tertile; mean net worth (€ 453,600) is 1.4 times higher than median net worth (€ 326,700), while for households in the lowest income tertile mean net worth (€ 116,600) is 4.8 times as high as the median (€ 24,100). The difference between the mean and median among persons with low lifetime income is less prevalent for financial wealth; the heterogeneity in accumulated net worth among the low-income groups is thus largely explained by housing equity: low-income households who bought a relative inexpensive house before the 1990s, accumulated substantial housing equity due to the high rates of return on housing as from the early 1990s. In addition, mortgage payments result in "forced" savings before retirement and allow them to consume more after retirement, when they are mortgage-free and therefore have low housing costs. For low-income groups, therefore, housing might work as a commitment device in which they are forced to save; see Thaler and Shefrin (1981). They can significantly improve their economic status in retirement by extracting housing equity to increase consumption. An important remaining question is, therefore, which factors determine homeownership status among low-income households in working life. Potential factors that reduce the demand for owner-occupied housing among low-income groups are the lower marginal tax rate, which results in lower mortgage rate deduction, and subsidized rents in the social housing sector.

Figure 4 shows the evolution of median net worth between 2005 and 2010 for widowed persons among different lifetime income groups and cohorts. The figure indicates that the profile of median net worth is very flat for all but the highest lifetime income group. A typical household in the bottom two income groups mainly holds riskless assets in checking and savings accounts, which remain rather unaffected by economic developments. Median savings are low among these groups and appear to be affected by the threshold for wealth taxation. For the highest lifetime income group, median net worth is highly affected by the rise and boom of financial markets and the housing markets. Regarding the older cohorts (age 75+), we observe that net worth already starts to decline before the financial crisis. This provides suggestive evidence that the richest households start drawing down their wealth after reaching age 75.

These asset profiles stratified by lifetime income are completely different compared to the asset profiles in the US, as shown by De Nardi et al. (2010) for single-person households for the years 1996–2006. First of all, there is more variation in median net worth among the income quantiles in the US, compared with the Netherlands: In the US, the bottom income group has virtually no assets, while the middle income group has substantially higher assets. Second, in contrast to households in the Netherlands, US households with high incomes see net worth rise with age. The opposite is the case for households with low income. De Nardi et al. (2010) explain the observed patterns by out-of-pocket health expenses, which are unimportant for the Netherlands. The

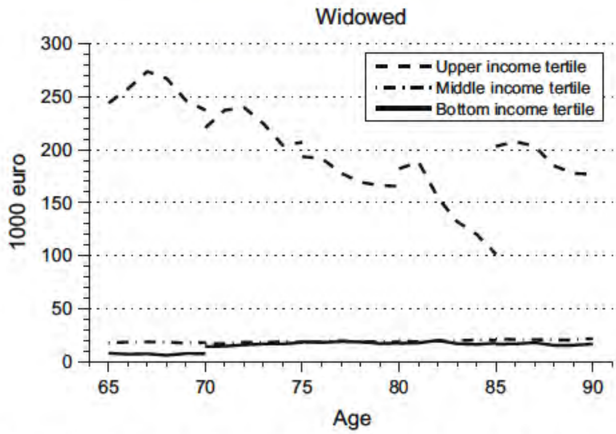

Fig. 4 Net worth profile (median) by cohort and permanent income tertile for singles, balanced panel

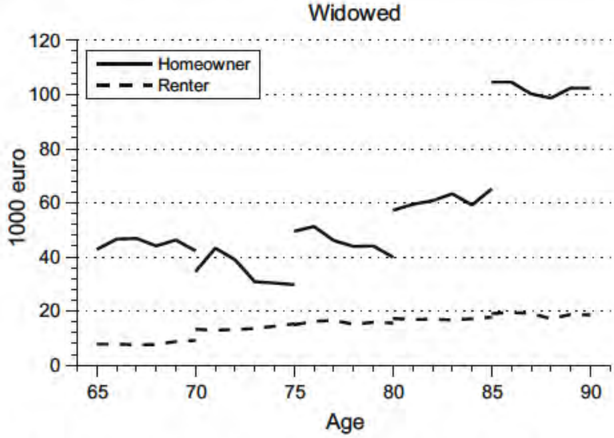

Fig. 5 Net financial assets profile (median) by cohort and homeownership status for singles, balanced panel

asset profiles might also be different because of the different periods of analysis with different economic activity. For example, we observe households before and after the downturn of the financial markets in 2008, which significantly affected asset holdings among the high-income group, while De Nardi et al. (2010) observed households in a period of higher economic growth, which might partly explain the rising wealth profile for the high-income groups. The higher prevalence of homeownership in the US might provide another explanation for the different asset patterns.

4.7 Financial Wealth Holdings of Homeowners and Renters

Homeownership status has an important impact on the wealth distribution among Dutch retirees. If we compare the tenure status in 2005 with the tenure status in 1989, we find that there is a strong persistence in ownership of housing, particularly among individuals in the older age groups. Among the oldest age group, less than 5 % of the households who lived in a rental home in 1989 became homeowners in 2005. For individuals at the start of retirement, this holds true for about 18 %. These households did not gain from the large appreciation of housing prices from the beginning of the nineties up to 2007.

Figure 5 shows the profile of median net financial wealth among homeowners and non-homeowners (in 2004) for widowed persons. The figure shows that renters are considerably poorer compared to homeowners. Besides the lower accumulated housing equity, they also hold limited financial savings. This might reflect their inability to purchase a house during their working life. The figure provides no clear evidence that elderly homeowners draw down their liquid savings.

5 Marital Transitions and Wealth Holdings

We observe that widowed persons have much less wealth than married couples. To understand the differences in the level of wealth between widowed households and couples, we consider the effect of the death of a spouse on wealth holdings and the composition of wealth holdings.

Table 8 examines the evolution of private wealth by marital status transition within 2 years.[11] We distinguish between three groups: married couples who survive between two waves (married–married); married couples of whom the partner dies in the next period (married–widowed); and widowed persons in two consecutive waves (widowed–widowed).

First, notice the significant difference in wealth between married couples who survive and those who lose a partner in the next period. Mean net worth of surviving couples in the age group 65–74 is € 260,100 in 2005 and € 280,200 in 2007, while net worth of couples of which the partner dies in the next period is € 191,900 in 2005 and € 245,200 in 2007. Similarly, persons who become widowed at older ages (age group 75+) are wealthier compared to those who lost their partner at an earlier age. This results in a lower level of net worth for widowed persons among all age groups.[12] The difference is caused by the survival of wealthier couples.

In addition to differential mortality, there is a direct effect of widowhood on net worth. The effect of the death of a spouse on wealth holdings can be seen by comparing net worth in the period before and (1 year) after the death of the spouse. For married couples in the age group 75 or older of whom the spouse dies within the next year, mean net worth is € 222,900 in 2005 and declines by 9.8 % to € 201,000 in the year after the death of the spouse. To interpret the magnitude of the effect of widowhood, we compare the change in net worth between surviving couples and couples in which the spouse dies in the same period. Net worth of surviving couples increases between 2005 and 2007 by 5.3 % to € 266,700 in 2007. The relative decline in net worth due to bereavements is thus 15.1 % (i.e. difference between −9.8 and +5.3). For the period between 2007 and 2009, net worth declines by 9.1 % among surviving couples. Wealth declines much faster when there is bereavement. For couples who lose their spouse, mean net worth declines by 37.8 %. We thus find a similar net effect as in the years 2005 and 2007. For net financial wealth we even find a somewhat larger drop, presumably because this is more liquid compared to housing wealth. An explanation for the drop in financial wealth after the death of the spouse may include transfers to the children or estate taxes. In addition, wealth holdings might be lower if the collected assets from the sale of the house are less than the valuation of the owner-occupied house. Poterba et al. (2011) find less explicit effects for financial assets but strong effects for housing equity. Sheiner and Weil (1992) and Feinstein and McFadden (1989) also show that the decease of a partner is an important determinant of housing turnover.

We find that widowhood results in a significant decline in homeownership in the years after the financial crisis, but not in the period before the financial crisis; see Table 9. A possible explanation for this asymmetric effect is that widowed persons decide to sell the house sooner if future prospects about the housing market are poor or because the supply of suitable housing is larger. Moreover, it might be more likely

[11] We examine the change in wealth holdings between wave t and wave $t + 2$.

[12] The observation that widowhood at an early age is associated with lower net worth is also illustrated by the difference in net worth between continuing couples in 2005 and 2007, where mean net worth is € 276,600 in 2007, and couples who are alive in 2007 and 2009, where mean net worth is € 290,200 in 2007.

Table 8 Marital status transition and wealth changes by year-of-birth cohort

	Mean						Median					
	t	$t+2$	%Δ	t	$t+2$	%Δ	t	$t+2$	% Δ	t	$t+2$	% Δ
	2005	2007		2007	2009		2005	2007	% Δ	2007	2009	% Δ
Net worth												
Aged 65–74 in 2005												
Widowed to widowed	175.5	184.2	5.0	184.5	158.0	−14.4	27.9	27.8	−0.4	31.5	29.2	−7.3
Married to widowed	191.9	192.0	0.0	245.2	196.9	−19.7	59.7	60.2	0.8	180.1	130.1	−27.8
Married to married	260.1	276.6	6.3	280.2	252.3	−10.0	159.2	171.1	7.5	174.4	151.4	−13.2
Aged 75+ in 2005												
Widowed to widowed	154.2	154.6	0.3	157.3	141.0	−10.4	24.9	24.7	−0.8	24.7	24.5	−0.8
Married to widowed	222.9	201.0	−9.8	186.6	116.1	−37.8	47.4	74.2	56.5	71.5	36.5	−49.0
Married to married	253.4	266.7	5.3	274.9	250.0	−9.1	125.6	132.8	5.7	146.3	125.3	−14.4
All												
Widowed to widowed	162.7	166.3	2.3	168.3	147.9	−12.1	24.9	24.7	−0.8	24.7	24.5	−0.8
Married to widowed	208.6	196.9	−5.6	220.8	163.3	−26.1	54.6	60.4	10.6	121.7	76.0	−37.6
Married to married	257.8	273.1	5.9	278.4	251.5	−9.7	147.6	157.6	6.8	164.5	144.2	−12.3
Net financial assets												
Aged 65–74 in 2005												
Widowed to widowed	67.4	69.1	2.5	69.4	59.8	−13.8	17.6	17.9	1.7	18.0	18.1	0.6
Married to widowed	84.4	77.6	−8.0	101.3	89.7	−11.5	28.2	24.6	−12.8	32.2	28.2	−12.4
Married to married	115.8	122.6	5.9	125.0	114.1	−8.7	32.4	33.9	4.6	34.6	35.4	2.3
Aged 75+ in 2005												
Widowed to widowed	79.3	76.5	−3.6	77.3	70.4	−9.0	21.8	22.3	2.3	22.8	22.0	−3.5
Married to widowed	130.5	100.5	−23.0	118.6	72.4	−39.0	33.4	29.5	−11.7	42.4	24.5	−42.2
Married to married	120.1	126.9	5.7	130.0	125.5	−3.5	42.6	45.7	7.3	45.8	45.4	−0.9

that the children demand their statutory portion (of the estate) if economic prospects are poor, which results in the sale of the house. In addition, we observe a significant reduction in ownership of risky assets among widowed households compared to sur-

Table 8 continued

	Mean						Median					
	t	$t+2$	%Δ	t	$t+2$	%Δ	t	$t+2$	% Δ	t	$t+2$	% Δ
	2005	2007		2007	2009		2005	2007	% Δ	2007	2009	% Δ
All												
Widowed to widowed	74.6	73.6	−1.4	74.1	66.1	−10.8	20.4	20.8	2.0	21.1	20.7	−1.9
Married to widowed	109.3	89.9	−17.7	108.5	82.5	−24.0	30.0	27.1	−9.7	39.4	25.4	−35.5
Married to married	117.3	124.1	5.8	126.7	117.9	−6.9	35.7	37.4	4.8	38.3	38.9	1.6

All amounts are expressed in €1000 and in 2010 prices using the CPI deflator

viving couples (observing not only the ownership rate but also the average portfolio share). In contrast to housing equity, the effect of widowhood on risky assets is much stronger in the years before the financial crisis. These opposite effects of risky assets and housing equity might explain why there is no clear-cut effect of widowhood on the share of savings in checking and savings accounts.

The observation that widowhood is associated with a reduction in the portfolio share and ownership of risky assets is not in line with Coile and Milligan (2009), who find that widowhood increases the share of assets held in liquid financial assets such as stocks and mutual funds (but also checking and savings accounts) and reduces the share of assets held in illiquid assets such as housing. This suggests that widowed persons prefer liquid household portfolios (to pay for health expenditures, for example). Our results indicate that widowed persons prefer less complex and less risky household portfolios. Whether they sell their house or stocks depends on the economic situation. The liquidity consideration might be less relevant in the Netherlands.

6 Health Status, Wealth Holdings and Financial Portfolios

We have shown above that widowhood at an early age is associated with lower wealth. In addition, persons with low lifetime income often have little wealth holdings. This suggests that health differences are important in explaining the financial status of the elderly: health problems in working life reduce the ability to work, which leads to lower pensions and less private savings; in retirement, these health problems lead to early death. For example, Smith (2004) shows for US households that the unfolding of a major health event leads to a large cumulative loss in income and consequently less wealth accumulation and reduced pensions.

There are other ways in which health status affects economic resources after retirement. A new health problem might lead to sizable out-of-pocket medical expenses, which reduce savings in case of limited insurance coverage. In addition, health status might affect the level of non-medical consumption. Finally, health shocks might reduce the expected remaining lifetime. This reduces the marginal utility of holding

Table 9 Marital status transition and changes in household portfolio composition

	Ownership rate (%)						Mean portfolio share					
	t	$t+2$	%Δ	t	$t+2$	%Δ	t	$t+2$	% Δ	t	$t+2$	% Δ
	2005	2007		2007	2009		2005	2007		2007	2009	
All												
Checking and savings accounts												
Widowed to widowed	91.1	93.6	2.7	93.3	94.5	1.4	65.1	65.9	1.2	65.5	67.2	2.7
Married to widowed	95.6	98.2	2.8	96.8	93.5	−3.3	63.4	61.4	−3.2	62.0	65.5	5.7
Married to married	97.6	97.4	−0.1	97.9	98.2	0.3	52.2	51.7	−1.0	51.1	53.7	5.2
Risky assets												
Widowed to widowed	19.2	16.8	−12.4	16.4	15.6	−4.6	5.9	5.2	−12.5	4.9	4.2	−14.4
Married to widowed	17.7	11.5	−35.0	19.4	16.9	−12.5	3.7	2.8	−25.0	2.9	2.3	−21.5
Married to married	28.7	24.7	−13.9	25.3	22.8	−9.8	6.3	5.4	−15.6	5.5	4.6	−17.4
House												
Widowed to widowed	31.6	32.7	3.5	33.0	32.3	−2.1	26.0	26.8	2.9	27.2	26.1	−4.1
Married to widowed	37.2	38.9	4.6	42.7	36.3	−15.0	28.2	30.4	8.1	32.5	28.7	−11.6
Married to married	50.3	52.3	4.0	53.3	51.6	−3.2	38.5	40.2	4.3	40.6	38.7	−4.8
Mortgage debt												
Widowed to widowed	14.1	13.0	−7.9	13.0	12.3	−5.4	2.5	2.3	−10.9	2.3	2.5	10.8
Married to widowed	17.7	16.8	−5.0	20.2	17.7	−12.0	2.1	2.2	3.0	3.6	4.2	16.9
Married to married	27.1	25.4	−6.3	26.1	24.0	−8.0	5.7	5.6	−2.2	5.7	5.4	−5.7

'Mean portfolio share (%)' reports the average portfolio share of each asset (debt) item in 'total assets'. Total assets is the sum of checking and savings accounts, risky assets, the value of the primary residence (house) and other assets

wealth in the absence of a bequest motive. Wealth holdings are not affected through reduced income in retirement, since all retirees have a certain pension income. However, as already indicated, both pension income and wealth holdings might be adversely affected by pre-existing health problems before retirement.

Since the analysis is at the household level, we account for the health status of both partners in a household. Table 10 shows the association between health status and wealth holdings for different combinations of health and different age groups. The table shows that there is a strong association between wealth holdings and health

Table 10 Household wealth in 2005 by age, marital status and health status

	Married					Widowed				
	65–69	70–74	75–79	80–84	85+	65–69	70–74	75–79	80–84	85+
Mean balance										
Net worth										
No health problems	265.6	251.7	237.5	303.4	332.4	224.4	166.9	152.7	179.3	146.2
Minor diseases	262.6	272.7	255.6	222.8	192.9	133	130.9	119.2	164.5	143.5
Major diseases	276.2	190.4	210.4	231.6	225.8	98.4	118.2	152.2	141.4	233.4
Net financial assets										
No health problems	110.2	116.8	100.2	168.3	205.2	89.3	61.5	67.8	100.4	89.5
Minor diseases	113.1	127.6	118.8	118	113.2	55.5	42	57.7	88.7	94.5
Major diseases	141	71.2	102.7	107.3	145.4	45.3	37	91.9	83.9	155.3
Housing equity										
No health problems	155.4	134.9	137.3	135	127.2	135.2	105.4	84.8	79	56.6
Minor diseases	149.5	145.2	136.8	104.8	79.6	77.5	88.9	61.6	75.8	49
Major diseases	135.2	119.1	107.7	124.3	80.5	53.1	81.2	60.3	57.5	78.1
Median balance/homeownership %										
Net worth										
No health problems	175.9	146.3	143.2	101.7	122.8	133	24.9	25	24.3	24.9
Minor diseases	158.1	161.6	112.2	69.4	64.6	13.7	24.9	21.8	24.9	23
Major diseases	110	71.2	54.1	89.4	46	14.5	20.7	22.1	17.2	22.4
Net financial assets										
No health problems	31.3	34.3	38.2	41.4	46	22.5	17.2	22.5	21.2	24.6
Minor diseases	29.4	34.9	38.8	43.7	46	7.1	17.2	17.2	24	21.5
Major diseases	28.6	28.9	33.4	39.7	46	9.8	11.9	18.3	12.2	17.3
Homeownership										
No health problems	60.2	48.7	46.0	39.7	37.0	48.26	36.47	30.12	25.51	17.18
Minor diseases	54.0	51.6	44.0	36.5	30.3	27.78	34.27	23.65	25.45	18.27
Major diseases	49.3	44.6	38.2	40.3	24.6	18.42	31.40	22.52	20.18	22.08

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator
We distinguish between three categories of diseases: major diseases (cancer or cardiovascular diseases), minor diseases (all other diseases) and the remaining "healthy" group with no hospitalization. For married couples we define the household to have a 'minor disease' if neither the key person nor the partner has a 'major disease' but at least of them is admitted to the hospital during the last three waves

for both the median and mean. For example, a couple between the ages of 75 and 79 with no previous health problems has an average net worth of € 237,500, while a couple of which one or both partners has major health problems has a net worth of € 210,000. This difference can mainly be attributed to differences in homeownership status between households with a different health status, as reported in the final column. Homeownership among households aged 75–79 with no preexisting health problems is 46.0 %, while homeownership among couples with major health problems is 38.2 %. The strong association between health and financial resources, among other things, is found by Poterba et al. (2011), among others. Their study also shows that households in good health have rising wealth profiles in retirement, while unhealthy households have a very flat wealth profile.

Next, we examine whether the onset of a new major disease (cancer or cardiovascular disease) affects wealth holdings between two waves. To analyze the effect of a new health event on wealth, we control for initial health status. We compare households who had no health problems (of any household member) between 2003 and 2005 but experienced different health shocks thereafter. We distinguish between five groups (see Fig. 6). The healthy group (dashed line) experienced no health shock (of any member) between 2005 and 2009 and serves as reference group. The other groups experienced a health shock (of at least one member) between 2005 and 2009 that differs in severity: the second group (dotted line) experienced a minor health shock (of at least one member) between 2005 and 2007 and is readmitted to the hospital for a minor condition between 2007 and 2009; the third group (thick line) experienced a minor health shock (of at least one member) between 2005 and 2007 and a severe health shock between 2007 and 2009; the fourth group (thick dashed line) experiences a severe health shock (of at least one member) between 2005 and 2007 and is readmitted to the hospital for a similar severe condition between 2007 and 2009; the final group (thin line) experienced a health shock (of at least one member) between 2005 and 2007 and one of the members dies in 2010 (not necessarily for the same cause).

Figure 6 shows that there are significant differences in the level of net worth, depending on health status: households experiencing a severe health shock are somewhat poorer, compared to households who experienced a minor health shock or no health shock. The slopes of the lines are very similar, which implies that there is no differential effect of health on mean net worth. When we look at homeownership we do not observe a clear effect of health on the change in homeownership status. Health problems might deter individuals from moving, due to the high physical and psychological burden of moving. Older people might already have moved in anticipation of getting health problems in the near future. Since elderly persons do not move house after the onset of a health event, it is relevant to analyze the effect of health on financial assets. For net financial wealth we also observe the initial differences in net financial wealth among different health groups. Notice that the level of net financial wealth eventually diverges in 2009 for all groups (except for the group of whom one of the members dies in 2010). This implies that those groups who experience a severe health shock accumulate relatively more financial wealth than those who stay in good health.

These results do not match the US evidence, as provided by Poterba et al. (2011), that households with health problems accumulate less wealth than healthy households. Possible explanations are the comprehensive health insurance system in the Netherlands and the relatively high replacement rates in the Netherlands, which guarantee a relatively constant standard of living; see, for example, García-Gómez et al. (2013). Another possibility is a decline in the marginal utility of consumption after a health shock, which results in more savings.

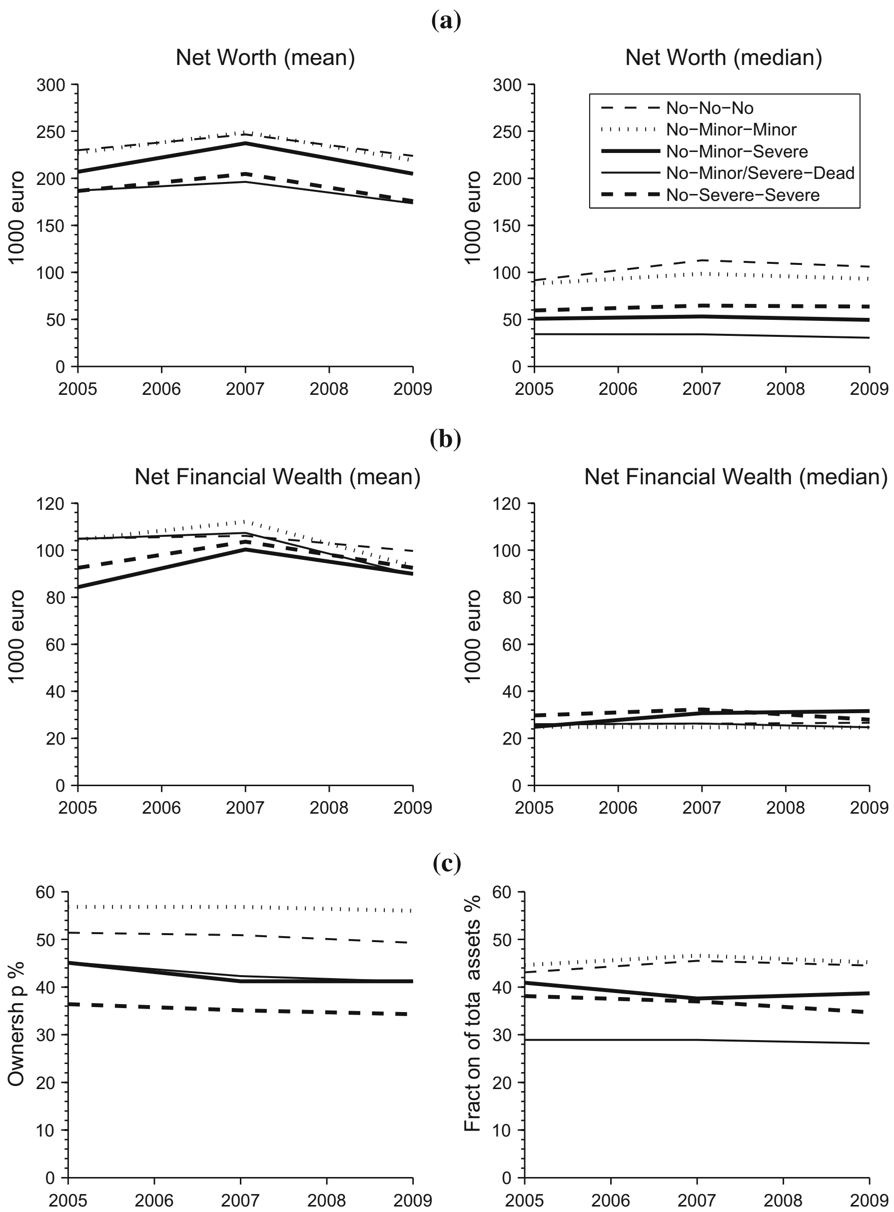

Fig. 6 Health shock and wealth holdings. **a** Net worth: mean and median, **b** net financial wealth: mean and median, **c** primary residence: ownership rate and fraction

6.1 Household Wealth Before Nursing Home Entry

Long-term care expenditures account for approximately 25.5 % of health expenditures and 2.9 % of GDP in 2012. These expenditures are almost completely covered by the Exceptional Medical Expenses Act (AWBZ), the public long-term care insurance

Table 11 Incidence of at least one day of LTC between 2004 and 2011 for the key-person of the household

	Age group in 2004							
	65–69	70–74	75–79	80–84	85–89	90–94	95+	Total
Nursing home care	12.7	19.0	32.7	49.2	67.3	74.2	83.3	34.5
Home care (personal and nursing)	26.8	38.8	54.4	63.8	60.2	48.2	29.6	47.6
Total (No.)	1816	2974	2570	2088	1010	461	108	10,817

Information about long-term care utilization is provided by the CAK 2004–2011

program (CBS, 2012). The projected growth of LTC expenditures puts further pressure on the fiscal budget. As a result, there is growing interest in requiring persons to use their own resources to pay for LTC. LTC services are costly, however, and may require substantial savings.

The most expensive form of LTC is nursing home use. The risk of entering a nursing home is very high: about one-third of the persons over age 65 spent at least one night in a nursing home between 2004 and 2011. The incidence of nursing home entry is particularly high at advanced old age; only one-third of persons aged 85 years and older in 2004 did not stay in a nursing home; see Table 11.

The time that a person spends in a nursing home is distributed very unevenly, which makes total expenditures on LTC uncertain. LTC institutions receive a fixed payment for each patient, depending on the severity of the patient's needs. The payment ranges from € 65 a day for patients with lighter LTC needs, to € 270 a day for patients who are nearing the end of life and have serious LTC needs. A year's stay in a nursing home cost, on average, € 58,500 in 2012 [13]. This implies that individuals need almost € 300,000 in financial resources to finance a 5-year stay in a nursing home. In particular, with regard to individuals diagnosed with degenerative diseases such as dementia, it is not unlikely that they will spend an enduring period in a nursing home; see e.g. Hurd et al. (2013). In the Netherlands, roughly 30 % of the nursing home population has dementia or related disorders as reported by CIZ in 2012.

Only a small fraction of the elderly would be able to finance nursing home expenditures out-of-pocket using their income and net worth. Table 12 reports the distribution of total resources of single elderly in the year before they permanently enter a nursing home. These resources are in theory available to fund LTC costs. For the vast majority, pension income is well under the amount required to cover these costs. A somewhat larger group would be able to self-support a nursing home stay if they would draw down their private savings. Table 13 shows the maximum number of years of nursing home use that these persons would be able to finance from their private resources; we assume that the costs of LTC move in line with asset prices and that there are no transaction costs involved with selling the house. Only 40 % of nursing home residents would be able to pay out-of-pocket a nursing home stay of more than 1 year; only 20 % of the residents would be able to finance a nursing home stay of more than 5 years. This group consists primarily of homeowners.

[13] Authors' calculations using information taken from the NZA and CIZ.

Table 12 Total resources of single elderly in the year before they permanently enter a nursing home (2005–2009) (%)

Net worth (in € 1000s)	Net income (in € 1000s)			
	<15	15–25	25+	Total (No.)
<25	72.3	61.0	13.6	501
Net worth 26–50	6.6	10.1	9.5	79
Net worth 51–100	5.8	6.7	7.5	58
Net worth 101–200	7.3	5.4	10.9	61
Net worth 201–300	4.4	7.3	14.3	67
Net worth 300+	3.6	9.5	44.2	119
Total (No.)	274	464	147	885

Table 13 Years of nursing home stay covered by private resources (%)

	<1 year	1–2	2–3	3–4	4–5	>5 years	Total
Renters	61.7	7.1	3.7	1.0	1.2	4.4	79.2
Homeowners	0.8	0.0	0.6	0.8	1.9	16.7	20.8
Total	62.5	7.1	4.3	1.8	3.2	21.1	100.0

The table shows the maximum number of years of nursing home use that single elderly would be able to finance from private resources. The resources are measured in the year before entering a nursing home and include both income and net worth

This calculation does not even take into account the possible use of home care services prior to entering a nursing home. Although the cost of receiving nursing care or personal care at home is somewhat less expensive, the likelihood of receiving home care is very high; see Table 11.

7 Savings During the Last Years of Life

We find that the elderly, on average, keep large amounts of assets even at a very old age and do not decumulate assets. In the absence of a bequest motive, they might hold these assets because of uncertainty about the time of death or uncertain expenses in the last years of life. In that case, we should find that households start drawing down their money in the last phase of life and this holds in particular for individuals in poor health who have a lower life expectancy.

Table 14 reports wealth levels in the first wave (2005) and final wave (2010) for single households with no pre-existing health problems. The first set of columns of the table shows the trajectory of wealth holdings for individuals who do not die between 2005 and 2011. The second set of columns shows the trajectory of wealth for individuals who die between 2005 and 2011. These columns indicate that assets decline in the reporting period. However, there is no difference in the decline between both groups. The table also shows the same analysis for single households with major pre-existing health problems before 2005. The table indicates that there is differential mortality between both groups. There is no evidence of dissaving in the years before death.

Table 14 Net worth before death (1000 euro), single households, age 70 and older in 2005

	Survives			Dies		
	2005	Δ annual	Δ final year	2005	Δ annual	Δ final year
No health problems						
Mean	187.5	−2.85	−6.1	185.5	−1.62	−5.89
Median	24.85	−0.02	−0.2	24.85	0.02	−0.08
Obs	997			437		
Minor health problems						
Mean	158.3	−2.13	−3.17	140.9	1.3	−5.08
Median	24.85	−0.02	−0.2	22.7	0	0
Obs	587			364		
Major health problems						
Mean	159.7	−4.27	−4.68	149.1	−3.58	−4.7
Median	24.85	0	−0.2	20.9	0.04	0.01
Obs	526			415		

All amounts are expressed in thousands of euros and in 2010 prices using the CPI deflator
We distinguish between three categories of diseases: major diseases (cancer or cardiovascular diseases), minor diseases (all other diseases) and the remaining "healthy" group with no hospitalization. For married couples we define the household to have a 'minor disease' if neither the key person nor the partner has a 'major disease' but at least of them is admitted to the hospital during the last three waves

It seems that individuals in poor health save during the last years of life. These results are not in line with evidence from US studies, which find a large decline in assets in late-life (e.g. French et al. 2006). Poterba et al. (2014) show that the decline in assets at the end of life is strongly associated with deteriorating health and not caused by an underestimation of life expectancy or lower pension benefits. This suggests that medical expenditure risk is not important in the Netherlands and that a bequest motive might be relevant.

8 Conclusion

The elderly, on average, keep large amounts of assets even at a very old age, and they leave a considerable bequest. We do not find evidence of decumulation of wealth after retirement for singles, despite the fact that retirees face limited income uncertainty and limited uncertainty about out-of-pocket payments for medical expenses. We find some suggestive evidence of dissaving for high-income widowed persons.

At the median, we observe that the elderly have accumulated a decent buffer of financial wealth, high enough to cover small unexpected expenses but too small to significantly increase consumption in retirement. These households depend mainly on social security and pension income to support retirement consumption.

Our results also show that not many homeowners sell off their house to finance their retirement, and it is very likely that homeownership among the elderly will increase in the future because of cohort effects. There is some suggestive evidence that younger elderly persons extract housing equity by means of interest-only mortgages.

There are large initial differences in the level of wealth holdings among different health groups and between couples and singles. The latter is most likely related to the socioeconomic status of households, since we do not find major differences in the decumulation pattern for different health groups. The onset of a newly diagnosed severe health condition even results in increased savings in financial assets. A possible explanation for this finding is that deteriorating health constrains non-health-care consumption. Persons in bad health are no longer able to travel or to enjoy leisure activities and they consume less food. It is questionable whether people take this declining consumption path into account when planning for retirement. This results in higher savings in old-age.

The bereavement of a spouse results in a significant reduction of net worth compared to surviving couples, in both the period before and after the financial crisis. We also observe a slight reduction in homeownership after the death of a spouse (in the years after the financial crisis) and a significant reduction in the ownership rate and portfolio share of risky assets (in the years before the financial crisis). The reduction in homeownership indicates that people downsize their housing wealth when they become widowed. The collected assets from the sale of the house might partly be transferred to the heirs, resulting in a drop in net worth. Not surprisingly, we find strong evidence of differential mortality, which also explains the differences in household portfolios between widowed persons and married couples.

It can be concluded that a simple life-cycle model is soundly rejected. To explain the saving behavior of the elderly, it is important to consider extended versions of this basic model that explicitly take into account not only a bequest motive, but also the role of lifetime uncertainty, housing, family structures and (wealth and estate) tax-rules. In addition, it is important to allow for health-dependent utility. It is unclear whether the observed large bequests are intended or accidental. Data on the economic status of the children and the exact division of the estate among the heirs might allow us to approach this important research question in future research.

These results are relevant for public policies that seek to encourage the use of private savings to cover risks in retirement, such as out-of-pocket LTC expenses, and to support consumption in retirement. We briefly discuss policy measures which stem from the analysis below.

8.1 Facilitate the Use of Housing Assets for Long-Term Care

Housing equity is rarely spent throughout old-age and is commonly left as a bequest. Housing equity is a very suitable means to save for LTC because the elderly do not downsize their housing equity except in the event of severe illness or after the decease of the spouse. This implies that housing equity becomes available in situations when health and LTC expenditures are potentially large. We show that for the vast majority of homeowners who permanently enter a nursing home, the proceeds from the sale of the house can cover a nursing-home stay of more than 5 years. Housing equity is therefore a valuable vehicle to save for LTC services that will not be covered by the public LTC insurance system, such as a stay in a nursing home with better care facilities.

The government can encourage the accumulation of housing equity by allowing individuals to use part of their pension savings to pay off mortgage debt or by discouraging home equity borrowing before retirement. A lower mortgage debt also reduces the costs of living because of lower mortgage payments. This provides more scope to cover immediate costs from financial assets without the need to sell the house. In addition, the government should discourage transfers to the children after the decease of the spouse. Our analysis suggests that these transfers are currently substantial.

Housing equity is essentially not available for LTC expenses unless a person sells the house and moves elsewhere. Financial products to extract home equity such as reverse mortgages are therefore beneficial if a person desires care at home or if only one of the household members moves to a nursing home. The market for these type of products is thin, partly because of the relative high costs of compensating the lender for the large risk that the total amount of monthly payments exceeds the value of the house. This is either because the last surviving borrower remains in the home for a long period or because house prices decline.

A reverse mortgage product providing a line of credit that can only be used for LTC expenses reduces this risk, for two reasons. First, persons in need of LTC are already at an advanced age and typically remain in their home for a relatively short period. Second, given that the line of credit can only be used for LTC-related expenses, there is a lower risk that all home equity will be spent. This is also beneficial for people who like to leave a bequest.

8.2 Eligibility for Public Long-Term Care Insurance Should Not Depend on Wealth Holdings

People who find it important to save for LTC are discouraged doing so if the eligibility for public LTC depends on the level of wealth. There is strong empirical evidence that the introduction of asset-testing—which requires persons to first run down their assets in order to become eligible for public LTC—discourages saving, particularly if the quality of publicly provided LTC is high. For the Netherlands, anecdotal evidence suggests that the recent introduction of a wealth-based payment for nursing-home care led to increased transfers of wealth between parents and children.

A means-tested system that is based only on the level of income does not have these disadvantages. To restrict the utilization of public-provided care it is therefore more efficient to increase income-related payments. A benchmark study about LTC expenses among OECD countries shows that income-related payments are relatively low in the Netherlands (OECD 2011). This holds in particular for care at home. When an individual is unable to pay these higher income-related expenses, they can be deferred until after death. At that time, claims can be recovered from the estate before the estate is transferred to the heirs.

8.3 Align Pension Benefits with Consumption Needs in Old-Age

In the current pension system, pension income does not decrease with age. This does not reflect the declining needs as people age. Our analysis provides evidence that the marginal utility of consumption declines in old-age because of deteriorating health. This results in higher savings in old-age due to the comprehensive coverage of health care expenditures. It is questionable whether people take this declining consumption path into account while planning for retirement. Besides, they are not able to borrow against future pension benefits to increase consumption at the start of retirement. To align pension benefits with actual consumption needs, we propose a pension payout that declines with age.

The available funds can, if desired, be provided for LTC services that will not be covered by the public LTC insurance system, such as a stay in a nursing home with better care facilities or more intensive home care that makes it possible to stay at home for a longer period.

8.4 Integrate Pensions and Long-Term Care

Our analysis shows that a sizable fraction of the Dutch elderly has accumulated a small buffer of financial wealth that is sufficient for small incidental expenditures but insufficient for large expenditures such as LTC. This predominantly holds for renters. The introduction of individual saving accounts for LTC is inefficient, since they demand excessive wealth accumulation to self-insure against potentially large LTC expenses. Moreover, it is doubtful whether these accounts generate additional savings by people with a low income who have little room for saving.

One attractive alternative is to require persons at retirement to make an active choice between a lower (age-declining) pension (which provides additional payments when persons are in need of LTC) and a ‘normal’ pension (which provides a constant stream of pension benefits). The exact additional payments will depend on the severity of the disability, which is determined by an assessment of needs. The problem of adverse selection in this product is limited, for two reasons. First of all, persons who are in need of LTC have a lower life expectancy and consequently a lower expected present discounted value of future pension benefits. Second, persons have to commit themselves for one of both products already at the start of retirement when the prevalence of LTC is low. Asymmetric information about future LTC use is also limited at an earlier age. An additional benefit of combining LTC and pensions is that it leads to a reduction in costs.[14]

Another possibility is to use these funds to pay for the premiums of an LTC policy, which covers the costs of LTC on top of the basic public LTC. The experience from different countries, such as the US and the UK, shows that the willingness to buy these insurance products is very low. We will therefore not consider the possibility of private LTC insurance as a supplement to publicly provided LTC.

[14] See also Murtaugh et al. (2001) for an extensive welfare analysis of a combination of LTC and annuities.

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Do the Rich Save More?

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The question of whether higher–lifetime income households save a larger fraction of their income was the subject of much debate in the 1950s and 1960s, and while not resolved, it remains central to the evaluation of tax and macroeconomic policies. We resolve this long-standing question using new empirical methods applied to the Panel Study of Income Dynamics, the Survey of Consumer Finances, and the Consumer Expenditure Survey. We find a strong positive relationship between saving rates and lifetime income and a weaker but still positive relationship between the marginal propensity to save and lifetime income. There is little support for theories that seek to explain these positive correlations by relying solely on time preference rates,

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nonhomothetic preferences, or variations in Social Security benefits. There is more support for models emphasizing uncertainty with respect to income and health expenses, bequest motives, and asset-based means testing or behavioral factors causing minimal saving rates among low-income households.

I. Introduction

It would be easy to convince a room full of noneconomists that higher lifetime income levels lead to higher saving rates. Noneconomists would tell you that low-income people cannot afford to save. Certainly a room full of journalists would need little convincing: Examples include "a sales tax would shift the tax burden from the rich to the middle class, since affluent people save a much larger portion of their earnings" (Passell 1995, p. 1) and "the poor and middle class spend a higher percentage of their income on goods than do the rich, and so, according to most economists' studies, a value-added tax is regressive" (Greenhouse 1992, p. 1).

A room full of economists would be less easily persuaded that higher lifetime income levels lead to higher saving rates. The typical economist would point out that people with temporarily high income will tend to save more to compensate for lower future income, and people with temporarily low income will tend to save less in anticipation of higher future income. Thus, even if the saving rate is invariant with regard to *lifetime* income, we would observe people with high *current* incomes saving more than their lower-income brethren (Friedman 1957).

Moreover, one can point to several stylized facts that do not seem to support a positive correlation between saving rates and income. First, there has been no time-series increase in the aggregate saving rate during the past century despite dramatic growth in real per capita income. Also, the increasing concentration of income toward the top income quintile during the 1980s and early 1990s did not lead to higher aggregate saving rates.[1] Looking across countries, Schmidt-Hebbel and Serven (2000) found no evidence of a statistically significant link between measures of income inequality and aggregate saving rates. Turning to household data, several recent studies that estimate roughly constant wealth-income ratios across lifetime income groups (Gustman and Steinmeier 1997, 1999; Venti and Wise 1999) pose a serious challenge to the view that saving rates rise with lifetime income.

[1] Blinder (1975) finds little connection between shifts in the income distribution and the aggregate saving rate but argues that the changes in the income distribution present in postwar U.S. data are unlikely to correspond to the type of pure redistribution required by the theory.

Despite an outpouring of research in the 1950s and 1960s, the question of whether the rich save more has since received little attention. Much of the early empirical work favored the view that high-income people did in fact save a higher fraction of their income (e.g., Mayer 1966, 1972). However, studies by Milton Friedman and others that reached the opposite conclusion, together with suggestive evidence like that described above, have left "reasonable doubt" about the alleged propensity of high–lifetime income households to save more.

We return to the relationship between saving rates and lifetime income for two reasons. First, there are a wide variety of newer data sources such as the Panel Study of Income Dynamics (PSID), the Survey of Consumer Finances (SCF), the Consumer Expenditure Survey (CEX), and work on imputed saving from Social Security and pension contributions (Gustman and Steinmeier 1989; Feldstein and Samwick 1992). Second, we believe that the topic has important implications for the evaluation of economic policy. If Friedman and his collaborators did not earn a clear-cut victory in the empirical battles of the 1960s, they won the war. "Representative agent" models and many other models used for macroeconomic or microeconomic policy evaluation *assume* that saving rates are at best invariant to proportional increases in the sum of human and physical wealth (Auerbach and Kotlikoff 1987; Fullerton and Rogers 1993; Leeper and Sims 1994; Altig et al. 2001).

The link between income and saving rates bears on a number of specific issues. First, differences across income groups in saving rates and marginal propensities to save imply that the effects on aggregate consumption of shocks to aggregate income or wealth depend on the distribution of the shock across income groups (see Stoker 1986; Shapiro and Slemrod 2003); this issue figured prominently in the debate surrounding the 2001 tax "rebates." Second, the incidence and effectiveness of reform proposals that shift taxation away from saving, such as consumption or value-added taxes or expanded 401(k) or individual retirement accounts, depend on how much saving is done by each income group. Third, the link between income and saving rates influences how changes in income inequality alter saving and possibly aggregate growth. Finally, the question of whether higher-income households save at higher rates than lower-income households has important implications for the distribution of wealth.

We find first, like previous researchers, a strong positive relationship between current income and saving rates across all income groups, including the very highest income categories. Second, and more important, we continue to find a positive correlation when we use proxies for permanent income such as education, lagged and future earnings, and measures of consumption. Estimated saving rates range from zero for the bottom quintile of the income distribution to more than 25 percent of income for the top quintile. The positive relationship is equally strong or even more pronounced when we include imputed Social Security saving and pension contributions. Among the elderly, we find little evidence of dissaving and some suggestive evidence of slightly higher saving rates among high-income households. In sum, our results suggest strongly that the rich do save more; more broadly, we find that saving rates increase across the entire income distribution. In addition, we present evidence suggesting that the *marginal* propensity to save is greater for higher-income households than for lower-income households.

After documenting the basic patterns of saving, we consider why the rich save more. Our findings are not consistent with the predictions of standard homothetic life cycle models. Nor, as we show below, are they consistent with explanations that range from differences in time preference rates or subsistence parameters to variation in Social Security replacement rates. Alternative models of saving that can explain the empirical regularities include those with hyperbolic discounting (e.g., Laibson, Repetto, and Tobacman 1998) or those with differential asset accumulation against out-of-pocket health expenditures late in life (e.g., Smith 1999*b*; Dynan, Skinner, and Zeldes 2002).

II. The Empirical and Theoretical Background

Many economists in previous generations used both theory and empirics to assess whether people with high incomes save more than those with low incomes (e.g., Fisher 1930; Keynes 1936; Vickrey 1947; Duesenberry 1949; Hicks 1950; Pigou 1951; Friend and Kravis 1957; Modigliani and Ando 1960). In his pioneering work on the permanent income hypothesis, Friedman (1957) argued that the positive correlation between income and saving rates observed in cross-sectional data reflected individuals changing their saving in order to keep consumption smooth in the face of temporarily high or low income. He presented empirical evidence consistent with the proportionality hypothesis that individuals with high permanent income consume the same fraction of income as individuals with low permanent income. Many studies of this hypothesis followed, some supporting Friedman and some not. Evans (1969) summarized the state of knowledge about consumption in 1969, concluding that "it is still an open question whether relatively wealthy individuals save a greater proportion of their income than do relatively poor individuals" (p. 14).

In a comprehensive examination of the available results and data, Mayer (1972) disagreed, claiming strong evidence against the proportionality hypothesis. For example, using five-year income and spending measures, he found the elasticity of consumption with respect to permanent income to be significantly below one (0.905) and not much different from the elasticity based on one year of income.

Despite the abundance of early studies on this important question, little work has been done since the 1970s. The lull in part reflects the influential work of Lucas (1976) and Hall (1978), which shifted interest away from learning about levels of consumption or saving and toward "Euler equation" estimation techniques that implicitly examine first differences in consumption (see Browning and Lusardi 1996).

Some studies have found that *wealth* levels are disproportionately higher among households with high lifetime income (Diamond and Hausman 1984; Bernheim and Scholz 1993; Hubbard, Skinner, and Zeldes 1995). While this result could be explained by higher saving rates among higher-income households, it could also be explained by higher rates of return (on housing or the stock market, e.g.) or the receipt of proportionately more intergenerational transfers by these households. Others (Gustman and Steinmeier 1999; Venti and Wise 1999) have argued that ratios of wealth including Social Security and pension wealth to lifetime income are no higher among high-income households, consistent with the Friedman hypothesis.

To help make our question more precise, consider a life cycle/permanent income model with a bequest motive. At each age t, households maximize expected lifetime utility

$$U_{it} \equiv E_t \sum_{s=t}^{T} \left[\frac{U(C^*_{is}) D_{is}}{(1+\delta_i)^{s-t}} + (D_{is-1} - D_{is}) V(B_{is}) \right], \tag{1}$$

where E is the expectation operator, C^*_{is} is nonmedical consumption for household i at age s, δ_i is the household-specific rate of time preference, B_{is} is the bequest left in the event of death, and $V(\cdot)$ is the utility of leaving a bequest. To allow for mortality risk, D_{is} is a state variable that is equal to one if the household is alive through period s and zero otherwise, and T is the maximum possible length of life.

The family begins period s with net worth (exclusive of human wealth) $A_{is-1}(1 + r_{is-1})$, where r_{is-1} is the real after-tax rate of return on non–human wealth between $s - 1$ and s. We assume that there are no private annuity markets. The family first learns about medical expenses (M_{is}), which we treat as necessary consumption that generates no utility. It next receives transfers (TR_{is}) from the government. It then learns whether it survives through the period. If not, it leaves to heirs a nonnegative bequest

$$B_{is} = A_{is-1}(1 + r_{is-1}) - M_{is} + TR_{is}. \tag{2}$$

If it survives, the household receives after-tax earnings (E_{is}) and chooses nonmedical consumption. We define total consumption as $C_{is} \equiv C^*_{is} + M_{is}$. End-of-period wealth (A_{is}) is thus

$$A_{is} = A_{is-1}(1 + r_{is-1}) + TR_{is} + E_{is} - C_{is}. \tag{3}$$

We define real annual income as $Y_{is} \equiv r_{is-1}A_{is-1} + E_{is} + TR_{is}$ and saving as $S_{is} \equiv Y_{is} - C_{is} = A_{is} - A_{is-1}$.[2]

Define lifetime resources (as of age t) as age t non–human wealth plus the expected present value of future earnings and transfers. Under what circumstances will saving rates be identical across households with different lifetime resources? In a life cycle model without uncertainty, there are two alternative assumptions that will cause consumption to be proportional to lifetime resources. Either we can assume that the rate of time preference (δ_i) and the rate of return (r_{is}) are constant and equal to each other (in which case the result holds for *any* time-separable utility function), or we can assume that preferences are homothetic (i.e., $U(C) = [C^{1-\gamma} - 1]/[1 - \gamma]$, in which case the result holds for any rate of interest or time preference). If all households face the same interest rates and have the same preference parameters and life span, then the ratio of consumption to lifetime resources will be the same for all households (of a given age). If one further assumes that the initial wealth and the age-earnings and age-transfers profiles of rich households are simply scaled-up versions of those for poor households, then the proportionality in consumption implies that the saving rate (at a given age) will be the same across lifetime resource groups.[3]

How then could saving rates differ across income groups? We consider three general classes of models: one encompasses certainty models without a bequest motive, the second allows for uncertainty with respect to future income or health expenses (but no bequest motive), and the third includes an operative bequest motive. To provide illustrative calculations of how saving rates differ across income groups in these classes of models, we present results from a simple three-period version of the model above. We think of period 1 ("young") as ages 30–60, period 2

[2] Note that since r includes the total return to non–human wealth including capital gains, saving measured as income minus consumption is identical to saving measured as the change in wealth. We return to this issue below.

[3] Adding uncertainty complicates the model, but again two sets of assumptions will generate the result that consumption rises proportionately with the scale factor for earnings. First, if the utility function is quadratic and δ_i and r_{is} are constant and equal to each other, consumption will be proportional to the expected value of lifetime resources, as defined above. If the utility function is not quadratic, then there is no single summary statistic that defines consumption. However, if one assumes that the utility function is isoelastic and initial wealth and all possible realizations of earnings are scaled up by a constant factor, then consumption will also be scaled up by that factor and saving rates will be identical (Bar-Ilan 1995).

("old") as ages 60–90, and period 3 as the time around death (when old) when medical expenditures are paid and bequests are left.[4]

A. Consumption Models with No Uncertainty and No Bequest Motive

We begin with a model with no bequest motive and no uncertainty other than about the length of life.[5] We use an isoelastic utility function with $\gamma = 3$, a value consistent with previous studies. We examine low-income and high-income groups, with respective average first-period incomes of $14,634 and $78,666, based on the top and bottom quintiles of five-year average income from the 1984–89 PSID (discussed in more detail below). We assume that in the second period Social Security and pension income replace 60 percent of preretirement (or first-period) income, consistent with the overall replacement rate in Gustman and Steinmeier (1999). The (annual) rates of time preference and interest are 0.02 and 0.03, respectively, which, together with uncertain life span, result in a roughly flat pattern of nonmedical consumption over the lifetime.

As shown in table 1, for both working-age (young) and retirement age (old) households, the predicted saving rate for the low-income group is identical to that of the high-income group. The saving rate (exclusive of pension and Social Security) while young equals 12.5 percent and while old equals -16.0 percent.

There are two approaches to generating higher saving rates for higher-income households in the standard life cycle model: differences in the timing of income for these households and differences in the timing of consumption. We consider each in turn.

Differences in the timing of earnings and transfers across lifetime income groups do not change the slope of the consumption path but yield different patterns of saving. For example, Social Security programs typically provide a higher replacement rate for low-income households and thus reduce the need for these households to save for retirement (e.g., Smith 1999*b*; Huggett and Ventura 2000).[6] As shown in table 1, increasing the replacement rate for the low-income households from 60 percent to 75 percent (and increasing their first-period Social Security taxes such that the present value of lifetime resources is unaffected) reduces saving while young—to 6.7 percent. However, it also increases saving while old to -7.5 percent. The higher replacement rate

[4] The only purpose of the third period is to allow for medical expenses late in life; we assume no nonmedical consumption in this period.

[5] We set the probability of living to old age (period 2) at 82 percent, on the basis of U.S. life tables from the Berkeley-Wilmoth data set (http://www.demog.berkeley.edu/wilmoth/mortality/). Since period 3 represents the very end of life, all households that survive to period 2 die in period 3.

[6] Other examples include differences in age-earnings profiles, differences in life expectancy, and differences in retirement age.

TABLE 1
Simulated Saving Patterns

	Saving Rate of Young	Saving Rate of Old
Benchmark:		
Low income	12.5	−16.0
High income	12.5	−16.0
Income replacement rate:		
Low income (75%)	6.7	−7.5
High income (60%)	12.5	−16.0
Time preference rate:		
Low income (5%)	5.4	−8.0
High income (2%)	12.5	−16.0
Income and medical expense uncertainty:		
Low income	29.9	24.2
High income	16.8	−7.9
Income and medical expense uncertainty with consumption floor ($10,000):		
Low income	.0	.0
High income	16.8	−7.9
Bequest motive (μ = 1.5):		
Low income	12.5	−16.1
High income	17.2	−2.9
Income and medical expense uncertainty, consumption floor, and bequest motive:		
Low income	.0	.0
High income	18.3	−1.8

Note.—Default parameters are 2 percent time preference rate, 82 percent chance of surviving to be “old,” 60 percent replacement rate, and 3 percent interest rate.

for the low-income households leads to less saving while working and less *dissaving* while retired.

To properly account for Social Security saving, we construct a more comprehensive first-period saving rate that includes implicit Social Security saving (equal to the present value of future Social Security benefits accrued as a result of contributions) in both the numerator (saving) and the denominator (income), an approach we also use in the empirical section. This comprehensive saving rate (not shown in the table) is identical for low-income and high-income households. In other words, adding back implicit Social Security saving “undoes” the substitution between private and public saving that might otherwise make low-income households appear to save less. Furthermore, were the Social Security program in the model progressive, providing a net present value transfer to lower-income households, their comprehensive saving rate would be greater than that of high-income households.[7]

[7] If low-income households were unable to fully offset higher Social Security saving with lower private saving, then the comprehensive saving rate would again be higher for low-income households.

Next consider differences in the timing of consumption. If high-income households choose more rapid growth rates in consumption, they will have higher saving rates, at least at younger ages.[8] This might happen in a world with imperfect capital markets because households with lower time preference rates would have a greater inclination toward saving (when young) and would also be more likely to have higher earnings because of greater investment in education and other forms of human capital.[9] Alternatively, Becker and Mulligan (1997) suggest that a higher level of income might encourage people to invest in resources that make them more farsighted, steepening their consumption paths. Finally, differences across lifetime income groups in the number and timing of children could also generate differences in the timing of consumption (Attanasio and Browning 1995).

Table 1 shows that when low-income households have an (annual) time preference rate of 0.05 instead of 0.02, saving patterns look similar to those when the income replacement rate is higher for these households. Their saving rate while young drops to 5.4 percent, and their saving rate while old increases to −8.0 percent. Once again, we see higher saving by higher-income households while young and more dissaving while old.[10]

A "subsistence" or necessary level of consumption will also produce differences in consumption growth rates across income levels. Informal arguments are sometimes made that subsistence levels imply that poor households have lower saving rates because they cannot "afford to save" after buying the necessities. However, this result requires that $r > \delta$; if $r < \delta$, a subsistence level of consumption causes rich households to save *less* than poor households.[11] Closely related are models in which the intertemporal elasticity of substitution is larger for high-income house-

[8] See especially Samwick (1998) for a model in which δ is correlated with income. Lawrance (1991) offers empirical evidence to this effect, although Dynan (1994) shows that the patterns are not pronounced after controlling for ex post shocks to income.

[9] With perfect capital markets, households with a high time preference would borrow to finance their education, yielding no relationship between time preference and years of schooling or earnings (see, e.g., Cameron and Taber 2000).

[10] A similar logic holds if survival probabilities increase with lifetime income. Higher-income households will have higher saving rates when young but lower rates when old, conditional on surviving to that age (Skinner 1985).

[11] Although the need to meet the current subsistence level depresses the saving rate of lower-income households, the need to meet future requirements boosts the saving rate of those households. Because of the subsistence level, poor households will be on a more steeply sloped portion of their utility functions than rich households. As a result, they will be less willing to substitute consumption over time and will have flatter consumption paths. If $r > \delta$, the consumption paths of both rich and poor households will slope upward, and the flatter paths of poor households will be associated with lower saving rates when young. If $r < \delta$, the reverse is true: consumption paths will slope downward, and the flatter path of the poor will be associated with a higher saving rate when young. A different way to generate the result that higher-income households have higher saving rates is to assume that subsistence levels decline with age.

holds (Attanasio and Browning 1995; Atkeson and Ogaki 1996; Ogaki, Ostry, and Reinhart 1996). Finally, higher-income households may save more if they enjoy better access to investment opportunities, such as equity markets, pensions, housing, and businesses, potentially providing a higher rate of return (Yitzhaki 1987; Gentry and Hubbard 2000).[12] In sum, differences in the timing of income and differences in the timing of consumption can explain higher saving among higher-income households while young, but they also imply that these households have higher dissaving rates when old.

B. *Consumption Models with Uncertainty but No Bequest Motive*

Does the precautionary motive for saving imply that high-income households should save more? To answer this question, we incorporate two additional sources of uncertainty in the model. First, we allow for risk to second-period income that might be associated with earnings shocks, forced early retirement, or the loss of a spouse. We assume a discretized distribution with an equal chance of earnings either one-quarter higher or one-quarter lower than in the case of perfect certainty.[13]

Second, we allow for the possibility of large medical expenses, especially near death. For example, Hurd and Wise (1989) found a decline in median wealth of $103,134 (in 1999 dollars) for couples following the death of a husband, and Smith (1999*a*) estimated that wealth fell following severe health shocks, by $25,371 for households above median income and by $11,348 for families below median income. Covinsky et al. (1994) found that 20 percent of a sample of families experiencing a death from serious illness reported that the illness had essentially wiped out their assets.[14] We include uncertainty about health care expenditures that is revealed only in the final period, at the very end of life. In the model, the bad state of health occurs 10 percent of the time, and when it does, out-of-pocket expenditures are $8,000, or one-quarter second-period income averaged across high- and low-income groups.[15] We compute the average saving rate in period 2 as average saving divided by average income.

[12] This result presumes that substitution effects dominate income effects (see Elmendorf 1996). Note also that higher-income households face higher marginal tax rates, lowering their after-tax return.

[13] This degree of uncertainty is consistent with empirical parameterizations of earnings variability (e.g., Hubbard et al. 1994).

[14] On the other hand, Hurd and Smith (2001) find smaller median changes in wealth near death.

[15] Crystal et al. (2000) found that elderly patients in poor health spend 28.5 percent of their income in out-of-pocket health care expenditures. See also French and Jones (2003), who find that a very small fraction of individuals experience health shocks with a present value of $125,000 or more. In good health, health expenditures are assumed to be zero.

Table 1 shows that when these types of uncertainty are added, the saving rate while young for low-income households (29.9 percent) is *larger* than that for high-income households (16.8 percent), and low-income households continue to save even in the second period against the possibility of large final-period medical expenses. While income risk is proportional to lifetime income, health expenditures represent a greater proportional risk for low-income households. The introduction of these factors alone implies that low-income households should save *more* than high-income households.

A difficult part of fitting theoretical models to actual saving patterns is to explain why low-income households save so little. At a minimum, one requires a Medicaid program (or charity care) to avoid the implication that every elderly household needs to save against the "worst-case" health expense outcome. One additional approach is to specify hyperbolic preferences among some households but allow financial institutions such as pension plans and home ownership to be available differentially to higher-income households. This would leave many low-income households in a hyperbolic saving trap with little or no wealth accumulation (Thaler 1994; Laibson 1997; Laibson et al. 1998; Harris and Laibson 2001). For analytic convenience, we consider in this model a mechanism that relies instead on the presence of asset-based means-testing, like Medicaid or supplemental security income, combined with a consumption "floor," to explain low saving among the bottom income group (Hubbard et al. 1995; Powers 1998; Gruber and Yelowitz 1999). We guarantee to households a consumption floor of $10,000 in period 2 plus payment of all period 3 medical expenses; to be eligible, households must hand over all available period 2 assets. Table 1 shows that these programs lead low-income households to have zero saving when young and to dissave nothing when older.

C. Consumption Models with a Bequest Motive

Thus far, our model has produced only bequests that do not generate utility for the household—sometimes referred to as unintended or accidental bequests. Here we consider an operative bequest motive as in Becker and Tomes (1986) or Mulligan (1997). Suppose that individuals value the utility of their children and that earnings are mean-reverting across generations. In this case, Friedman's permanent income hypothesis effectively applies across generations: a household with high lifetime income will save a higher fraction of its lifetime income in order to leave a larger bequest to its offspring, who are likely to be relatively worse off.[16]

[16] An alternative model is one in which wealth per se gives utility above and beyond the flow of consumption it enables (Carroll 2000).

We implement this model by specifying an operative bequest function $V(B_{is}) = \mu[(B_{is} + YL^c_{is})^{1-\gamma} - 1]/(1 - \gamma)$, where μ is the trade-off parameter between own consumption and bequests, and YL^c_{is} is the value of the next generation's lifetime earnings. We assume complete mean reversion of earnings, so that earnings of the children are equal to the average earnings of parents, and $\mu = 1.5$.

Saving rates in this bequest model (without income or medical expense uncertainty) are shown in table 1. Saving rates while young and old are higher for the higher-income group, where the bequest motive is operative. By contrast, lower-income households expect their children to have earnings higher than theirs and so consume their overall resources, yielding saving rates that are the same as for the life cycle model.

Finally, we consider a model with income and medical expense uncertainty, a consumption floor, and an operative bequest motive. Here, bequests are conditional on the health and income draws, so in the good states of the world, the family leaves a much larger bequest than in the bad states of the world (Dynan et al. 2002). For the high-income household, the saving rate is 18.3 percent when young and just −1.8 percent when old. For the low-income household, the saving rate is zero for both periods because saving is discouraged by the presence of an asset-tested consumption floor.

III. Empirical Methodology

Three key issues arise in designing and implementing empirical tests. The first is how to define saving. One approach is to consider all forms of saving, including realized and unrealized capital gains on housing, financial assets, owned businesses, and other components of wealth. (These capital gains should also be added to income to be consistent with the Haig-Simon definition of full income.) An alternative is to examine a definition of saving that focuses on the "active" component—that is, the difference between income *exclusive of capital gains* and consumption.

Neither saving concept is clearly superior for our purposes. Measures that include capital gains are more comprehensive, in that they include all wealth accumulation regardless of the form it takes. However, if capital gains are unanticipated as of the time the saving decision is made, then the true intentions of households may be better captured by active saving measures that exclude these capital gains. The appropriate saving concept may also depend on the question of interest. For example, capital gains should be included when measuring the adequacy of saving (ex post) for retirement. On the other hand, active saving corresponds to the supply of loanable funds for new investment and therefore may be helpful in gauging the effect of a redistribution of income on economic growth (Gale and Potter 2002). We thus consider both measures that include capital gains (from the SCF and PSID) and active saving measures (from the CEX and PSID).

The second and third key issues are how to distinguish those with high lifetime income from those whose income is high only transitorily and how to correct for measurement error in income. As Friedman (1957, p. 29) pointed out, these issues are intertwined: “in any statistical analysis errors of measurement will in general be indissolubly merged with the correctly measured transitory component [of income].”

When we measure saving as the residual between income and consumption, measurement error in income (Y) will, by construction, show up as measurement error of the same sign in saving ($Y - C$).[17] Therefore, measurement error in income, like transitory income, can induce a positive correlation between measured income and saving rates even when saving rates do not actually differ across groups with different lifetime resources. A bias arises in the other direction when we define saving as the change in wealth: measurement error in income enters only in the denominator, inducing a negative correlation between measured income and the saving rate.

To reduce the problems associated with measurement error and transitory income, we use proxies for permanent income—an approach with a long history (Mayer 1972). We consider four instruments: consumption, lagged labor income, future labor income, and education. A good instrument for permanent income should satisfy two requirements. First, it should be highly correlated with true “permanent” or anticipated lifetime income at the time of the saving decision. Second, the instrument should be uncorrelated with the error term, which includes measurement error and transitory income, so that it affects saving rates only through its influence on permanent income.

All our instruments are likely to satisfy the first requirement. What about the second? Since consumption reflects permanent income in standard models, it should be uncorrelated with transitory income and thus be an excellent instrument (see, e.g., Vickrey 1947).[18] However, transitory consumption will bias the estimated relationship between saving rates and permanent income toward being negative, and measurement error will reinforce the bias when saving is defined as the difference between income and consumption. Although these (highly probable) forms of bias likely make the resulting point estimates not useful for policy analysis, we can still potentially use the point estimates to address our main question. Specifically, a finding that measured sav-

[17] This assumes that the measurement error in Y is uncorrelated with that in C.

[18] If some households face binding liquidity constraints, however, consumption may be correlated with transitory income.

ing rates rise with measured consumption, despite the induced bias in the opposite direction, would represent strong evidence that saving rates do rise with permanent income.

Consider next the use of lagged and future labor earnings. The longer the lags used and the less persistent transitory income is, the more likely that lagged and future labor income will be uncorrelated with transitory income. MaCurdy (1982) and Abowd and Card (1989) find that the transitory component of earnings shows little persistence. Note that if households' forecasts of future labor income are superior to what they would be on the basis solely of the income history, then using future labor income as an instrument will (as with consumption) tend to bias the estimated relationship between income and saving rates toward being negative; households predicting higher income in the future (and hence more likely allocated to a higher instrumented income quintile) will tend to save less in anticipation.

Finally, education is typically constant over time and therefore has little correlation with transitory income; there is a long tradition of using it to proxy for permanent income (Modigliani and Ando 1960; Zellner 1960). However, it may be correlated with tastes toward saving (see Mayer 1972) or have an independent effect on the ability to plan for retirement (e.g., Lusardi 1999).

A related set of issues arises with respect to our choice of denominator for the saving rate. Our theoretical analysis focused on consumption and saving relative to lifetime resources; since we cannot measure lifetime resources, we must use an imperfect proxy in our empirical work. We use "current" income as the denominator; that is, we use a five-year average for the PSID, a two-year average for the SCF, and a one-year figure for the CEX. Although these income measures are likely more influenced by transitory income and measurement error than some of the instruments for permanent income mentioned above, measurement error in the denominator is unlikely to bias median estimates of saving ratios as long as the permanent income quintiles are determined accurately. In practice, we have not found evidence that the choice of denominator is important; the patterns we find are not sensitive to switching between a one-year and two-year average of income in the SCF and switching between a one-year, five-year, and ten-year (or more) average of income in the PSID (results not reported).

Most of our results are based on a two-stage estimation procedure. In the first stage, we regress current income on proxies for permanent income and age dummies. We then use the fitted values from the first-stage regression to place households into predicted permanent income quintiles and create an indicator dummy for each predicted income quintile. The quintiles of predicted permanent income are created separately for each age group. In the second stage, we estimate a median regression, with the saving rate as the dependent variable and the predicted permanent income quintile dummies and age dummies as the independent variables. We follow this procedure to allow for nonlinearities in the saving rate–income relationship. We construct standard errors for the estimated saving rates by bootstrapping the entire two-step process. Separately, we also use fitted permanent income, instead of fitted quintiles, as the independent variable in the second stage, both to summarize the relationship between the variables and to provide a simple test of whether the relationship is positive.

IV. Data

Using the CEX, the SCF, and the PSID not only allows for different measures of saving but also ensures that our conclusions are not unduly influenced by the idiosyncracies of a single data source. Most of our results are based on the saving patterns of working-age households—those between the ages of 30 and 59 (as of the midpoint of their participation in each sample), with younger households excluded because they are more likely to be in transitional stages. Examination of the saving behavior of older households is complicated by the noncomparability of households that are on the verge of retirement and those that are beyond retirement. To increase comparability, our CEX and SCF analyses of older households are based on those aged 70–79 (most of whose heads should already be retired). For the PSID, we examine households aged 62 and older, but we focus on the subset of retired households. In this section we describe briefly each of the data sets; further details are in a data appendix available from the authors on request.

A. Consumer Expenditure Survey

The CEX has the best available data on total household consumption.[19] In each quarter since 1980, about 5,000 households have been interviewed; a given household remains in the sample for four consecutive quarters and then is rotated out and replaced with a new household. The survey asks for information about consumption, demographics, and income.

We define the saving rate for a CEX household as the difference between consumption and after-tax income divided by after-tax income. Consumption equals total household expenditures *plus* imputed rent for home owners *minus* mortgage payments, expenditures on home

[19] Attanasio (1994) provides a comprehensive analysis of U.S. saving rate data based on the CEX.

capital improvements, life insurance payments, and spending on new and used vehicles. This definition includes expenditures for houses and vehicles as part of saving, in part in order to make the measure of saving in the CEX closer to those in the PSID and SCF. We use Nelson's (1994*a*) reorganization of the CEX, which sums consumption across the four interview quarters for households in the 1982–89 waves. After-tax income equals pretax income for the previous year less taxes for this period, as reported in each household's final interview.[20] We deflate both income and consumption with price indexes based in 1994.

We exclude households with income below $1,000, as well as households with invalid income or missing age data and households that did not participate for all the interviews. We are left with 13,054 households for our working-age analysis and 2,970 households for our older-household analysis.

B. *Survey of Consumer Finances*

The 1983–89 SCF panel contains information on 1,479 households that were surveyed in 1983 and then again in 1989. The sample has two parts: households from an area-probability sample and households from a special high-income sample selected on the basis of tax data from the Internal Revenue Service. The SCF contains very high quality information about assets and liabilities, as well as limited data on demographic characteristics and income in the calendar year prior to the survey.

The saving rate variable used for the SCF calculations equals the change in real net worth between 1983 and 1989 divided by six times the average of 1982 and 1988 total real household income. Because it spans several years, this variable is likely to be a less noisy measure of average saving than a one-year measure. Net worth is calculated as the value of financial assets (including the cash value of life insurance and the value of defined-contribution pension plans), businesses, real estate, vehicles, and other nonfinancial assets *minus* credit card and other consumer debt, business debt, real estate debt, vehicle debt, and other debt.

We exclude households with 1982 or 1988 income less than $1,000. We also eliminate households in which the head or spouse changed between 1983 and 1989 because such changes tend to have dramatic and idiosyncratic effects on household net worth. The resulting sample

[20] Nelson (1994*b*) warns that the data on household tax payments are quite poor. Inaccurate tax data will bias our results only if the degree of inaccuracy is correlated with our instruments for permanent income.

contains information on 728 households for our working-age analysis and 154 households for our older-household analysis.[21]

C. *Panel Study of Income Dynamics*

The PSID is the longest-running U.S. panel data set, and, as such, it provides a valuable resource unavailable to researchers in the 1950s and 1960s. The long earnings history for each household helps us disentangle transitory and permanent income shocks, thus facilitating the key issue of identification. Our baseline analysis explores saving between 1984 and 1989; these years correspond to the first two wealth supplements. We also confirm the robustness of our results by examining saving between 1989 and 1994.

Net worth is calculated as the sum of the value of checking and savings accounts, money market funds, certificates of deposit, government savings bonds, Treasury bills, and individual retirement accounts; the net value of stocks, bonds, rights in a trust or estate, cash value of life insurance, valuable collections, and other assets; the value of the main house, net value of other real estate, net value of farm or business, and net value of vehicles; *minus* remaining mortgage principal on the main home and other debts. Net worth does not include either defined-benefit or defined-contribution pension wealth.

We consider several different measures of the saving rate. First, we use the change in real net worth divided by average real after–federal tax money income for the period. Second, we use an "active saving" measure. We start with a measure designed by the PSID staff—the change in wealth *minus* capital gains for housing and financial assets, inheritances and gifts received, and the value of assets less debt brought into the household *plus* the value of assets less debt taken out of the household—and then modify it, following Juster et al. (2001), to correct for inflation and to account for likely reporting error in whether a family moved.[22] The saving rate is computed by dividing active saving by five times the average real income measure described above. This active

[21] Our SCF samples actually contain 2,184 and 462 observations, respectively, because each household's data are repeated three times with different random draws of imputed variables in order to more accurately represent the variance of the imputed variables. Thus the standard errors in our analysis must be corrected for the presence of replicates. We do so by multiplying them by 1.73—the square root of the number of replicates (three).

[22] Capital gain in housing is set equal to the change in the value of the main home during years in which the family did not move and to zero during years in which the family did move less the cost of additions and repairs made to the home. We also tried a third measure of saving, equal to the change in net worth adjusted for assets and debt brought into and out of the household and inheritances. The results were very close to those based on the change in net worth without adjustments.

saving measure should more closely match the traditional income minus consumption measure of saving.

We also create variants of the two PSID saving measures above that include estimates of saving through Social Security and private pensions. Feldstein and Samwick (1992) used then-current (1990) Social Security legislation to determine how much of the payroll tax is reflected in higher marginal benefits at retirement and how much constitutes redistribution. We count the former part as the implicit saving component of the 11.2 cents in total Social Security (Old Age and Survivors Insurance) contributions per dollar of net income. In addition, if a household worker is enrolled in a defined-contribution plan, we count his or her own contribution as saving (we have no data on employer contributions). If a household worker is enrolled in a defined-benefit plan, we include imputations of saving for representative defined-benefit plans, as provided by Gustman and Steinmeier (1989).

We drop households that had active saving greater in absolute value than $750,000 (1994 dollars) and households that, during relevant years (either 1984–89 or 1989–94), had missing data, a change in head or spouse, or real disposable income less than $1,000. For the regressions that include lagged or future earnings, we drop households for which there was a change in head or spouse during the relevant years.

D. *Summary Statistics from the Three Data Sources*

Table 2 shows summary measures of saving and income from the CEX, SCF, and PSID. All saving rates are given on an annual basis, and all income figures are given in 1994 dollars. To avoid undue influence from extreme values of the saving rate when income is close to zero, the "average" saving rates are calculated as average saving for the group divided by average income for the group.

The PSID "active" saving rates are generally the lowest in the table. By contrast, the estimates from the CEX—where saving is also based on the "active" concept—are among the highest. The high levels of CEX saving have been noted by previous authors (e.g., Bosworth, Burtless, and Sabelhaus 1991) and probably reflect measurement error: both income and consumption are understated by respondents, but consumption is thought to be understated by a greater amount, lending an upward bias to saving (Branch 1994). We also calculate the saving rate averaged over the entire sample in each data set, including younger and older respondents, to correspond most closely to an aggregate rate of saving. For comparison, the average national income and product

TABLE 2
SUMMARY SAVING AND INCOME MEASURES

	CEX	SCF	PSID			
	$Y-C$ (1)	ΔWealth (2)	ΔWealth (3)	ΔWealth + Pension (4)	Active (5)	Active+ Pension (6)
			Ages 30–39			
Median saving rate	.27	.07	.05	.13	.05	.14
Average saving rate	.30	.04	.17	.25	.12	.20
Median income	33,807	39,566	36,438	38,670	36,438	38,670
			Ages 40–49			
Median saving rate	.26	.10	.03	.15	.05	.16
Average saving rate	.29	.32	.19	.28	.14	.23
Median income	38,810	38,425	45,626	49,586	45,626	49,586
			Ages 50–59			
Median saving rate	.26	.06	.03	.16	.02	.16
Average saving rate	.30	.25	.31	.41	.07	.19
Median income	34,087	38,186	33,478	36,828	33,478	36,828
			Aggregate (All Ages)			
Average saving rate	.25	.22	.21	NA*	.11	NA*
			Aggregate (NIPA)			
Saving rate for period covered by data set	.09 (1982–89)	.08 (1983–89)	.08 (1984–89)			

NOTE.—For each column, the top heading indicates the data set used and the second heading indicates the saving measure used. Measures of income: CEX: disposable income; SCF: pretax income; PSID Δwealth and active: disposable income; PSID "Δwealth+pension" and "active+pension": sum of disposable income and employer contributions to Social Security and pensions. All income data are expressed in 1994 dollars. Median saving rate equals median of the ratio of saving to income. Average saving rate equals average saving divided by average income. The sample is the same as the one used in table 3.
* Estimates of pension saving not available for the elderly.

accounts (NIPA) saving rate is shown in the final row; conceptually, this rate is closest to the average "active" saving rate.[23]

[23] Note, though, that our active saving measures include purchases of motor vehicles, which should boost them relative to the NIPA concept.

TABLE 3
Median Regressions of Saving Rate on Current Income

	CEX	SCF	PSID (1984–89)			
	$Y-C$ (1)	ΔWealth (2)	ΔWealth (3)	ΔWealth+ Pension (4)	Active (5)	Active+ Pension (6)
Quintile 1	−.227	.014	.000	.068	.010	.090
	(.017)	(.019)	(.002)	(.007)	(.006)	(.008)
Quintile 2	.150*	.090*	.015*	.110*	.033*	.135*
	(.008)	(.029)	(.007)	(.010)	(.008)	(.009)
Quintile 3	.269*	.111	.055*	.162*	.063*	.172*
	(.007)	(.032)	(.009)	(.011)	(.007)	(.011)
Quintile 4	.346*	.173	.077	.195*	.067	.192*
	(.006)	(.027)	(.012)	(.011)	(.009)	(.010)
Quintile 5	.455*	.236	.185*	.307*	.137*	.244*
	(.006)	(.040)	(.018)	(.016)	(.011)	(.011)
Top 5%	NA	.372	NA	NA	NA	NA
		(.098)				
Top 1%	NA	.512	NA	NA	NA	NA
		(.111)				
Ages 30–39	.006	−.041	.000	−.012	−.005	−.025
	(.006)	(.028)	(.004)	(.008)	(.006)	(.008)
Ages 50–59	−.001	−.012	.002	.017	−.010	.005
	(.007)	(.027)	(.005)	(.016)	(.006)	(.011)
Pseudo R^2	.142	.047	.028	.045	.030	.044
Sample size	13,054	728	2,854	2,854	2,854	2,854
Coefficient on income/10^4	.068	.018	.022	.028	.015	.019
	(.002)	(.002)	(.002)	(.002)	(.001)	(.001)

Note.—For each column, the top heading indicates the data set used and the second heading indicates the saving measure used. Bootstrapped standard errors are shown in parentheses. The SCF and PSID quintiles are weighted; all regressions are unweighted. Definitions of income: CEX: current income; SCF: average of 1982, 1988 income; PSID: average of 1984–88 income. The PSID active saving and wealth data cover 1984–89.

* The coefficient is significantly greater than that for the previous quintile, on the basis of a one-sided 5 percent test.

V. Empirical Results

A. *Saving Rates and Current Income*

We begin our empirical inquiry by documenting the well-accepted fact that saving rates increase with current income. Table 3 summarizes how the saving rate varies with respect to the current income quintile for households between the ages of 30 and 59.[24] We estimate median regressions, with the saving rate as the dependent variable and dummies for income quintiles and age categories as independent variables. In each case, we suppress the constant term and include dummies for all

[24] Income quintiles were calculated (on a weighted basis for the SCF and PSID) for each 10-year age group separately to ensure comparability across data sets and within the U.S. population. We did not use population weights in the regression analysis because the SCF weights—especially those for the top of the income distribution—ranged by orders of magnitude, causing considerable instability in the estimated coefficients. For example, just three of the 107 households in the top 1 percent of the income distribution accounted for 38 percent of the total population weights of these 107 households.

five income quintiles and the 30–39 and 50–59 age groups so that the estimated coefficient for a given income quintile corresponds to the saving rate for households in that quintile with heads between 40 and 49 years old. (Regressions that include interaction terms between age and income variables are similar.) Bootstrapped standard errors for the coefficients, based on 500 replications, are shown in parentheses.

Column 1 of table 3 shows that the saving rate increases dramatically with measured current income in the CEX. Among households with heads between 40 and 49, median saving rates range from −23 percent in the lowest income quintile to 46 percent in the highest. We also calculate (but do not report) bootstrapped standard errors for the difference in the saving rate of quintiles i and $i-1$ and use an asterisk to indicate a statistically significant difference, based on a 95 percent confidence level and a one-sided test. All the differences in this column are statistically significant. We also report the coefficient from a regression of saving rates on the level of income. This coefficient suggests that a $10,000 increase in income is associated with a seven-percentage-point increase in the saving rate. Consistent with previous research based on the CEX, we estimate an extremely low saving rate for the lowest income quintile; this reflects bias from measurement error in income and possibly transitory income, since households in this quintile could not sustain such a high rate of dissaving for very long (see Sabelhaus 1993).

Column 2 shows results from similar regressions using SCF data, including saving rate estimates for households in the ninety-fifth and ninety-ninth percentiles of the income distribution.[25] The slope of the relationship between the saving rate and measured current income is smaller than in the CEX. This result is not surprising: the change-in-wealth saving rate is not subject to the upward bias associated with measurement error in income, and many transitory movements in income likely wash out over the six-year period covered by the SCF panel. Nevertheless, we see the estimated (annualized) median saving rate rising significantly from 1 percent for households in the bottom quintile to 24 percent for households in the top quintile.[26] Saving rates are even larger for the richest households: 37 percent for those in the top 5 percent of the income distribution and 51 percent for those in the top

[25] We are able to estimate fairly precise saving rates for households in the highest part of the income distribution because the SCF disproportionately samples high-income households: out of a total of 728 households in the age 30–59 sample, 193 have income above the ninety-fifth percentile and 86 have income above the ninety-ninth percentile.

[26] Because median saving rates within quintiles are calculated using population weights, the saving rates of the fifth quintile in the SCF (in this and subsequent tables) will be biased upward because of the very high income households in this group. Since median income in this quintile will be higher as well, however, the slope of the line in fig. 2 below will convey the true relationship between saving rates and income.

1 percent.[27] The coefficient from the linear regression suggests that the saving rate rises two percentage points for each additional $10,000 in income.[28]

The remaining columns of the table show the relationship between saving and income in the PSID. As in the SCF, the several-year period over which saving is measured reduces the importance of transitory income. The (annualized) change-in-wealth saving rate—shown in column 3—is similar to that in the SCF for the lowest-income households and rises as income moves up. For the highest income quintile, the estimated saving rate of 19 percent is somewhat lower than the comparable figure from the SCF. Still, the coefficient from the linear regression is similar to that from the SCF.

Adding estimates of saving through Social Security and private pensions to the PSID change-in-wealth saving rate (col. 4) both raises the levels and somewhat steepens the trajectory of saving rates across the income distribution. How can this be, given the higher Social Security rates of return and replacement rates among households with lower earnings? The main answer is that saving through private pensions increases disproportionately with income, more than offsetting the decline in Social Security saving rates.[29] The column 4 results suggest that the low observed rates of financial saving among lower-income households cannot be explained by higher implicit Social Security and pension wealth accumulation.

Columns 5 and 6 of table 3 show the results for the active PSID saving measures. For the first four income quintiles, active saving rates are very similar to change-in-wealth saving rates. But for the highest income group, the change-in-wealth saving rates are five to six percentage points higher than the active ones, owing to "passive" capital gains.

Looking at averages rather than medians does not alter the basic

[27] The top quintile includes the top 5 percent, and the top 5 percent includes the top 1 percent.

[28] Because of nonlinearities at very high levels of income, in this SCF regression (but not in the quintile regressions) we exclude households with income in excess of $500,000. In the corresponding subsequent SCF two-stage regressions, we exclude households from the second-stage regression if their fitted values of income exceed $500,000.

[29] For example, among households 40–49, median Social Security saving as a percentage of disposable income declines from 6.5 percent for the lowest income quintile to 3.9 percent for the highest income quintile. However, Social Security plus pension saving rises from 7.6 percent in the lowest income quintile to 11.1 percent in the highest income quintile. One reason why Social Security saving is not more strongly progressive is that we measure saving relative to disposable income rather than earnings. Because transfer payments such as Aid to Families with Dependent Children, disability insurance, and unemployment insurance are concentrated among lower-income households, Social Security saving is a smaller fraction of disposable income among these households. Accounting for additional factors such as the correlation between income and life span would presumably attenuate the progressivity of Social Security further (Coronado, Fullerton, and Glass 2000; Gustman and Steinmeier 2001; Liebman 2002).

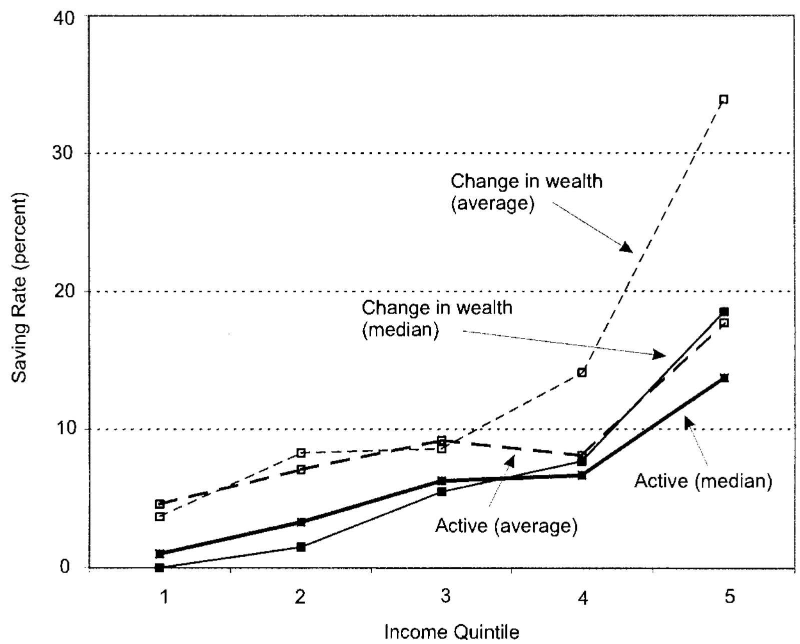

FIG. 1.—Median and average saving rates: active saving and change in wealth, PSID, 1984–89. Estimates of the median saving rate are taken from table 3. Average saving rates were calculated by dividing the average level of saving for the quintile by the average level of income; to improve statistical power, the full sample (ages 30–59) was used for the calculation.

picture formed by table 3. Figure 1 shows average saving rates and median saving rates (from table 3) by income quintile for both the change-in-wealth measure of saving and active saving. As in table 2, average saving rates are defined to be average saving for each quintile divided by average five-year income. Although the mean saving rates are somewhat higher than the medians, the patterns are generally similar except in the top quintile, where the mean change-in-wealth saving rate jumps to 34 percent of income.

B. *Saving Rates and Permanent Income*

We now turn to the relationship between saving rates and permanent income, using the two-stage procedure described earlier. We first focus on consumption as an instrument. Recall that transitory consumption will bias the estimated slope toward a negative number in all three data sets, as will measurement error in the case of the CEX.

Column 1 of table 4 shows results from the CEX. The estimated

TABLE 4
MEDIAN INSTRUMENTAL VARIABLE REGRESSIONS OF SAVING RATE ON INCOME USING CONSUMPTION AS AN INSTRUMENT

	CEX	SCF	PSID			
	$Y-C$	ΔWealth	ΔWealth		ΔWealth+Pension	Active
	Nonauto Consumption (1)	Vehicles (2)	Food Consumption (3)	Weighted Consumption (4)	Weighted Consumption (5)	Weighted Consumption (6)
Quintile 1	.211	.028	.000	.000	.077	.011
	(.010)	(.030)	(.005)	(.004)	(.010)	(.006)
Quintile 2	.288*	.140*	.021*	.029*	.124*	.045*
	(.008)	(.044)	(.008)	(.008)	(.011)	(.008)
Quintile 3	.278	.134	.033	.044	.159*	.053
	(.008)	(.039)	(.010)	(.010)	(.013)	(.007)
Quintile 4	.283	.173	.057*	.078*	.191*	.076*
	(.007)	(.027)	(.010)	(.013)	(.016)	(.008)
Quintile 5	.246	.286*	.139*	.260*	.344*	.121*
	(.007)	(.049)	(.018)	(.032)	(.027)	(.013)
Top 5%	NA	.505	NA	NA	NA	NA
		(.113)				
Top 1%	NA	.356	NA	NA	NA	NA
		(.158)				
Ages 30–39	.007	−.051	.005	.000	−.012	−.003
	(.007)	(.029)	(.007)	(.005)	(.011)	(.006)
Ages 50–59	−.001	−.016	.006	.002	.042	−.011
	(.009)	(.034)	(.008)	(.007)	(.018)	(.007)
Pseudo R^2	.003	.031	.013	.034	.040	.022
Sample size	13,054	728	2,793	2,793	2,793	2,793
Coefficient on income/10^4	−.003	.040	.022	.035	.041	.018
	(.002)	(.026)	(.003)	(.004)	(.004)	(.002)

NOTE.—For each column, the top heading indicates the data set used, the second heading indicates the saving measure used, and the third heading indicates the instrument used. Bootstrapped standard errors are shown in parentheses. The SCF and PSID quintiles are weighted; all regressions are unweighted.

* The coefficient is significantly greater than that for the previous quintile, on the basis of a one-sided 5 percent test.

median saving rate rises from the predicted first to second quintile but then remains fairly flat. One interpretation is that the results favor the Friedman proportionality hypothesis, but a more likely explanation is that the negative bias associated with transitory consumption and consumption measurement error is approximately offset by a positive correlation between saving rates and permanent income.

We next consider data from the SCF and PSID, where saving is derived from the change in wealth and is thus likely uncorrelated with consumption measurement error. The SCF does not contain direct consumption flow measures, but it does include the reported value of owned vehicles. As shown in column 2, the results when the average of 1983 and 1989 vehicle values is used as an instrument are surprisingly similar to those in table 3, with saving rates rising from 3 percent in the lowest quintile to 29 percent in the top quintile. Saving rates in the top 5 percent are even higher. The estimated linear impact of income on saving rates is roughly four percentage points per $10,000 in income but is not significant at the 5 percent level.

Column 3 of table 4 shows that when PSID food consumption is used as an instrument, the estimated change-in-wealth saving rate rises consistently with income.[30] Indeed, the step-up in the saving rate is significant for every quintile but the third. Columns 4–6 of table 4 use a more comprehensive measure of consumption from the PSID: a weighted average of food at home, food away from home, rental payments, and imputed housing flows, with weights derived from the CEX (Hamermesh 1984; Skinner 1987).[31] The estimated gradients of the saving rate with respect to income are similar to (and in some cases slightly larger than) those in table 3.[32]

Our next approach instruments current income with lagged and future earnings. For the CEX, we have no data on lagged or future earnings. For the SCF, we redefine current income (for the purposes of putting households into quintiles) as 1988 income and instrument with 1982 income. Column 1 of table 5 shows that this procedure yields a strong relationship between predicted income and saving rates. Only

[30] In the first stage, we predict average current disposable income (1984–88) using food consumption for each year from 1984 to 1987. (The food questions were temporarily suspended in 1988, so that we have no consumption measures for that year.) See Zeldes (1989) for further details on the construction of the food consumption variable.

[31] More specifically, we calculate the measure for each year from 1984 to 1987, using weights from Bernheim, Skinner, and Weinberg (2001), so that

$$C^{\text{weighted}} = 1.930(\text{food at home}) + 2.928(\text{food away from home})$$
$$+1.828(\text{rental payments if renter}) + .1374(\text{value of house if home owner}).$$

[32] To save space, we do not report active plus pension and Social Security saving estimates in this and subsequent tables. Full sets of regression results are available on request.

TABLE 5

Median Instrumental Variable Regressions of Saving Rate on Income using Lagged and/or Future Earnings as Instruments

	SCF	PSID					
	Lagged Income	Lagged Earnings			Future Earnings		
	ΔWealth (1)	ΔWealth (2)	ΔWealth+ Pension (3)	Active (4)	ΔWealth (5)	ΔWealth+ Pension (6)	Active (7)
Quintile 1	.022	.000	.065	.003	.000	.063	.003
	(.025)	(.004)	(.010)	(.005)	(.003)	(.008)	(.005)
Quintile 2	.094*	.024*	.136*	.024*	.025*	.140*	.028*
	(.027)	(.012)	(.019)	(.009)	(.008)	(.013)	(.009)
Quintile 3	.106	.059	.174	.052*	.057*	.170*	.064*
	(.036)	(.019)	(.020)	(.011)	(.010)	(.011)	(.008)
Quintile 4	.167	.081	.195	.073	.072	.201*	.062
	(.028)	(.019)	(.019)	(.013)	(.014)	(.015)	(.009)
Quintile 5	.246	.115	.239	.080	.170*	.289*	.119*
	(.035)	(.035)	(.030)	(.016)	(.017)	(.020)	(.010)
Ages 30–39	−.057	.000	−.012	.006	.000	−.020	−.001
	(.026)	(.008)	(.016)	(.009)	(.004)	(.010)	(.006)
Ages 50–59	−.016	.001	.029	−.003	.000	.010	−.003
	(.027)	(.007)	(.018)	(.006)	(.004)	(.015)	(.006)
Pseudo R^2	.041	.013	.022	.017	.025	.041	.030
Sample size	728	1,359	1,359	1,359	2,471	2,471	2,471
Coefficient on income/10^4	.020	.014	.022	.011	.026	.031	.017
	(.005)	(.002)	(.003)	(.002)	(.002)	(.003)	(.002)

Note.—For each column, the top heading indicates the data set used, the second heading indicates the saving measure used, and the third heading indicates the instrument used. Bootstrapped standard errors are shown in parentheses. The SCF and PSID quintiles are weighted; all regressions are unweighted. The SCF results use 1988 income as current income and 1982 income as lagged income. The PSID results use 1974–78 for lagged earnings and 1989–91 for future earnings. The SCF coefficients for the top 5 percent and top 1 percent are .397 (.115) and .455 (.088), respectively.

* The coefficient is significantly greater than that for the previous quintile, on the basis of a one-sided 5 percent test.

TABLE 6
MEDIAN REGRESSIONS OF SAVING RATE ON EDUCATION

	CEX	SCF	PSID		
	$Y-C$ (1)	ΔWealth (2)	ΔWealth (3)	ΔWealth+ Pension (4)	Active (5)
No high school diploma	.155	.057	.000	.090	.020
	(.009)	(.043)	(.003)	(.009)	(.006)
High school diploma	.284*	.131	.039*	.148*	.052*
	(.006)	(.031)	(.006)	(.009)	(.007)
College degree+	.342*	.323*	.123*	.236*	.102*
	(.007)	(.027)	(.015)	(.014)	(.010)
Ages 30–39	−.004	−.063	.002	−.021	−.006
	(.007)	(.033)	(.005)	(.009)	(.007)
Ages 50–59	.017	.021	.008	.033	−.017
	(.009)	(.046)	(.007)	(.013)	(.008)
Pseudo R^2	.017	.025	.014	.020	.014
Sample size	13,054	728	2,840	2,840	2,840
Coefficient on income/10^4	.060	.009	.028	.033	.021
	(.003)	(.002)	(.003)	(.003)	(.002)

NOTE.—For each column, the top heading indicates the data set used and the second heading indicates the saving measure used. Bootstrapped standard errors are shown in parentheses. The regressions are unweighted. Definitions of income: CEX: current income; SCF: average of 1982, 1988 income; PSID: average of 1984–88 income.
* The coefficient is significantly greater than that for the next lower education, on the basis of a one-sided 5 percent test.

one of the differences between quintile estimates is statistically significant, but the estimate from the linear equation (a two-percentage-point increase for each $10,000 in predicted income) is highly significant.

For the PSID, we use as instruments labor earnings of the head and wife (combined) for each year from 1974 to 1978—10 years before the period over which saving is measured.[33] Columns 2, 3, and 4 of table 5 show the results of this approach for the three PSID saving measures. In all cases, saving rates rise with predicted permanent income. The magnitudes of the differences are in fact quite close to those from the uninstrumented results in table 3, suggesting that the simple five-year average of current income eliminates much of the effects of transitory income. Columns 5–7 of table 5 show that when future earnings (1989–91) are used as instruments, we again see saving rates increasing with predicted income. This is true whether one looks at the quintile coefficients (ranging, for the change-in-wealth plus pension saving measure, from 6 percent to 29 percent) or the coefficient from the regression on predicted income.

In table 6, we next turn to education as an instrument—a proxy for permanent income that is generally fixed over the life cycle. For the

[33] We have earnings information back to 1967, but when we condition on earnings in more recent years, the earlier earnings added little or no predictive power for income in 1984–88.

top of the table, we do not use a two-stage procedure but simply report the "reduced-form" estimates of saving rate by education group. We suppress the constant and include dummies for two age groups (30–39 and 50–59) and all education groups; the excluded age group is 40–49. At the bottom of the table, we report the coefficient on predicted income from a two-stage regression.

As shown in column 1 of table 6, estimated median saving rates in the CEX range from 16 percent for high school dropouts to 34 percent for college graduates, with the differences statistically significant. The range for the SCF (col. 2) is 6–32 percent. The PSID also shows a positive correlation, with the range depending on the saving rate measure; for example, the change-in-wealth saving rate with imputed Social Security and pension income ranges from 9 percent for high school dropouts to 24 percent for college graduates. Almost all the differences between education groups are statistically significant. The coefficients on predicted income for the PSID runs indicate that the saving rate rises by between two and three percentage points for each $10,000 increase in income.

We summarize the results presented so far in figure 2. For each fitted income quintile or education group, we plot the median saving rate against median income.[34] The results are striking. While the CEX (fig. 2*a*) shows a much flatter line for the consumption-based regression than for the others, the SCF (fig. 2*b*) and PSID (figs. 2*c* and *d*) show upward-sloping lines that are essentially the same across all choices of instruments and when no instrumenting is done. In sum, the results presented thus far strongly suggest that saving rates rise with lifetime income among working-age households.

C. Is It Just High-Income Entrepreneurs Who Save More?

Quadrini (1999, 2000), Gentry and Hubbard (2000), and Hurst and Lusardi (2004 [in this issue]) have emphasized the importance of entrepreneurs in wealth accumulation, particularly at the top of the income distribution. To what extent are our results driven by the saving behavior of entrepreneurs? To examine this question, we restrict our SCF sample to nonentrepreneurs using the Gentry-Hubbard definition: households for which the value of businesses in which they have an active management role is less than $5,000. We continue to estimate a strong positive correlation between saving rates and income. For example, the specification corresponding to column 2 of table 3 yields

[34] The median saving rate numbers plotted are the coefficients from the regressions in tables 3–6. The median income numbers are coefficients from median regressions of current income on the same variables included in the corresponding saving rate regression.

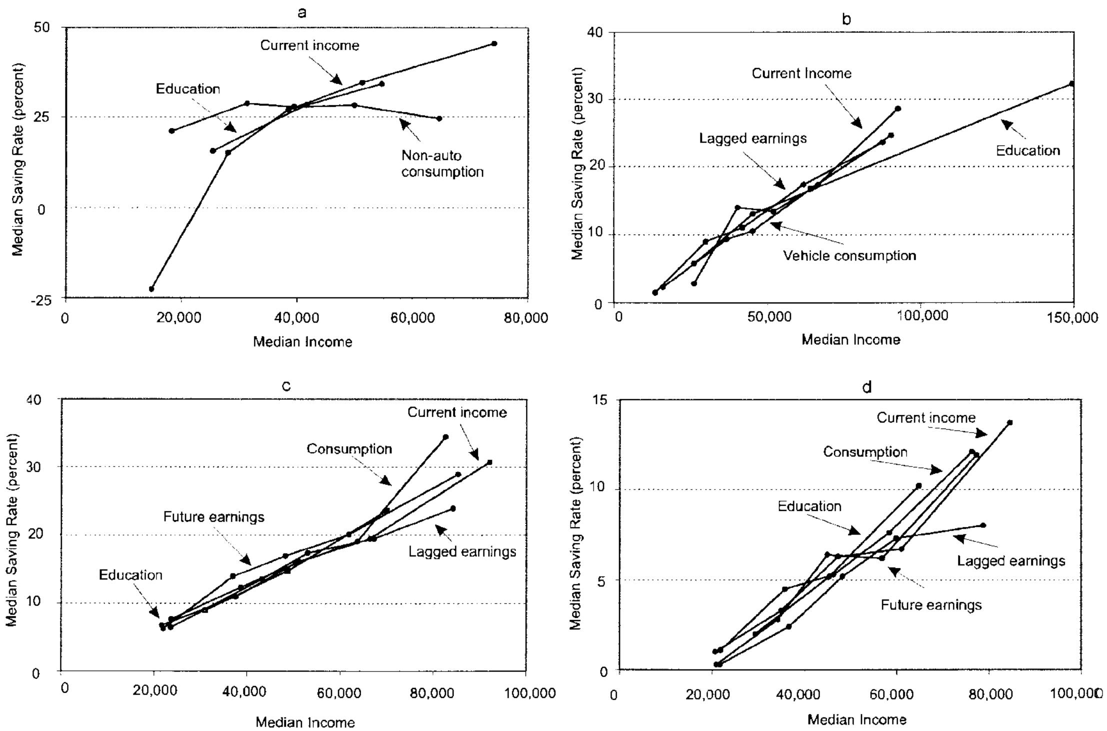

Fig. 2.—Summary of regressions: *a*, CEX saving rates; *b*, SCF saving rates; *c*, PSID saving rates, 1984–89, change in wealth plus pension; *d*, PSID saving rates, 1984–89, active.

estimated median saving rates that range from zero for the first quintile to 22 percent for the fifth quintile to 49 percent for the top 5 percent of the sample. We also find a significant positive relationship for nonentrepreneurs defined as those not self-employed.

D. Saving Rates and Children

The dynastic smoothing model implies that higher-income households smooth consumption over generations by leaving bequests to their children (e.g., Becker and Tomes 1986). One would expect that, on average, households with children would save more for bequests than childless households, with income held constant. Of course, the null hypothesis of equal saving rates is overly simplistic, given the importance of inter vivos transfers to children that may appear either as saving (for college) or as expenditures and the presence of philanthropic bequest motives among childless households. Nonetheless, we find no evidence that the saving rates of households with children are higher or have a higher gradient with respect to income than those of households without children (see also Hurd 1987; Altonji and Villanueva 2003).[35] This suggests that dynastic consumption smoothing through bequests alone is not the primary explanation for why high-income households save more.

E. Saving Rates among Older Households

In this subsection, we consider how the relationship between saving and permanent income changes at older ages. Estimating the relationship for older households is difficult because observable measures of income may not be good indicators of lifetime income, particularly if we pool together people who are still working and those who have already retired. For the CEX and SCF, we attempt to avoid at least the noncomparability issue by restricting the sample to just the age group 70–79, where fewer than 15 percent of households have heads or spouses who are still working more than 20 hours a week. For the PSID, in table 7, we use a larger sample of retired households aged 62 and over, and for columns 4 and 6 we use the sum of the averages of real after-tax earnings of the head and of the spouse (if present) during all their available working years (age 62 and below). For the estimates based on this average, we restrict the sample to those with earnings data going back at least 10 years for the head and five years for the spouse. We examine

[35] Households with children were determined on the basis of whether either head or spouse had been a biological or adoptive parent, even if the child was not currently living in the household. The specification and the sample (working-age households) were the same as in table 3. If anything, the saving rates of households without children are higher and have a slightly higher gradient with respect to income.

TABLE 7
MEDIAN REGRESSIONS OF SAVING RATE FOR OLDER HOUSEHOLDS BY INCOME QUINTILE

	CEX (Ages 70–79)	SCF (Ages 70–79)	PSID (Ages 62+, Retired)			
	$Y-C$	ΔWealth	ΔWealth		Active	
	Current Income (1)	Pension/Social Security Income (2)	Current Income (3)	10-Year+ Earnings (4)	Current Income (5)	10-Year+ Earnings (6)
Quintile 1	−.485	.012	−.005	.000	.000	−.004
	(.039)	(.098)	(.010)	(.015)	(.004)	(.009)
Quintile 2	−.341*	.601*	−.005	−.022	.000	−.010
	(.032)	(.238)	(.010)	(.024)	(.005)	(.016)
Quintile 3	−.136*	−.019	−.027	−.013	−.013	.004
	(.018)	(.109)	(.036)	(.042)	(.018)	(.029)
Quintile 4	.049*	.158	.001	.053	.006	.019
	(.018)	(.155)	(.029)	(.040)	(.017)	(.018)
Quintile 5	.319*	−.090	.144*	.130	.027	.023
	(.013)	(.111)	(.060)	(.120)	(.027)	(.068)
Pseudo R^2	.116	.032	.004	.006	.002	.002
Sample size	2,970	154	636	262	636	262
Coefficient on income/10^4	.144	.027	.012	.007	.004	.001
	(.007)	(.019)	(.012)	(.009)	(.004)	(.004)

NOTE.—For each column, the top heading indicates the data set used, the second heading indicates the saving measure used, and the third heading indicates the income measure used to form quintiles. Bootstrapped standard errors are shown in parentheses. In the SCF regression, dummy variables for the top 5 percent and top 1 percent are included but not reported in the table. In the PSID regressions, age dummy variables (62–69 and 80+) are included but not reported in the table. Denominator for saving rate: CEX: current disposable income; SCF: average of 1982, 1988 total income; PSID: average of 1984–88 disposable income. Ten-year+ earnings for PSID equals the average of (present value of) all available lagged earnings for the head during years the head was aged 62 or younger, plus a similar average for the spouse. The sample is restricted to households with earnings histories for the head and spouse of 10 years and five years, respectively.

* The coefficient is significantly greater than that for the next lower quintile, on the basis of a one-sided 5 percent test.

TABLE 8
MEDIAN REGRESSIONS OF SAVING RATE FOR OLDER HOUSEHOLDS BY EDUCATION

	CEX (Ages 70–79)	SCF (Ages 70-79)	PSID (Age 62+, Retired)	
	$Y-C$ (1)	ΔWealth (2)	ΔWealth (3)	Active (4)
No high school	−.069	.016	−.003	.000
	(.014)	(.035)	(.006)	(.003)
High school graduate	.027*	.134	.005	.003
	(.032)	(.170)	(.029)	(.014)
College graduate+	.128	.182	.020	−.031
	(.047)	(.160)	(.111)	(.039)
Pseudo R^2	.092	.005	.000	.001
Sample size	2,970	154	630	630

NOTE.—For each column, the top heading indicates the data set used and the second heading indicates the saving measure used. Bootstrapped standard errors are shown in parentheses. In the PSID regressions, age dummy variables (62–69 and 80+) are included but not reported in the table. Denominator for saving rate: CEX: current disposable income; SCF: average of 1982, 1988 total income; PSID: average of 1984–88 disposable income.

* The coefficient is significantly greater than that for the next lower education group, on the basis of a one-sided 5 percent test.

the change-in-wealth and active measures of saving, but we do not attempt to impute the "dissaving" that occurs by the drawing down of Social Security and pension wealth.

Table 7 presents median saving rates by income quintile. Not surprisingly, given the apparent bias from measurement error and transitory income, there is a strong correlation between saving rates and income in the CEX (col. 1). However, there is little or no correlation in the SCF (col. 2) or, for most measures of saving, in the PSID (cols. 3–6). One exception is the change-in-wealth saving rate in the PSID, where the estimate for the fifth quintile is at least 14 percentage points higher than those for any of the lower quintiles and statistically different both from zero and from the coefficient for the fourth quintile.[36] Table 8 shows corresponding results by educational attainment. The CEX results show a positive association between education and saving among older groups. The SCF is suggestive of a positive education–saving rate gradient, although the sample size is too small to establish statistical significance. However, results from the PSID suggest no relationship. Taken together, the results certainly provide no evidence that older high–lifetime income households dissave at a faster rate than older low–lifetime income households; if anything, they provide some weak evidence to the contrary.

[36] When working households aged 62 or older were added to the sample, the results showed a stronger and more consistently positive relationship between saving rates and income.

F. *Do the Results Hold Up for a Later Time Period?*

Using the third wealth supplement of the PSID (holdings as of 1994), we constructed estimates of both change in wealth and active saving between 1989 and 1994 and reran most of the estimations reported in the tables above (these results are available on request). The estimated median active saving rate for the later period rose from 0.7 percent for the lowest current income quintile to 11.2 percent for the highest quintile, similar to the estimates of 1.0 percent and 13.7 percent for the earlier period. The estimated medians for the change-in-wealth saving rate were also similar to those of the earlier period for the bottom four quintiles, although the estimate for the top income decile, 12.5 percent, was below the estimate from the earlier time period, 18.5 percent. Results were generally similar across periods when our sets of instruments were used, except for a downturn in the later period in active (but not change-in-wealth) saving when weighted consumption was used as an instrument.

G. *The Marginal Propensity to Save*

For some questions, the relevant relationship between income and saving is not that pertaining to the *average* propensity to save but instead that pertaining to the *marginal* propensity to save (MPS) (see Blinder 1975). We consider two approaches to estimating the MPS. The simplest approach, based on a cross section, is to use the variation in average saving rates across income classes to trace out a "marginal" saving schedule. To do this, we divide the change in the level of saving across income groups by the change in income across these groups. The dots in figure 3 correspond to the predicted (change-in-wealth) saving from the cross-sectional regressions, and the slope of each line connecting the dots is the estimated MPS.[37] These MPS estimates range from 3 cents per dollar of income between quintiles 1 and 2 up to 43 cents between quintiles 4 and 5.

These estimates may be problematic, however, if there is a third factor that varies across the population and is driving differences in both income and saving rates. For example, if households with high rates of time preference tend to have both a lower permanent income (perhaps due to lack of investment in education) and a low saving rate (e.g., Evans and Montgomery 1995), then exogenously increasing the permanent income of those in the low-income group would not cause them to save at the rate observed in the high-income group (Mayer 1972).

Our second approach to estimating the MPS relates the change in

[37] The implied level of saving is equal to median income multiplied by the corresponding coefficient from col. 3 in table 3.

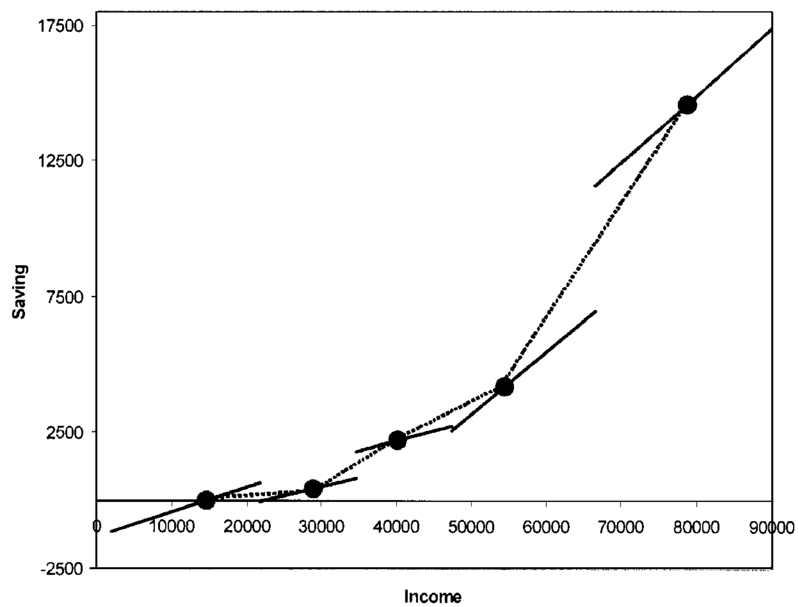

Fig. 3.—Cross-section and time-series estimates of the marginal propensity to save. (1) Estimates are based on the change-in-wealth measure of saving. All saving and disposable income measures are given in 1994 dollars. (2) Each dot represents the predicted median level of saving for an income quintile. Its horizontal position is equal to the median household income for the quintile. Its vertical position is equal to the product of median income and the median saving rate for that quintile, estimated in col. 3 of table 3. (3) The connecting dotted lines therefore trace out an implicit saving function, where the slope of each line is the implicit MPS for that income bracket. The slopes of the implicit MPS segments are 3.0 percent (quintiles 1 and 2), 15.8 percent (quintiles 2 and 3), 13.9 percent (quintiles 3 and 4), and 42.9 percent (quintiles 4 and 5). (4) The slopes of the solid lines are equal to the quintile-specific MPS estimated directly from the time-series changes in saving rates (col. 1 of table 9 below). For ease of comparison, these solid lines are drawn through the corresponding median income and saving dots described above.

saving across time for a given household to the change in its income. We use the PSID and define the change in saving as the difference between 1989–94 saving and 1984–89 saving. We define the change in income as the difference between average income for 1989–93 and average income for 1984–88 and estimate the median regression as

$$\Delta S_{iq} = a_q + b_q \Delta Y_{iq} + \zeta_3 \mathrm{age}_3 + \zeta_5 \mathrm{age}_5 + e_{qi}, \tag{4}$$

where ΔS_{iq} equals the change in saving for household i in age-specific income quintile q (in 1984–89), a_q is the quintile-specific trend term over this period, b_q is the quintile-specific coefficient corresponding (under appropriate assumptions) to the MPS, ΔY_{iq} is the household's change in average income, and the remaining terms reflect age dummy

TABLE 9
MEDIAN REGRESSION ESTIMATES OF THE MARGINAL PROPENSITY TO SAVE

	PSID	
	ΔWealth (1)	Active Saving (2)
Quintile 1	.089	.080
	(.033)	(.040)
Quintile 2	.068	.035
	(.044)	(.043)
Quintile 3	.075	.088
	(.057)	(.087)
Quintile 4	.227	.183
	(.086)	(.083)
Quintile 5	.248	.039
	(.111)	(.081)
Pseudo R^2	.006	.004
Sample size	2,907	2,068

NOTE.—For each column, the top heading indicates the data set used and the second heading indicates the saving measure used. The dependent variable is the change in household saving between 1989–94 and 1984–89. Included as independent variables are the changes in household income between 1989–93 and 1984–88, interacted with 1984–88 income quintile dummy variables. Also included (coefficients are not reported in the table) are age dummies (30–39 and 50–59, with ages 40–49 the excluded value) and a set of dummy variables for the initial quintile of income in 1984–88.

variables (age_3 for ages 30–39 and age_5 for ages 50–59 in 1987) multiplied by their coefficients and the error term. Note that the validity of this procedure depends on the assumption that the changes in five-year average income reflect permanent rather than transitory changes.

Table 9 presents estimates of equation (4) for both active saving and change-in-wealth saving from the PSID. For both types of saving, the estimated coefficients b_q are modest and not statistically significant for quintiles 2 and 3. For the change-in-wealth definition of saving, the coefficients for quintiles 4 and 5 are 0.227 and 0.248, respectively, and are significantly different from zero. For the active saving measure, the quintile 4 coefficient, 0.183, is large and significant, but surprisingly, the predicted estimate of the quintile 5 coefficient is neither.[38] Figure 3 displays these direct estimates; the slopes of the solid lines equal the quintile-specific estimated MPS, with each line drawn for convenience

[38] The substantial difference in the two estimates for quintile 5 could reflect statistical noise, since the 95 percent confidence intervals overlap. Alternatively, if households in the top quintile had experienced both rapid wage growth and rapid appreciation of house prices (because of regional growth), their estimated MPS based on the change-in-wealth saving measure would be too high (because it would include the appreciation in asset values) and their estimated MPS based on the active saving measure would be too low (because it would include the consumption response both to the income gain and to the capital gain; see, e.g., Juster et al. [2001]). Note also that the results were somewhat sensitive to variations (not reported) in the specification of the equation.

through the corresponding median income and saving dots described above. While the two MPS estimates do not match up exactly, suggesting heterogeneity in saving behavior across income groups in saving behavior, both approaches suggest that the MPS (and the marginal propensity to consume) differs across income groups. This means that the impact of a change in taxes or other fiscal variable on the aggregate economy will depend on its distribution across income groups and thus suggests that a representative agent model cannot fully predict the results of a given fiscal policy (e.g., Stoker 1986; Caselli and Ventura 2000; see also Harris and Laibson 2001).

H. Comparison with Earlier Results on Wealth-Earnings Ratios

Our results are seemingly at odds with several recent studies using the Health and Retirement Survey (HRS) that find that the ratio of wealth to lifetime earnings is highest for households with the lowest lifetime earnings, falls off sharply at slightly higher earnings levels, and is roughly constant thereafter (Gustman and Steinmeier 1997, 1999; Venti and Wise 1999). How can our results be reconciled with theirs? An important difference is that Gustman and Steinmeier's and Venti and Wise's measure of pension and Social Security wealth is more accurate than our measure of pension and Social Security saving, because they use information from actual Social Security records to compute Social Security wealth and because the HRS has more comprehensive data on defined-benefit pension coverage. This does not appear to be the explanation, however. Gustman and Steinmeier find that Social Security and pension wealth as a percentage of lifetime earnings is roughly flat between the tenth and ninetieth percentiles, which is consistent with our finding above in table 3. When they examine a measure of wealth that excludes Social Security and pension wealth (leaving financial, business, and housing wealth), the resulting ratio of wealth to lifetime earnings continues to be either declining or flat across the income distribution (see Gustman and Steinmeier 1997, tables 9 [p. 75], 12 [p. 78]).

Perhaps the discrepancy can instead be explained by the fact that Gustman and Steinmeier and Venti and Wise focus on wealth stocks whereas we measure saving flows. This also does not appear to be the explanation, however, since in our data sets wealth-income ratios display a pattern similar to that of saving-income ratios. Table 10 shows estimates of wealth-income ratios by income quintile from the PSID and SCF, based on samples that match the ages (51–61) of the HRS households considered by Gustman and Steinmeier and Venti and Wise. For the 1983–89 SCF panel (col. 1), the wealth-income ratio rises from 1.5 in the lowest quintile to 3.4 in the highest quintile. Similar results are found in the 1992 SCF (col. 2) and the PSID (col. 3) using quintiles

TABLE 10
MEDIAN REGRESSION ESTIMATES OF WEALTH-INCOME RATIOS BY INCOME QUINTILE: HOUSEHOLD HEADS AGED 51–61 AT TIME OF SURVEY

	1983–89 SCF PANEL	1992 SCF CROSS SECTION	1989 PSID	
	Average 1982, 1988 Income (1)	1991 Income (2)	Average 1984–89 Income (3)	10 Year+ Average Earnings (4)
Quintile 1	1.50	.86	.58	.37
	(.61)	(.62)	(.28)	(.14)
Quintile 2	1.59	2.93*	1.75*	1.78*
	(.66)	(.51)	(.30)	(.21)
Quintile 3	1.48	3.18	2.19	2.79*
	(.70)	(.36)	(.30)	(.26)
Quintile 4	1.88	2.82	2.57	2.76
	(.39)	(.18)	(.22)	(.28)
Quintile 5	3.37*	4.01	3.85*	4.04*
	(.48)	(.66)	(.34)	(.26)
Pseudo R^2	.031	.001	.056	.085
Sample size	294	684	717	677

NOTE.—Wealth includes housing equity. Wealth in col. 1 is the average of 1983 and 1989 wealth. For each column, the top heading indicates the data set used and the second heading indicates the income measure used both to form quintiles and as the denominator in the wealth-income ratio. The SCF and PSID quintiles are weighted; the SCF regressions are weighted. The 10-year+ earnings for PSID equals the average of (the present value of) all available lagged earnings (back to 1987) for the head while the head was aged 62 or younger, plus a similar average for the spouse. The sample is restricted to households with at least 10 years of earnings history for the head and at least five years for the spouse (even if earnings are zero).
* The coefficient is significantly greater than that for the next lower quintile, on the basis of a one-sided 5 percent test.

computed as we have previously. Another possible explanation for the different findings is the definition of lifetime income; for the most part, we have used proxies that average over fewer years than the Gustman-Steinmeier and Venti-Wise measure. For column 4 of table 10, the variable used to define quintiles and for the denominator of the ratio is the very long average of lagged earnings (stretching back to 1967 when possible), described in subsection *E* above. However, we again see a distinct positive relationship between income and the wealth-income ratio.

What are the remaining possible explanations for why their results might differ from ours? One is measurement error: when permanent income is measured imperfectly, wealth-income ratios for households misclassified to the lowest income groups will tend to be biased upward (because the denominator is too small), whereas wealth-income ratios for households misclassified to the highest income groups will be biased downward (since the denominator is too big). The greater the error in classification is, the larger the negative bias in the estimated relationship between income and wealth-income ratios.[39] Venti and Wise and Gustman and Steinmeier use Social Security administrative records to compute lifetime earnings.[40] While this will likely result in an accurate measure of lifetime earnings for some types of households, for others, such as households with "off-the-books" earnings, it is likely to be biased downward.[41] Indeed, the Venti-Wise and Gustman-Steinmeier estimates imply a present value of lifetime earnings (in 1992 dollars) for the bottom decile of about $36,000 and $86,000, respectively. On an annual (rather than accumulated) basis, these figures imply average total household income of less than $3,500; moreover, the wealth of these groups *exceeds* their lifetime earnings—an implausible result. These patterns suggest a downward bias in the bottom decile of lifetime earnings. If this mismeasurement carries over to other deciles, it could help explain the flatness in the Venti-Wise/Gustman-Steinmeier estimates.

VI. Discussion

This paper revisits an old question: Do high–lifetime income households save a larger fraction of their income than low–lifetime income households? This question was the topic of heated and largely inconclusive debates in the 1950s and 1960s. We have approached it with three data sources: the Consumer Expenditure Survey, the Survey of Consumer Finances, and the Panel Study of Income Dynamics. For households aged 30–59, we consistently find that higher–lifetime income households save a larger fraction of their income than lower-income households.

[39] Of course, the bias could run in the other direction if a household experiences a transitory income shock that induces a percentage change in wealth greater than that of income (and thus moves the wealth-income ratio in the direction of the transitory shock). But we view this latter effect as likely to be limited since it will occur only when a household has a low level of starting wealth and experiences a large shock to transitory income.

[40] For individuals not covered by Social Security or with earnings above the Social Security earnings cap, Gustman and Steinmeier also use survey questions about earnings at current and past jobs.

[41] Another example is immigrants with few years of covered earnings (Gustman and Steinmeier 2000). We average earnings only over years in which households are in the survey (and do not include any new immigrants after 1968), whereas Gustman-Steinmeier/Venti-Wise average across all years, including pre-immigration years in which Social Security earnings equal zero. Yet another example is divorced spouses who did not work outside the house in earlier years: we average only across years subsequent to divorce whereas the Gustman-Steinmeier/Venti-Wise average would include the zeros from earlier years as well. Finally, for households above the Social Security earnings cap, Gustman and Steinmeier estimate earnings based on recollective questions about earnings at past jobs. This is likely to be a noisier estimate of earnings than the contemporary questions asked in the PSID.

A. *Which Model Is Right?*

Our results clearly rule out models that imply that saving is proportional to permanent income. But, as shown in Section II, a variety of economic models deliver the prediction that saving rates are positively related to permanent income. Is there any way to distinguish among them?

First, our results are not consistent with life cycle explanations based on differences in the timing of income. We find that including imputed Social Security and pension saving does not alter our basic result that high-income households save a larger fraction of their income. The decline in Social Security saving rates as income rises is more than offset by a rise in pension saving rates, so that including imputed Social Security and pension saving leads to a *steeper* relationship between saving rates and income within each age group. Thus models such as Huggett and Ventura (2000), which appeal to differential Social Security replacement rates, are not capable of explaining why high-income households save more.

Second, our results are inconsistent with life cycle explanations based solely on differences in time preference rates or differing elasticities of intertemporal substitution, which lead to differences in the timing of consumption. Our data sets show no evidence of the "switching" pattern at later ages implied by these explanations: Households with higher saving rates when young do not exhibit higher dissaving rates when old. This is consistent with Altonji and Villanueva's (2003) finding that the marginal propensity to bequeath out of permanent income rises with permanent income. Indeed, we find no evidence of dissaving across all income groups, a result that differs from Hurd (1987) but is consistent with more recent studies of wealth changes among the elderly (e.g., Alessie, Lusardi, and Aldershof 1997; Alessie, Lusardi, and Kapteyn 1999; Hurd 1999; Attanasio and Hoynes 2000; Feinstein and Ho 2000; Hildebrand 2001). That active saving—netting out capital gains in equity or housing—is nonnegative among the elderly suggests that our results are not simply the consequence of the buoyant equity market during the 1980s and 1990s.

Third, precautionary saving models with uncertain medical expenses alone are not consistent with observed saving patterns because lower-income households typically face more uncertainty about health costs relative to their income. Fourth, higher saving rates for higher-income groups are consistent with an operative bequest motive as in Becker and Tomes (1986) or models in which wealth itself is an argument in the utility function (Carroll 2000); the very high saving rates of the top 1 percent or top 5 percent are difficult to explain any other way. However, we did not find significant differences in saving behavior between households with children and those without, casting doubt on the ability of the dynastic smoothing model alone to explain the correlation between income and saving rates. Nor would a simple bequest model alone explain why observed levels of saving (and dissaving) in the lowest income quintiles are so small.[42]

In sum, we suggest that the minimum components of a model to capture the empirical regularity that the rich save more should include a precautionary saving motive against uncertain expenditures late in life, thus explaining the nondissaving behavior among the elderly, coupled with a bequest motive. The different motives need not be exclusive: Households save for precautionary reasons but with a reasonable expectation that they will be able to pass along unspent balances to their children (Smith 1999*b*; Dynan et al. 2002).[43] As well, the empirical patterns of the data are consistent with an institutional or behavioral mechanism that systematically leads to low levels of saving among the poor. This may be caused by the absence of financial institutions such as pension plans or home ownership necessary to overcome time-inconsistent saving behavior. It may also be the consequence of asset-based means testing of government programs, or even a result of very high time preference rates.[44] These results can be consistent with the lack of a times-series increase in the aggregate saving rate (noted in the Introduction), as long as the theoretical model implies that saving rates are invariant to constant proportional increases in the relevant parameters, such as income, health care expenditures, anticipated income of heirs, and (as in the model above) the size of the consumption floor.

This type of model is not at odds with the difficulty in detecting a correlation between income inequality and the saving rate (Blinder 1975; Schmidt-Hebbel and Serven 2000). Were the income share received by the bottom quintile in 1998 cut from 4.2 percent of aggregate income (U.S. Bureau of the Census 2000, p. 471) to *zero*, with all the dollars appearing in the income share of the top income quintile (boost-

[42] See Bernheim et al. (2001) and De Nardi (2002). Mulligan (1997) has also criticized this simple "bequest smoothing" model because the data suggest that consumption is no less likely to converge toward the mean among those making intergenerational financial transfers. He proposes an alternative model in which households choose how much to transfer depending on their financial resources and the degree of (endogenous) altruism toward their children.

[43] This view of saving behavior can reconcile the high fraction of respondents in surveys who say that they save primarily against future contingencies and the substantial fraction who say that they want to leave a bequest for their children (Laitner and Juster 1996; Horioka and Watanabe 1997; Horioka et al. 2000). For further empirical evidence, see Jianakoplos, Menchik, and Irvine (1996).

[44] Extreme time preference rates would be required to generate observed low saving rates near retirement; even in buffer stock models of consumption, saving rates revert to traditional life cycle levels as households near retirement (Carroll and Samwick 1997). Engen, Gale, and Uccello (1999) also suggest that low wealth accumulation near retirement may be the consequence of adverse income shocks. However, their model is less likely to explain *median* saving rates for households with low *permanent* income.

ing it from 47.3 to 51.5 percent), the rise in the aggregate personal saving rate predicted by the average values of active saving in figure 1 would be just 0.55 percentage point.[45] In other words, increased income inequality should tend to increase aggregate saving, but the magnitudes of such changes are likely to be modest and therefore difficult to find in the time-series data.

B. *What Are the Policy Implications?*

Our results suggest that the marginal propensities to save and to consume differ substantially across income groups, suggesting that government policies that redistribute across income groups can have real effects on saving. Although the differential saving effects of typical government transfer programs are not so large as to make a measurable dent in aggregate saving statistics (as illustrated above), our results cast doubt on the assumption of a representative agent in the economy.

In addition, our results that high-income households save a greater fraction of income while working than low-income households imply that a flat rate consumption tax will (on a lifetime basis) be regressive relative to a flat rate income tax. There are two reasons for this. First, even if there were no bequests (so that all households consumed their wealth during their lifetime), households with higher incomes would pay more under an income tax compared to an equal-revenue consumption tax, simply because such households can expect to receive a disproportionate share of interest and dividend income.

Second, one needs to take into account that bequests are not zero and may vary with lifetime earnings. A number of studies have calculated the distributional effects of moving from an income-based tax system to one that taxes just consumption. Fullerton and Rogers (1993), Metcalf (1994), and Altig et al. (2001) use data from Menchik and David (1982) to estimate how bequests differ by lifetime income group. The Menchik and David data, however, exhibited a U-shaped relationship between the fraction of resources bequeathed and lifetime income; bequests were the largest share of lifetime resources for the *lowest* income decile.[46] This pattern is consistent with the poor (in the lowest income decile) saving, on average, a larger fraction of their lifetime resources than the rich! Not surprisingly, Metcalf (1994) found, using these data, that adjusting

[45] To compute this change, we multiply 0.042 by the difference between the quintile 5 and quintile 1 saving rates. The direct estimates of the MPS based on the change-in-wealth saving measure from table 9 yield a slightly larger estimate, whereas those based on active saving imply a much smaller estimate.

[46] This U-shaped pattern may be the consequence of using Wisconsin probate records matched with tax returns; farmers are more likely to show low or zero after-tax income but leave sizable farms.

for bequests added progressivity to a consumption tax relative to an income tax. In contrast, our results show substantially higher saving rates (and wealth-income ratios) among families with higher lifetime incomes (see also Mieszkowski and Palumbo 2002). These results, together with the lack of evidence that the elderly high-income households dissave at a higher rate, suggest that, on average, higher-income households bequeath a larger fraction of lifetime earnings than lower-income households. Because bequests are effectively exempt from a consumption tax (at least for the current generation) but are not exempt from an income tax, our evidence suggests further regressivity in a consumption tax relative to an income tax.

Finally, the results have implications for the "choice versus chance" question first raised by Friedman (1953) and more recently by Venti and Wise (1998). Is the considerable variation in accumulated wealth the consequence of choice (preferences and tastes) or chance? Venti and Wise argue that most of the variation in wealth *within* lifetime income groups is due to saving decisions, or choice. Our finding that differences in saving behavior *across* income groups are also an important source of the overall variation in wealth of the U.S. population suggests a diminished role for choice. For example, wealth accumulation because of government or private policies that differentially affect saving (such as asset-based means testing or the availability of 401(k) plans) cannot be readily attributed to tastes or preferences. Nor can a lucky career outcome such as joining Microsoft in 1984, and a subsequently higher rate of saving, be attributed entirely to choice.

In sum, much remains to be learned about household saving behavior, especially that of elderly households and that of the very top of the income distribution. Still, we believe that our work has established one fact: The rich do, indeed, save more.

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FOI 2980
Document 15

IN CONFIDENCE - DSS INTERNAL WORKING DOCUMENT

WARNING
These raw data must be kept secure and not disclosed.
All data descriptions must remain attached to the data at all times.
These data must not be published without the express authority of the Group Manager, Policy Office Group, Department of Social Services.

The table on 'Died in 2018' tab contains assessed assets (each) information regarding age pensioners who died in 2018 calendar year. The table in 'Commenced in 2012' tab contains information regarding age pensioners who commenced in 2012 calendar year.
Change in assets between 2012 and 2017 are shown. It is broken down by their assets in 2012.
Where a recipient is partnered the assets are the sum of the customer assets and the partner assets, divided by 2.
Persons that changed marital or home owner status during the period were excluded. Persons not in max rate, income test, or asset test (zero rate, manual rate, blind, etc) have been excluded.
Recipients with 0 assets in 2012 were excluded as their percentage change cannot be calculated. Recipients with 0 assets in 2017 were included and those recipients have -100% change in assets.
The ranges in the table are upper value inclusive (ex. "> 0 to $5,000" means greater than 0, less than or equal to $5,000. "> 0% to 20%" means greater than 0%, less than or equal to 20%).

Data is as at 31st December 2012, 2013, 2014, 2015, 2016, 2017.
All data is as known at 19th of April 2019.

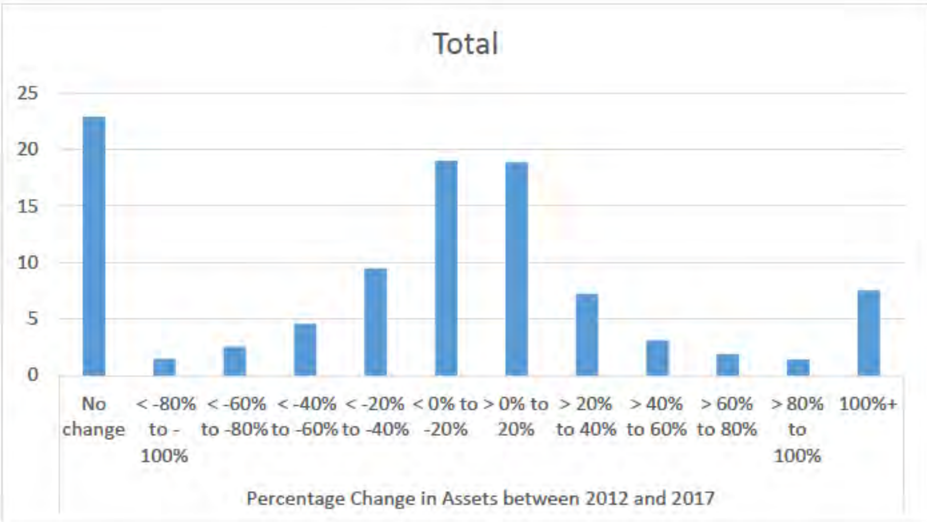
Assets in 2012	Percentage Change in Assets between 2012 and 2017												Total
	No change	< -80% to -100%	< -60% to -80%	< -40% to -60%	< -20% to -40%	< 0% to -20%	> 0% to 20%	> 20% to 40%	> 40% to 60%	> 60% to 80%	> 80% to 100%	100%+	
>0 to $5,000	5,056	139	126	139	161	158	374	429	118	95	126	2,009	8,930
>$5,000 to $25,000	7,828	368	490	564	733	1,028	1,580	870	403	311	239	2,293	16,707
>$25,000 to $50,000	3,867	255	372	470	685	1,313	1,641	704	366	279	189	926	11,067
>$50,000 to $75,000	1,959	192	235	340	623	1,245	1,434	522	255	193	104	426	7,528
>$75,000 to $100,000	1,077	133	165	271	445	989	1,296	472	218	93	74	201	5,434
>$100,000 to $125,000	623	101	121	165	329	866	1,096	420	152	87	49	135	4,144
>$125,000 to $150,000	323	70	105	137	266	700	804	287	121	50	34	68	2,965
>$150,000 to $175,000	207	72	76	85	167	531	607	245	76	44	23	47	2,180
>$175,000 to $200,000	142	51	61	90	153	433	525	169	61	20	22	20	1,747
$200,000+	447	331	312	461	750	2,011	2,149	617	166	69	22	18	7,353
Total	21,529	1,712	2,063	2,722	4,312	9,274	11,506	4,735	1,936	1,241	882	6,143	68,055
Average change in assets ($'s)													
>0 to $5,000	$0.00	-$2,030.63	-$1,873.30	-$1,326.52	-$831.32	-$265.08	$224.71	$612.46	$1,331.06	$1,872.44	$2,268.43	$23,716.90	$5,345.62
>$5,000 to $25,000	$0.00	-$11,507.54	-$9,940.56	-$6,862.00	-$4,379.49	-$1,223.14	$1,205.54	$3,755.83	$6,919.27	$9,842.65	$12,655.30	$59,722.06	$7,993.40
>$25,000 to $50,000	$0.00	-$32,017.92	-$25,008.43	-$18,394.08	-$10,840.37	-$3,253.34	$2,703.94	$10,512.83	$18,105.19	$25,632.91	$32,680.58	$94,100.86	$7,329.91
>$50,000 to $75,000	$0.00	-$55,686.11	-$42,679.69	-$30,119.48	-$18,086.11	-$5,127.60	$4,718.85	$17,601.56	$30,510.59	$43,282.19	$54,671.81	$136,050.93	$6,259.10
>$75,000 to $100,000	$0.00	-$77,957.38	-$60,413.94	-$43,211.25	-$24,903.54	-$7,187.43	$6,499.37	$24,927.28	$43,371.25	$59,721.13	$75,272.36	$167,493.12	$4,452.85
>$100,000 to $125,000	$0.00	-$100,850.57	-$77,525.83	-$54,788.40	-$31,640.08	-$8,878.87	$8,575.00	$31,670.34	$54,165.70	$78,245.08	$99,569.78	$185,154.13	$5,045.77
>$125,000 to $150,000	$0.00	-$123,096.87	-$95,825.09	-$67,999.54	-$39,478.65	-$11,381.38	$10,718.50	$38,668.30	$66,693.96	$94,261.12	$121,797.50	$217,171.85	$1,667.68
>$150,000 to $175,000	$0.00	-$142,024.43	-$112,318.92	-$81,443.73	-$46,006.66	-$12,288.53	$12,922.30	$45,965.71	$77,453.78	$112,133.74	$144,170.08	$216,846.97	$1,624.08
>$175,000 to $200,000	$0.00	-$168,202.18	-$132,017.95	-$90,216.37	-$52,594.65	-$13,940.02	$15,579.46	$51,883.89	$89,158.36	$132,386.60	$166,532.51	$257,812.96	-$2,850.56
$200,000+	$0.00	-$288,063.12	-$230,718.27	-$160,918.55	-$91,997.03	-$25,072.71	$23,204.85	$75,974.24	$120,922.85	$158,627.30	$214,060.72	$292,038.50	-$30,355.99
Total	$0.00	-$97,369.93	-$69,037.21	-$52,252.87	-$32,179.54	-$10,535.01	$9,171.05	$26,016.99	$38,485.88	$43,791.56	$46,997.83	$68,975.97	$1,982.59

1,445 recipients had 0 assets in 2012. On average their assets increased by $6,810.87

Assets in 2012	Percentage Change in Assets between 2012 and 2017												Total
	No change	< -80% to -100%	< -60% to -80%	< -40% to -60%	< -20% to -40%	< 0% to -20%	> 0% to 20%	> 20% to 40%	> 40% to 60%	> 60% to 80%	> 80% to 100%	100%+	
>0 to $5,000	6,890	72	73	74	110	214	659	561	96	73	58	1,120	10,000
>$5,000 to $25,000	10,599	218	392	536	735	1,308	2,386	1,211	392	304	231	2,893	21,205
>$25,000 to $50,000	4,541	222	468	640	811	1,497	2,343	1,018	492	317	280	1,970	14,599
>$50,000 to $75,000	2,463	209	365	591	892	1,487	2,150	883	474	290	292	1,208	11,304
>$75,000 to $100,000	1,449	173	297	496	817	1,701	2,010	919	478	327	238	828	9,733
>$100,000 to $125,000	923	142	237	414	866	1,840	2,097	853	457	302	227	568	8,926
>$125,000 to $150,000	532	117	168	373	758	1,866	1,892	665	383	237	137	448	7,576
>$150,000 to $175,000	318	102	179	274	747	1,583	1,478	510	280	174	106	190	5,941
>$175,000 to $200,000	205	91	139	283	678	1,476	1,339	473	221	119	101	90	5,215
$200,000+	504	476	822	1,980	5,324	10,611	7,021	1,855	569	215	75	34	29,486
Total	28,424	1,822	3,140	5,661	11,738	23,583	23,375	8,948	3,842	2,358	1,745	9,349	123,985
Average change in assets ($'s)													
>0 to $5,000	$0.00	-$2,094.37	-$1,720.79	-$1,329.87	-$826.32	-$166.68	$193.92	$514.58	$1,299.81	$1,839.82	$2,388.73	$33,326.94	$3,763.89
>$5,000 to $25,000	$0.00	-$13,077.90	-$10,376.54	-$7,673.57	-$4,438.15	-$1,110.26	$1,119.08	$3,675.54	$7,385.10	$10,331.36	$12,921.56	$73,847.41	$10,093.68
>$25,000 to $50,000	$0.00	-$32,087.68	-$25,945.29	-$18,620.49	-$11,057.65	-$3,124.58	$2,800.43	$10,282.82	$18,368.38	$26,395.34	$33,478.98	$108,091.01	$14,516.00
>$50,000 to $75,000	$0.00	-$54,985.58	-$43,054.33	-$30,671.42	-$18,464.78	-$5,271.77	$4,661.65	$17,635.60	$30,823.16	$43,947.64	$56,102.00	$132,360.58	$14,117.11
>$75,000 to $100,000	$0.00	-$77,296.01	-$60,084.31	-$42,617.55	-$25,610.03	-$7,299.53	$6,461.99	$24,663.78	$43,308.01	$59,975.32	$78,843.77	$157,429.90	$14,321.29
>$100,000 to $125,000	$0.00	-$97,521.39	-$78,012.42	-$54,880.71	-$32,247.66	-$9,613.64	$8,641.52	$31,874.76	$55,227.28	$77,317.98	$100,089.68	$182,145.95	$13,377.26
>$125,000 to $150,000	$0.00	-$120,386.03	-$94,672.59	-$66,935.01	-$39,023.72	-$11,335.23	$10,249.37	$39,479.63	$67,014.03	$94,955.30	$121,306.73	$198,204.23	$12,347.23
>$150,000 to $175,000	$0.00	-$144,395.01	-$110,598.43	-$78,471.38	-$46,341.77	-$13,914.91	$12,860.41	$45,456.13	$79,413.91	$110,872.99	$144,950.36	$209,236.41	$4,404.41
>$175,000 to $200,000	$0.00	-$165,044.42	-$128,775.42	-$90,493.23	-$53,097.98	-$16,598.09	$15,304.34	$52,266.04	$91,626.89	$130,103.73	$165,004.15	$219,942.29	-$310.87
$200,000+	$0.00	-$299,156.69	-$232,246.43	-$169,364.63	-$99,439.71	-$31,966.59	$22,833.94	$75,618.98	$117,779.69	$157,622.80	$197,729.57	$274,203.83	-$37,699.69
Total	$0.00	-$129,016.77	-$99,647.42	-$85,768.20	-$60,253.52	-$19,123.32	$11,538.00	$32,975.72	$54,080.09	$67,225.06	$76,701.09	$108,597.35	-$899.76

684 recipients had 0 assets in 2012. On average their assets increased by $3,319.41

Assets in 2012	Percentage Change in Assets between 2012 and 2017												Total
	No change	< -80% to -100%	< -60% to -80%	< -40% to -60%	< -20% to -40%	< 0% to -20%	> 0% to 20%	> 20% to 40%	> 40% to 60%	> 60% to 80%	> 80% to 100%	100%+	
>0 to $5,000	69	1	1	1	1	2	7	6	1	1	1	11	100
>$5,000 to $25,000	50	1	2	3	3	6	11	6	2	1	1	14	100
>$25,000 to $50,000	31	2	3	4	6	10	16	7	3	2	2	13	100
>$50,000 to $75,000	22	2	3	5	8	13	19	8	4	3	3	11	100
>$75,000 to $100,000	15	2	3	5	8	17	21	9	5	3	2	9	100
>$100,000 to $125,000	10	2	3	5	10	21	23	10	5	3	3	6	100
>$125,000 to $150,000	7	2	2	5	10	25	25	9	5	3	2	6	100
>$150,000 to $175,000	5	2	3	5	13	27	25	9	5	3	2	3	100
>$175,000 to $200,000	4	2	3	5	13	28	26	9	4	2	2	2	100
$200,000+	2	2	3	7	18	36	24	6	2	1	0	0	100
Total	23	1	3	5	9	19	19	7	3	2	1	8	100



Age Pensioners: Assets Changes

Introduction

The purpose of this paper is to examine the drawdown behaviour of age pensioners.

Research undertaken by the Department of Social Services in 2014[1] found that the majority of pensioners were maintaining or growing their assets through retirement rather than drawing them down to support themselves. This occurred under both the $1.50 taper rate which applied from 2007-2014 and the $3.00 taper rate which applied before 20 September 2007.

Method

This paper examines changes in the value of assessed assets for two groups of age pensioners.

Group one was analysed to examine changes in the assessed assets in the first five years of receiving Age Pension. This group's assessed assets were compared at the time they commenced receiving Age Pension in 2012, and again five years later.

Group two was analysed to examine changes in assessed assets in the last five years of life. This Group's assets were compared five years before their death and at the time of death in 2018.

The time period used for both groups was 31 December 2012 – 31 December 2017 and mostly when the $1.50 taper rate applied, noting that the taper rate increased to $3.00 on 1 January 2017.

For couples, the assessable assets value is the combined value of both partners assets divided by two.

The data used only included individuals who did not report a change in partner status or a change in home ownership status. This controlled for events that significantly affect assessed assets levels.

Key points

- Pensioners are more commonly maintaining their level of assessable assets in both their first five years on Age Pension and the last five years of life.
    - In the first five years on Age Pension, the assessable assets of just under half of pensioners remained stable (change less than $10,000). Around one quarter increased their assets by more than $10,000 and just over one quarter saw their assets decrease by more than $10,000.
    - In the last five years of life, 62.2 per cent of pensioners maintained their assessable assets at stable levels (change less than $10,000), 21.3 per cent increased their assessable assets by more than $10,000 and 16.5 per cent reduced their assessable assets by more than $10,000.
- The net change in pensioner's assets are not as significant for the two groups in this analysis when compared to the analysis undertaken in 2014. That is, the average change in assessed assets are not as high as they were in previous analysis.

[1] Department of Social Services (2014) *Do age pensioners make rational choices when managing their financial asset?*

- In the first five years on Age Pension, the average change was a small decrease of $877, whereas under previous analysis, the average change under a $3.00 taper increased by $5,066 and by $6,633 under a $1.50 taper.
- In the last five years of life, the average change was an increase of $2,083, whereas under previous analysis, the average change under a $3.00 taper increased by $5,314 and by $6,761 under a $1.50 taper.

- Homeowners are more likely than non-homeowners to both increase and decrease their assessable assets; both in their first five years on Age Pension, and the last five years of life.
  - Partnered homeowners have more wealth than non-homeowners and people who are single. Because partnered homeowners have more wealth, they have greater scope to spend/drawdown their assets to provide a higher standard of living if they choose. They also have the financial means to accrue assets.
- There are more part-rate income tested pensioners than part-rate assets tested pensioners, both in their first five years on Age Pension, and the last five years of life. This is consistent with the entire Age Pension population. Age Pension fact sheet, September 2019 shows 63 per cent of the Age Pension population are part-rate income tested and 37 per cent are part-rate assets tested.
- Part-rate assets tested pensioners draw down their assets more than part-rate income tested pensioners, both in their first five years on Age Pension, and the last five years of life.
  - In the first five years on Age Pension, 35 per cent (15,341) income tested pensioners increased their assessable assets and 27 per cent (11,930) decreased their assessable assets; whereas for assets tested pensioners, only 24 per cent (6,104) increased their assessable assets and 60 per cent (15,132) decreased their assessable assets (Table 3 refers).
  - In the last five years of life, 29 per cent (5,341) income tested pensioners increased their assessable assets and 25 per cent (4,594) decreased their assessable assets; whereas for assets tested pensioners, 33 per cent (1,631) increased their assessable assets and 46 per cent (2,288) decreased their assessable assets (Table 6 refers).
- This key point indicates that the assets test is working as intended. Part-rate assets tested pensioners have more wealth to access and draw down.

Recommendation

This analysis covered the drawdown behaviour of age pensioners under the $1.50 taper rate (31 December 2012 – 31 December 2016) and for one year under the $3.00 taper rate 1 January 2017 – 31 December 2017). It would therefore be worthwhile for similar analysis to be undertaken again, in four years and compared with this analysis.

This would provide a more current view around whether the change in the assets test taper rate that took effect from 1 January 2017, has encouraged age pensioners to draw down on their assets at a faster rate than they were under a $1.50 taper rate.

Group one - Change in assessed assets in the first five years of receiving Age Pension ($1.50 assets test taper)

124,669 individuals who commenced Age Pension in the 2012 calendar year were still receiving Age Pension five years later, and had not changed either home ownership or marital status over the period.

For this group *(Chart 1 refers)*:

- 47.8 per cent (59,600 pensioners) showed no change or a modest (less than $10,000) change in assessable assets.
- 25.4 per cent (31,728 pensioners) showed an increase in assessable assets of $10,000 or more.
- 26.7 per cent (33,341 pensioners) showed a reduction in assessable assets of $10,000 or more.

The average change in assessed assets across this group was a decrease of $877.

This differs from previous analysis, that showed pensioners' average assessed assets increased in the first five years of receiving the Age Pension by $5,066 under a $3.00 taper and by $6,633 under a $1.50 taper.

Chart 1

Change in assessed assets by gender

The differences in results between males and females were small *(Table 1 refers)*.

Females were marginally more likely to have stable asset holdings. They were equally likely to decrease or increase their assets.

- Around 27 per cent of males increased their assets by $10,000 or more, while 24 per cent of females experienced the same result.
- Around 27 percent of both males and females decreased their assets by $10,000 or more.
- Among those whose asset values changed by more than $10,000, the average increase for males was $65,923 and $61,361 for females and the average decrease was $65,740 for males and $62,755 for females.

Overall, the average change for males was an increase of $196 while female's assets decreased by $1,888.

This change is smaller than in previous analysis, which showed that average assessed assets increased by $3,498 for males and $7,037 for females under a $3.00 taper, and increased by $5,932 for males and $7,271 for females under a $1.50 taper.

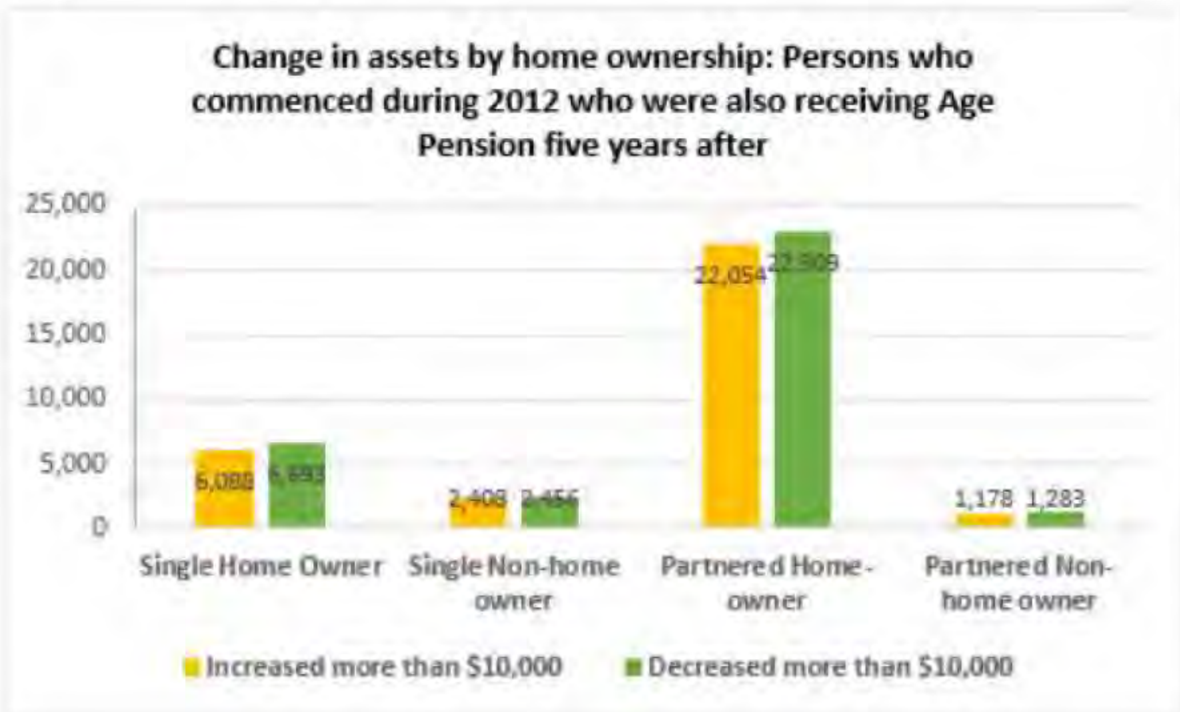
Table 1

Change in assessed assets by gender: Persons who commenced Age Pension during 2012 who were also receiving Age Pension five years after				
	No change (less than $10,000)	**Increased more than $10,000**	**Decreased more than $10,000**	**Total**
Recipients				
Male	28,074	16,244	16,190	60,508
Female	31,526	15,484	17,151	64,161
Total	59,600	31,728	33,341	124,669
Average change in assets				
Male	$190	$65,923	-$65,740	$196
Female	$160	$61,361	-$62,755	-$1,888
Total	$174	$63,697	-$64,204	-$877

Change in assessed assets by home ownership

Homeowners (particularly partnered homeowners) were more likely than non-homeowners to have both increases and decreases in their assessable assets by amounts greater than $10,000 *(Chart 2 refers).*

Chart 2



Single homeowners experienced an average decrease in assessable assets of $4,092, while partnered homeowners, had an average increase of $238.

Single non-homeowners had an average decrease in assessable assets of $738, while partnered non-homeowners had a decrease of $1,400.

Table 2 compares this analysis with the previous analysis undertaken of the average changes in assessed assets in the first five years on Age Pension.

Table 2

	Previous Analysis: Average change in assessed assets		Current Analysis: Average change in assessed assets
	Recipients who commenced Age Pension in 2001-02 ($3.00 taper)	Recipients who commenced Age Pension in 2008-09 ($1.50 taper)	Recipients who commenced in 2012 ($1.50 taper)
Single Homeowner	$3,222	$5,862	-$4,092
Single Non-homeowner	$1,078	-$389	-$738
Partnered Homeowner	$6,780	$9,000	$238
Partnered Non-homeowner	$1,606	-$1,259	-$1,400

Change in assessed assets by means test at commencement by means test five years after commencement *(Table 3 below refers)*

Of the 124,669 recipients in this group at commencement, 44.7 per cent (55,696 pensioners) were receiving the maximum rate, 35.1 per cent (43,720 pensioners) were receiving a part-rate, income reduced payment and 20.3 per cent (25,253 pensioners) were receiving a part-rate assets reduced payment.

Five years after commencement, 57 per cent (71,105 pensioners) were receiving the maximum rate, 24 per cent (30,166 pensioners) were receiving a part-rate, income reduced payment and 19 per cent (23,398 pensioners) were receiving a part-rate, assets reduced payment.

Of the 55,696 recipients receiving the maximum rate at commencement, the average change in the value of assessable assets was an increase of $9,234.

- Those who remained at the maximum rate of payment over the five years (92 per cent) had an increase in assessable assets of $2,473 on average. Those who moved to a part-rate, income reduced payment (5 per cent) had an average increase of $43,783, while those who moved to a part-rate, assets reduced payment (2 per cent) had an average increase of $193,787.

Of the 43,720 recipients receiving part-rate, income reduced payment at commencement, the average change in the value of assessable assets was an increase of $7,572.

- Those who remained at the part-rate, income reduced payment over the five years (54 per cent) had an increase in assessable assets of $4,691 on average. Those who moved to the maximum rate of payment (34 per cent) had an average decrease of $10,397, while those who moved to a part-rate assets reduced payment (12 per cent) had an average increase of $72,164.

Of the 25,253 recipients receiving a part-rate, assets reduced payment at commencement, the average change in the value of assessable assets was a decrease of $37,803.

- Those who remained at a part-rate, assets reduced payment over the five years (67 per cent) had a decrease in assessable assets of $19,017 on average. Those who moved to a part-rate, income reduced payment (14 per cent) had an average decrease of $76,247, while those who moved to the maximum rate of payment (19 per cent) had an average decrease of $75,233.

Table 3

Change in assessable assets by means test at commenent by means test five years after commencement, recipients and average change in assets					
Means test applied at 2012	Means test applied at 2017	No change (less than $10,000)	Increased more than $10,000	Decreased more than $10,000	Total
Recipients					
Maximum rate (44.7%)	Maximum rate	38,048	7,528	5,870	**51,446**
	Part rate income test	1,086	1,415	409	**2,910**
	Part rate assets test	0	1,340	0	**1,340**
	TOTAL	**39,134**	**10,283**	**6,279**	**55,696**
Part rate income test (35.1%)	Maximum rate	5,855	3,726	5,235	**14,816**
	Part rate income test	10,062	7,765	5,897	**23,724**
	Part rate assets test	532	3,850	798	**5,180**
	TOTAL	**16,449**	**15,341**	**11,930**	**43,720**
Part rate assets test (20.3%)	Maximum rate	859	337	3,647	**4,843**
	Part rate income test	474	284	2,774	**3,532**
	Part rate assets test	2,684	5,483	8,711	**16,878**
	TOTAL	**4,017**	**6,104**	**15,132**	**25,253**
TOTAL (100.1%)	Maximum rate	44,762	11,591	14,752	**71,105**
	Part rate income test	11,622	9,464	9,080	**30,166**
	Part rate assets test	3,216	10,673	9,509	**23,398**
	TOTAL	**59,600**	**31,728**	**33,341**	**124,669**
Average change in assets ($'s)					
Maximum rate	Maximum rate	$130	$41,651	-$32,589	**$2,473**
	Part rate income test	$400	$100,719	-$38,002	**$43,783**
	Part rate assets test	$0	$193,787	$0	**$193,787**
	TOTAL	**$138**	**$69,604**	**-$32,942**	**$9,234**
Part rate income test	Maximum rate	$184	$39,692	-$57,881	**-$10,397**
	Part rate income test	$538	$52,709	-$51,452	**$4,691**
	Part rate assets test	$320	$108,320	-$54,377	**$72,164**
	TOTAL	**$405**	**$63,504**	**-$54,469**	**$7,572**
Part rate assets test	Maximum rate	-$974	$22,588	-$101,763	**-$75,233**
	Part rate income test	-$1,047	$33,484	-$100,331	**-$76,247**
	Part rate assets test	-$123	$57,250	-$72,843	**-$19,017**
	TOTAL	**-$414**	**$54,230**	**-$84,853**	**-$37,803**
TOTAL	Maximum rate	$116	$40,467	-$58,666	**-$5,502**
	Part rate income test	$460	$59,310	-$65,779	**-$1,015**
	Part rate assets test	-$49	$92,814	-$71,294	**$13,357**
	TOTAL	**$174**	**$63,697**	**-$64,204**	**-$877**

Group Two - Change in assessed assets in the last five years of receiving Age Pension (\$1.50 assets test taper mostly – some \$3 taper)

During the 2018 calendar year, 69,500 individuals died who had been receiving Age Pension each year from 31 December 2012 through to 31 December 2017, and had not changed either their home ownership or marital status between these two dates.

For this group *(Chart 3 refers)*:

- 62.2 per cent (43,251 pensioners) showed either no change or a modest change (less than \$10,000) change in assessable assets.
- 16.5 per cent (11,474 pensioners) showed a reduction in assessable assets of \$10,000 or more.
- 21.3 per cent (14,775 pensioners) showed an increase in assessable assets of \$10,000 or more.

While there were both increases and decreases in this group, the net change in assets was an average increase of \$2,083.

This is lower compared to previous analysis, which showed average assessed assets increased by \$5,314 under a \$3.00 taper, and by \$6,761 under \$1.50 taper, in the last five years of life.

Chart 3

Change in assessable assets by gender

The results between males and females were very similar *(Table 4)*.

- 21 per cent of both males and females had an increase of \$10,000 or more.
- 17 per cent of males and 16 per cent of females had a decrease of \$10,000 or more.
- 62 percent of both males and females had a modest or no change in assessable assets (less than \$10,000).

The average change for males was an increase of \$2,618, while females had an average increase of \$1,527.

This change is smaller than in the previous analysis, which showed the average value of assessed assets increased by \$4,976 for males and \$5,599 for females under a \$3.00 taper rate; and by \$5,952 for males and \$7,531 for females under a \$1.50 taper rate.

Table 4

Change in assessed assets by gender: Persons who died in 2018 who had received Age Pension at death and five years earlier				
	No change (less than $10,000)	**Increased more than $10,000**	**Decreased more than $10,000**	**Total**
Recipients				
Male	21,840	7,571	5,993	35,404
Female	21,411	7,204	5,481	34,096
Total	43,251	14,775	11,474	69,500
Average change in assets				
Male	$165	$53,295	-$52,460	$2,618
Female	$238	$53,720	-$62,037	$1,527
Total	$201	$53,502	-$57,035	$2,083

Change in assessable assets by home ownership

Homeowners were more likely than non-homeowners to experience both increases and decreases in their asset holdings by amounts greater than $10,000 *(Chart 4 refers)*.

Chart 4

Single homeowners experienced an average increase in their assessable assets of $3,163, while partnered homeowners had an increase of $4,538.

Single non-homeowners had an average decrease of $1,662, while partnered homeowners decreased their assets by $303.

Table 5 provides a comparison of the average changes in assessed assets in the last five years of life in different time periods.

Table 5

	Previous Analysis: Average change in assessed assets		Current Analysis: Average change in assed assets
	Recipients who died in 2006-07 ($3.00 taper)	Recipients who died in 2013-14 ($1.50 taper)	Recipients who died in 2018 ($1.50 taper)
Single Homeowner	$8,213	$12,885	$3,163
Single Non-homeowner	$2,531	$2,916	-$1,662
Partnered Homeowner	$6,795	$6,989	$4,538
Partnered Non-homeowner	$1,794	-$427	-$303

Change in assessed assets by means test applied five years before death by means test applied at death *(Table 6 below refers)*

Of the 69,500 recipients in this group, five years before death, 66.4 per cent (46,129) were receiving the maximum rate, 26.5 per cent (18,400) were receiving a part-rate, income reduced payment and 7.2 per cent (4,971) were receiving a part-rate assets reduced payment.

At the time of their death, 73 per cent (50,502) were receiving the maximum rate, 21 per cent (14,488) were receiving a part-rate, income reduced payment and 6 per cent (4,509) were receiving a part-rate, assets reduced payment.

Of the 46,129 recipients receiving the maximum rate five years before their death, the average change in the value of assessable assets was an increase of $5,996.

- Those who remained at the maximum rate of payment over the five years (96 per cent) had an increase in assessable assets of $2,309 on average. Those who switched to receiving a part-rate income reduced payment (3 per cent) had an average increase of $66,063, while those who switched to a part-rate, assets reduced payment (1 per cent) had an average increase of $236,630.

Of the 18,400 recipients receiving a part-rate, income reduced payment five years before their death, the average change in the value of assessable assets was a decrease of $329.

- Those who remained at the part-rate, income reduced payment over the five years (67 per cent) had an average increase in assessable assets of $4,197. Those who switched to receiving the maximum rate of payment (27 per cent) had an average decrease of $30,467, while those who switched to a part-rate, assets reduced payment (6 per cent) had an average increase of $91,464.

Of the 4,971 recipients receiving a part-rate, assets reduced payment five years before their death, the change in the value of assessable assets was an average decrease of $25,303.

- Those who remained at a part-rate assets reduced payment over the five years (63 per cent) had an average increase in assessable assets of $5,329. Those who switched to receiving a part-rate income reduced payment (16 per cent) had an average decrease of $70,579, while those who switched to the maximum rate of payment (22 per cent) had an average decrease of $81,280.

Table 6

Change in assessable assets by means test applied five years before death by means test applied at death , recipients and average change in assets					
Means test applied at 2012	**Means test applied at 2017**	**No change (less than $10,000)**	**Increased more than $10,000**	**Decreased more than $10,000**	**Total**
Recipients (count)					
Maximum rate (66.4%)	Maximum rate	33,320	6,608	4,488	**44,416**
	Part rate income test	414	838	104	**1,355**
	Part rate assets test	0	357	0	**357**
	TOTAL	**33,734**	**7,803**	**4,592**	**46,129**
Part rate income test (26.5%)	Maximum rate	2,138	700	2,170	**5,008**
	Part rate income test	6,220	3,773	2,364	**12,357**
	Part rate assets test	107	868	60	**1,035**
	TOTAL	**8,465**	**5,341**	**4,594**	**18,400**
Part rate assets test (7.2%)	Maximum rate	241	115	722	**1,078**
	Part rate income test	145	94	537	**776**
	Part rate assets test	666	1,422	1,029	**3,117**
	TOTAL	**1,052**	**1,631**	**2,288**	**4,971**
TOTAL	Maximum rate	35,699	7,423	7,380	**50,502**
	Part rate income test	6,779	4,705	3,005	**14,488**
	Part rate assets test	773	2,647	1,089	**4,509**
	TOTAL	**43,251**	**14,775**	**11,474**	**69,500**
Average change in assets ($'s)					
Maximum rate	Maximum rate	$154	$35,188	-$30,102	**$2,309**
	Part rate income test	$63	$111,163	-$34,610	**$66,063**
	Part rate assets test	$0	$236,630	$0	**$236,630**
	TOTAL	**$153**	**$52,564**	**-$30,204**	**$5,996**
Part rate income test	Maximum rate	$28	$29,520	-$79,863	**-$30,467**
	Part rate income test	$506	$46,858	-$54,179	**$4,197**
	Part rate assets test	$1,104	$111,587	-$38,518	**$91,464**
	TOTAL	**$392**	**$55,105**	**-$66,107**	**-$329**
Part rate assets test	Maximum rate	-$582	$21,538	-$124,593	**-$81,280**
	Part rate income test	-$371	$29,524	-$107,059	**-$70,579**
	Part rate assets test	$625	$56,804	-$62,762	**$5,329**
	TOTAL	**$211**	**$52,745**	**-$92,670**	**-$25,303**
TOTAL	Maximum rate	$141	$34,442	-$53,978	**-$2,726**
	Part rate income test	$460	$57,965	-$62,951	**$5,982**
	Part rate assets test	$691	$99,022	-$61,426	**$43,413**
	TOTAL	**$201**	**$53,502**	**-$57,035**	**$2,083**

Assets changes in selected groups of Age Pension recipients

Introduction

This paper will look at the changes in the level of assets holdings, over five year periods, for four distinct groupings of Age Pension recipients. The first two groups will have their level of assets holdings compared at the time they commenced receiving Age Pension against the assets they held five years after commencement. The first group will have their level of assets holdings compared during a five year period when the assets test taper was a $19.50 per year reduction in pension for every $250 in excess assets or equivalently $3.00 per fortnight reduction for every $1,000 in excess assets. The second group will have their level of assets holdings compared during a five year period when the assets test taper was a $9.75 per year reduction in pension for every $250 in excess assets or equivalently $1.50 per fortnight reduction for every $1,000 in excess assets.

The last two groups will have their level of assets holdings compared at a time five years before their death against the level of their assets holdings at the time of their death, while in receipt of Age Pension on both dates. The third group will have their level of assets holdings compared during a five year period when the assets test taper was a $19.50 per year reduction in pension for every $250 in excess assets or equivalently $3.00 per fortnight reduction for every $1,000 in excess assets. The fourth and final group will have their level of assets holdings compared during a five year period when the assets test taper was a $9.75 per year reduction in pension for every $250 in excess assets or equivalently $1.50 per fortnight reduction for every $1,000 in excess assets.

In order to control for events that are likely to have large changes on assets holdings, for example, the sale of the principal home when moving into an aged care facility or the redistribution of assets to a surviving partner after a bereavement, each group is limited to those recipients who during the five year period under consideration, had neither a change in partner status nor a change in home ownership status.

In the Social Security law (see *Social Security Act 1991*, Section 1064-G2), the value of the assets of a member of a couple is taken to be their one-half share of the sum of the value of the person’s assets and the value of the person’s partner’s assets. Throughout this paper, asset amounts for partnered recipients will similarly refer to this one-half share of the combined assets of the couple, rather than the value of one’s own assets.

Summary of findings

Regardless of whether we look at groups during periods when higher assets test tapers applied or whether we look at changes during the first five years or the last five years in receipt of Age Pension, there are always three distinct behaviours within each group: those with large accumulation of assets; those who have minor or no change at all in their holdings of assets; and those who have large dispersal of assets.

- In the group in the first five years of Age Pension receipt during the higher taper period, 29.2 per cent had an increase in assets of $10,000 or more, 47.4 per cent had either a modest or no change in assets, and 23.4 per cent had a reduction of $10,000 or more in assets.
- In the group in the first five years of Age Pension receipt during the lower taper period, 32.3 per cent had an increase in assets of $10,000 or more, 38.4 per cent had either a modest or no change in assets, and 29.3 per cent had a reduction of $10,000 or more in assets.
- In the group in the last five years of Age Pension receipt during the higher taper period, 19.7 per cent had an increase in assets of $10,000 or more, 68.6 per cent had either a modest or no change in assets, and 11.7 per cent had a reduction of $10,000 or more in assets.
- In the group of in the last five years of Age Pension receipt during the lower taper period, 24.8 per cent had an increase in assets of $10,000 or more, 57.3 per cent had either a modest or no change in assets, and 17.9 per cent had a reduction of $10,000 or more in assets.

In overall terms, the net change in the average assets holdings is remarkably similar across the four groups. For the groups studied during the first five years of Age Pension receipt the net change in assets was an average increase of $5,066 and $6,633 during the higher and lower assets taper periods respectively. For the groups studied during the last five years of Age Pension receipt the net change in assets was an average increase of $5,314 and $6,761 during the higher and lower assets taper periods respectively.

Some other observations that we can make across all of the four groups are:

- Home owners were more likely than persons who were not home owners to have both increases and decreases by amounts greater or equal to $10,000 in their assets holdings.
- Persons with more assets holdings at the start of the five year period were more likely than persons with lower assets holdings at the start of the five year period to have both increases and decreases by amounts greater or equal to $10,000 in their assets holdings.
- Persons who had either an assets or income reduced rate at the start of the five year period were much more likely to have a change of $10,000 or more in their assets holdings (both increases and decreases) than persons who were receiving a maximum rate pension at the start of the period.

Analysis 1: Change in assessed assets (nominal dollars) in the first five years of receiving Age Pension (higher assets taper period, pre-20 September 2007)

Between 1 July 2001 and 30 June 2002, 117,833 persons started to receive Age Pension. Of this group, 101,175 individuals were also receiving Age Pension five years after their date of commencement. Persons need not have received the payment continuously, but rather simply needed to be in receipt of Age Pension on the fifth anniversary of their date of commencement in 2001-02. This section of the paper will investigate the changes that took place in the level of assets holdings within this group in the first five years after the person started to receive Age Pension. In order to control for changes in circumstances that are likely to have had substantial effects on the holdings of assets, the above group is further limited to those who had neither a change in whether they were partnered nor a change in their home ownership status in that same five year period. This limits the final group that we will study to 89,700 persons who commenced receiving Age Pension during 2001-02.

Table 1 shows some basic demographics of the group under study. Males made up 55.7 per cent of the group and commenced Age Pension at an average age of 66.2 years. Females commenced Age Pension at an average age of 64.5 years reflecting the younger pension age for women for those born on or before 31 December 1948. During 2001-02 women reached pension age at 62 years of age and they were only reaching pension age in six of the 12 months in the financial year, 1 January 2002 through 30 June 2002.

Table 1. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: sex by month of commencement, recipients and average age commenced

	Male		Female		Total	
	Recipients	Average age commenced	Recipients	Average age commenced	Recipients	Average age commenced
Jul-01	4,970	66.6	3,319	65.8	8,289	66.3
Aug-01	4,424	66.4	2,663	66.3	7,087	66.4
Sep-01	4,255	66.3	1,945	66.5	6,200	66.4
Oct-01	4,418	66.3	1,862	66.9	6,280	66.5
Nov-01	4,068	66.2	1,524	66.9	5,592	66.3
Dec-01	3,867	66.1	1,315	66.7	5,182	66.2
Jan-02	4,278	66.2	4,643	63.8	8,921	64.9
Feb-02	3,825	66.1	4,321	63.7	8,146	64.8
Mar-02	3,925	66.0	4,683	63.3	8,608	64.5
Apr-02	4,002	66.2	4,470	63.7	8,472	64.8
May-02	4,164	66.1	4,575	63.5	8,739	64.8
Jun-02	3,766	66.1	4,418	63.6	8,184	64.8
Total	49,962	66.2	39,738	64.5	89,700	65.4

Some 52,564 or 58.6 per cent of the group were receiving some type of pension on or before reaching pension age. For most of this group (90.6%), Age Pension was the pension received at pension age, however, a further 4,935 persons who commenced Age Pension during 2001-02 were receiving a pension other than Age Pension on the day that they reached pension age (see Table 2).

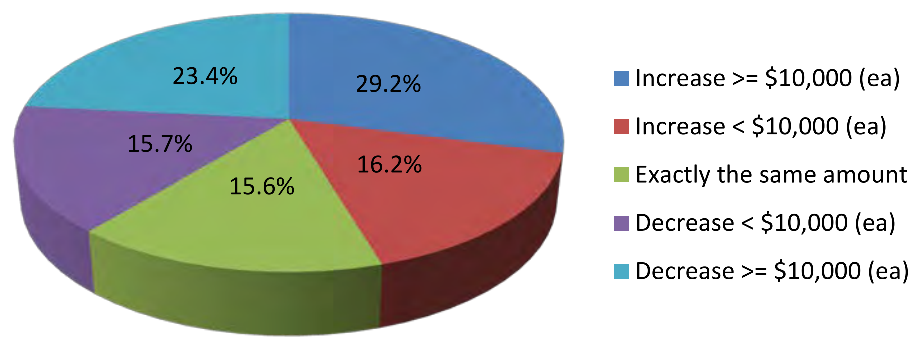
There were a further 37,136 persons who commenced Age Pension during 2001-02 who were not receiving any pension on the day that they had reached pension age. Of these persons, 5,416 (14.6%) had commenced within three months of reaching pension age. Within a year of reaching pension age this proportion had accumulated to 28.3 per cent, within two years to 41.3 per cent and within three years had reached 50.0 per cent. This illustrates that while there is a large group of persons receiving pension at pension age, there is also another large group who steadily flows onto the Age Pension at various ages beyond pension age.

Table 2. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: whether original date of grant (start date of the current period of continuous pensions entitlement) was on before pension age by period after pension age commenced Age Pension, recipients and average age commenced

	Original date of grant on or before pension age		Original date of grant after pension age		Total	
	Recipients	Average age commenced	Recipients	Average age commenced	Recipients	Average age commenced
Commenced on pension day	47,629	63.9	-	-	47,629	63.9
Commenced within 3 months	2,944	64.0	5,416	64.1	8,360	64.1
Commenced within 6 months	501	64.0	1,957	64.0	2,458	64.0
Commenced within 9 months	187	64.1	1,596	63.9	1,783	63.9
Commenced within 1 year	138	63.9	1,533	64.0	1,671	64.0
Commenced within 2 years	204	63.8	4,822	64.5	5,026	64.5
Commenced within 3 years	115	64.5	3,253	65.5	3,368	65.4
Commenced within 4 years	89	65.2	3,187	66.0	3,276	66.0
Commenced within 5 years	392	65.3	2,253	67.0	2,645	66.8
Commenced within 10 years	300	67.3	7,449	69.4	7,749	69.3
Commenced later	65	73.4	5,670	76.4	5,735	76.4
Total	52,564	64.0	37,136	67.5	89,700	65.4

In the group as a whole, 29.2 per cent increased their assessed assets by an amount greater or equal to $10,000 in the five years after commencing Age Pension (see Chart 1 and Table 3). Some 47.4 per cent of the group had either a modest change in assets or no change in assets at all (their assets neither increased nor decreased by an amount that exceeded $10,000). Finally, 23.4 per cent of the group had a decrease in assets over the five years that exceeded $10,000. While there were both increases and decreases in the group, in overall net terms, the average assessed assets of the group increased by an average of $5,066 in the five years after commencing Age Pension.

Chart 1. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary



Differences between males and females in the group were not large. Some 27.2 per cent of males had an increase in assets of $10,000 or more, while 23.8 per cent had a decrease in assets of $10,000 or more. In comparison, 31.7 per cent of females had an increase in assets of $10,000 or more, while 22.8 per cent of females had a decrease in assets of $10,000 or more. Overall, average assessed assets of males in the group increased by an average of $3,498 and similarly females had a net overall average increase of $7,037.

Table 3. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by sex, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Males	13,585	8,506	7,492	8,473	11,906	49,962
Females	12,613	6,026	6,461	5,568	9,070	39,738
Persons	26,198	14,532	13,953	14,041	20,976	89,700
	Average change in assets (ea)					
Males	$46,340	$3,737	$0	-$3,942	-$38,062	$3,498
Females	$52,570	$3,910	$0	-$3,922	-$42,465	$7,037
Persons	$49,339	$3,809	$0	-$3,934	-$39,966	$5,066

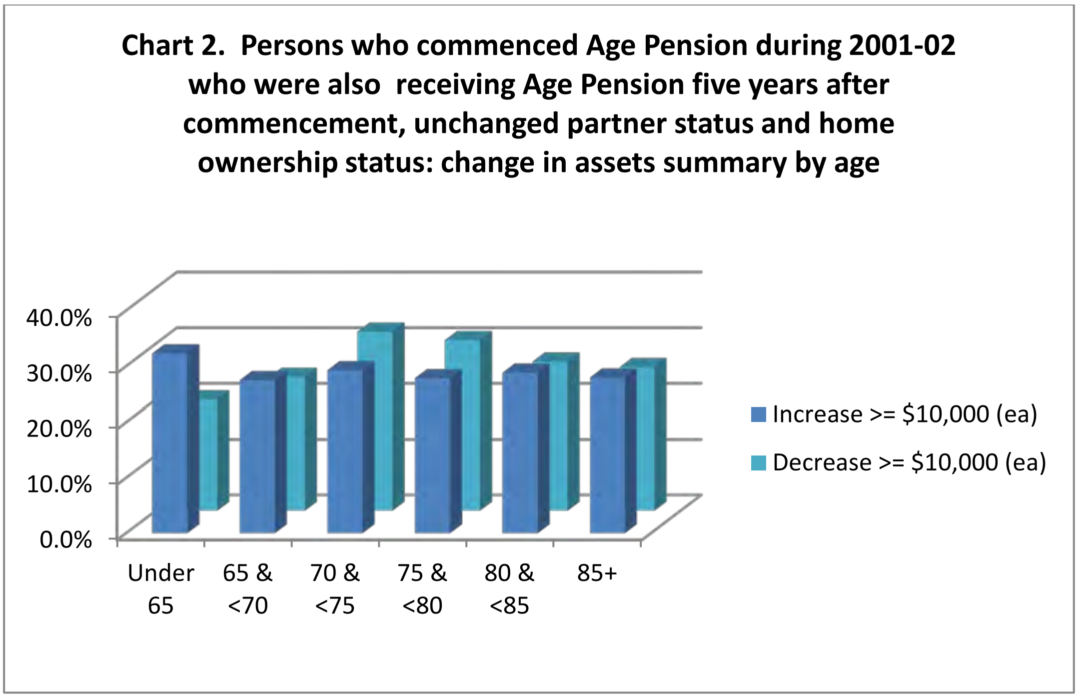
Persons who commenced receiving Age Pension under 65 years were more likely to have a large increase in assets than persons who commenced at older ages. Amongst those who were aged less than 65 years at commencement, 32.3 per cent increased their assets by an amount of $10,000 or more. This proportion ranged between 27.5 and 29.3 per cent for those who commenced in older age groups (see Table 4 and Chart 2).

One-fifth of persons aged under 65 years at commencement had a large decrease in assets of $10,000 or more in the five years after commencement. This proportion was 24.0 per cent for those aged 65 and less than 70 years at commencement and 32.1 per cent of those aged 70 and less than 75 years at commencement (see Table 4).

The overall average change in assets ranged between an average net increase of $9,368 for persons aged under 65 years at commencement of Age Pension down to an average net decrease in assets of $5,069 for persons aged 85 years or more at commencement (see Table 4).

Table 4. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by age commenced Age Pension, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Under 65	9,569	4,660	5,268	4,219	5,918	29,634
65 & <70	14,047	8,572	7,543	8,667	12,278	51,107
70 & <75	1,635	812	595	750	1,795	5,587
75 & <80	624	299	354	278	686	2,241
80 & <85	222	122	135	85	206	770
85+	101	67	58	42	93	361
Persons	26,198	14,532	13,953	14,041	20,976	89,700
	Average change in assets (ea)					
Under 65	$52,485	$3,870	$0	-$3,928	-$38,204	$9,368
65 & <70	$46,613	$3,781	$0	-$3,943	-$38,119	$3,620
70 & <75	$52,099	$3,892	$0	-$3,923	-$48,470	-$287
75 & <80	$52,877	$3,738	$0	-$3,880	-$52,767	-$1,412
80 & <85	$52,570	$3,226	$0	-$3,422	-$64,981	-$2,095
85+	$56,941	$3,408	$0	-$4,400	-$81,984	-$5,069
Persons	$49,339	$3,809	$0	-$3,934	-$39,966	$5,066



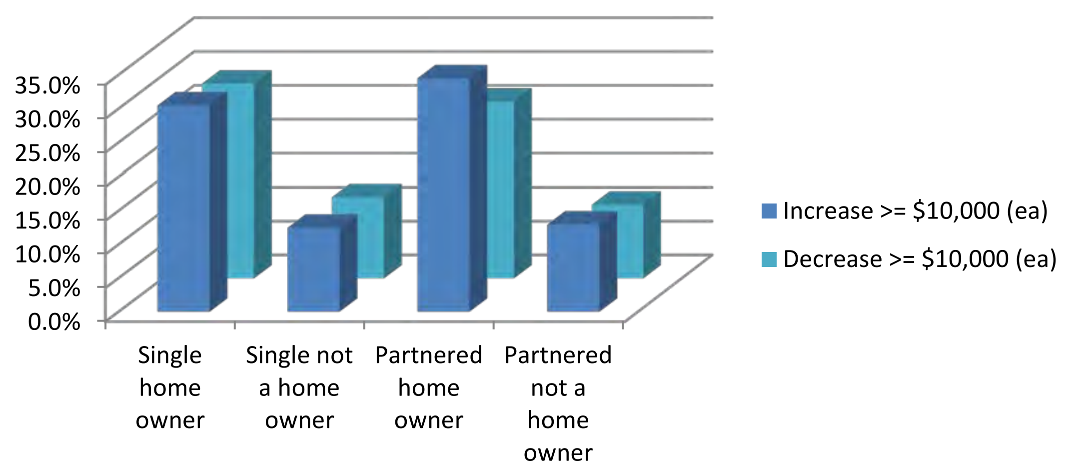
Home owners were more likely to have a large increase in their assets than persons who were not home owners. Some 30.5 per cent of single home owners and 34.5 per cent of partnered home owners had an increase in their assets of $10,000 or more. In comparison, only 12.5 per cent of singles who were not a home owner and 13.0 per cent of partnered persons who were not a home owner had an increase in their assets by an amount of $10,000 or more (see Table 5 and Chart 3).

Home owners were also more likely to have a large decrease in their assets than persons who were not home owners. Some 28.7 per cent of single home owners and 26.1 per cent of partnered home owners had a decrease in their assets of $10,000 or more. In comparison, only 12.0 per cent of singles who were not a home owner and 10.9 per cent of partnered persons who were not a home owner had a decrease in their assets by an amount of $10,000 or more (see Table 5 and Chart 3).

In overall terms, in the five years after commencement of Age Pension, single home owners had a net overall increase in assets of an average $3,222. For partnered persons who were home owners the net overall change was an average increase of $6,780. For single persons who were not a home owner the net overall change was an average increase of $1,078, while for partnered persons who were not a home owner, the net overall change was an average increase of $1,606 (see Table 5).

Table 5. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by partner status by home ownership status, recipients and average change in assets						
	Increase >= $10,000 (ea)	**Increase < $10,000 (ea)**	**Exactly the same amount**	**Decrease < $10,000 (ea)**	**Decrease >= $10,000 (ea)**	**Total**
	Recipients					
Single home owner	4,190	1,672	2,281	1,666	3,950	13,759
Single not a home owner	1,407	1,789	5,343	1,398	1,357	11,294
Partnered home owner	19,589	8,910	4,182	9,335	14,817	56,833
Partnered not a home owner	1,012	2,161	2,147	1,642	852	7,814
Persons	26,198	14,532	13,953	14,041	20,976	89,700
	Average change in assets (ea)					
Single home owner	$57,481	$4,089	$0	-$4,050	-$49,771	$3,222
Single not a home owner	$56,325	$2,784	$0	-$3,049	-$49,956	$1,078
Partnered home owner	$47,623	$4,242	$0	-$4,205	-$36,857	$6,780
Partnered not a home owner	$39,143	$2,652	$0	-$3,031	-$32,651	$1,606
Persons	$49,339	$3,809	$0	-$3,934	-$39,966	$5,066

Chart 3. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by home ownership status



Persons with larger amounts of assets at commencement were more likely to have changes of $10,000 or more in the value of their assets (both increases and decreases) than persons with smaller amounts of assets (see Table 6).

Just over one-quarter of persons with under $50,000 in assets at commencement had an increase of $10,000 or more in their level of assets. This proportion increased to 36.0 per cent in the group who had assets between $50,000 and under $100,000, 34.9 per cent in the group who had assets between $100,000 and under $150,000, 28.1 per cent in the group who had between $150,000 and under $200,000 and 21.6 per cent in the group who had $200,000 or more (see Table 6 and Chart 4).

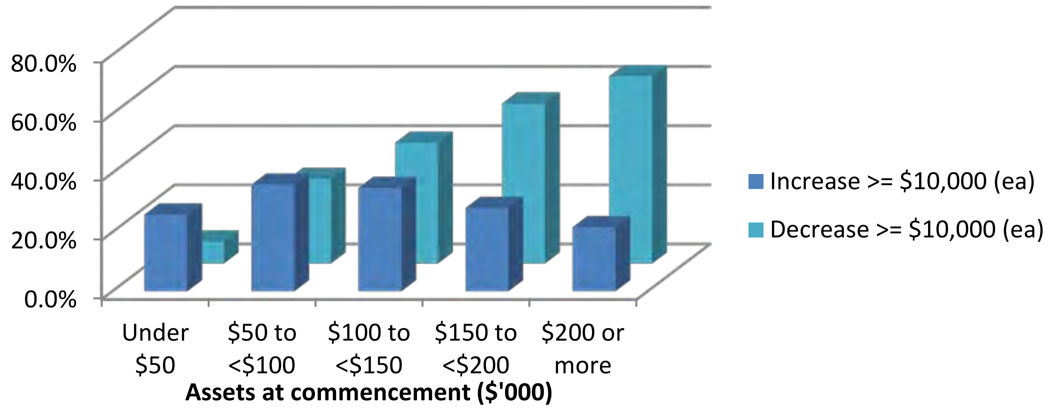
Similarly, persons with more assets at commencement were more likely to have had a reduction in their assets holdings than persons with lower initial levels of assets. Only 7.4 per cent of persons with under $50,000 in assets at commencement had a decrease in their assets by $10,000 or more. This proportion jumped to 28.5 per cent in the group with assets between $50,000 and under $100,000, 40.8 per cent in the group with $100,000 and under $150,000, 54.1 per cent in the group with initial assets of between $150,000 and under $200,000 and 63.3 per cent of persons with $200,000 or more.

In the group with under $50,000 in assets at commencement, the overall net change in the five years was an average increase of $12,163. In the group with assets between $50,000 and under $100,000 the overall net change was an average increase of $9,287, an overall net increase of $733 in the group with assets between $100,000 and $150,000. In the group with assets between $150,000 and $200,000 the net overall change was an average decrease in assets of $16,136 and for those with $200,000 or more it was an average decrease of $34,054 (see Table 6).

Table 6. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by partner status by assets at commencement, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Under $50,000	11,823	9,475	12,928	8,096	3,379	45,701
$50,000 to <$100,000	7,467	2,997	890	3,462	5,914	20,730
$100,000 to <$150,000	3,637	1,113	84	1,337	4,251	10,422
$150,000 to <$200,000	2,134	594	24	731	4,100	7,583
$200,000 or more	1,137	353	27	415	3,332	5,264
Persons	26,198	14,532	13,953	14,041	20,976	89,700
	Average change in assets (ea)					
Under $50,000	$51,920	$3,380	$0	-$3,312	-$18,707	$12,163
$50,000 to <$100,000	$49,648	$4,520	$0	-$4,628	-$29,716	$9,287
$100,000 to <$150,000	$48,502	$4,762	$0	-$5,060	-$39,355	$733
$150,000 to <$200,000	$41,410	$4,640	$0	-$4,876	-$51,200	-$16,136
$200,000 or more	$38,036	$4,875	$0	-$5,002	-$66,673	-$34,054
Persons	$49,339	$3,809	$0	-$3,934	-$39,966	$5,066

Chart 4. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by assets at commencement



In the total group of recipients, at commencement 45,941 (51.2%) recipients were receiving the maximum rate 28,633 (31.9%) recipients were receiving a part-rate income reduced payment and 15,126 (16.9%) recipients were receiving a part-rate assets reduced payment.

Of the 45,941 persons who were receiving the maximum rate at commencement, 81.8 per cent were also receiving maximum rate five years after commencement, 14.0 per cent switched to receiving a part-rate income reduced rate and 4.2 per cent switched to receiving a part-rate assets reduced rate. Nearly one-quarter of recipients who were receiving maximum rate at commencement had an increase in the value of their assets by $10,000 or more, while 12.7 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were maximum rate recipients at commencement, the net overall change in the value of assets was an average increase of $9,174. Those who remained at the maximum rate of payment over the five years had a net overall change in assets of an average increase of $1,893, those who moved to a part-rate income reduced rate had an average increase of $22,758, while those who moved to a part-rate assets reduced rate had an average increase of $105,327 (see Table 7).

In comparison, of the 28,633 persons who were receiving a part-rate income reduced rate at commencement, 63.3 per cent were also receiving a part-rate income reduced rate five years after commencement, 26.1 per cent switched to receiving maximum rate and 10.5 per cent switched to receiving a part-rate assets reduced rate. Some 38.6 per cent of recipients who were receiving a part-rate income reduced rate at commencement had an increase in the value of their assets by $10,000 or more, while 23.2 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate income reduced rate recipients at commencement, the net overall change in the value of assets was an average increase of $11,667. Those who remained on a part-rate income reduced rate of payment over the five years had a net overall change in assets of an average increase of $7,841, those who moved to a maximum rate had an average decrease of $3,962, while those who moved to a part-rate assets reduced rate had an average increase of $73,466 (see Table 7).

Finally, of the 15,126 persons who were receiving a part-rate assets reduced rate at commencement, 60.1 per cent were also receiving a part-rate assets reduced rate five years after commencement, 13.1 per cent switched to receiving maximum rate and 26.8 per cent switched to receiving a part-rate income reduced rate. Just over one-quarter of recipients who were receiving a part-rate assets reduced rate at commencement had an increase in the value of their assets by $10,000 or more, while 56.2 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate assets reduced rate recipients at commencement, the net overall change in the value of assets was an average decrease of $19,911. Those who remained on a part-rate assets reduced rate of payment over the five years had a net overall change in assets of an average increase of $1,990, those who moved to a maximum rate had an average decrease of $65,459, while those who moved to a part-rate income reduced rate had an average decrease of $46,683 (see Table 7).

Table 7. Persons who commenced Age Pension during 2001-02 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by means test at commencement by means test five years after commencement, recipients and average change in assets

		Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
Means test applied at commence-ment	**Means test applied five years after commencement**			Recipients			
Maximum rate	**Maximum rate**	6,305	7,578	12,031	6,668	4,980	37,562
	Part rate income test	3,109	1,093	468	924	851	6,445
	Part rate assets test	1,934	0	0	0	0	1,934
	Total	11,348	8,671	12,499	7,592	5,831	45,941
Part rate income test	**Maximum rate**	1,970	1,288	355	1,408	2,461	7,482
	Part rate income test	6,337	3,274	1,072	3,387	4,066	18,136
	Part rate assets test	2,736	84	0	82	113	3,015
	Total	11,043	4,646	1,427	4,877	6,640	28,633
Part rate assets test	**Maximum rate**	9	53	0	151	1,770	1,983
	Part rate income test	251	216	9	391	3,191	4,058
	Part rate assets test	3,547	946	18	1,030	3,544	9,085
	Total	3,807	1,215	27	1,572	8,505	15,126
Total	**Maximum rate**	8,284	8,919	12,386	8,227	9,211	47,027
	Part rate income test	9,697	4,583	1,549	4,702	8,108	28,639
	Part rate assets test	8,217	1,030	18	1,112	3,657	14,034
	Total	26,198	14,532	13,953	14,041	20,976	89,700
				Average change in assets (ea)			
Maximum rate	**Maximum rate**	$31,818	$3,284	$0	-$3,565	-$26,229	$1,893
	Part rate income test	$53,792	$4,211	$0	-$4,086	-$25,139	$22,758
	Part rate assets test	$105,327	-	-	-	-	$105,327
	Total	$50,366	$3,401	$0	-$3,628	-$26,070	$9,174
Part rate income test	**Maximum rate**	$34,564	$4,211	$0	-$4,148	-$39,546	-$3,962
	Part rate income test	$43,698	$4,358	$0	-$4,007	-$33,301	$7,841
	Part rate assets test	$82,053	$5,143	-	-$4,141	-$27,345	$73,466
	Total	$51,572	$4,331	$0	-$4,050	-$35,514	$11,667
Part rate assets test	**Maximum rate**	$12,289	$4,237	-	-$5,535	-$73,053	-$65,459
	Part rate income test	$26,470	$4,624	$0	-$5,443	-$61,095	-$46,683
	Part rate assets test	$40,818	$4,769	$0	-$4,836	-$35,620	$1,990
	Total	$39,805	$4,720	$0	-$5,054	-$52,968	-$19,911
Total	**Maximum rate**	$32,450	$3,424	$0	-$3,701	-$38,785	-$1,879
	Part rate income test	$46,488	$4,336	$0	-$4,142	-$43,383	$3,472
	Part rate assets test	$69,731	$4,799	$0	-$4,784	-$35,364	$31,586
	Total	$49,339	$3,809	$0	-$3,934	-$39,966	$5,066

Analysis 2: Change in assessed assets (nominal dollars) in the first five years of receiving Age Pension (lower assets taper period, post-20 September 2007)

Between 1 July 2008 and 30 June 2009, 183,563 persons started to receive Age Pension. Of this group, 162,538 individuals were also receiving Age Pension five years after their date of commencement. This section of the paper will investigate the changes that took place in the assets holdings within this group in the first five years after the person started to receive Age Pension. In order to control for changes in circumstances that are likely to have had substantial effects on the holdings of assets, the above group is further limited to those who had neither a change in whether they were partnered nor a change in their home ownership status in that same five year period since they started to receive Age Pension. This limits the final group that we will study to 147,265 persons.

Table 8 shows some basic demographics of the group under study. Males made up 47.6 per cent of the group and commenced Age Pension at an average age of 67.3 years. Females commenced Age Pension at an average age of 65.8 years reflecting the younger pension age for women, for those women born on or before 31 December 1948. Women reached pension age during 2008-09 at age 63 years and six months.

Table 8. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: sex by month of commencement, recipients and average age commenced

	Male		Female		Total	
	Recipients	Average age commenced	Recipients	Average age commenced	Recipients	Average age commenced
Jul-08	5,450	67.0	6,381	65.3	11,831	66.1
Aug-08	5,033	66.8	5,489	65.3	10,522	66.1
Sep-08	5,245	67.0	5,869	65.5	11,114	66.2
Oct-08	7,200	68.0	7,895	66.2	15,095	67.0
Nov-08	6,566	67.9	7,351	66.2	13,917	67.0
Dec-08	6,235	67.6	6,747	66.0	12,982	66.8
Jan-09	6,152	67.4	6,450	66.0	12,602	66.7
Feb-09	5,808	67.5	6,237	66.0	12,045	66.8
Mar-09	6,305	67.3	6,961	65.9	13,266	66.6
Apr-09	5,460	67.2	6,113	65.8	11,573	66.5
May-09	5,509	66.9	5,906	65.5	11,415	66.2
Jun-09	5,159	66.8	5,744	65.8	10,903	66.3
Total	70,122	67.3	77,143	65.8	147,265	66.5

Some 72,312 or just under half of the group were receiving some type of pension on or before reaching pension age. For most of this group (91.4%), Age Pension was the pension received at pension age, however, a further 6,219 persons who commenced Age Pension in 2008-09 were receiving a pension other than Age Pension on the day that they reached pension age (see Table 9).

There were a further 74,953 persons who commenced Age Pension during 2008-09 who were not receiving any pension on the day that they had reached pension age. Of these persons, 12,093 (16.1%) had commenced within three months of reaching pension age.

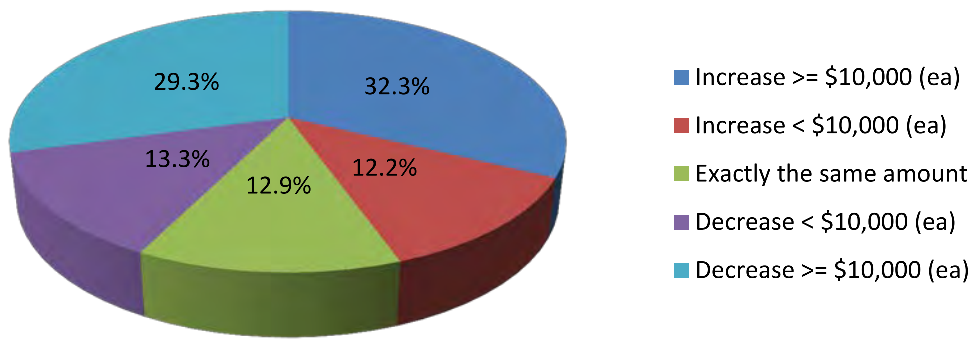
Within a year of reaching pension age this proportion had accumulated to 28.0 per cent, within two years 38.4 per cent and within three years 48.8 per cent.

Table 9. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: whether original date of grant (start date of the current period of continuous pensions entitlement) was on before pension age by period after pension age commenced Age Pension, recipients and average age commenced

	Original date of grant on or before pension age		Original date of grant after pension age		Total	
	Recipients	Average age commenced	Recipients	Average age commenced	Recipients	Average age commenced
Commenced on pension day	66,093	64.2	-	-	66,093	64.2
Commenced within 3 months	4,201	64.3	12,093	64.4	16,294	64.4
Commenced within 6 months	653	64.5	3,924	64.6	4,577	64.6
Commenced within 9 months	151	64.7	2,872	64.9	3,023	64.9
Commenced within 1 year	99	65.2	2,130	65.3	2,229	65.3
Commenced within 2 years	291	65.5	7,782	65.7	8,073	65.7
Commenced within 3 years	246	66.1	7,801	66.3	8,047	66.3
Commenced within 4 years	135	67.1	4,926	67.5	5,061	67.5
Commenced within 5 years	126	67.8	5,181	68.2	5,307	68.2
Commenced within 10 years	218	69.9	15,024	70.6	15,242	70.6
Commenced later	99	76.2	13,220	77.2	13,319	77.2
Total	72,312	64.3	74,953	68.7	147,265	66.5

In the group as a whole, 32.3 per cent increased their assessed assets by an amount greater or equal to $10,000 in the five years after commencing Age Pension (see Chart 5 and Table 10). Some 38.4 per cent of the group had either a modest change in assets or no change in assets at all (their assets neither increased nor decreased by an amount that exceeded $10,000). Finally, 29.3 per cent of the group had a decrease in assets over the five years that exceeded $10,000. While there were both increases and decreases in the group, in overall net terms, the average assessed assets of the group increased by $6,633 in the five years after commencing Age Pension.

Chart 5. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary



Differences between males and females in the group were minor. Some 32.4 per cent of males had an increase of $10,000 or more, while 30.0 per cent had a decrease of $10,000 or more. In comparison, 32.2 per cent of females had an increase of $10,000 or more, while 28.6 per cent of females had a decrease of $10,000 or more. Overall, males had a net change of an average increase of $5,932 and similarly females had a net overall average increase of $7,271.

Table 10. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by sex, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Males	22,713	8,554	8,270	9,546	21,039	70,122
Females	24,809	9,476	10,760	10,006	22,092	77,143
Persons	47,522	18,030	19,030	19,552	43,131	147,265
	Average change in assets (ea)					
Males	$73,148	$3,786	$0	($3,910)	($58,963)	$5,932
Females	$74,747	$3,678	$0	($3,929)	($58,347)	$7,271
Persons	$73,982	$3,729	$0	($3,920)	($58,647)	$6,633

Persons who commenced receiving Age Pension at a later age were more likely to have a large increase in assets than persons who commenced at a younger age. Amongst those who were aged less than 65 years at commencement, 29.8 per cent increased their assets by an amount of $10,000 or more. This proportion was 32.1 per cent for those who commenced aged 65 but less than 70 years, 36.6 per cent for those who commenced aged 70 but less than 75 years, 40.0 per cent for those aged 75 but less than 80 years and 45.3 per cent for those aged 80 but less than 85 years (see Table 11 and Chart 6).

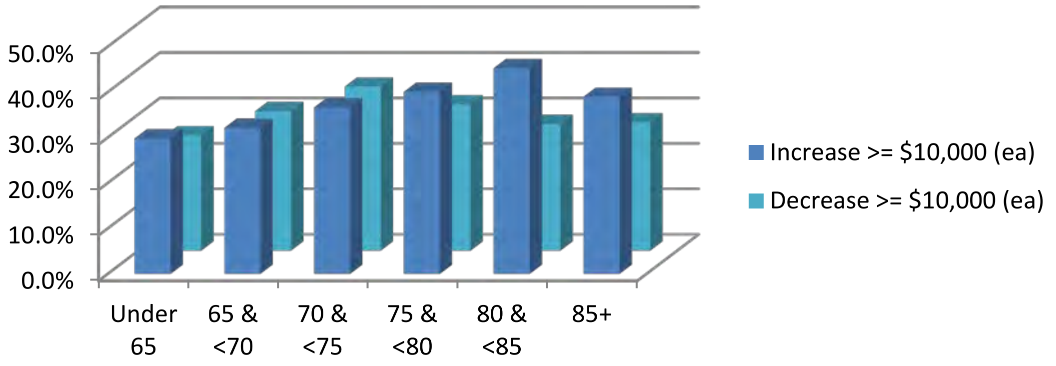
Around one-quarter of persons aged under 65 years at commencement had a large decrease in assets of $10,000 or more in the five years after commencement. This proportion was 30.6 per cent for those aged 65 and less than 70 years at commencement and 36.1 per cent of those aged 70 and less than 75 years at commencement (see Table 11).

The overall average change in assets ranged between an average net increase of $3,731 for persons aged 70 and less than 75 years at commencement of Age Pension up to an average net increase of $18,375 for persons aged 80 and less than 85 years at commencement (see Table 11).

Table 11. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by age commenced Age Pension, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Under 65	15,538	6,907	9,331	7,168	13,224	52,168
65 & <70	23,158	8,855	8,365	9,656	22,106	72,140
70 & <75	5,095	1,358	697	1,746	5,020	13,916
75 & <80	2,429	597	404	687	1,951	6,068
80 & <85	1,034	214	172	229	636	2,285
85+	268	99	61	66	194	688
Persons	47,522	18,030	19,030	19,552	43,131	147,265
	Average change in assets (ea)					
Under 65	$72,632	$3,636	$0	($3,955)	($50,354)	$8,807
65 & <70	$72,176	$3,766	$0	($3,938)	($59,120)	$4,988
70 & <75	$76,773	$4,035	$0	($3,881)	($67,319)	$3,731
75 & <80	$84,319	$3,791	$0	($3,690)	($75,826)	$9,328
80 & <85	$90,123	$3,145	$0	($3,330)	($80,364)	$18,375
85+	$99,392	$3,664	$0	($2,932)	($101,715)	$10,281
Persons	$73,982	$3,729	$0	($3,920)	($58,647)	$6,633

Chart 6. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by age



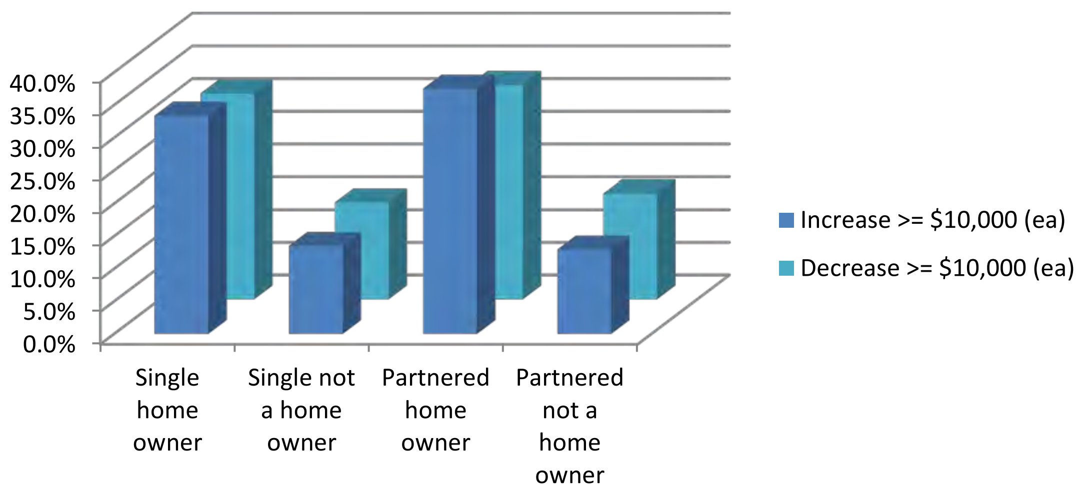
Home owners were more likely to have a large increase in their assets than persons who were not home owners. Some 33.4 per cent of single home owners and 37.5 per cent of partnered home owners had an increase in their assets of $10,000 or more. In comparison, only 13.5 per cent of singles who were not a home owner and 13.0 per cent of partnered persons who were not a home owner had an increase in their assets by an amount of $10,000 or more (see Table 12 and Chart 7).

Home owners were also more likely to have a large decrease in their assets than persons who were not home owners. Some 31.4 per cent of single home owners and 32.8 per cent of partnered home owners had a decrease in their assets of $10,000 or more. In comparison, only 14.9 per cent of singles who were not a home owner and 16.2 per cent of partnered persons who were not a home owner had a decrease in their assets by an amount of $10,000 or more (see Table 12 and Chart 7).

In overall terms, in the five years after commencement of Age Pension, single home owners had a net overall increase in assets of an average $5,862. For partnered persons who were home owners the net overall change was an average increase of $9,000. For single persons who were not a home owner the net overall change was an average decrease of $389, while for partnered persons who were not a home owner, the net overall change was an average decrease of $1,259 (see Table 12).

Table 12. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by partner status by home ownership status, recipients and average change in assets						
	Increase >= $10,000 (ea)	**Increase < $10,000 (ea)**	**Exactly the same amount**	**Decrease < $10,000 (ea)**	**Decrease >= $10,000 (ea)**	**Total**
	Recipients					
Single home owner	8,961	2,771	3,739	2,948	8,446	26,865
Single not a home owner	2,420	2,646	7,779	2,416	2,662	17,923
Partnered home owner	34,929	10,704	4,742	12,239	30,507	93,121
Partnered not a home owner	1,212	1,909	2,770	1,949	1,516	9,356
Persons	47,522	18,030	19,030	19,552	43,131	147,265
	Average change in assets (ea)					
Single home owner	$84,554	$3,828	$0	($4,014)	($70,918)	$5,862
Single not a home owner	$65,301	$2,754	$0	($3,160)	($61,853)	($389)
Partnered home owner	$72,740	$4,130	$0	($4,187)	($55,580)	$9,000
Partnered not a home owner	$48,949	$2,693	$0	($3,043)	($46,383)	($1,259)
Persons	$73,982	$3,729	$0	($3,920)	($58,647)	$6,633

Chart 7. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by home ownership status



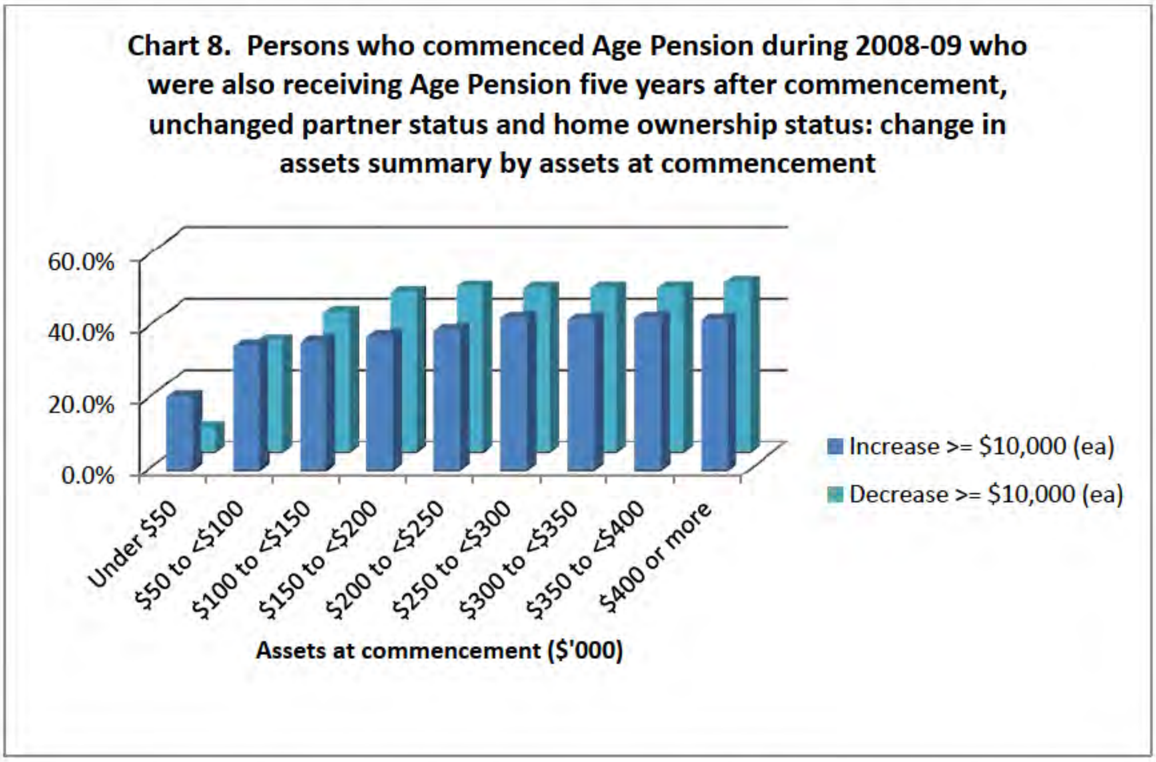
Persons with larger amounts of assets at commencement were more likely to have changes of $10,000 or more in the value of their assets (both increases and decreases) than persons with smaller amounts of assets (see Table 13).

Some 20.6 per cent of persons with under $50,000 in assets at commencement had an increase of $10,000 or more in their level of assets. This proportion increased to 35.0 per cent in the group who had assets between $50,000 and under $100,000, 36.0 per cent in the group who had between $100,000 and under $150,000, 37.5 per cent in the group who had between $150,000 and under $200,000, 39.2 per cent in the group who had between $200,000 and under $250,000 and over 42 per cent in each of the higher assets ranges (see Table 13 and Chart 8).

Similarly, persons with more assets at commencement were more likely to have a reduction in their assets holdings than persons with lower initial levels of assets. Only 6.9 per cent of persons with under $50,000 in assets at commencement had a decrease in their assets by $10,000 or more. This proportion jumped to 31.5 per cent in the group with assets between $50,000 and under $100,000, 39.5 per cent in the group with $100,000 and under $150,000, 44.8 per cent in the group with initial assets of between $150,000 and under $200,000 and more than 46 per cent of persons in the higher assets ranges.

In the group with under $50,000 in assets at commencement, the overall net change in the five years was an average increase of $12,325. In the group with assets between $50,000 and under $100,000 the overall net change was an average increase of $15,963, decreasing as we move up the asset ranges, but still an overall net increase of $969 in the group with assets between $250,000 and $300,000. In the group with assets between $300,000 and $350,000 the net overall change was an average decrease in assets of $4,534, between $350,000 and $400,000 it was an average decrease in assets of $9,118 and for those with $400,000 or more it was an average decrease of $17,203 (see Table 13).

Table 13. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by partner status by assets at commencement, recipients and average change in assets						
	Increase >= $10,000 (ea)	**Increase < $10,000 (ea)**	**Exactly the same amount**	**Decrease < $10,000 (ea)**	**Decrease >= $10,000 (ea)**	**Total**
	Recipients					
Under $50,000	10,790	9,897	16,963	11,004	3,634	52,288
$50,000 to <$100,000	8,012	3,077	1,391	3,213	7,204	22,897
$100,000 to <$150,000	5,809	1,719	370	1,865	6,379	16,142
$150,000 to <$200,000	4,030	857	125	918	4,812	10,742
$200,000 to <$250,000	3,407	579	54	605	4,053	8,698
$250,000 to <$300,000	3,267	389	37	425	3,523	7,641
$300,000 to <$350,000	3,375	464	33	439	3,689	8,000
$350,000 to <$400,000	4,103	516	20	526	4,442	9,607
$400,000 or more	4,729	532	37	557	5,395	11,250
Persons	47,522	18,030	19,030	19,552	43,131	147,265
	Average change in assets (ea)					
Under $50,000	$66,500	$3,044	$0	($3,295)	($18,422)	$12,325
$50,000 to <$100,000	$72,512	$4,266	$0	($4,634)	($29,664)	$15,963
$100,000 to <$150,000	$80,884	$4,506	$0	($4,661)	($41,166)	$12,781
$150,000 to <$200,000	$78,081	$4,666	$0	($5,134)	($52,733)	$5,604
$200,000 to <$250,000	$80,886	$4,633	$0	($4,678)	($65,391)	$1,196
$250,000 to <$300,000	$81,794	$4,865	$0	($4,820)	($73,706)	$969
$300,000 to <$350,000	$77,185	$5,114	$0	($4,601)	($80,542)	($4,534)
$350,000 to <$400,000	$69,160	$5,019	$0	($4,673)	($83,631)	($9,118)
$400,000 or more	$73,103	$5,081	$0	($4,902)	($99,946)	($17,203)
Persons	$73,982	$3,729	$0	($3,920)	($58,647)	$6,633



In the total group of recipients, at commencement 52,469 (35.6%) recipients were receiving the maximum rate 53,447 (36.3%) recipients were receiving a part-rate income reduced payment and 41,349 (28.1%) recipients were receiving a part-rate assets reduced payment.

Of the 52,469 persons who were receiving the maximum rate at commencement, 89.0 per cent were also receiving maximum rate five years after commencement, 6.6 per cent switched to receiving a part-rate income reduced rate and 4.4 per cent switched to receiving a part-rate assets reduced rate. Some 21.7 per cent of recipients who were receiving maximum rate at commencement had an increase in the value of their assets by $10,000 or more, while 13.6 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were maximum rate recipients at commencement, the net overall change in the value of assets was an average increase of $11,238. Those who remained at the maximum rate of payment over the five years had a net overall change in assets of an average increase of $1,802, those who moved to a part-rate income reduced rate had an average increase of $33,291, while those who moved to a part-rate assets reduced rate had an average increase of $170,509 (see Table 14).

In comparison, of the 53,447 persons who were receiving a part-rate income reduced rate at commencement, only 53.3 per cent were also receiving a part-rate income reduced rate five years after commencement, 30.7 per cent switched to receiving maximum rate and 15.9 per cent switched to receiving a part-rate assets reduced rate. Some 36.5 per cent of recipients who were receiving a part-rate income reduced rate at commencement had an increase in the value of their assets by $10,000 or more, while 30.9 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate income reduced rate recipients at commencement, the net overall change in the value of assets was an average increase of $12,445. Those who remained on a part-rate income reduced rate of payment over the five years had a net overall change in assets of an average increase of $5,156, those who moved to a maximum rate had an average decrease of $12,241, while those who moved to a part-rate assets reduced rate had an average increase of $84,435 (see Table 14).

Finally, of the 41,349 persons who were receiving a part-rate assets reduced rate at commencement, 81.8 per cent were also receiving a part-rate assets reduced rate five years after commencement, 7.0 per cent switched to receiving maximum rate and 11.1 per cent switched to receiving a part-rate income reduced rate. Some 40.2 per cent of recipients who were receiving a part-rate assets reduced rate at commencement had an increase in the value of their assets by $10,000 or more, while 47.2 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate assets reduced rate recipients at commencement, the net overall change in the value of assets was an average decrease of $6,721. Those who remained on a part-rate assets reduced rate of payment over the five years had a net overall change in assets of an average increase of $10,779, those who moved to a maximum rate had an average decrease of $109,403, while those who moved to a part-rate income reduced rate had an average decrease of $70,580 (see Table 14).

Table 14. Persons who commenced Age Pension during 2008-09 who were also receiving Age Pension five years after commencement, unchanged partner status and home ownership status: change in assets summary by means test at commencement by means test five years after commencement, recipients and average change in assets

		Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
Means test applied at commencement	**Means test applied five years after commencement**			Recipients			
Maximum rate	**Maximum rate**	7,503	8,227	16,282	8,177	6,515	46,704
	Part rate income test	1,588	511	292	494	595	3,480
	Part rate assets test	2,285	0	0	0	0	2,285
	Total	11,376	8,738	16,574	8,671	7,110	52,469
Part rate income test	**Maximum rate**	3,596	2,653	1,090	2,650	6,430	16,419
	Part rate income test	9,418	3,783	1,195	5,259	8,856	28,511
	Part rate assets test	6,498	404	10	374	1,231	8,517
	Total	19,512	6,840	2,295	8,283	16,517	53,447
Part rate assets test	**Maximum rate**	17	80	14	187	2,609	2,907
	Part rate income test	678	191	18	250	3,463	4,600
	Part rate assets test	15,939	2,181	129	2,161	13,432	33,842
	Total	16,634	2,452	161	2,598	19,504	41,349
Total	**Maximum rate**	11,116	10,960	17,386	11,014	15,554	66,030
	Part rate income test	11,684	4,485	1,505	6,003	12,914	36,591
	Part rate assets test	24,722	2,585	139	2,535	14,663	44,644
	Total	47,522	18,030	19,030	19,552	43,131	147,265
				Average change in assets (ea)			
Maximum rate	**Maximum rate**	$37,116	$3,082	$0	($3,477)	($29,355)	$1,802
	Part rate income test	$85,904	$3,785	$0	($3,886)	($34,583)	$33,291
	Part rate assets test	$170,509	-	-	-	-	$170,509
	Total	$70,720	$3,123	$0	($3,500)	($29,793)	$11,238
Part rate income test	**Maximum rate**	$36,452	$4,006	$0	($4,140)	($51,590)	($12,241)
	Part rate income test	$60,148	$4,060	$0	($4,023)	($46,711)	$5,156
	Part rate assets test	$119,685	$5,054	$0	($4,730)	($47,811)	$84,435
	Total	$75,608	$4,098	$0	($4,092)	($48,692)	$12,445
Part rate assets test	**Maximum rate**	$13,646	$3,817	$0	($4,743)	($121,765)	($109,403)
	Part rate income test	$50,252	$4,367	$0	($4,656)	($103,496)	($70,580)
	Part rate assets test	$75,395	$4,943	$0	($4,790)	($62,340)	$10,779
	Total	$74,307	$4,861	$0	($4,774)	($77,596)	($6,721)
Total	**Maximum rate**	$36,865	$3,311	$0	($3,658)	($54,048)	($6,586)
	Part rate income test	$63,074	$4,042	$0	($4,038)	($61,380)	($1,689)
	Part rate assets test	$95,827	$4,960	$0	($4,781)	($61,120)	$33,007
	Total	$73,982	$3,729	$0	($3,920)	($58,647)	$6,633

Analysis 3: Change in assessed assets (nominal dollars) in the last five years of receiving Age Pension (higher assets taper period, pre-20 September 2007)

Between 1 July 2006 and 30 June 2007, 67,239 persons died who were: i) receiving Age Pension on the day before they died; and ii) also receiving Age Pension five years prior to their death. This paper will investigate what changes took place in the assets holdings within this group in the five years before the person's death. In order to control for changes in circumstances that are likely to have had substantial effects on the holdings of assets, the above group is further limited to those who had neither a change in whether they were partnered nor a change in their home ownership status in that same five year period prior to their death. This limits the final group that we will study to 53,606 persons.

Table 15 shows some of the basic demographics of the group. Males made up 45.6 per cent of the group and they died at an average age of 80.9 years after receiving Age Pension for an average period of 15.5 years. Females died at an average age of 84.4 years after receiving Age Pension for an average period of 23.1 years.

Table 15. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: sex by month of death, recipients, average duration on Age Pension and average age at death

	Males			Females			Persons		
	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)
Jul-06	2,220	15.8	81.0	2,720	23.4	84.6	4,940	20.0	83.0
Aug-06	2,269	15.6	80.8	2,788	23.0	84.6	5,057	19.7	82.9
Sep-06	2,080	15.6	81.1	2,542	23.2	84.7	4,622	19.8	83.0
Oct-06	2,027	15.3	80.7	2,466	23.1	84.4	4,493	19.6	82.7
Nov-06	1,934	15.6	80.9	2,302	23.0	84.6	4,236	19.6	82.9
Dec-06	1,912	15.2	80.7	2,237	23.0	84.1	4,149	19.4	82.5
Jan-07	1,942	15.5	80.9	2,281	22.6	84.1	4,223	19.4	82.6
Feb-07	1,728	15.6	80.9	2,016	23.2	84.4	3,744	19.7	82.8
Mar-07	1,999	15.6	81.0	2,319	22.8	84.1	4,318	19.5	82.7
Apr-07	1,969	15.6	80.9	2,241	22.9	84.3	4,210	19.5	82.7
May-07	2,115	15.2	80.6	2,572	23.2	84.5	4,687	19.6	82.8
Jun-07	2,260	15.7	81.2	2,667	23.5	84.7	4,927	19.9	83.1
Total	24,455	15.5	80.9	29,151	23.1	84.4	53,606	19.6	82.8

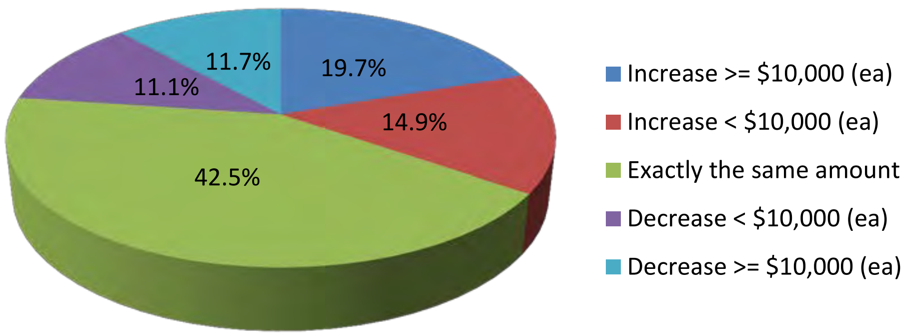
In the group as a whole, just under one-fifth increased their assessed assets by an amount greater or equal to $10,000 in the five years leading up to their death (see Chart 9 and Table 16). Just over two-thirds of the group had either a modest change in assets or no change in assets at all (their assets neither increased nor decreased by an amount that exceeded $10,000). Only 11.7 per cent of the group had a decrease in assets over the five years that exceeded $10,000. While there were both increases and decreases in the group, in overall net terms, the average assessed assets of the group increased by $5,314 in the five years prior to the death of the recipient.

There weren't large differences between males and females in the group. Some 20.5 per cent of males had an increase of $10,000 or more, while 12.6 per cent had a decrease of $10,000 or more. In comparison, 19.0 per cent of females had an increase of $10,000 or more, while 11.0 per cent of females had a decrease of $10,000 or more. Overall, males had a net change of an average increase of $4,976 and similarly females had a net overall average increase of $5,599 (see Table 16).

Table 16. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by sex, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Males	5,017	3,960	9,131	3,267	3,080	24,455
Females	5,543	4,041	13,670	2,694	3,203	29,151
Persons	10,560	8,001	22,801	5,961	6,283	53,606
	Average change in assets (ea)					
Males	$44,298	$3,672	$0	-$3,653	-$33,495	$4,976
Females	$52,979	$3,817	$0	-$3,630	-$42,494	$5,599
Persons	$48,855	$3,745	$0	-$3,643	-$38,082	$5,314

Chart 9. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary



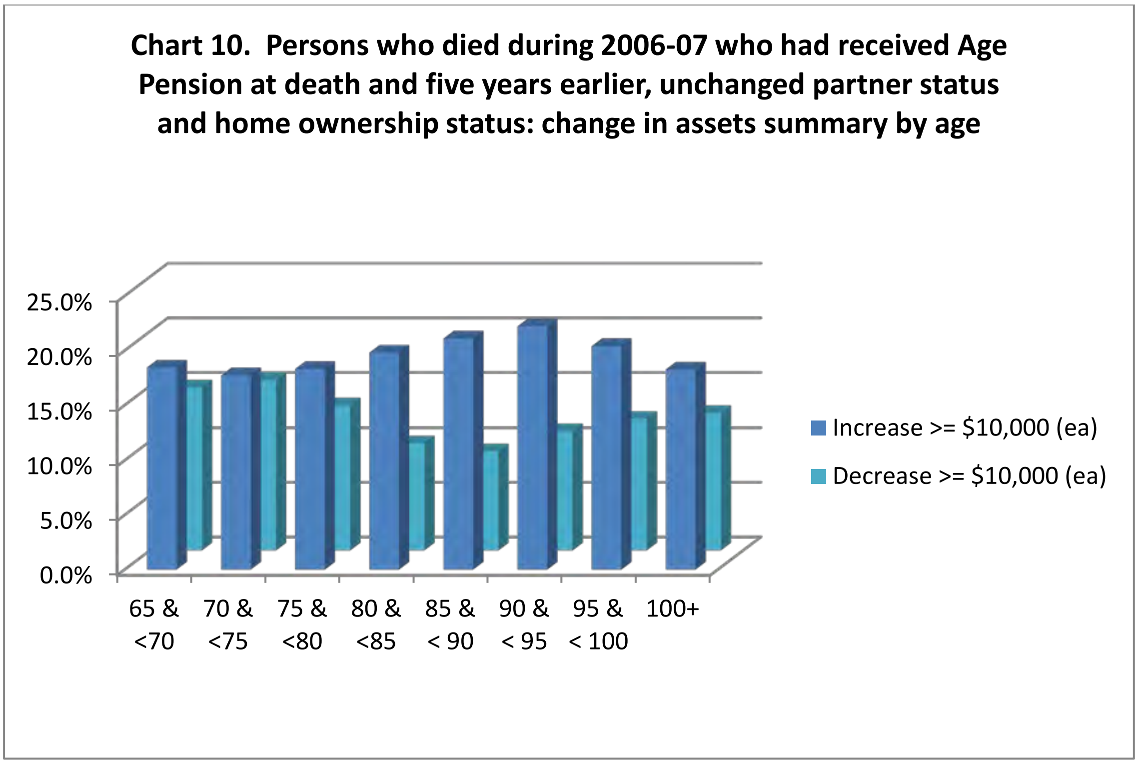
Persons who died at a later age were more likely to have a large increase in assets than persons who died at a younger age. Amongst those who were aged 70 and less than 75 years at death, 17.7 per cent increased their assets by an amount of $10,000 or more. In the group of persons aged 90 and less than 95 years of age, 22.2 per cent had an increase in assets of $10,000 or more (see Table 17 and Chart 10).

Conversely, persons who died at a younger age were more likely to have a large decrease in assets than persons who died at an older age (Table 17 and Chart 10). For example, 15.5 per cent of persons who died aged between 70 and less than 75 years had a decrease in their assets of $10,000 or more. Only 9.0 per cent of those aged 85 and less than 90 years at death had a decrease in assets of $10,000 or more.

The overall average change in assets ranged between an average net increase of $2,659 for persons aged 100 years or more at death up to an average net increase of $7,288 for persons aged 85 and less than 90 years at death (see Table 17).

Table 17. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partnered status and home ownership status: change in assets summary by age at death, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
65 & <70	252	242	491	179	203	1,367
70 & <75	1,434	1,271	2,891	1,247	1,255	8,098
75 & <80	2,204	1,924	4,739	1,583	1,590	12,040
80 & <85	2,230	1,739	4,910	1,286	1,103	11,268
85 & < 90	2,041	1,454	4,419	891	875	9,680
90 & < 95	1,681	983	3,532	547	825	7,568
95 & < 100	607	337	1,487	190	356	2,977
100+	111	51	332	38	76	608
Persons	10,560	8,001	22,801	5,961	6,283	53,606
	Average change in assets (ea)					
65 & <70	$48,059	$3,711	$0	-$3,297	-$32,478	$4,262
70 & <75	$43,485	$3,560	$0	-$3,743	-$32,411	$2,660
75 & <80	$43,914	$3,594	$0	-$3,751	-$32,118	$3,878
80 & <85	$47,539	$3,752	$0	-$3,569	-$35,686	$6,087
85 & < 90	$52,230	$3,794	$0	-$3,520	-$43,922	$7,288
90 & < 95	$54,490	$4,146	$0	-$3,579	-$48,562	$7,089
95 & < 100	$57,759	$3,751	$0	-$3,697	-$53,924	$5,517
100+	$48,476	$4,884	$0	-$3,475	-$51,067	$2,659
Persons	$48,855	$3,745	$0	-$3,643	-$38,082	$5,314



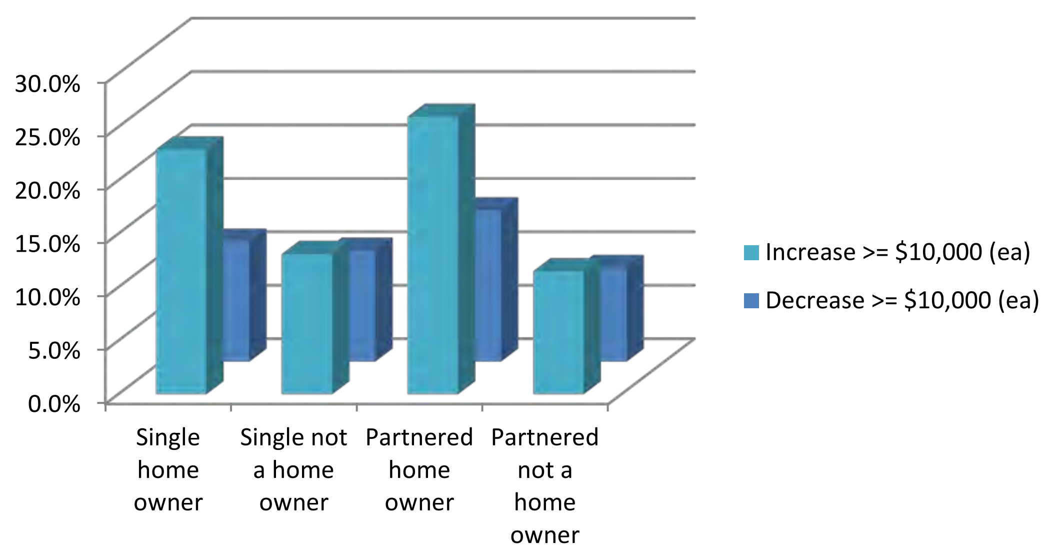
Home owners were more likely to have a large increase in their assets than persons who were not home owners. Some 22.9 per cent of single home owners and 26.0 per cent of partnered home owners had an increase in their assets by $10,000 or more. In comparison, only 13.1 per cent of singles who were not a home owner and 11.5 per cent of partnered persons who were not a home owner had an increase in their assets by an amount of $10,000 or more (see Table 18 and Chart 11).

In relation to decreasing assets, some 11.2 per cent of single home owners and 14.2 per cent of partnered home owners had a decrease in their assets by $10,000 or more. In comparison, only 10.4 per cent of singles who were not a home owner and 8.8 per cent of partnered persons who were not a home owner had a decrease in their assets by an amount of $10,000 or more (see Table 18 and Chart 11).

In overall terms, in the five years before death, single home owners had a net overall increase in assets of an average $8,213. For partnered persons who were home owners the net overall change was an average increase of $6,795. For single persons who were not a home owner the net overall change was an average increase of $2,531, while for partnered persons who were not a home owner, the net overall change was an average increase of just $1,794 (see Table 18).

Table 18. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by partner status by home ownership status, recipients and average change in assets						
	Increase >= $10,000 (ea)	**Increase < $10,000 (ea)**	**Exactly the same amount**	**Decrease < $10,000 (ea)**	**Decrease >= $10,000 (ea)**	**Total**
	Recipients					
Single home owner	3,067	1,582	6,071	1,179	1,502	13,401
Single not a home owner	2,397	2,397	10,216	1,394	1,900	18,304
Partnered home owner	4,629	3,141	4,826	2,717	2,525	17,838
Partnered not a home owner	467	881	1,688	671	356	4,063
Persons	10,560	8,001	22,801	5,961	6,283	53,606
	Average change in assets (ea)					
Single home owner	$54,837	$4,137	$0	-$3,879	-$40,005	$8,213
Single not a home owner	$58,319	$3,517	$0	-$3,264	-$51,238	$2,531
Partnered home owner	$41,322	$3,937	$0	-$3,924	-$28,425	$6,795
Partnered not a home owner	$35,655	$2,980	$0	-$2,875	-$28,250	$1,794
Persons	$48,855	$3,745	$0	-$3,643	-$38,082	$5,314

Chart 11. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by home ownership



Persons with larger amounts of assets five years before their death were more likely to have changes of $10,000 or more in the value of their assets (both increases and decreases) than persons with smaller amounts of assets (see Table 19).

Some 16.0 per cent of persons with under $50,000 in assets five years before their death had an increase of $10,000 or more in their level of assets. This proportion increased to 27.0 per cent in the group who had assets between $50,000 and under $100,000, 33.2 per cent in the group who had assets between $100,000 and under $150,000, 34.3 per cent in the group who had between $150,000 and under $200,000 and 32.3 per cent in the group that had $200,000 or more (see Table 19 and Chart 12).

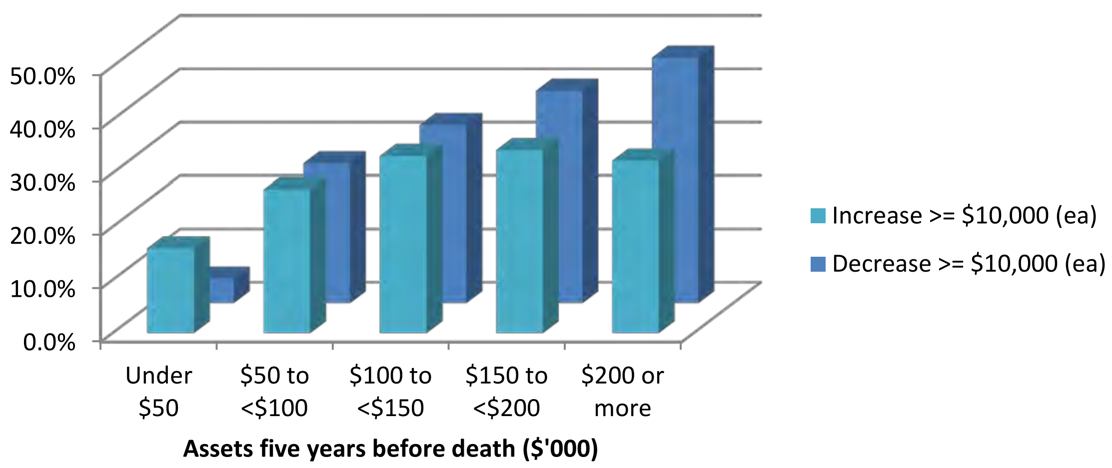
Similarly, persons with more assets five years before their death were more likely to have a reduction in their assets holdings than persons with lower initial levels of assets. Only 4.6 per cent of persons with under $50,000 in assets five years before their death had a decrease in their assets by $10,000 or more. This proportion jumped to 26.2 per cent in the group with assets between $50,000 and under $100,000, 33.4 per cent in the group with $100,000 and under $150,000, 39.8 per cent in the group with initial assets of between $150,000 and under $200,000 and 46.0 per cent in the group with $200,000 or more in assets (see Table 19 and Chart 12).

In the group with under $50,000 in assets five years before death, the overall net change in the five years was an average increase of $6,812. In the group with assets between $50,000 and under $100,000 the overall net change was an average increase of $4,630 and still an overall net increase of $1,629 in the group with assets between $100,000 and $150,000. In the group with assets between $150,000 and $200,000 the net overall change was an average decrease in assets of $6,954 and for those with $200,000 or more in assets it was an average decrease of $17,739 (see Table 19).

Table 19. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by ranged assets five years before death, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Under $50,000	6,204	6,167	20,612	4,116	1,784	38,883
$50,000 to <$100,000	2,354	1,181	1,755	1,149	2,287	8,726
$100,000 to <$150,000	1,185	430	329	432	1,191	3,567
$150,000 to <$200,000	538	146	74	185	624	1,567
$200,000 or more	279	77	31	79	397	863
Persons	10,560	8,001	22,801	5,961	6,283	53,606
	Average change in assets (ea)					
Under $50,000	$46,951	$3,583	$0	-$3,269	-$19,642	$6,812
$50,000 to <$100,000	$49,713	$4,134	$0	-$4,397	-$33,430	$4,630
$100,000 to <$150,000	$52,554	$4,569	$0	-$4,661	-$47,371	$1,629
$150,000 to <$200,000	$53,642	$4,505	$0	-$4,481	-$63,439	-$6,954
$200,000 or more	$58,999	$4,768	$0	-$4,633	-$80,027	-$17,739
Persons	$48,855	$3,745	$0	-$3,643	-$38,082	$5,314

Chart 12. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partnered status and home ownership status: change in assets summary by ranged assets five years before death



In the total group of recipients, five year before their death 38,487 (71.8%) were receiving the maximum rate 12,740 (23.8%) were receiving a part-rate income reduced payment and 2,379 (4.4%) were receiving a part-rate assets reduced payment.

Of the 38,487 persons who were receiving the maximum rate five years before their death, 92.3 per cent were also receiving maximum rate at the time of their death, 6.3 per cent switched to receiving a part-rate income reduced rate and 1.3 per cent switched to receiving a part-rate assets reduced rate. Some 15.8 per cent of recipients who were receiving maximum rate five years before their death had an increase in the value of their assets by $10,000 or more, while 8.3 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were maximum rate recipients five years before their death, the net overall change in the value of assets was an average increase of $5,554. Those who remained at the maximum rate of payment over the five years had a net overall change in assets of an average increase of $738, those who moved to a part-rate income reduced rate had an average increase of $48,606, while those who moved to a part-rate assets reduced rate had an average increase of $133,588 (see Table 20).

In comparison, of the 12,740 persons who were receiving a part-rate income reduced rate five years before their death, 78.7 per cent were also receiving a part-rate income reduced rate at the time of their death, 17.3 per cent switched to receiving maximum rate and 4.1 per cent switched to receiving a part-rate assets reduced rate. Some 28.4 per cent of recipients who were receiving a part-rate income reduced rate five years before their death had an increase in the value of their assets by $10,000 or more, while 17.3 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate income reduced rate recipients five years before their death, the net overall change in the value of assets was an average increase of $6,285. Those who remained on a part-rate income reduced rate of payment over the five years had a net overall change in assets of an average increase of $6,786, those who moved to a maximum rate had an average decrease of $17,207, while those who moved to a part-rate assets reduced rate had an average increase of $96,267 (see Table 20).

Finally, of the 2,379 persons who were receiving a part-rate assets reduced rate five years before their death, 54.4 per cent were also receiving a part-rate assets reduced rate at the time of their death, 10.4 per cent switched to receiving maximum rate and 35.3 per cent switched to receiving a part-rate income reduced rate. Some 35.1 per cent of recipients who were receiving a part-rate assets reduced rate five years before their death had an increase in the value of their assets by $10,000 or more, while a similar 37.1 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate assets reduced rate recipients five years before their death, the net overall change in the value of assets was an average decrease of $3,761. Those who remained on a part-rate assets reduced rate of payment over the five years had a net overall change in assets of an average increase of $23,718, those who moved to a maximum rate had an average decrease of $65,603, while those who moved to a part-rate income reduced rate had an average decrease of $27,903 (see Table 20).

Table 20. Persons who died during 2006-07 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by means test applied five years before death by means test applied at death, recipients and average change in assets							
		Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
Means test applied five years before death	**Means test applied at death**	Recipients					
	Maximum rate	3,925	5,356	19,574	3,660	3,021	35,536
	Part rate income test	1,656	245	212	147	172	2,432
	Part rate assets test	519	.	.	.	.	519
Maximum rate	**Total**	6,100	5,601	19,786	3,807	3,193	38,487
	Maximum rate	275	336	385	367	835	2,198
	Part rate income test	2,841	1,761	2,615	1,435	1,372	10,024
	Part rate assets test	508	4	.	5	1	518
Part rate income test	**Total**	3,624	2,101	3,000	1,807	2,208	12,740
	Maximum rate	1	9	.	26	211	247
	Part rate income test	65	116	8	171	479	839
	Part rate assets test	770	174	7	150	192	1,293
Part rate assets test	**Total**	836	299	15	347	882	2,379
	Maximum rate	4,201	5,701	19,959	4,053	4,067	37,981
	Part rate income test	4,562	2,122	2,835	1,753	2,023	13,295
	Part rate assets test	1,797	178	7	155	193	2,330
Total	**Total**	10,560	8,001	22,801	5,961	6,283	53,606
		Average change in assets (ea)					
	Maximum rate	$28,817	$3,551	$0	-$3,493	-$30,824	$738
	Part rate income test	$74,469	$4,361	$0	-$3,736	-$32,734	$48,606
	Part rate assets test	$133,588	.	.	.	.	$133,588
Maximum rate	**Total**	$50,124	$3,586	$0	-$3,503	-$30,927	$5,554
	Maximum rate	$30,477	$3,742	$0	-$4,086	-$55,042	-$17,207
	Part rate income test	$40,413	$4,132	$0	-$3,640	-$35,599	$6,786
	Part rate assets test	$98,214	$5,027	.	-$5,565	-$18,668	$96,267
Part rate income test	**Total**	$47,762	$4,072	$0	-$3,736	-$42,944	$6,285
	Maximum rate	$12,616	$2,874	.	-$5,046	-$76,357	-$65,603
	Part rate income test	$24,398	$4,504	$0	-$4,675	-$51,607	-$27,903
	Part rate assets test	$46,051	$4,472	$0	-$4,655	-$25,373	$23,718
Part rate assets test	**Total**	$44,328	$4,436	$0	-$4,694	-$51,817	-$3,761
	Maximum rate	$28,921	$3,561	$0	-$3,557	-$38,158	-$732
	Part rate income test	$52,547	$4,179	$0	-$3,749	-$39,146	$12,247
	Part rate assets test	$86,079	$4,485	$0	-$4,684	-$25,338	$64,320
Total	**Total**	$48,855	$3,745	$0	-$3,643	-$38,082	$5,314

Analysis 4: Change in assessed assets (nominal dollars) in the last five years of receiving Age Pension (lower assets taper period, post-20 September 2007)

Between 1 July 2013 and 30 June 2014, 77,311 persons died who were: i) receiving Age Pension on the day before they died; and ii) also receiving Age Pension five years prior to their death. Again, in order to control for changes in circumstances that are likely to have had substantial effects on the holdings of assets, the above group is further limited to those who had neither a change in whether they were partnered nor a change in their home ownership status in that same five year period prior to their death. This limits the final group that we will study to 63,065 persons.

Table 21 shows some of the basic demographics of the group. Males made up 48.8 per cent of the group and they died at an average age of 82.2 years after receiving Age Pension for an average period of 16.0 years. Females died at an average age of 85.2 years after receiving Age Pension for an average period of 23.3 years.

Table 21. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: sex by month of death, recipients, average duration on Age Pension and average age at death

	Males			Females			Persons		
	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)	Recip-ients	Average duration on Age Pension (years)	Average age at death (years)
Jul-13	2,872	16.1	82.3	3,103	23.6	85.2	5,975	20.0	83.8
Aug-13	2,854	16.2	82.2	3,018	23.7	85.4	5,872	20.1	83.9
Sep-13	2,665	16.0	82.0	2,741	23.6	85.3	5,406	19.9	83.7
Oct-13	2,659	15.7	82.1	2,714	23.8	85.5	5,373	19.8	83.8
Nov-13	2,523	16.1	82.2	2,565	22.9	84.9	5,088	19.5	83.6
Dec-13	2,530	16.1	82.1	2,658	23.3	85.3	5,188	19.8	83.8
Jan-14	2,563	15.9	82.0	2,752	23.4	85.4	5,315	19.8	83.8
Feb-14	2,238	15.9	82.0	2,328	23.3	85.0	4,566	19.7	83.5
Mar-14	2,493	16.3	82.3	2,652	22.8	85.1	5,145	19.7	83.8
Apr-14	2,496	15.9	82.1	2,617	22.9	84.9	5,113	19.5	83.6
May-14	2,820	16.1	82.4	2,934	23.6	85.4	5,754	19.9	83.9
Jun-14	2,055	16.3	82.5	2,215	23.0	85.3	4,270	19.8	83.9
Total	30,768	16.0	82.2	32,297	23.3	85.2	63,065	19.8	83.8

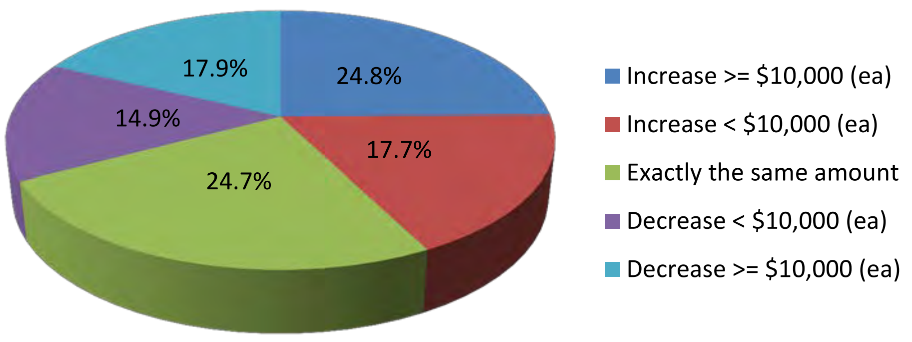
In the group as a whole, just under one-quarter increased their assessed assets by an amount greater or equal to $10,000 in the five years leading up to their death (see Chart 13 and Table 22). Some 57.3 per cent of the group either had a modest change in assets or no change in assets at all (their assets neither increased nor decreased by an amount that exceeded $10,000). Only 17.9 per cent of the group had a decrease in assets over the five years that exceeded $10,000. While there were both increases and decreases in the group, in overall net terms, the average assessed assets of the group increased by $6,761 in the five years prior to the death of the recipient.

There weren't large differences between males and females in the group. Some 24.4 per cent of males had an increase of $10,000 or more, while 19.2 per cent had a decrease of $10,000 or more. In comparison, 25.1 per cent of females had an increase of $10,000 or more, while 16.6 per cent of females had a decrease of $10,000 or more. Overall, males had a net change of an average increase of $5,952 and similarly females had a net overall average increase of $7,531 (see Table 22).

Table 22. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by sex, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Males	7,510	5,397	6,806	5,140	5,915	30,768
Females	8,100	5,772	8,763	4,286	5,376	32,297
Persons	15,610	11,169	15,569	9,426	11,291	63,065
	Average change in assets (ea)					
Males	$56,567	$3,736	$0	-$3,791	-$40,975	$5,952
Females	$62,507	$3,903	$0	-$3,948	-$49,979	$7,531
Persons	$59,649	$3,822	$0	-$3,863	-$45,262	$6,761

Chart 13. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary



Similarly to the group studied in the previous section, persons who died at a later age were more likely to have a large increase in assets than persons who died at a younger age. Amongst those who were aged 70 and less than 75 years at death, 20.0 per cent increased their assets by an amount of $10,000 or more. In the group of persons aged 95 and less than 100 years of age, 31.9 per cent had an increase in assets of $10,000 or more (see Table 23 and Chart 14).

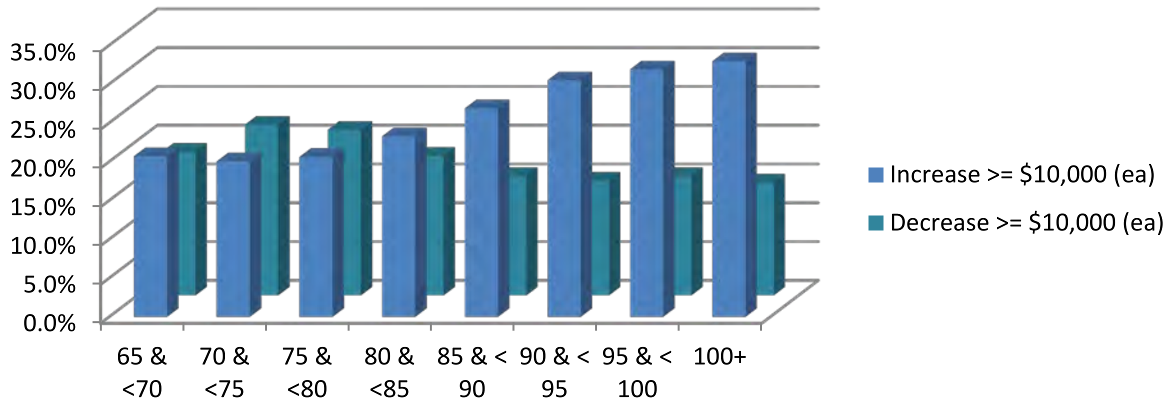
The proportion of persons who had a decrease in assets of $10,000 or more was quite similar across the different age groups at death (Table 23 and Chart 14). For example, 22.0 per cent of persons who died aged between 70 and less than 75 years had a decrease in their assets of $10,000 or more. This proportion fell to around 14 to 15 per cent in age ranges aged 85 years and over.

The overall average change in assets ranged between an average net increase of $3,041 for persons aged 70 and less than 75 years at death up to an average net increase of $11,238 for persons aged 100 years or more at death (see Table 23).

Table 23. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by age at death, recipients and average change in assets

	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
65 & <70	144	100	196	127	129	696
70 & <75	1,585	1,306	2,010	1,273	1,742	7,916
75 & <80	2,421	1,972	2,911	1,942	2,509	11,755
80 & <85	3,546	2,746	3,727	2,485	2,742	15,246
85 & < 90	3,904	2,717	3,491	2,180	2,239	14,531
90 & < 95	2,586	1,582	2,071	990	1,255	8,484
95 & < 100	1,141	621	900	366	550	3,578
100+	283	125	263	63	125	859
Persons	15,610	11,169	15,569	9,426	11,291	63,065
	Average change in assets (ea)					
65 & <70	$61,624	$3,470	$0	-$3,525	-$47,091	$3,877
70 & <75	$62,720	$3,528	$0	-$3,901	-$43,042	$3,041
75 & <80	$56,153	$3,639	$0	-$3,934	-$38,916	$3,219
80 & <85	$57,303	$3,792	$0	-$3,892	-$40,386	$6,113
85 & < 90	$59,545	$3,952	$0	-$3,722	-$48,139	$8,761
90 & < 95	$61,631	$3,979	$0	-$3,920	-$55,619	$10,843
95 & < 100	$64,822	$4,151	$0	-$3,950	-$64,552	$11,065
100+	$63,223	$4,299	$0	-$3,899	-$68,244	$11,238
Persons	$59,649	$3,822	$0	-$3,863	-$45,262	$6,761

Chart 14. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by age



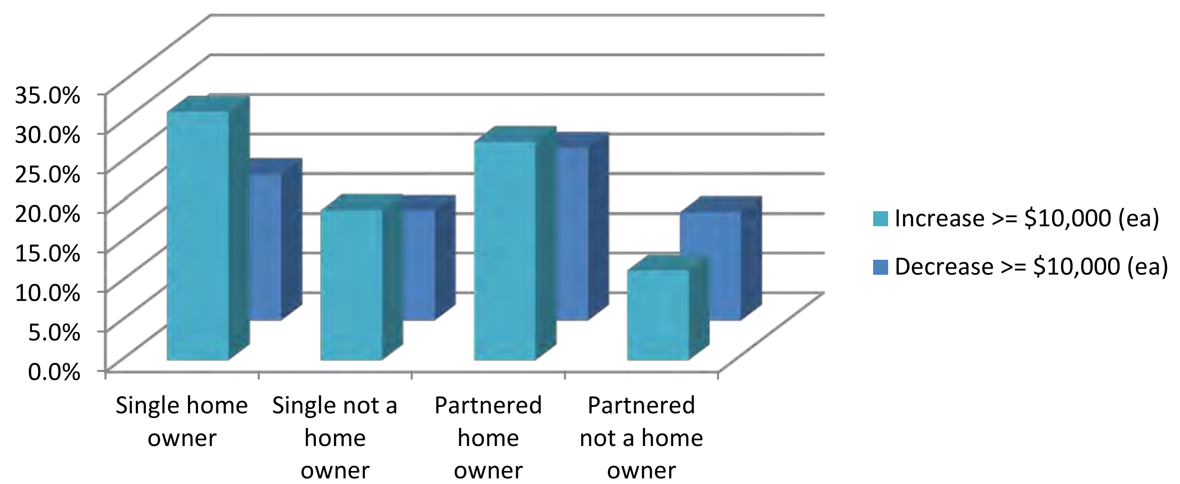
In a similar pattern to the earlier group, home owners were more likely to have a large increase in their assets than persons who were not home owners. Some 31.3 per cent of single home owners and 27.5 per cent of partnered home owners had an increase in their assets by $10,000 or more. In comparison, only 18.9 per cent of singles who were not a home owner and 11.3 per cent of partnered persons who were not a home owner had an increase in their assets by an amount of $10,000 or more (see Table 24 and Chart 15).

Home owners were also more likely to have a large decrease in their assets than persons who were not home owners. Some 18.5 per cent of single home owners and 21.7 per cent of partnered home owners had a decrease in their assets by $10,000 or more. In comparison, only 13.8 per cent of singles who were not a home owner and 13.6 per cent of partnered persons who were not a home owner had a decrease in their assets by an amount of $10,000 or more (see Table 24 and Chart 15).

In overall terms, in the five years before death, single home owners had a net overall increase in assets of an average $12,885. For partnered persons who were home owners the net overall change was an average increase of $6,989. For single persons who were not a home owner the net overall change was an average increase of $2,916, while for partnered persons who were not a home owner, the net overall change was an average decrease of just $427 (see Table 24).

Table 24. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by partner status by home ownership status, recipients and average change in assets						
	Increase >= $10,000 (ea)	**Increase < $10,000 (ea)**	**Exactly the same amount**	**Decrease < $10,000 (ea)**	**Decrease >= $10,000 (ea)**	**Total**
	Recipients					
Single home owner	5,131	2,323	3,902	2,007	3,028	16,391
Single not a home owner	3,632	3,832	6,815	2,276	2,650	19,205
Partnered home owner	6,345	4,039	3,479	4,171	5,009	23,043
Partnered not a home owner	502	975	1,373	972	604	4,426
Persons	15,610	11,169	15,569	9,426	11,291	63,065
	Average change in assets (ea)					
Single home owner	$70,930	$4,122	$0	-$4,058	-$50,916	$12,885
Single not a home owner	$56,778	$3,739	$0	-$3,599	-$59,004	$2,916
Partnered home owner	$53,748	$3,929	$0	-$4,031	-$35,744	$6,989
Partnered not a home owner	$39,711	$2,990	$0	-$3,353	-$35,560	-$427
Persons	$59,649	$3,822	$0	-$3,863	-$45,262	$6,761

Chart 15. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by home ownership



Similar to the earlier group, persons with larger amounts of assets five years before their death were more likely to have changes of $10,000 or more in the value of their assets (both increases and decreases) than persons with smaller amounts of assets (see Table 25).

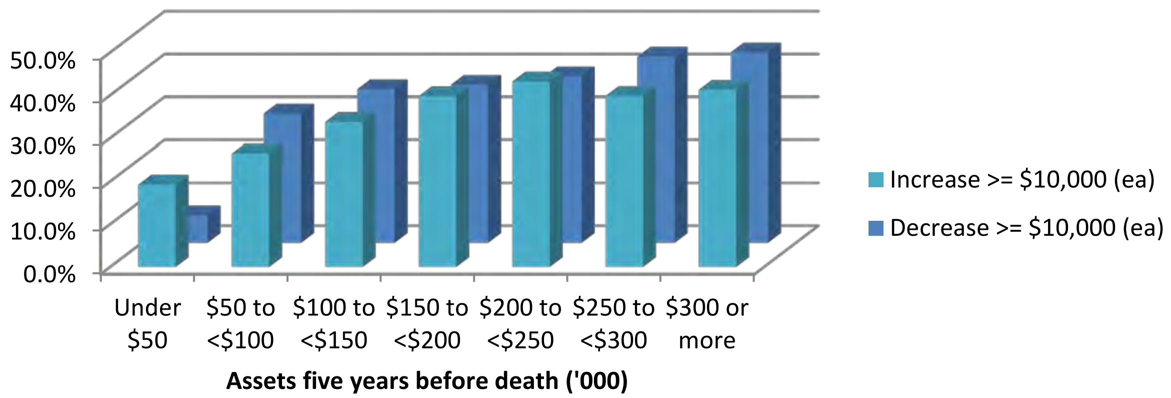
Some 19.2 per cent of persons with under $50,000 in assets five years before their death had an increase of $10,000 or more in their level of assets. This proportion increased to 26.4 per cent in the group who had assets between $50,000 and under $100,000, 33.8 per cent in the group who had assets between $100,000 and under $150,000, 39.8 per cent in the group who had between $150,000 and under $200,000 and 43.2 per cent in the group who had between $200,000 and under $250,000 (see Table 25 and Chart 16).

Similarly, persons with more assets five years before their death were more likely to have a reduction in their assets holdings than persons with lower initial levels of assets. Only 6.4 per cent of persons with under $50,000 in assets five years before their death had a decrease in their assets by $10,000 or more. This proportion jumped to 30.1 per cent in the group with assets between $50,000 and under $100,000, 35.7 per cent in the group with $100,000 and under $150,000, 36.7 per cent in the group with initial assets of between $150,000 and under $200,000, 38.7 per cent in the group with between $200,000 and under $250,000 and 43.4 per cent in the group with assets between $250,000 and $300,000.

In the group with under $50,000 in assets five years before death, the overall net change in the five years was an average increase of $9,586. In the group with assets between $50,000 and under $100,000 the overall net change was an average increase of $5,878, those with assets between $100,000 and under $150,000 had a net average increase of $4,567, those with assets between $150,000 and under $200,000 had a net average increase of $5,673 and still an overall net increase of $1,422 in the group with assets between $200,000 and $250,000. In the group with assets between $250,000 and $300,000 the net overall change was an average decrease in assets of $5,316 and for those with $300,000 or more it was an average decrease of $22,277 (see Table 25).

Table 25. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by ranged assets five years before death, recipients and average change in assets						
	Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
	Recipients					
Under $50,000	7,139	7,994	13,394	6,296	2,362	37,185
$50,000 to <$100,000	3,048	1,791	1,487	1,743	3,467	11,536
$100,000 to <$150,000	2,093	735	390	768	2,215	6,201
$150,000 to <$200,000	1,284	326	136	297	1,186	3,229
$200,000 to <$250,000	817	134	76	133	733	1,893
$250,000 to <$300,000	471	73	49	77	513	1,183
$300,000 or more	758	116	37	112	815	1,838
Persons	15,610	11,169	15,569	9,426	11,291	63,065
	Average change in assets (ea)					
Under $50,000	$55,148	$3,606	$0	-$3,538	-$18,543	$9,586
$50,000 to <$100,000	$56,862	$4,201	$0	-$4,514	-$30,334	$5,878
$100,000 to <$150,000	$59,453	$4,433	$0	-$4,456	-$43,318	$4,567
$150,000 to <$200,000	$67,338	$4,486	$0	-$4,725	-$57,508	$5,673
$200,000 to <$250,000	$68,741	$5,048	$0	-$4,805	-$72,999	$1,422
$250,000 to <$300,000	$84,008	$5,104	$0	-$4,267	-$89,475	-$5,316
$300,000 or more	$75,832	$4,914	$0	-$4,217	-$120,888	-$22,277
Persons	$59,649	$3,822	$0	-$3,863	-$45,262	$6,761

Chart 16. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by ranged assets five years before death



In the total group of recipients, five year before their death 40,298 (63.9%) recipients were receiving the maximum rate 18,648 (29.6%) recipients were receiving a part-rate income reduced payment and 4,119 (6.5%) recipients were receiving a part-rate assets reduced payment.

Of the 40,298 persons who were receiving the maximum rate five years before their death, 95.2 per cent were also receiving maximum rate at the time of their death, 3.3 per cent switched to receiving a part-rate income reduced rate and 1.5 per cent switched to receiving a part-rate assets reduced rate. Some 20.2 per cent of recipients who were receiving maximum rate five years before their death had an increase in the value of their assets by $10,000 or more, while 11.9 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were maximum rate recipients five years before their death, the net overall change in the value of assets was an average increase of $8,142. Those who remained at the maximum rate of payment over the five years had a net overall change in assets of an average increase of $2,345, those who moved to a part-rate income reduced rate had an average increase of $86,145, while those who moved to a part-rate assets reduced rate had an average increase of $204,852 (see Table 26).

In comparison, of the 18,648 persons who were receiving a part-rate income reduced rate five years before their death, 64.3 per cent were also receiving a part-rate income reduced rate at the time of their death, 30.4 per cent switched to receiving maximum rate and 5.3 per cent switched to receiving a part-rate assets reduced rate. Some 30.7 per cent of recipients who were receiving a part-rate income reduced rate five years before their death had an increase in the value of their assets by $10,000 or more, while 26.0 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate income reduced rate recipients five years before their death, the net overall change in the value of assets was an average increase of $5,639. Those who remained on a part-rate income reduced rate of payment over the five years had a net overall change in assets of an average increase of $9,664, those who moved to a maximum rate had an average decrease of $20,862, while those who moved to a part-rate assets reduced rate had an average increase of $109,515 (see Table 26).

Finally, of the 4,119 persons who were receiving a part-rate assets reduced rate five years before their death, 69.8 per cent were also receiving a part-rate assets reduced rate at the time of their death, 13.6 per cent switched to receiving maximum rate and 16.6 per cent switched to receiving a part-rate income reduced rate. Some 42.2 per cent of recipients who were receiving a part-rate assets reduced rate five years before their death had an increase in the value of their assets by $10,000 or more, while a similar 40.2 per cent had a decrease in the value of their assets of $10,000 or more. In this group who were part-rate assets reduced rate recipients five years before their death, the net overall change in the value of assets was an average decrease of $1,680. Those who remained on a part-rate assets reduced rate of payment over the five years had a net overall change in assets of an average increase of $28,393, those who moved to a maximum rate had an average decrease of $92,526, while those who moved to a part-rate income reduced rate had an average decrease of $53,884 (see Table 26).

Table 26. Persons who died during 2013-14 who had received Age Pension at death and five years earlier, unchanged partner status and home ownership status: change in assets summary by means test applied five years before death by means test applied at death, recipients and average change in assets							
		Increase >= $10,000 (ea)	Increase < $10,000 (ea)	Exactly the same amount	Decrease < $10,000 (ea)	Decrease >= $10,000 (ea)	Total
Means test applied five years before death	Means test applied at time of death	Recipients					
Maximum rate	Maximum rate	6,497	7,901	13,249	6,019	4,700	38,366
	Part rate income test	1,048	80	45	63	92	1,328
	Part rate assets test	604	0	0	0	0	604
	Total	8,149	7,981	13,294	6,082	4,792	40,298
Part rate income test	Maximum rate	642	898	792	1,031	2,311	5,674
	Part rate income test	4,209	1,903	1,415	1,976	2,488	11,991
	Part rate assets test	870	37	3	27	46	983
	Total	5,721	2,838	2,210	3,034	4,845	18,648
Part rate assets test	Maximum rate	8	33	9	42	467	559
	Part rate income test	109	55	14	63	443	684
	Part rate assets test	1,623	262	42	205	744	2,876
	Total	1,740	350	65	310	1,654	4,119
Total	Maximum rate	7,147	8,832	14,050	7,092	7,478	44,599
	Part rate income test	5,366	2,038	1,474	2,102	3,023	14,003
	Part rate assets test	3,097	299	45	232	790	4,463
	Total	15,610	11,169	15,569	9,426	11,291	63,065
		Average change in assets (ea)					
Maximum rate	Maximum rate	$32,952	$3,675	$0	-$3,773	-$27,752	$2,345
	Part rate income test	$112,648	$4,580	$0	-$4,291	-$40,765	$86,145
	Part rate assets test	$204,852	-	-	-	-	$204,852
	Total	$55,943	$3,685	$0	-$3,779	-$28,002	$8,142
Part rate income test	Maximum rate	$26,995	$3,796	$0	-$4,084	-$58,373	-$20,862
	Part rate income test	$53,329	$4,210	$0	-$3,884	-$43,779	$9,664
	Part rate assets test	$126,144	$5,292	$0	-$3,922	-$47,444	$109,515
	Total	$61,447	$4,093	$0	-$3,952	-$50,775	$5,639
Part rate assets test	Maximum rate	$14,711	$3,765	$0	-$5,474	-$110,780	-$92,526
	Part rate income test	$42,483	$3,883	$0	-$4,646	-$93,472	-$53,884
	Part rate assets test	$73,298	$5,070	$0	-$4,462	-$50,696	$28,393
	Total	$71,099	$4,760	$0	-$4,636	-$79,118	-$1,680
Total	Maximum rate	$32,397	$3,688	$0	-$3,828	-$42,400	-$1,796
	Part rate income test	$64,694	$4,216	$0	-$3,919	-$50,970	$13,813
	Part rate assets test	$113,800	$5,097	$0	-$4,399	-$50,507	$70,142
	Total	$59,649	$3,822	$0	-$3,863	-$45,262	$6,761

Issues considered by the review

The review was prompted by increasing life expectancies, the impact of the current low interest rate environment on investment returns, and the changes made in response to the GFC.

The review considered whether, in light of these factors, the current drawdown rates are still appropriate and whether concerns about ad hoc changes or retirees running out of money in retirement could be addressed through changes to the existing drawdown requirements. Options considered included measures to create flexibility around the drawdown requirements, as well as across-the-board changes to the rates.

Is the level of the current drawdown rates appropriate?

The Australian Government Actuary (AGA) provided Treasury with advice on the impact of the current minimum drawdown factors in light of increasing life expectancies. Treasury's analysis also took into account the appropriateness of the current rates in the event of low long-term real returns.

The current minimum drawdown factors are based on conservative assumptions about real interest rates, such that if investment earnings average 2 to 3 per cent more than inflation over the course of a person's retirement, then the current rates ensure that retirement income can be broadly maintained in real terms over a fairly long retirement.

While investment volatility is likely in the short term, for the purpose of minimum drawdown a long-run view is appropriate. Historical experience suggests that an expectation of 2 to 3 per cent per annum in real earnings is realistic and, if anything, conservative. For example, analysis of the last 20 years (which includes the GFC) of investment return data suggests an average real return above the rate of inflation of 4.7 per cent per annum for balanced superannuation funds.

Other research suggests that retirees who have invested their superannuation in a diversified conservative investment option have experienced a median return of 8.9 per cent per annum over the last three years.

The AGA advised that, even on somewhat conservative assumptions about investment, the current minimum drawdown factors lead to an expected average balance on death of around 25 per cent of the purchase price in net present value terms.

Given that the objective of the drawdown rates is to ensure that superannuation balances are used primarily to provide retirement income and that the amount of money left over on death is not inappropriately high, we have concluded that although life expectancies are increasing, there is not a strong case for reducing the minimum drawdown factors at this time.

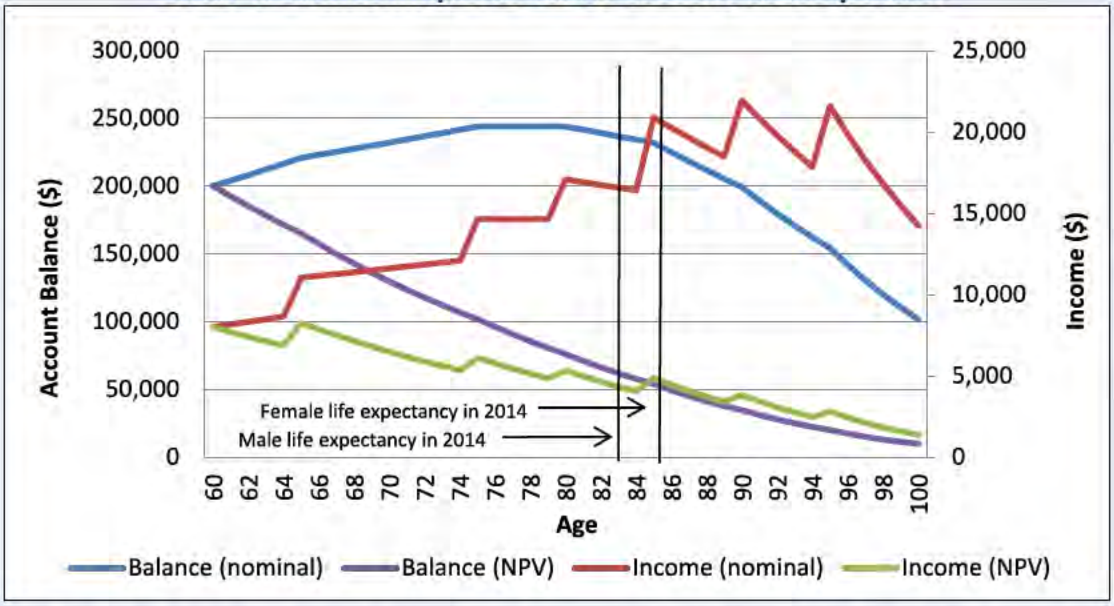
Stakeholders also generally thought the current minimum drawdown rates were appropriate although there were a few (conflicting) proposals for amendments. A common suggestion was to review the minimums regularly to ensure they continue to be appropriate.

Box 1: Minimum drawdowns in practice

Chart 1 (below) illustrates a drawdown scenario for male and female retirees commencing an account-based pension with a balance of $200,000 at age 60 and drawing down at the minimum payment amounts with investment returns of 6 per cent per annum. The chart shows the account balance at various ages and the income drawn down each year in both nominal and net present value (NPV) terms.

An account-based pension drawn down only at the minimum rates can be expected to last beyond average life expectancy, although the NPV of the annual income will generally gradually diminish. In the below example, the net present value of the account balance at life expectancy is around 25 per cent of the initial opening account balance. The net present value of income from the pension declines steadily over time, but 'ratcheting-up' occurs when the regulated percentages increase, resulting in a somewhat variable income stream in nominal terms.

Chart 1: Drawdown profile for an account-based pension



Note: The analysis assumes an average nominal investment return of 6 per cent. This is also the discount rate for net present value.

Is more flexibility in the drawdown requirements required?

The review considered several possible mechanisms that could introduce more flexibility to the minimum drawdown rates to address concerns around outliving retirement savings in the face of market shocks. These included:

- linking the minimum drawdowns to prevailing market conditions so that rates could change if a 'shock' occurred ('automatic adjustment');
- allowing individuals to draw down less than the prescribed minimum in a given year, provided they 'caught up' within a certain number of years. This would allow flexibility to cope with a 'bad year' ('carry-forward mechanism'); and
- introducing more age bands into the current schedule, with some adjustments to the percentages to help deliver a 'smoother' income stream.

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The ATO Longitudinal Information Files (ALife): A New Resource for Retirement Policy Research*

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Abstract

The Australian Taxation Office release of annual longitudinally linked individual tax and superannuation records, known as the ATO Longitudinal Information Files (ALife), opens-up opportunities for new research. In this study, we provide an overview of ALife, focusing on its use for retirement income research. To this end, we provide the first longitudinal estimates of superannuation outcomes for one-year birth cohorts. Results show marked increase in disparity of super balances in the lead-up to retirement as those in the top quartile ramp-up their contributions, possibly to take advantage of the favourable tax treatment of superannuation income in retirement years.

JEL classification: H24, H55, J26.

Keywords: retirement income; taxation; private pension.

1. Introduction

Governments around the world are seeking to improve the efficiency of programs and service delivery through the curation and release of large administrative datasets for research. In Australia, following the Australian government's 2015 Public Data Policy Statement[1] that committed the government to release non-sensitive public data, there has been a wave of activity to release administrative data for research. Consistent with this push, in 2019 the Australian Taxation Office has compiled and released a 10 percent sample of annual longitudinally linked individual tax and superannuation records (panel data), known as the ATO Longitudinal Information Files (ALife). ALife data are released annually around January each year, but due to late lodgements in tax returns, there is a two-year delay in data release. The current release, ALife2017, tracks individuals from 1990-91 in tax records and 1996-97 in superannuation records up to 2016-17.

The release of ALife opens-up opportunities for new research across many policy domains, including income distribution and dynamics and the labour market. Perhaps less obvious is that the data creates important new opportunities for research on retirement. Prior to ALife, retirement income analysis relied on the use of nationally representative annual survey data, especially individual panel data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey and repeated cross-sectional data from the Australian Bureau of Statistics' Household Income and Wealth Survey. There are several advantages of ALife over these surveys. First, the large number of observations in ALife provide new opportunities to conduct statistically robust analysis on sub-groups of interest that may be targeted by policy. For example, ALife allows for analysis of responses to the Low Income Superannuation Tax Offset (LISTO), introduced in 2012, that targets low-income earners. The longitudinal dimension of ALife means that it can be used to also examine differences in sub-group responses over time, which because of differences in their life circumstances and experiences, are often varied. Second, there is a well-established literature on survey non-response and response error and bias in relation to questions that have clear socially (un)desirable answers such as income (see Moore and Welniak (2000) for a review), that give analysis with administrative data an advantage. Third, ALife includes criteria for program eligibility which

[1] https://www.pmc.gov.au/sites/default/files/publications/aust_govt_public_data_policy_statement_1.pdf

allows for more precise estimation of program effects. For example, LISTO eligibility depends on taxable income from specific income sources and concessional superannuation contributions, which are not available in other datasets.[2] Finally, the new historical data in Alife2017 extends further back than existing survey data, which allows for new analysis of long-term trends and policy impacts.[3]

In this paper, we provide a brief overview of ALife for researchers and showcase its potential for superannuation and retirement income policy research in Australia using the initial ALife release — Alife2016, which was the version available at the time of analysis. To do this, we first describe briefly the retirement income system and policy landscape in Australia to better understand the utility of ALife data for retirement research (section 2). Following this, to better understand the underlying Alife population and the superannuation data, we compare the ALife sampling frame with population estimates from ABS Census (section 3), provide an overview of ALife content (section 4), compare ALife superannuation data with that from the HILDA Survey (section 5) present longitudinal superannuation information for one-year cohorts (section 6) and compare super balances across occupations (section 7). In concluding (section 8), we summarise ALife's strengths and areas for future development. Like other administrative datasets, ALife is constantly evolving and these developments, where possible, will be incorporated into future ALife releases.

2. Superannuation and retirement income policy in Australia

Retirement income policy in Australia is based on three pillars: the means tested and publicly funded Age Pension; superannuation, a compulsory employer-funded private retirement pension; and voluntary private savings, including voluntary private contributions to superannuation, that are supported through tax concessions and targeted government payments. A feature of the Australian system is the high interdependency of the three pillars, due mainly to the income and assets tests of the Age Pension, which means that Age Pension payments depend on the accumulation of private savings (whether in superannuation or not). This interdependency potentially incentivises people to trade-off higher savings from private sources for greater access to the publicly-funded Aged Pension, which has fiscal implications.

[2] Taxable income up to $37,000, with at least 10% from business income or earnings.

[3] The first wave of HILDA is 2000 and 1995 in the Household Income and Wealth Survey.

As identified by the Productivity Commission (2015), the margins where this occurs and the fiscal implications of this are not well understood. The release of ALife is an important development in efforts to understand superannuation accumulation and deaccumulation behaviour in response to tax, superannuation and pension reforms. Research by the authors is currently underway to examine some of these interrelationships and their fiscal implications.[4]

Below we provide a brief introduction to superannuation in Australia. For more detailed information about the superannuation system, including recent changes, see the Australian Taxation Office website (https://www.ato.gov.au/Individuals/Super/).

2.1. The superannuation system

Superannuation was first introduced in the 19th century for select white collar workers, including public servants, but was made compulsory for most employees from April 1992 (see Nielson and Harris (2010) for a chronology of superannuation in Australia). From 1992, employers were required to make minimum contributions to their employees' retirement, except for employees paid less than $450 in a calendar month; those aged under 18 who worked no more than 30 hours a week, and certain contractors.[5] The compulsory retirement payments, known as the Superannuation Guarantee (SG), started at 3 percent of employee pay and has been gradually increased over time to its current rate of 9.5%.[6] SG employer contributions are generally tax deductible to the employer and are excluded from taxable income for the employee, but are taxed at a rate of 15% on deposit into the superannuation fund (concessional contribution).

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[4] These issues are being addressed under ARC Linkage Grant LP170101045 between the University of Melbourne and the ATO.

[5] Such as freelancers or as self-employed. Other exemptions include domestic or private work not more than 30 hours per week; non-residents in Australia being paid by an employer from outside Australia and some foreign executives who hold certain visas or entry permits under migration regulations.

[6] The SG was supposed to increase to 10% on 1 July 2018; and then increase by 0.5% each year until it reached 12% on 1 July 2022. However, the 2014 federal budget deferred the proposed 2018 SG rate increases by 3 years, with the 9.5% rate remaining until 30 June 2021, and then the rate increasing by 0.5% each following year until the SG rate reaches 12%, on 1 July 2025.

On top of SG contributions, concessional contributions can also be made by employees requesting that their employer salary sacrifice all or part of their pay. However, from July 2012 individuals whose aggregate income and concessional contributions are above a threshold became liable to pay an extra 15% on concessional contributions (known as Division 293 tax).[7] Concessional contributions are subject to an annual cap, which has been tightened over time.[8] Contributions made above the cap are taxed at a higher rate — at the highest marginal tax rate plus the medicare levy up to 2012-13, and at the individual's actual marginal tax rate plus the medicare levy thereafter. Employees can also make voluntary after-tax contributions, known as personal contributions, which can be claimed until the age of 75. Personal contributions are either deductible or non-deductible. Those that are deductible count towards the concessional cap and are taxed in the superannuation fund. Non-deductible personal contributions are not taxed in the superannuation fund and count towards a non-concessional (and not concessional) contribution cap. For low income earners, if they make personal contribution to a super fund, the government will also make a co-contribution, the amount depending on their income and the size of the non-deductible personal contribution.

Typically, the minimum age at which one can draw down super (the preservation age) was 55 until July 2016, since then it has been increasing by one year every two years; it is scheduled to keep increasing up until July 2024, when it will reach 60. Generally, individuals can access their superannuation after they have reached their preservation age and are retired. Once a person reaches the Age Pension age, which has been slowly increasing from 65 years in financial year 2016-17 to 67 years by July 2023, there is no requirement to be retired to access superannuation. Access to superannuation prior to preservation age is possible, but only under certain conditions — extreme financial hardship, terminal illness, temporary residency, a superannuation balance less than $200 or on compassionate grounds. For those beyond their preservation age, but less than 60, superannuation income received is taxed at the marginal tax rate, but there is a 15% tax offset,[9] whereas super paid from age 60 is

[7] The threshold was $300,000 from 1 July 2012-30 June 2017, then it was reduced to $250,000.

[8] From July 2018, people with super balances of less than $500,000 can carry forward unused concessional caps.

[9] Tax offsets are available for superannuation income paid prior to age 60 depending on individual circumstances.

generally tax free. The latter was introduced in July 2007 as part of the Government's *Simplified Superannuation* reforms. Prior to these reforms, superannuation income at the age of 60 and above was taxed at the same rate as at the age below 60 (marginal tax rate less a 15% tax offset). Benefits can be paid as either a lump-sum or as an income stream, but if the latter is taken, there are requirements for minimum payments to be made.

3. Sample design

The initial ALife2016 sample is a 10 percent random sample of the ATO's 2016 client register of tax filers regularly updated since 1980, including temporary visa holders and people who died prior to 2016.[10] The 10% random sample is called ALife's 'broad sample'. To draw the random sample from the client register, each client is given a unique permanent random number between 0 and 1 and clients with a number less than 0.1 are included in the sample. In effect this means that the selection of each client is an independent Bernoulli trial with a 10% chance of selection. Historical information is added retrospectively by tracking individuals of the broad sample back through time via their tax file number. In each release of ALife following initial sample, the broad sample is updated by a 10% random sample of people added to the client register since the previous annual release.

From the broad sample, ALife comprises individuals with at least one tax or superannuation record from 1990-91 with no blank rows in the dataset. This means that individuals from the broad sample may appear in one, both or none of the superannuation and tax records in ALife. A small number of individuals who face relatively high risk of re-identification (such as those aged 95 or more) are excluded from Alife.

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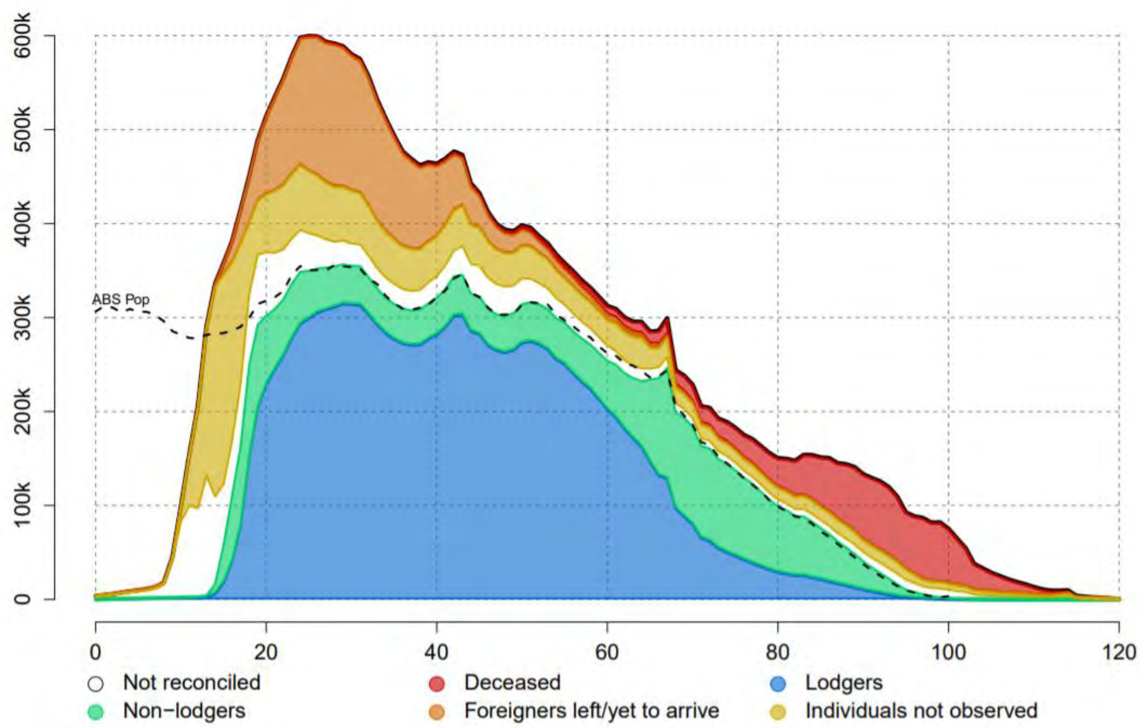
[10] The ATO client register contains individuals (including sole traders) who are not tax lodgers, e.g. people who have a tax file number who have not lodged a tax return.

Figure 1: Comparison of the of the distribution of people by age in the ATO client register against the ABS's Estimated Resident population, 30 June 2014



To help users understand the client register, the ALife sample and their relationship to population measures, we compare the client register to the ABS Estimated Resident Population (ERP) in 2014 (Figure 1). ERP is the official measure of Australia's population, based on the concept of 'usual residence'.[11] For this exercise, we exclude around 1.8 million (out of 31.7 million) people from the client register who do not have date of birth. In Figure 1, the ERP estimates are shown by the dotted line and the client register is the solid black line

[11] Usual residence are people, regardless of citizenship, who usually live in Australia, except for diplomats and their families and includes usual residents who are overseas for less than 12 months. It excludes overseas visitors who are in Australia for less than 12 months. The ERP is based on the results of the Census of Population and Housing, adjusted for net undercount and Australian usual residents temporarily overseas on census night. The ERP is compiled as at 30 June of each census year and updated quarterly between censuses for Australia, states and territories and annually for smaller areas. Population measures based on place of usual residence are also referred to as the de jure population. More details about the concept of ERP, as adopted by the ABS for official population estimates, are contained in Information Paper: Population Concepts, 2008 (cat. no. 3107.0.55.006) and Population Estimates: Concepts, Sources and Methods (cat. no. 3228.0.55.001).

at the top of the distribution. From Figure 1, the client register contains far more individuals overall — 31.7 million compared to 23.5 million for the ABS estimated resident population — with the difference most pronounced during working age. To reconcile the ERP and the client register, we link information from other administrative datasets including: personal income tax returns; superannuation contribution statements; social security payments summaries; pay as you go (PAYG) payment summaries; distributions from partnerships and trusts; divided distributions from companies; education data and temporary work visa departure dates.

The main observation to be made from Figure 1 is that tax lodgers and visible non-lodgers (social security recipients and others observed in the administrative data, such as those in PAYG payment summaries and students), or the blue and green sections, are a reasonable approximation of the ABS ERP in 2014. The Australian Taxation Office is currently conducting work to develop population measures that will more closely reflect ERP.

The difference between the client register and ERP estimates, the area between the hard-black line and the dotted black line can be mostly explained by three groups at 30 June 2014 — people in the client register who are deceased (red section) ; foreigners who have left/yet to arrive in Australia (orange section) and citizens who do not appear in any dataset since 2000 and who are likely to be overseas (yellow section).[12] The blank section reflects those who are not seen in any dataset in 2014 and cannot be reconciled.

4. ALife content

The unit of analysis in ALife is the individual tax filer who is tracked over time using their unique client identification. Individual information available in Tax Return forms, Super Member Contribution Statements (MCS) forms and the Self Managed Superannuation Fund (SMSF) annual returns are included in ALife, including age, gender, residential address (ABS SA4 level category) and occupation. In the current standard release of ALife, there is no partner identifier. Generating a household identifier is in an experimental phase of development and will be made available in future ALife releases.

[12] These are people who are observed in the data in the future or have been observed in the past.

Below we provide an overview of the superannuation and tax information in ALife. For more detailed information, including how to access the data, refer to material on the ALife website (https://alife-research.app/).

4.1. Superannuation information

Superannuation data in ALife is annual financial-year curated superannuation balance and contribution information from all MCS and SMSF annual returns forms reported to the ATO. All providers are required to report details of each member's superannuation account in MCS or SMSF annual returns forms regardless of whether they are regulated by the Australian Prudential Regulation Authority (APRA). Details of what are collected in the MCS and SMSF annual returns forms are available on the ATO website.[13] Identifying information of the member in the MCS forms (e.g. name, date of birth, address) and provider (e.g. name, address, contact details) are excluded in the standard ALife release. While provider identifying information is omitted, ALife does distinguish balances and contributions by provider type — APRA regulated, self-managed and exempt public sector super schemes (not APRA regulated).

While all filed tax records are available in each year of ALife, the coverage of superannuation in ALife varies over time in accordance to legislative requirements for fund managers to report MCS forms to the ATO. Prior to 2013 (financial year 2012-13), fund managers were only required to lodge MCS forms to the ATO for accounts that received contributions during the financial year. This means that inactive accounts will be missing from ALife prior to 2013, which particularly affects data on retirees.[14] In 2013, it became a requirement for super funds to report all of their members' accounts (both active and inactive) to the ATO , which means that ALife only has full superannuation accounts coverage from here on.[15] For self-

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[13] https://www.ato.gov.au/Forms/Super-member-contribution-statement-for-2012-13-and-later-financial-years/

[14] Some superannuation fund managers voluntarily provided MCS for inactive accounts, possibly because it was administratively easier.

[15] Since 1 July 2012, obligations under Division 390 have been extended as a result of the *Stronger Super* reforms, which required MCS statement to be extended to all members, including those for whom no contributions were made. The main motivation for this was to reunite people with lost superannuation accounts.

managed superannuation funds, which are not required to produce MCS, the ATO extracts all relevant information from their annual returns, which all fund managers are legally obliged to report.

A feature of the ALife superannuation data is the inclusion of rich information that is derived by the ATO for administering tax and superannuation regulations that are vital for policy evaluation. In summary, these include:

- each member's concessional and non-concessional cap and contributions;
- tax liability for excess contributions;
- super co-contributions; and
- member's Division 293 tax liability.

While there is comprehensive information in ALife about superannuation contributions and annual balance information from 2012-13, there is currently incomplete information available on draw-down and returns to superannuation. Superannuation payments, made to account holders, in MCS and SMSF forms are only available for lump-sum withdrawals. The ATO does hold superannuation payment summaries (for 2008-2018) that include *taxable* superannuation income streams, but not *untaxed* streams (for members aged 60 and over) and these are yet to be included in ALife. Members with zero balances are retained in ALife, which allows for the identification of complete draw-down.

4.2. Tax record information

Tax data in ALife consists of annual financial-year's incomes, deductions, tax rebates and offsets, medicare levy and surcharge and other tax information from the individual tax returns, including those of sole traders. In years where a tax return was not lodged, the individual's information for that year is missing in ALife. For information on the items collected in individual tax returns, visit the ATO website.[16] For reasons of confidentiality, tax payers identifying information is removed or generalized, for example, date of birth is generalized to age at 30 June (to integer level), and occupation is generalized to the 2-digit level of the Australian and New Zealand Standard Classification of Occupation codes. In

[16] https://www.ato.gov.au/Forms/Prior-years-individuals-tax-return-forms---schedules/.

addition to individual information from tax return forms, ALife includes the outcomes of tax assessment.

For more information on the components of individual income, deductions and other items from individual income tax returns, see Bond and Wright (2018).

5. Sample characteristics

In this section, we compare the superannuation balances and characteristics of superannuation members between ALife and HILDA. To showcase some of the advantages of ALife over past surveys, we also present superannuation statistics over time and across occupation categories.

The total value of superannuation balances in the ALife sample in 2016-17 is $208 billion (2017 values), which is somewhat lower than 10% of the total value of $2.5 trillion reported by the Australian Prudential Regulation Authority (APRA) (APRA 2017). The difference may be due to the exclusion of people from ALife who have a high risk of re-identification and the exclusion of unmatched superannuation accounts belonging to people who cannot be specified in the ATO database (due to missing identification information).

In Table 1 we compare the average superannuation membership rates and average balances for the ALife sample against those from HILDA, separately for males and females across birth cohorts in 2014. We choose 2014 as a comparison year because it is the latest year superannuation data is available in HILDA as part of its wealth module. The statistics in HILDA, but not ALife, are population weighted and both are deflated using the December 2014 CPI, with a base year of December 2017.

An interesting observation is differences in the superannuation gender gap estimated under the two datasets. Across all those born before 1998 (aged 17 and older) the average female superannuation balance in 2014 in HILDA is 41% lower than for men — $67,774 compared to $115,525 for men. In contrast, the comparable gender gap in 2014 in ALife is 26% — $63,751 compared to $93,687. As a point of comparison, the gap estimated for the Survey of

Income and Wealth is 44% (Clare 2015).[17] The smaller gender gap in ALife can be explained by two factors. First, in Alife there is a greater proportion of women in Alife with non-zero superannuation balances than in HILDA. Second, among people with non-zero superannuation balances, the average difference between male and female balances is smaller in Alife.

A possible explanation is that in men in surveys may be more likely to over-inflate their wealth, and/or be too embarrassed to answer questions on wealth, because it is more socially desirable for them to be wealthy.[18] An alternative explanation is that there are differences in the base population that skew the data, for example, ALife may capture working-age short-term residents who are more likely to be male (Australian Bureau of Statistics 2016).

In terms of characteristics of superannuation members with a non-zero balances that are common to ALife and HILDA (Table 2), we observe only minor differences in average statistics. As discussed above, the current version of ALife doesn't include a household identifier and around a quarter of all coupled superannuation members (16.7% out of 65.8%) have a missing partner identifier.

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[17] Average estimates from the Australian Bureau of Statistics' Survey of Income and Wealth, published by the Australian Superannuation Funds of Australia for all male members aged 15 and over (at June 2014) are $98,535 and $135,000 respectively. For females the relevant statistics are $54,916 and $83,000.

[18] Non-response is similar by gender, 17% for females and 15% for males in 2014. However, non-response appears more selective for males, with imputed values 25% lower than reported values. In contrast, imputed values for females are 2% higher than reported values on average.

Table 1: Average superannuation balances for ALife2016 10% sample in 2014[a]

Birth cohort	Average balance, all		Average balance, non-zero balances		Proportion with non-zero balances (%)[c]	
	HILDA[b]	**ALife**	**HILDA[b]**	**ALife**	**HILDA[b]**	**ALife**
	$A2017	$A2017	$A2017	$A2017	%	%
			Females			
All	67,774	63,751	97,723	95,786	69	67
1930-1933	13,441	16,736	131,038	247,516	10	7
1934-1937	27,303	45,012	205,259	298,311	13	15
1938-1941	89,957	77,814	290,910	315,964	31	25
1942-1945	126,067	125,246	318,063	309,211	40	41
1946-1949	130,269	160,523	284,188	298,325	46	54
1950-1953	172,952	162,133	268,160	234,413	65	69
1954-1957	142,637	135,019	189,555	173,135	75	78
1958-1961	112,369	109,510	133,335	129,120	84	85
1962-1965	94,923	85,188	114,282	97,861	83	87
1966-1969	87,690	70,253	102,705	80,489	85	87
1970-1973	56,924	57,335	64,005	65,839	89	87
1974-1977	47,103	45,301	52,675	52,596	89	86
1978-1981	40,167	36,249	44,010	42,060	91	86
1982-1985	24,877	25,013	29,940	29,558	83	85
1986-1989	13,521	14,701	16,655	18,197	81	81
1990-1993	5,747	6,229	6,769	8,290	85	75
1994-1997	1,138	955	2,039	1,949	56	49
			Males			
All	115,525	93,687	151,942	130,042	76	72
1930-1933	29,416	40,351	138,845	262,030	21	15
1934-1937	98,049	82,766	315,307	322,735	31	26
1938-1941	185,279	131,844	441,747	370,707	42	36
1942-1945	154,127	182,571	351,682	365,634	44	50
1946-1949	281,953	213,130	438,639	345,992	64	62
1950-1953	296,200	224,303	378,274	291,493	78	77
1954-1957	231,816	207,950	289,474	249,042	80	84
1958-1961	201,067	168,685	221,595	192,203	91	88
1962-1965	168,388	131,443	183,073	146,841	92	90
1966-1969	138,943	103,769	154,468	115,666	90	90
1970-1973	106,002	82,680	115,274	92,023	92	90
1974-1977	83,248	62,876	88,677	70,314	94	89
1978-1981	50,805	45,967	54,334	51,496	94	89
1982-1985	34,488	31,549	37,202	35,945	93	88
1986-1989	18,397	18,269	20,403	21,739	90	84
1990-1993	8,201	7,666	9,545	10,008	86	77
1994-1997	1,453	1,351	2,496	2,807	58	48

[a]We do not report values for people born before 1930 because of small cell sizes. [b]Population weights are used to generate HILDA estimates.

Table 2: Characteristics of superannuation members with non-zero balances in ALife2016 and HILDA in 2014[a] (%)

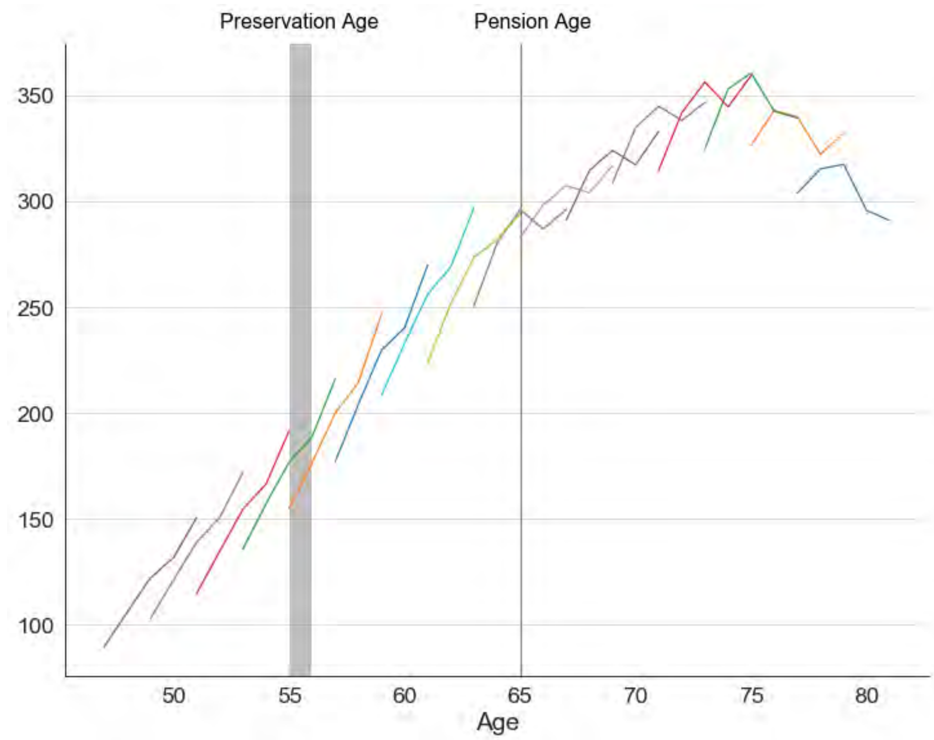
	ALife	HILDA[b]
Place of residence		
Sydney	21	20.7
Rest of NSW	10.6	10.7
Melbourne	19	19.8
Rest of Victoria	5.8	5.4
Brisbane	9.8	10.5
Rest of Queensland	10.2	9.9
Adelaide	5.6	5.8
Rest of South Australia	1.4	1.3
Perth	8.8	9.3
Rest of Western Australia	2.1	1.8
Tasmania	2.1	2.1
Northern Territory	0.9	0.8
ACT	1.8	1.8
Missing location	0.9	0
Total	100.0	100.0
Sex		
Male	52.1	51.5
Female	47.9	48.5
Total	100.0	100.0
Age		
15-19	2.7	3.3
20-24	9.2	9.7
25-34	21.9	21.7
35-44	21.8	21.7
45-54	20.4	20
55-64	15.5	15.2
65-69	4.6	4.3
70-74	2.3	2.3
75-79	1.1	1.1
80-84	0.4	0.5
85 and older	0.1	0.1
Total	100.0	100.0
Partner status		
Married/defacto	49.1	66.1
Not partnered	34.1	33.9
Missing information	16.7	-
Total	100.0	100.0
Population count estimate	14,526,040[c]	13,391,909

[a]Members are those with non-zero balances at the end of the financial year 2013-14. [b]Responding person population weights are used to generate HILDA estimates. [c]This is the population estimate generated by multiplying the actual numbers in ALife by 10 (because it is a 10% sample).

6. Super balances over time

A main advantage of ALife over survey data in retirement policy research are the large number of observations that allow for statistically robust estimates of sub-populations over time. In the figures below, we provide average superannuation member balances (Figure 2), rates of complete draw-down (Figure 3), rates of contribution (Figure 4) and average annual contributions (Figure 5) between 2012-13 and 2016-17 by one-year birth cohorts born 1936-1966. To save space, we only present averages for every second one-year birth cohort. The calculation of these averages is based on the same group of members with non-zero balances in ALife2016 at the end of the 2012-13 financial year. In all figures below, the preservation age is marked by a vertical bar spanning the ages 55 and 56, which reflects the changes in the preservation age that occurred over this period (from 1 July 2015). The Age Pension age remained constant for both men and women, which is reflected by the vertical line at 65.

Figure 2: Average superannuation balances 2013-2017 among members with non-zero balances on 30 June 2013 ($A'000s 2017), every second one-year birth cohort born 1936-66



For the cohort of members born in 1948, who have just reached pension eligibility age in 2012-13, their average balance is $282,540 (Figure 2). Balances for 2012-13 members over time by quartile are also provided in Figure A.1 in appendix A.[19] What is apparent from Figure A.1 is the large discrepancy in average balances between those in the top quartile (or top 25%) and the rest. For example, for the 1948 cohort who just reached pension age in 2012-13, the average balance in each quartile is: $6,235 for the bottom quartile (bottom

[19] Members balances in 2012-13 are ranked from lowest to highest and are divided into four equal groups or quantiles.

25%); \$63,912 for the 2nd quartile (2nd bottom 25%); \$201,924 for the 3rd quartile (2nd top 25%) and \$858,576 for the 4th quartile (top 25%). Comparing balances across quartiles, what is also apparent is that most of the disparity between the top quartile and the others is among cohorts approaching or in retirement years, which is likely to reflect differences in the use of superannuation in retirement.[20] For members with balances in the top half, these results suggest that superannuation is a liquid and tax-favourable place to park wealth in their retirement years, while for those in the bottom half, superannuation is more of a reservoir of wealth from which they can draw-on in retirement, for example, to pay-off debt, to re-invest and to fund retirement.

6.1. Superannuation draw-down over time

Over time we find little evidence that people, on average, run-down superannuation balances after reaching the preservation age (Figure 2), which is consistent with the findings of Reeson *et al.* (2016), who found similar results using a sample of 150,000 members of a large fund. Instead, across the cohorts born prior to 1960 who pass (or have passed) preservation age over the period, we find that superannuation balances have grown, which is due to superannuation returns and contributions outstripping the rate of superannuation draw-down, except for the oldest cohort in our analysis born in 1936 whose average balance falls. Growth in superannuation balances is also found across all member balance quartiles, although the greatest growth is for the top quartile (Figure A.1).

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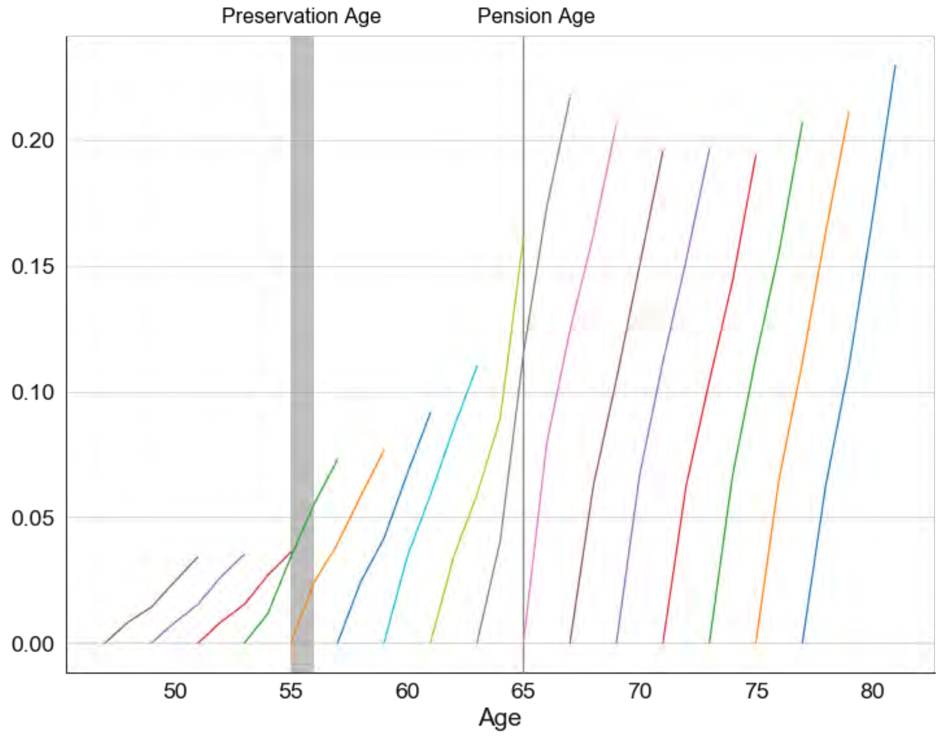
[20] The discrepancy in cohort mean balances between those in the top quartile and the rest is not driven by exceptionally high balances at the top, the discrepancy in cohort *median* balances between the top and the rest is of a similar magnitude. Figures for median balances are available upon request from the corresponding author.

Figure 3: Proportion of members with non-zero balances on 30 June 2013 who completely draw-down 2013-2017, every second one-year birth cohort born 1936-66



The rate of complete draw-down over time (Figure 3), reflected by the proportion of members in 2012-13 who completely withdraw their superannuation by 2016-17, doubles from around 3% for those who are just short of their preservation age (cohort born 1962) to around 6-7% for cohorts who pass their preservation age over the period (cohort born 1960).[21] The largest jump in complete drawn-down occurs for cohorts either side of the Age Pension eligibility age – 10% for those born 1954 who are just short of the pension age by 2016-17 to 22% for those born in 1950. For older cohorts who are well beyond pension age, the rate of draw-down over time is similar.

However, what is clear from Figure A.2 in appendix A, is that the rate of complete drawn-down depends heavily on the size of the initial balance. For members with balances in the bottom 50%, the rate of complete draw-down is much higher than for those with balances in the top half and the jump in draw-down around pension age much more pronounced. For example, for the cohort born in 1948 who have just reached pension age in 2012-13, 45% of

[21] Gradual draw-down after age 60, for example annuities, cannot be observed in ALife.

those in the bottom quartile withdraw their super balance completely by 2016-17; 20% of those in the second bottom quartile; 10% of those in the second top quartile and around 8% of those in the top quartile. The higher rates of complete draw-down among those with smaller initial balances, especially from pension age eligibility, does raise the likelihood that these people will be more reliant on the Age Pension to fund retirement. However, whether the complete draw-down of this group is a strategic decision to maximise pension income is unclear.

6.2. Superannuation contributions over time

The proportion of members in 2012-13 who make superannuation contributions declines over time, but as for the rate of complete draw-down, there is a more marked decline in the rate of contributions around pension age. For example, for cohort 1948 that has just reached retirement age in financial year 2012-13, the proportion of members who contribute declines by 40% over the time, whereas for cohort 1954 who are just short of the pension age (age 63 by 2016-17), the decline is 9%. As for drawn-down, there are marked differences in the proportion of members who are contributing over time by initial balance level, including prior to reaching preservation age. For members whose balances are in the bottom quartile (25%), only around a half are still contributing at age 50, compared to 81%, 91% and 93% in the second, third and top quartiles. The low contribution rate of members with balances in the bottom quartile is likely due to low rates of labour market participation among this group. Over time, cohorts across all quartiles reduce their rates of contribution, especially after the pension age, although this is less pronounced for members whose balances are in the bottom 25%. The contribution rate of this group may not be affected to the same extent by reaching retirement age because they may not have enough wealth to fund their retirement. Further, their future pension income (which is means tested) may be relatively unaffected from the accumulation of more superannuation past their pension age. It is those in the middle two groups whose contribution rate is most affected by reaching the pension age.

Figure 4: Proportion of members with non-zero balances on 30 June 2013 who make superannuation contributions 2013-2017, every second one-year birth cohort born 1936-66

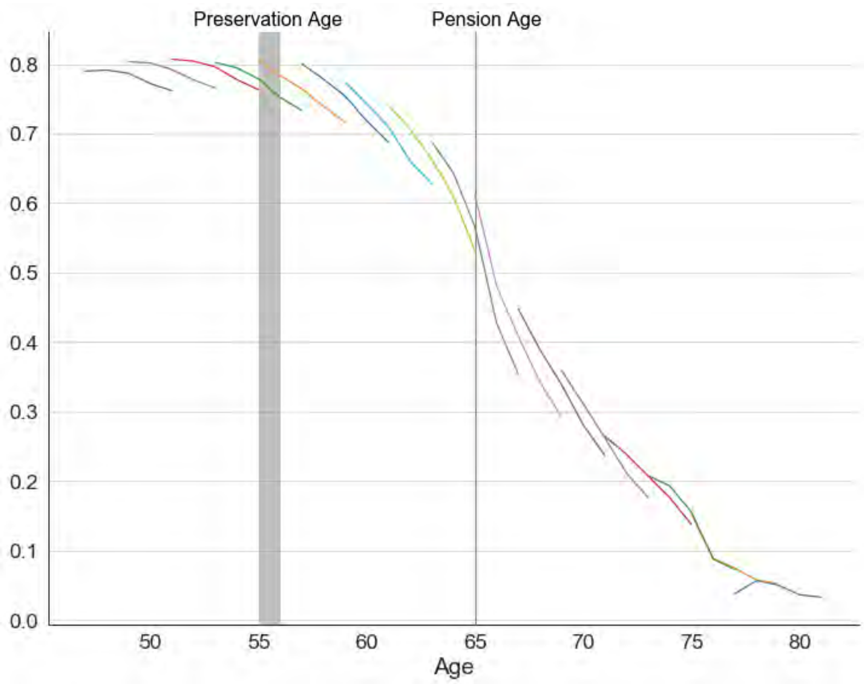
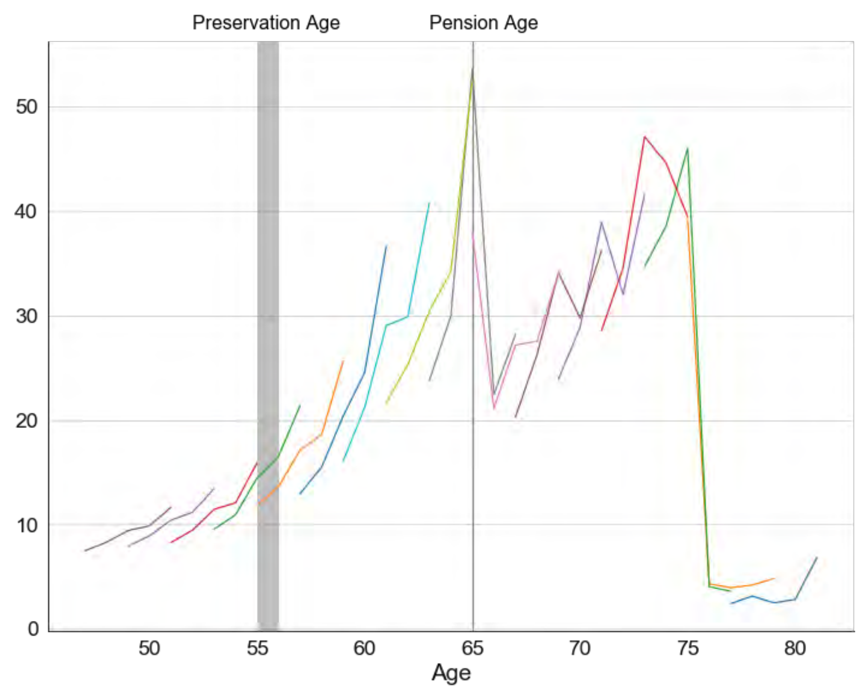


Figure 5: Average annual superannuation contributions 2016-17 among members with non-zero balances on 30 June 2013 ($A'000s 2017), every second one-year birth cohort born 1936-66



The amount that members contribute is estimated to ramp-up dramatically among cohorts that are close to the pension age. For example, among those born in 1952 who just meet the pension age by 30 June 2017, we estimate that their average contribution increases from around $21,626 per year to around $52,589 per year, which is around a 43% increase between 2012-13 to 2016-17. This is a dramatic increase that does not necessarily represent an increase in the savings rate, but possibly the diversion of wealth from other sources into superannuation to take advantage of concessional tax treatment of superannuation income in the draw-down phase. One way that wealth could be diverted is by liquidating assets to fund consumption, allowing a greater share of labour earnings to be diverted to superannuation. The ramp-up in contributions in the lead-up to retirement is apparent regardless of starting balances (Figure A.4), but is more pronounced for members whose balances are in the top 25%. For this group, although they may not be eligible for the pension, the pension age can still act as a psychological marker for a socially appropriate time to retire. The greater ramp-up in contributions among those in the top quartile suggests that those with greater superannuation balances to start with are more able to ramp-up contributions in the lead-up to retirement to take advantage of concessional tax treatment during the draw-down phase. Following the ramp-up in average contributions in the lead-up to pension age, there is an equally dramatic decline in average contributions after pension age, which coincides with increased rates of retirement.

Interesting, among those who remain attached to work after the retirement age, members again continue to increase their contributions over time in the lead-up to age 75, the maximum age at which people can legally contribute towards superannuation. Also of interest is the apparent kink in the increases in contributions over time, which coincides with the 2015-16 drop in superannuation returns. This kink is most noticeable amongst people who remain attached to work after the pension age, which again points to contributions at this time being driven more by expected returns from superannuation relative to other investments rather than members building their nest egg.

7. Super balances across occupations

As discussed above, a feature of ALife is being able to generate statistically robust estimates of population sub-groups. In Table 4, we present information on labour earnings (wages and salaries plus reportable employer superannuation contributions), contributions and superannuation balances by occupation subgroups for those who lodge a tax return in 2013-

14.[22] Despite the overall high coverage of superannuation among tax filers, an interesting result from Table 4 is that variation across occupations is highly related to skill level (and earnings). At one end of the spectrum, less than 5% of highly educated workers who are employed in professional jobs (excluding the occupational code "other professions") miss out on superannuation contributions. In contrast, around 15% of low skilled workers, such as labourers and food preparation assistants, miss out on superannuation contributions. The lower coverage among low-skilled workers is mostly likely because they are low paid and, when combined with casual intermittent employment, are more likely to earn less than $450 per month to qualify for the Superannuation Guarantee. Contributions as a share of earnings (excluding those with zero contributions) are relatively uniform across occupations at around the minimum, except for Protective Service Workers.

A point of note is that median contributions, as a share of labour earnings across most occupations, is close to the minimum Superannuation Guarantee (SG) in 2013-14 of 9.25%. However, it is important to stress that SG payment made by employers is calculated as a percent of Ordinary Time Earnings (OTE), not labour earnings. OTE is what employees are paid for their ordinary hours of work and excludes payments for overtime, which are part of labour earnings.[23] This is a likely reason why estimates of superannuation contributions as a share of labour earnings are less than employer responsibilities under the SG for some occupations.

The final column in Table 4 is the average balances of members who have non-zero balances by occupation. Given the relative consistency of the superannuation contribution rates as a share of labour earnings, the distributions across occupation groups appears closely linked to average labour earnings. However, it is worth keeping in mind that these are averages across all people with non-zero balances who filed a tax return in 2013-14. As shown in Figure A.1, discrepancies in super balances become much more pronounced as people approach retirement and these balances may not reflect differences in the size of the superannuation nest egg by occupation in retirement.

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[22] Information about occupation in ALife is captured via individual tax returns.

[23] Where there are no agreed hours of work and no pattern of customary, regular, normal or usual hours, all hours worked are treated as ordinary time hours.

Table 4: Average earnings, contributions and superannuation balances in ALife2016 by occupation for those who lodged a tax return in 2013-14[a]

ANZSCO classifications and codes	Average labour earnings[a]		Proportion with no contribution[b]		Median total contribution as a share of labour earnings[c]		Average balance of members with non-zero contributions	
	Female	Male	Female	Male	Female	Male	Female	Male
	$A2017	$A2017	%	%	%	%	$A2017	$A2017
Farm managers (12)	28,589	42,604	14.6	8.7	10.3	9.3	143,000	110,000
Hospitality managers (14)	44,468	62,092	4.1	5.0	9.4	9.3	64,764	108,000
Other managers (10,11,13)	70,190	101,000	4.9	6.3	10.0	9.9	153,000	240,000
Education professionals (24)	62,491	90,620	3.1	3.4	9.6	9.4	97,370	164,000
Health professionals (25)	59,084	94,150	2.8	2.2	9.4	9.5	83,433	176,000
ICT professionals (26)	53,965	65,275	1.6	1.6	9.8	10.3	124,000	182,000
Business professionals (22)	56,046	103,000	1.2	1.9	10.6	10.3	112,000	251,000
Legal professionals (27)	70,326	86,518	2.1	2.3	9.6	9.3	111,000	122,000
Design and engineering professionals (23)	57,407	72,860	2.5	4.9	10.4	10.9	102,000	168,000
Other professionals (20,21)	44,448	53,838	6.7	7.1	9.4	9.3	75,452	111,000
Auto & engineering trades (32)	46,806	75,861	1.8	2.3	9.8	9.3	70,333	130,000
Construction trades (33)	42,625	66,055	4.5	3.7	9.1	8.7	40,090	75,553
Electrotechnology trades (34)	30,442	47,782	10.3	9.7	9.2	8.9	30,303	48,727
Food trades (35)	57,250	72,500	2.6	3.5	9.5	9.0	79,689	96,888
Skilled animal and hort. Workers (36)	31,304	39,863	7.1	7.7	9.2	9.0	30,528	37,610
Engineering and ICT technicians (31)	29,132	38,917	5.8	5.3	9.3	9.2	36,511	61,066
Other trades and technicians (39)	30,854	57,176	7.4	5.0	9.3	9.1	36,590	92,285
Health and welfare support workers (41)	38,219	50,606	2.6	2.5	10.3	10.3	53,727	96,087
Carers and aides (42)	28,436	33,407	2.6	2.7	9.9	10.0	40,057	54,504
Hospitality workers (43)	20,922	25,267	10.3	8.7	9.1	9.1	16,073	21,844
Protective service workers (44)	61,163	65,643	2.8	3.3	12.9	12.3	96,803	131,000
Sports and personal service workers (45)	29,670	42,351	7.7	8.0	9.2	9.2	44,704	66,558
Clerks and administrative workers (50-59)	40,454	60,385	4.4	4.4	9.9	9.7	87,716	132,000
Sales and support workers (60-63)	25,833	39,938	7.7	7.5	9.4	9.2	33,148	54,520
Machine operators (70-72)	48,523	74,470	4.3	2.6	9.3	8.9	51,217	90,337
Road and rail drivers (73)	45,230	55,162	5.3	5.5	9.2	8.4	44,664	75,838
Storeperson (74)	33,289	41,243	3.8	2.8	9.2	9.1	35,291	55,209
Labourer (80)	25,365	25,762	16.3	8.6	8.8	8.4	14,129	27,203
Cleaners and laundary workers (81)	24,914	29,473	6.8	8.8	9.7	9.2	31,489	40,207
Construction and mining labourer (82)	50,247	59,577	8.3	6.3	9.1	8.4	43,917	56,021
Factory process worker (83)	31,647	42,918	5.3	4.3	9.1	8.8	36,917	54,274
Farm, Forestry and and garden worker (84)	23,018	31,387	12.2	9.9	9.2	9.2	29,845	46,162
Food preparation assistant (85)	20,625	17,062	13.2	19.1	9.4	8.8	20,959	9,124
Other labourer (89)	27,507	42,180	6.1	6.5	9.3	9.0	34,888	57,180
All	42,392	65,402	4.6	5.1	9.7	9.3	76,965[e]	114,731[d]

[a]Wages and salaries and employer reportable superannuation contributions. [b]Proportion of members with positive reported wages and salaries, but with no contributions in 2013-14. [c]Includes concessional and post-tax contributions, excluding members who made non-zero contributions. [d]These are different to figures reported in Table 1because balances in this table are for those who report a tax return in 2013-14.

8. Conclusions

The generation, curation and release of ALife data to trusted users (consistent with the UK's 'Five Safes Framework' adopted by the ABS), provides researchers with new opportunities in several domains of research.[24] The key advantages of ALife over survey data are the large number of observations that allow for robust sub-group analysis; avoidance of bias in responses related to social desirability of income and wealth reporting and the inclusion of administrative information that allows for the identification of groups affected by policy changes.

This study has showcased some of these advantages. Specifically, we bring to light potential bias associated with the over-reporting of superannuation balances by males in survey data, possibly due to the social desirability of wealth. By tracking cohorts over time according to their initial superannuation balances, we show remarkable differences in accumulation and deaccumulation behaviours by initial balance levels. Most importantly, we show stark differences in average balances and draw-down behaviour between members whose balances are in the bottom quartile compared to those whose balances are in the top. Importantly, these differences are more exaggerated for cohorts at pension eligibility age. This appears to be more because those with high initial balances are more able to park their wealth in superannuation to take advantage of the concessional tax treatment of superannuation income, rather than increased savings for retirement. This is reflected by large increases in contributions in the lead-up to the pension age and low rates of complete withdraw around pension age.

Based on comparison of the ALife sampling frame with the ABS's Estimated Resident Population data, our conclusion is that the sampling frame is highly representative of the Australian Census population. Similarly, characteristics of superannuation members with non-zero balances from the 10% sample are also highly consistent with the nationally representative HILDA survey that is commonly used to report national statistics (see for example Wilkins *et al.* 2019).

ALife, like all early-life datasets, is in the process of development. Two of the key areas that will be made available in future releases are the inclusion of family identifiers and a module

[24] The 'Five Safes Framework' was devised by the UK's Office of National Statistics.

of PAYG non-lodgers. These will further expand the use of ALife as a tool for household and labour market analysis.

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Appendix A: Superannuation balances and flows over time by 30 June 2013 balance quartile

Figure A.1: Average superannuation balances 2013-2017 among members with non-zero balances on 30 June 2013 ($A'000s 2017), every second one-year birth cohort born 1936-66 by 30 June 2013 balance quartile

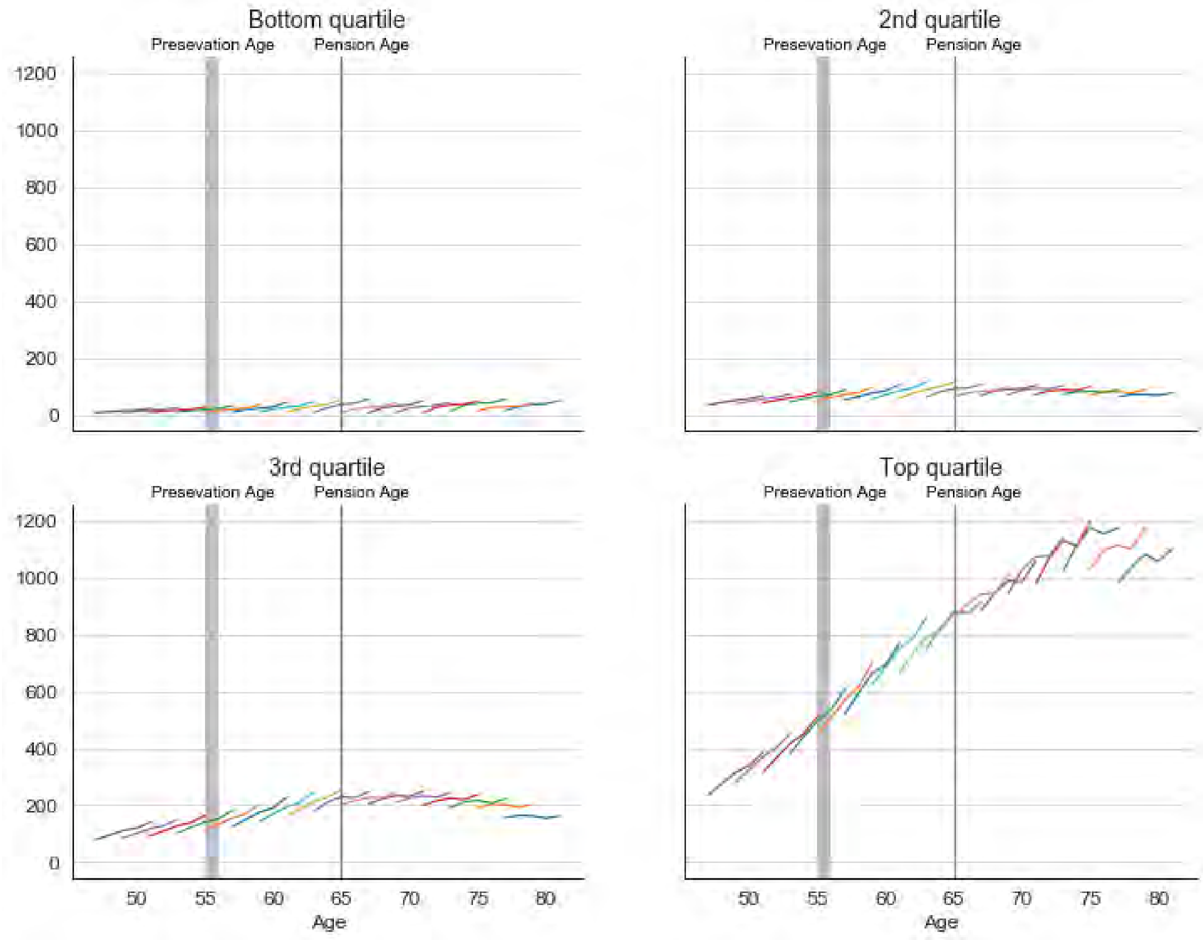


Figure A.2: Proportion of members with non-zero balances on 30 June 2013 who completely draw-down 2013-2017, every second one-year birth cohort born 1936-66 by 30 June2013 balance quartile

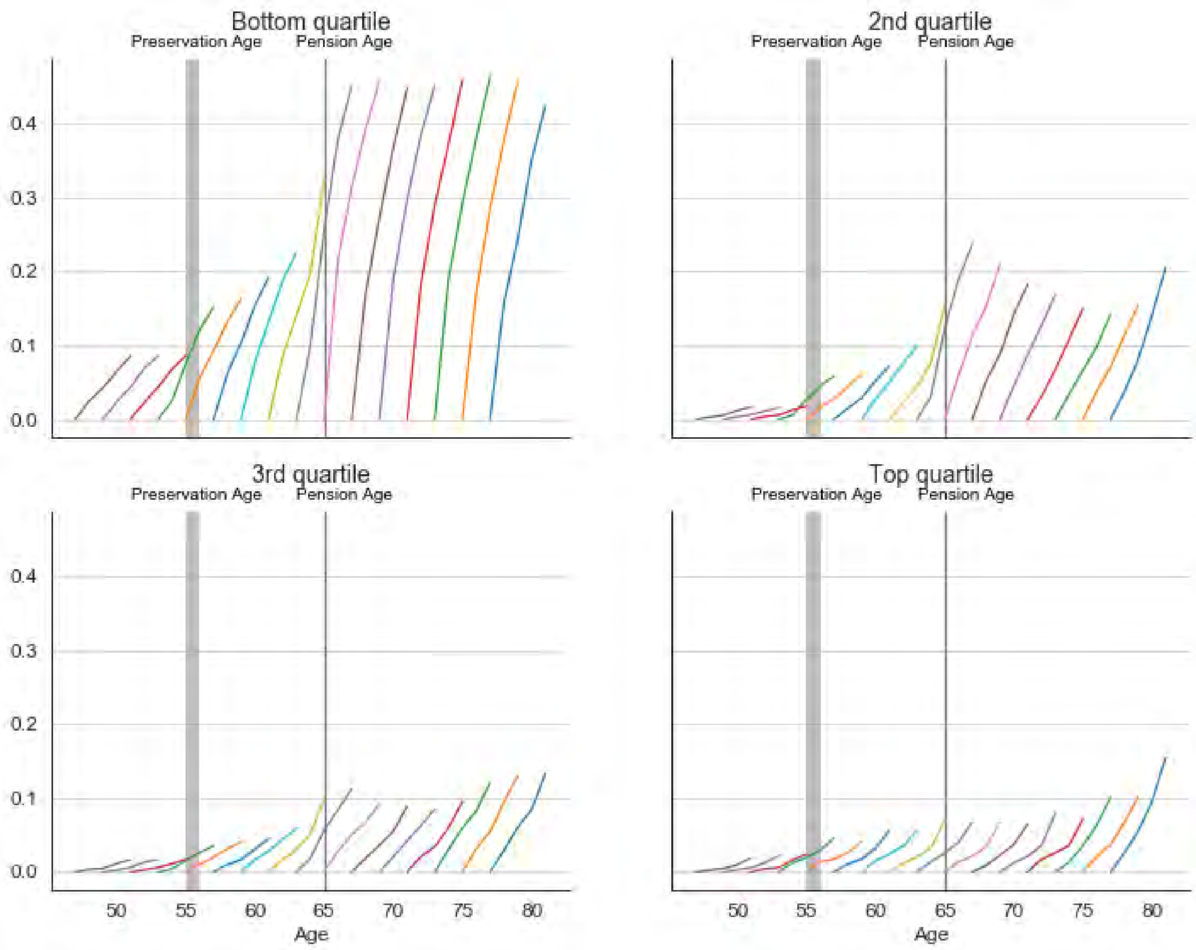


Figure A.3: Proportion of members with non-zero balances on 30 June 2013 who make superannuation contributions 2013-2017, every second one-year birth cohort born 1936-66 by 30 June 2013 balance quartile

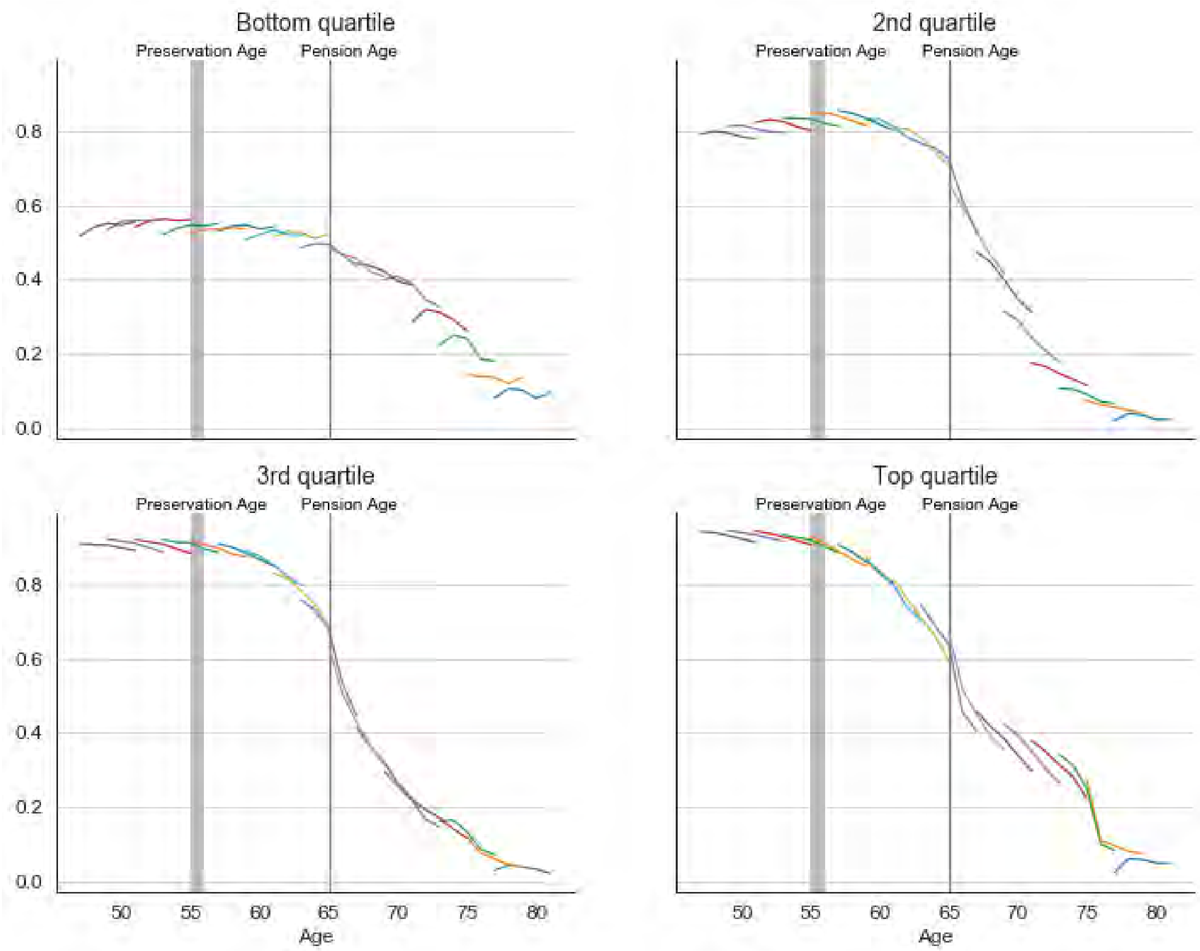
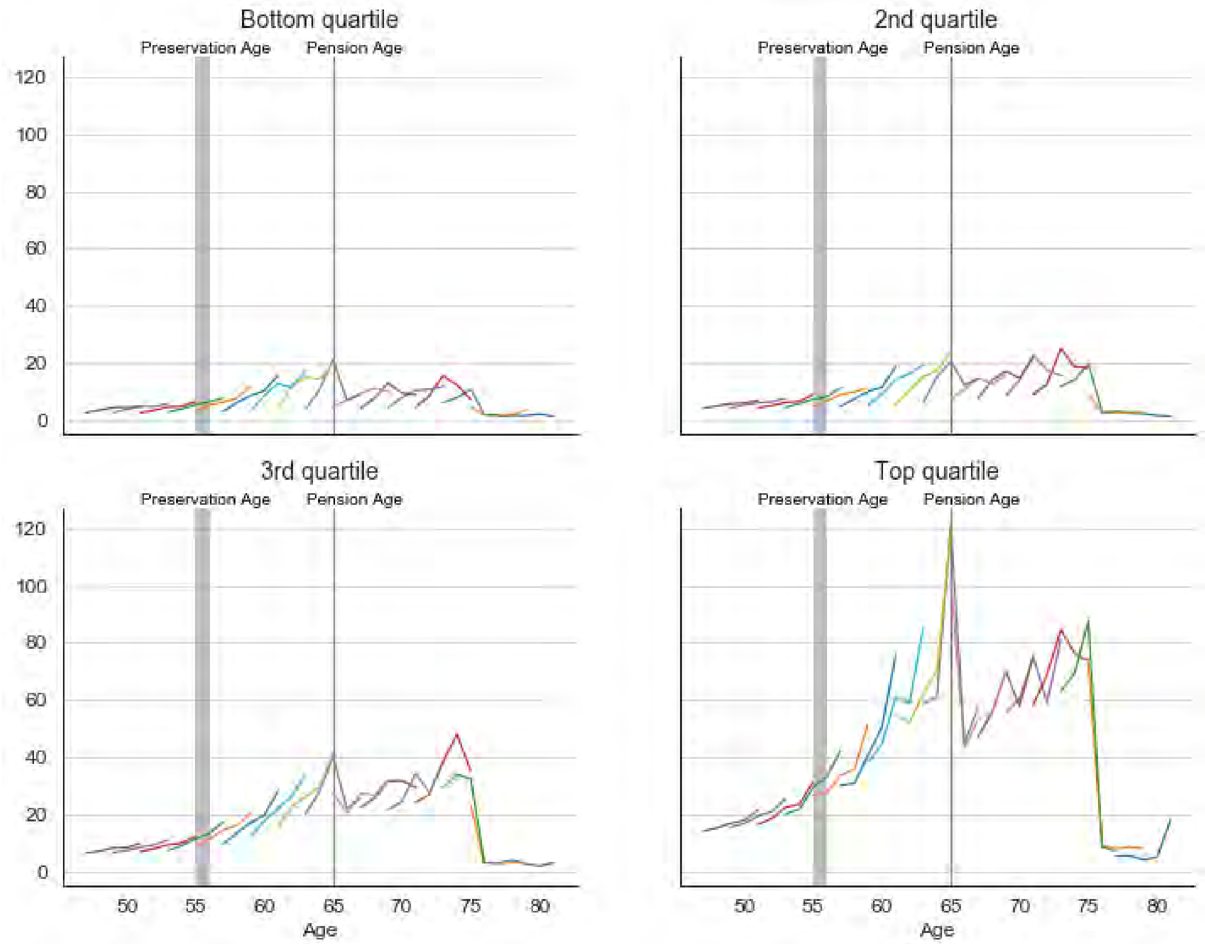


Figure A.4: Average annual superannuation contributions 2016-17 among members with non-zero balances on 30 June 2013 ($A'000s 2017), every second one-year birth cohort born 1936-66 by 30 June 2013 balance quartile



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5th Percentile

Age\Balance	Less than $20,000	$20,000 - $50,000	$50,000 - $100,000	$100,000 - $200,000	$200,000 - $300,000	$300,000 - $400,000	$400,000 - $500,000	$500,000 +
60-64	4.92%	4.24%	4.11%	4.01%	4.01%	4.00%	4.00%	4.00%
65-69	7.06%	5.02%	5.01%	5.00%	5.00%	5.00%	5.00%	5.00%
70-74	5.03%	5.02%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
75-79	6.15%	6.03%	6.02%	6.00%	6.00%	6.00%	6.00%	6.00%
80 - 84	7.37%	7.07%	7.03%	7.00%	7.00%	7.00%	7 03%	7.00%
85+	10.70%	9.15%	9.02%	9.01%	9.00%	9.03%	9 02%	9.01%

25th percentile

Age\Balance	Less than $20,000	$20,000 - $50,000	$50,000 - $100,000	$100,000 - $200,000	$200,000 - $300,000	$300,000 - $400,000	$400,000 - $500,000	$500,000 +
60-64	9.80%	9.22%	9.09%	6.40%	4.44%	4.13%	4.15%	4.04%
65-69	23 24%	10 00%	6.29%	5.24%	5.19%	5.18%	5.14%	5.06%
70-74	15.79%	6.68%	5.19%	5.15%	5.11%	5.12%	5.11%	5.04%
75-79	15.08%	7.90%	6.20%	6.14%	6.13%	6.14%	6.11%	6.09%
80 - 84	14.06%	9.26%	7.16%	7.13%	7.11%	7.11%	7.16%	7.08%
85+	20.22%	12.60%	9.17%	9.14%	9.13%	9.11%	9.15%	9.08%

50th percentile

Age\Balance	Less than $20,000	$20,000 - $50,000	$50,000 - $100,000	$100,000 - $200,000	$200,000 - $300,000	$300,000 - $400,000	$400,000 - $500,000	$500,000 +
60-64	35.68%	10 00%	9.99%	9.49%	7.73%	6.74%	6 37%	4.90%
65-69	56.95%	20.18%	10.20%	8.77%	7.49%	7.27%	6.49%	5.74%
70-74	39.55%	14.69%	8.43%	6.89%	6.30%	6.37%	6.14%	5.30%
75-79	31.25%	11 81%	8.82%	7.43%	6.96%	7.14%	6.67%	6.25%
80 - 84	22.82%	12.61%	9.47%	7.67%	7.36%	7.27%	7 26%	7.19%
85+	29.24%	16.15%	11.17%	9.54%	9.27%	9.18%	9.19%	9.31%

75th percentile

Age\Balance	Less than $20,000	$20,000 - $50,000	$50,000 - $100,000	$100,000 - $200,000	$200,000 - $300,000	$300,000 - $400,000	$400,000 - $500,000	$500,000 +
60-64	82.41%	19.78%	10.04%	10.00%	10.00%	9.96%	9 99%	7.86%
65-69	77.47%	39 39%	19.11%	13.79%	11.20%	10.23%	9 56%	8.00%
70-74	62.95%	27.74%	15.21%	11.03%	9.86%	8.98%	8.46%	7.28%
75-79	48.96%	19 59%	13.18%	10.47%	9.84%	9.48%	8 59%	7.53%
80 - 84	42.98%	17.18%	12.82%	10.96%	10.05%	9.17%	9 00%	8.43%
85+	46.39%	21.17%	15.60%	14.09%	10.17%	9.85%	9.63%	11 24%

95th percentile

Age\Balance	Less than $20,000	$20,000 - $50,000	$50,000 - $100,000	$100,000 - $200,000	$200,000 - $300,000	$300,000 - $400,000	$400,000 - $500,000	$500,000 +
60-64	97.67%	63 28%	33.84%	23.89%	21.38%	19.36%	18.29%	14 80%
65-69	96.11%	68 30%	44.56%	32.26%	24.66%	20.85%	18.66%	15.68%
70-74	89.48%	53.68%	32.51%	22.43%	18.61%	15.88%	15.01%	12.78%
75-79	81.27%	40 20%	25.62%	19.92%	16.87%	15.40%	13.01%	14 50%
80 - 84	85.26%	29 51%	24.06%	17.44%	16.14%	14.49%	15.36%	14.75%
85+	80.79%	30.71%	31.52%	26.16%	17.92%	13.09%	11.67%	21 99%

50th percentile

Age\Balanc	s than $20,	0,000 - $50,	,000 - $100	,000 - $200	,000 - $3	0,000 - $	00,000 - $500	$500,000 +
60-64	0.36	0.10	0.10	0.09	0.08	0.07	0.06	0.05
65-69	0.57	0.20	0.10	0.09	0.07	0.07	0.06	0.06
70-74	0.40	0.15	0.08	0.07	0.06	0.06	0.06	0.05
75-79	0.31	0.12	0.09	0.07	0.07	0.07	0.07	0.06
80-84	0.23	0.13	0.09	0.08	0.07	0.07	0.07	0.07
85+	0.29	0.16	0.11	0.10	0.09	0.09	0.09	0.09

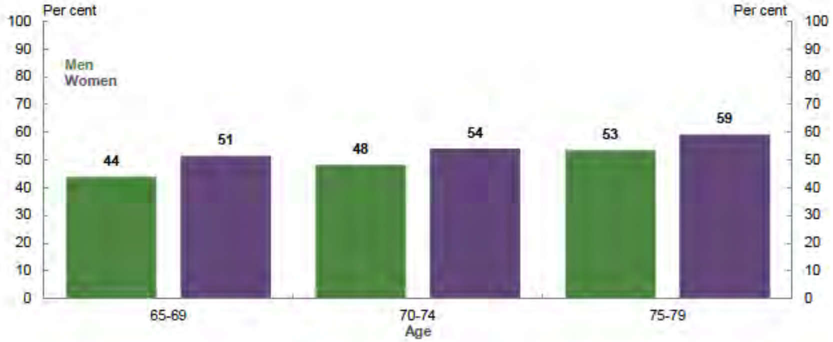
SOURCE: Rice Warner 2019 Super Insights \ Pension insights \ Drawdowns

Drawdowns

65-69	Minimum Drawdown	4% - 6%	6% - 8%	8% - 10%	10% - 12%	12% - 14%	14%+	
Male	43.86%	6.77%	10.94%	10.17%	5.84%	3.71%	18.93%	100.22%
Female	51.40%	6.82%	10.38%	9.91%	5.30%	2.98%	13.42%	100.21%

70-74	Minimum Drawdown	4% - 6%	6% - 8%	8% - 10%	10% - 12%	12% - 14%	14%+	
Male	48.27%	7.63%	12.66%	8.09%	5.29%	3.32%	14.85%	100.11%
Female	54.02%	7.19%	11.50%	7.18%	4.93%	3.01%	12.33%	100.16%

75-79	Minimum Drawdown	4% - 6%	6% - 8%	8% - 10%	10% - 12%	12% - 14%	14%+	
Male	53.35%	0.00%	12.03%	9.89%	6.00%	4.42%	14.37%	100.06%
Female	59.00%	0.00%	11.13%	10.39%	4.73%	3.11%	11.75%	100.11%



Minimum

	65-69	70-74	75-79
Male	43.86%	48.27%	53.35%
Female	51.40%	54.02%	59.00%

	65 - 69	70 - 74	75 - 79
Male	43.86	48.27	53.35
Female	51.40	54.02	59.00

Limited range of income stream products

Australians who wish to convert their superannuation assets into an income stream generally have the choice of an account-based pension or an annuity. A well-functioning market would be expected to provide a wider range of products that meet different needs and preferences. This would allow people to combine products to achieve their desired levels of income, risk management and flexibility. However, there are tax, regulatory and other impediments to developing innovative retirement income products.

Despite the heterogeneous nature of retirees, at least 94 per cent of pension assets are in account-based pensions, which provide flexibility but lack risk management features and may not deliver high levels of income from a given accumulated balance.[59,60] The lack of a significant market for products with longevity risk protection sets Australia apart from most other developed economies.[61] Evidence suggests that the major worry among retirees and pre-retirees is exhausting their assets in retirement.[62] An individual with an account-based pension can reduce the risk of outliving their wealth by living more frugally in retirement and drawing down benefits at the minimum allowable rates.[63] This is what the majority of retirees with account-based pensions do, which reduces their standard of living.[64,65] The difficulty in

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59 Plan for Life 2014, Data provided to Financial System Inquiry, 23 June 2014.

60 A measure of income from a given accumulated balance, 'income efficiency' is the expected present value of income in retirement as a percentage of a product's purchase price. The income efficiency of a 65-year-old male's account-based pension, drawn down at minimum rates, is around 70 per cent. Australian Government Actuary, Data provided to Financial System Inquiry, 11 June 2014.

61 The size of Australia's annuity market is only around 0.3 per cent of gross domestic product, compared with 28.8 per cent in Japan, 15.4 per cent in the United States and more than 40 per cent in some European countries. Organisation for Economic Co-operation and Development 2013, 'Survey of annuity products and their guarantees', paper presented at the *Insurance and Private Pensions Committee meeting*, Paris, 5–6 December.

62 More than half of the respondents to a survey were either worried or extremely worried about outliving their savings. When asked to identify the single most important feature in a retirement income product, twice as many members identified "income that lasts a lifetime" as the second most popular response. Investment Trends 2013, *December 2013 Retirement Income Report,* Investment Trends, Sydney. Note: Based on a survey of 5,730 Australians aged 40 and older. Results from another survey suggest that more than 90 per cent of Australians over the age of 50 believe that "money that lasts my lifetime" is somewhat important or very important. National Seniors Australia and Challenger 2013, *Retirees' needs and their (in)tolerance for risk*, National Seniors Australia, Brisbane, page 10.

63 The regulatory prescribed minimum rates range from 4 per cent for people aged 55 to 64, to 14 per cent for those over the age of 95.

64 Most retirees draw down their account-based pensions at the minimum allowable rates. Rothman, G and Wang, H 2013, 'Retirement income decisions: take up and use of Australian lump sums and income streams', paper presented at the *21st Colloquium of Superannuation Researchers*, Sydney, 9–10 July, page 19.

managing this risk is also exacerbated by the uncertainty as to how long a retiree will live.[66]

Rationale

The potential gains to members, the economy and taxpayers from a more efficient retirement phase are significant and warrant intervention. Higher income in retirement and a wider range of retirement income products would better meet the varied needs of retirees. The economy will benefit if the growing proportion of people in retirement can sustain their level of consumption.

Combinations of products enable retirees to balance the three desired features of retirement income products: high income, risk management features and flexibility (*Figure 9: Desired features of retirement income products*). Pooling of longevity risk would give retirees greater confidence to consume. Alternatively, by improving the superannuation system's efficiency in providing retirement income, people may be able to save less during their working lives to reach a given level of retirement income.

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65 Research suggests that these below-optimal rates result in lower welfare for individuals. Bateman, H and Thorp, S 2008, 'Choices and Constraints over Retirement Income Streams: Comparing Rules and Regulations', *Economic Record*, vol 84, pages S17–S31.

66 Although the life expectancy of a 65-year-old female today is about 89 years, 10 per cent of 65-year-old females will die before they reach 77 years and 10 per cent will live past 100 years. Even if individuals knew their life expectancy (which is generally not the case), the probability of a 65-year-old dying at a particular age is no greater than about 5 per cent. Commonwealth of Australia 2009, *Australian Life Tables 2005–07*, Canberra, using 25-year mortality improvement factors.

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s 22 [redacted]

From: s 22 [redacted]
Sent: Friday, 28 February 2020 1:39 PM
To: Retirement Income Review Secretariat
Subject: Fwd: [SEC=OFFICIAL]FW: CONFIDENTIAL: s 47G [redacted]
Attachments: s 47G [redacted]

Hi all

I thought I would share this information s 47G [redacted] as some of it was quite interesting.

s 47G [redacted]

Cheers

s 22 [redacted]

Sent from my iPad

Begin forwarded message:

> **From:** s 22 [redacted]
> **Date:** 25 February 2020 at 5:36:48 pm AEDT
> s 22 [redacted]
> **Subject: [SEC=OFFICIAL]FW: CONFIDENTIAL:** s 47G [redacted]

Slow and Steady: Drawdown Behaviours in Phased Withdrawal Retirement Income Products

Working Paper

UNSW Business School

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BActl(Hons)

Supervised by:

Associate Professor Anthony Asher

Scientia Professor Robert Kohn

Professor Denzil Fiebig

Version: January 2018

ABSTRACT

This project analyses twelve years of Australian longitudinal data on drawdowns from phased withdrawal accounts, investigating the behaviours of 44,000 retirees. The dataset used for this analysis is at an aggregate level, based on the combined data obtained from several superannuation funds operating in the industry. First, panel regression models relate drawdown rates to member characteristics. These models indicate the direction, magnitude and statistical significance of the effects of these characteristics on several dependent variables of interest. Second, a cluster analysis allocates members into distinct behavioural groups, characterised by their observed drawdowns over time. Finally, a categorical regression model determines the statistical relationships between member characteristics and the likelihood of belonging to the identified behavioural groups. Although regression models provide some insights into how members draw down their accounts, this project ultimately finds that a small number of simple drawdown strategies explain the vast majority of behaviours within these accounts. Dominant amongst these are two popular rules: adhering to the legislated minimum drawdown rates, and drawing a level dollar amount over time. Many members also make periodic adhoc drawdowns, justifying the need for some flexibility in retirement incomes. To date, the literature has focused on theoretically optimal behaviours derived from lifecycle models. However, a lack of panel data has prevented the empirical observation of these results, as well as a study into the factors which differentiate pensioners into distinct behavioural groups. Consequently, this research bridges the gap between the theoretical results and empirical behaviours. As Australia's legislative environment continues to shift in favour of more flexible arrangements for managing longevity risk in retirement, the findings from this project have important implications for policymakers, financial advisors, and retirement income product designers.

ACKNOWLEDGEMENTS

I would like to acknowledge several individuals whose contributions to this paper have been incredibly valuable.

Foremost, my supervisors Anthony Asher, Robert Kohn and Denzil Fiebig. Thank you for your limitless counsel and guiding support.

Second, I would like to thank Strategic Insight for their tremendous effort in gathering and cleaning a huge quantity of data from several Australian superannuation funds. I'm also indebted to Peter Barnes, who assisted greatly with the preparation of data and preliminary stages of the analysis.

Third, the academics and fellow research students living within the broader School of Risk and Actuarial Studies and at the ARC Centre of Excellence in Population Ageing Research (CEPAR). Amongst these, the contributions from two academics were particularly helpful: Professor Hazel Bateman, who provided extensive feedback on early drafts of several chapters, and Rafal Chomik, as discussant for my presentation at the UNSW Business School Student Research Fair. Both provided a wealth of constructive feedback, particularly in addressing the economic interpretations of results and ensuring adequate coverage of the related academic literature.

Furthermore, two members of the School of Economics were of outstanding assistance in consultations regarding the Econometric components of the methodology. Thank you to postdoctoral researchers Matias Quiroz and David Gunawan.

In addition, I would like to thank the Australian Prudential Regulatory Authority (APRA) and the Reserve Bank of Australia (RBA) for the *Brian Gray Scholarship*. APRA and the RBA established this scholarship program in memory of Brian Gray, who spent more than 20 years shaping public policy in Australia and supporting research relevant to financial institutions. I would also like to acknowledge the financial support provided by the UNSW Business School and CEPAR for their Honours Scholarships.

CONTENTS

CHAPTER 1

INTRODUCTION

This chapter motivates a research project that statistically analyses drawdown behaviours observed within account-based pensions—a phased withdrawal retirement income product.

1.1 Background

Retirement systems globally have shifted from Defined-Benefit (DB) to Defined-Contribution (DC) schemes (Broadbent et al., 2006). This move has transferred, from larger institutions to individuals, the management of longevity and investment risk inherent in producing retirement incomes. As a consequence, the modern retiree faces greater responsibility in managing risks and deriving income from their accumulated savings in retirement.

Historically offered by large corporations and the public sector, traditional DB arrangements entitled individuals to an income stream in retirement, usually by reference to a pre-determined formula (Ibid, p3). In contrast, DC funds operate by accepting contributions, generally from individuals or their employers, and subsequently investing strategically to optimise the members' risk-adjusted benefits (Ibid, p7). At retirement, individuals access their accumulated wealth stored in the fund.

Broadly, the income provided by retirement systems is based on three pillars (Bateman et al., 2016). Foremost, governments provide age-contingent—and often means-tested—welfare payments to alleviate poverty in old age. Second, governments may compel or assist individuals to save for their retirement, replacing or reducing the welfare payments required to maintain standards of living in retirement. Finally, voluntary savings behaviour by individuals accumulates assets which can provide additional income in retirement. Often, governments will provide concessional taxation arrangements to incentivise voluntary saving.

Although terminology may differ across countries, the findings of this project are applicable to all countries where DC savings form a significant component of the retirement system. Thus, where 'superannuation' or 'super' are used in this paper, the terms 'retirement savings' or 'pension system' may be substituted. In Australia, the first-pillar social security payments are known as the 'Age Pension' and are means-tested using both income and asset tests. Approximately 75% of retirees in Australia receive the part or full Age Pension (Bateman and Piggott, 2011).

This project focuses specifically on how retirees utilise second-pillar assets. This encompasses all accumulated capital residing within the tax-favourable superannuation environment. Although mandating second-pillar savings is still relatively uncommon internationally, Australia introduced this policy with the *Superannuation Guarantee (Administration) Act* 1992. Currently, 9.5% of earnings must be contributed to a nominated DC fund. For most individuals, these savings are inaccessible until retirement.

As the superannuation system continues to mature and individuals retire with higher levels of second-pillar assets, Australia represents an ideal case study in the decumulation of superannuation assets—free from selection effects that may exist in DC schemes with no compulsory retirement savings.

Ultimately, the findings from this project must be considered within the wider three-pillar context. For this purpose, Chapter 5 discusses the implications of the results and how they may interact with the other pillars.

Individuals at the threshold of retirement must decide how to access their accumulated assets. Although rules differ between countries, the choice generally lies in: deciding to convert assets into an income stream; retaining control over assets and generating income through the gradual decumulation of available capital; or some combination of the two.

Myriad income products have been suggested to assist retirees in this allocation, both in the academic literature and in practice. Broadly, the purchase of a life annuity can guarantee an income stream for life, while 'phased withdrawal' retirement income products assist in drawing down capital throughout retirement. Under this latter arrangement, which are the focus of this paper, an individual remains invested in a combination of risky and safer assets throughout retirement. To generate income, a retiree draws down their account balance over time, possibly subject to annual minimum or maximum rates.

The literature review in Chapter 2 will present a more detailed study of the options available to individuals at retirement. Generally, the allocation of assets between income streams and capital retention involves a trade-off between guaranteed lifetime income and flexible access to accumulated capital.

In Australia, the *Superannuation Industry (Supervision) Regulations* 1994 (SISR) enforces the rules applying to phased withdrawal products. Accounts opened on or after 20 September 2007 are referred to as 'account-based pensions', while 'allocated pension' is used to describe similar products existing prior to 2007. Throughout, we refer to these older products as 'legacy accounts', and accounts opened more recently as 'modern accounts'. Annual drawdowns from both account-based and allocated pensions must adhere to minimum rates, as specified in the regulations. Additionally, before 1 July 2007, legacy accounts were subject to maximum drawdown requirements.

1.2 Research Motivation

Historically, the retirement income stream products available in Australia have been restricted to traditional guaranteed term and lifetime annuities (Asher, 2015). Restrictive regulations have barred more advanced variants, such as deferred or variable annuities, from entering the Australian market. Moreover, the market for traditional annuity products was virtually non-existent in the early 2000s (Bateman and Piggott, 2011). Chapter 2 will describe many possible explanations for this lack of annuitisation from both the supply and demand side—as well as some evidence for slight growth in annuity demand during recent years.

Recently, the Australian government has removed regulatory obstacles to the development of more advanced retirement income products, such as variable and deferred annuities (Australian Government The Treasury, 2016a). Largely, this has been in response to appeals presented in the academic literature and policy research such as the Henry Review (Commonwealth of Australia, 2010). Having removed the regulatory barriers, the government intends to begin promoting hybrid products, referred to as Comprehensive Income Products for Retirement (CIPRs) (Australian Government The Treasury, 2016a). CIPRs will aim to promote longevity insurance by offering income streams in combination with the liquidity and investment freedom available in phased withdrawal products.

The development of suitable CIPRs requires inquiry into retiree drawdown behaviours, in order to understand their preferences for income, risk-management, and flexibility, which have been identified by the government as competing objectives. For instance, the design of appropriate benefit structures for retirement income products should consider whether desired income in retirement is level, increasing, or decreasing. Moreover, three-quarters of Australians regularly receive Age Pension payments, which form a longevity- and inflation-protecting income stream. Correspondingly, we can look to drawdown behaviours within account-based pensions to identify whether individuals use their liquid second-pillar assets to create their own income streams above the minimum drawdown rates. This would identify individuals who desire income streams above and beyond those already guaranteed by the government—or those who are too wealthy to obtain the Age Pension. Furthermore, examining the extent to which retirees use their account-based pensions to make adhoc drawdowns in retirement can help determine appropriate recommended levels of precautionary savings.

Academic research in the field of behavioural economics has underscored the impact of default options in decision-making (see e.g. Kahneman, 2003, p1459). Furthermore, recent work by Bateman et al. (2017) highlights that these findings are indeed applicable to individuals making financial decisions at retirement. Briefly, the findings imply that options which are given default values in product design, such as asset allocations and benefit amounts, will be gravitated towards in decision-making. In this respect, the design of default options for CIPRs requires considerable empirical research, as these defaults may determine what the majority of individuals choose at retirement. For example, within a CIPR, there may be multiple parameters to set at retirement, including a base level of income guaranteed by annuitisation, and a minimum amount of precautionary savings insured at any given time. Without defaults on these parameters, the process of committing to a CIPR may be daunting and require substantial financial advice, whereas with appropriate defaults, the majority of retirees may be automatically guided towards making prudent decisions. Moreover, the decision to select a CIPR at retirement could itself become the default option within a superannuation fund, and hence there is a considerable burden on the government and super funds to design these appropriately to meet the needs of retirees—specifically, those needs identified in the literature and in empirical analysis.

In the literature on phased withdrawal income products, Bateman and Thorp (2008) evaluate several retirement drawdown strategies that might be utilised by rational individuals, comparing them to simulated optimal behaviours. However, these results did not include the impact of the Age Pension on optimal drawdown behaviours. Empirical panel analysis of observed drawdown behaviours has the potential to extend the literature on optimal decumulation, by finding deviations from theoretical results and identifying the ways in which precautionary savings are used.

In the related literature, Asher et al. (2017) study the decumulation of total assets in retirement using panel data on a sample of retirees receiving the Age Pension. Furthermore, work by Hulley et al. (2013) and Spicer et al. (2016) similarly investigates the movement of retirement assets using the longitudinal HILDA dataset.

A gap that has remained in this literature is understanding the drawdown behaviours within phased withdrawal accounts specifically, rather than the decumulation of total assets. Due to the effect of asset allocations and investment returns on balances in account-based pensions, the true second-pillar asset drawdown behaviours have not been visible to previous researchers. As a result, our understanding of retirement decumulation behaviour has been incomplete.

Despite these motivations, existing empirical analysis on drawdown behaviours has been inadequate in meeting the above literature and policy needs, partly due to a lack of relevant longitudinal data. Poterba et al. (2013) analyse data on withdrawals from personal retirement accounts in the United States, but a lack of panel data and an inability to distinguish between regular and adhoc drawdowns limit the applicability of their results. However, large longitudinal datasets for both APRA-regulated and self-managed super funds have recently been collected in Australia, remedying the above issues. Currently, only descriptive analyses have been conducted on these datasets (see both Sneddon et al., 2016; Plan For Life, 2016), while this paper applies statistical methods in analysing the data.

In summary, the development of retirement savings systems and concomitant financial products is in a transitional phase. Globally, retirement systems are shifting from simpler arrangements, underwritten by larger corporations, to more advanced solutions, requiring retirees to take on greater responsibility for risk-management in retirement. Crucially, to design better retirement income products and provide appropriate advice, it is important to understand the empirical behaviours observed by individuals choosing to generate income in retirement through phased withdrawals from an investment-linked account. Concurrently, the literature on the decumulation of second-pillar assets is lacking a statistical analysis of the empirical drawdown data. Achieving this would enrich the empirical literature on retirement decumulation, and further bridge the gap between theory and reality. These needs, arising from contextual factors and the related literature, serve to motivate this project.

1.3 Research Aim

Consequently, this project aims to:

Identify and explain drawdown behaviours in phased withdrawal products

The impact of fulfilling this aim is two-fold. First, it will progress the academic literature on drawdown behaviours within phased withdrawal accounts, which until now has relied primarily on theoretical studies into optimal behaviours, and lacks feedback from empirical studies. Second, it will provide timely insights into appropriate policy decisions, retirement income product design, and financial advice, during a transitional period for Australia's retirement system.

1.4 Research Questions

In fulfilling the above aim, the research must address the following three questions:

1. What drawdown behaviours are observed in account-based pensions?
2. Are statistical models effective at predicting drawdown rates and behaviours?
3. Which income products and policy design recommendations would suit the identified groups of retirees?

1.5 Research Hypotheses

Existing research suggests the following hypotheses to test throughout this project.

Annual Drawdown Rates

1. Older individuals draw down less in excess of the minimum rates, compared to younger retirees
2. Individuals with larger account balances draw less in excess of the minimum rates, compared to retirees with smaller account balances

3. Females draw more slowly through their account balances than males, after controlling for factors such as account balances
4. In financial years following the GFC, drawdowns in excess of the minimum rates decreased
5. In financial years following the GFC, the temporarily lower (concessional) minimum drawdown rates encouraged many retirees who had been drawing at the previous minimum rates to reduce their drawdowns to the concessional levels

Behavioural Groups in the Drawdown Series

1. A substantial portion of retirees will draw consistently at minimum rates
2. A group will attempt to draw at a constant rate, for example 7% per year
3. Some will draw a constant nominal—not rising with inflation—dollar amount throughout retirement
4. A group will draw a constant real—rising with inflation—dollar amount
5. Some retirees will spend more than the minimum rates initially, but over time reduce drawdowns

1.6 Outline

The remainder of this paper has the following structure. Chapter 2 reviews the related literature, exploring how existing work interacts with this project and explaining the gap this research aims to address. Subsequently, Chapter 3 describes the methods used to analyse the available data, while Chapter 4 presents the research findings. Chapter 5 discusses these results in depth, highlighting the academic contributions and social implications of the findings. Finally, Chapter 6 links the results back to the research aim, questions and hypotheses, and provides a summary of the paper.

CHAPTER 2

LITERATURE REVIEW

This chapter explores key papers from the literature on retirement decumulation theory and practice, highlighting the gap this project aims to address. We begin by investigating the decumulation of assets in retirement more broadly, before honing in on drawdown behaviours within phased withdrawal accounts specifically. It is with this focus on second-pillar asset decumulation that we progress the academic literature. Finally, as the contextual motivating factors for this research include the design of more appropriate income streams in retirement, we also review the literature specific to the design of annuity products. While traditional guaranteed term and lifetime annuities are regularly available, the uptake of more advanced variants has been staggered around the world. Australia in particular has, until now, offered a restrictive environment for the development of these products, however recent legislative changes have removed these barriers.

In digesting such a broad literature, it will be helpful to borrow and extend the terminology used by MacDonald et al. (2013). Research into decumulation in retirement answers at least one of four questions: 'How Should?'; 'How Could?'; 'How Can?'; and 'How Do?'.

The phrase 'how should' will be used in reference to studies deriving theoretical, optimal behaviours that rational retirees are conjectured to exhibit. Often, a utility function underlies the derivation of these behaviours. As will be shown, these have expanded from the simpler assumptions used by Yaari (1965), which lent themselves to closed-form solutions, to more sophisticated models (e.g. in Iskhakov et al., 2015), which require simulation analysis to arrive at conclusions.

'How could' refers to the design of income products that retirees potentially could utilise in their financial decision-making. Generally, these are products that have been proposed by the literature, but are not yet offered by superannuation funds or other financial institutions.

In contrast, 'how can' describes products that are already available in the retirement incomes market. As examination of recent legislative changes in several countries will show, the 'how can' component contains a strong interaction with public policy.

Lastly, the literature investigates 'how do' retirees draw down their wealth, through statistical analysis of the empirical data on financial decisions observed in retirement. Importantly, MacDonald et al. (2013) note that the 'how do?' question has had the least attention in published papers, despite being necessary to feed back into the 'how should' and 'how could' literature. One explanation for this lack of 'how do' papers is the possible difficulty in collecting the requisite data.

2.1 Retirement Incomes and the Decumulation of Wealth

Retiree annuitisation—converting a lump sum into an income stream—has been encouraged to varying degrees by governments around the world. Some countries mandate partial or full annuitisation of DC savings at retirement, while retirees in other countries have complete autonomy over their finances—although some countries, like Australia, offer incentives for annuitisation (Mercer, 2016, p56).

These arrangements exist in a state of flux, indicating that countries are not unanimous in their response to contemporary concerns. For example, Singapore has introduced compulsory annuitisation within the last decade (Fong et al., 2010), while the United Kingdom, previously requiring annuitisation by age 75 (Emms, 2010, p176), has recently removed this regulation (Mercer, 2016, p47).

In Australia, legislation historically restricted the design of income products other than traditional guaranteed annuities and account-based pensions (Stringer, 2011; Clare, 2013). Until recently, SISR sections 1.05 and 1.06 required that account balance products must pay at least the legislated minimum drawdown rates, and that income stream products must pay a predetermined amount annually for the life of the holder (Stringer, 2011; Australian Government The Treasury, 2016b, p9).

In response to continued criticism, the Australian government committed to effecting meaningful change in its 2016 Federal Budget. In particular, they proposed the removal of barriers to freedom in the design and implementation of more advanced annuity and pension products (Australian Government The Treasury, 2016b). These legislative changes have since been enacted, and as noted in Chapter 1, the quest for superior income products is supported by the Australian government through its development of CIPRs.

While legislators have engaged with the influence of regulations on the breadth of the annuity market, the academic literature has continued to explore retiree attitudes towards annuitisation. In particular, a commonly quoted conundrum is the low levels of voluntary annuitisation observed in most countries throughout the second half of the 20th century. To contextualise the issue, it should be noted that one of the contributions of Yaari (1965) was to conclude that a rational individual—conforming to several restrictive utility assumptions, including a lack of bequest motive—should convert all wealth at retirement into a guaranteed lifetime annuity. Brown (2009) and Benartzi et al. (2011) cite Modigliani's 1985 Nobel Prize acceptance speech, revealing that the annuity 'puzzle'—a shortfall in annuitisation behaviour, relative to the expectations from the literature—has been known for several decades. This dearth in annuitisation continued to be observed after the turn of the century: in the United States (see e.g. Mitchell et al., 1999; Brown, 2009); in Australia (Bateman and Piggott, 2011); and generally, around the world (see e.g. James and Song, 2001).

A wide range of rational explanations for this departure from the original theory is summarised by Brown et al. (2008). Broadly, these justifications conclude that traditional annuity products may not meet the needs of a rational retiree due to a variety of possible factors, including: bequest motives; the need for liquidity and precautionary savings in retirement; and pre-existing annuitisation provided by public welfare systems.

Research into rational reasons for low annuity demand has shown that these do not entirely explain annuitisation behaviour. For example, Lockwood (2012) compares the results of a simulation study with empirical data to determine the validity of the bequest motive as a determinant of annuitisation decisions. Whilst the simulation results imply that bequest motives should be a significant factor, when analysing the data, individuals with strong bequest motives exhibited very similar rates of annuitisation to those with weak bequest motives. Lockwood notes that this is broadly consistent with the findings of Brown (2001), discovering that individuals self-reporting a higher level of importance placed on leaving a bequest did not annuitise their DC fund balances at significantly lower rates.

Indeed, Brown (2009) suggests that the explanations for low annuitisation rates need not assume individuals are behaving rationally. Some behavioural hypotheses for low annuitisation levels explored are:

- The framing effect—whether annuities are presented as an investment decision, or a consumption guarantee
- Complexity and financial literacy—Lusardi and Mitchell (2007) show evidence that retirees do not have the financial literacy required to deal with the complex financial decisions retirement now presents
- Mental accounting and loss aversion—individuals consider an annuity as wasted capital in the scenario where they die younger than expected
- Misleading heuristics—individuals view insurance as protection from adverse outcomes, but struggle to consider living 'too long' as the adverse scenario in retirement
- The illusion of control—believing that retaining control over one's assets will improve financial security in the future

Brown et al. (2008) study the framing hypothesis by presenting participants with actuarially equivalent choices, differing only in their framing. Their results found that framing annuities as investment decisions reduces their appeal, whereas presenting them as consumption guarantees makes them more attractive.

Considering the literature on behavioural impediments to annuitisation, and despite the low levels observed, Benartzi et al. (2011) ultimately find evidence that individuals value and even prefer annuities—when the underlying conditions are right. In addition to having enough accumulated capital to make an annuity purchase worthwhile, the option must be presented at the appropriate age, and with the right framing.

Extending this literature, Beshears et al. (2014) study survey data on hypothetical annuity purchase decisions. The results suggest that partial annuitisation is preferred to complete or no annuitisation, and that products which can provide additional choice and flexibility are more popular—for example, an annuity which provides a bonus payment during one month each year. Furthermore, they confirm the findings of Brown et al. (2008) regarding the significance of the framing effect: ignoring the implied investment returns generated by annuities increases their appeal.

Thus there have been attempts to justify low annuity demand using rational reasons, as well as by investigation of relevant cognitive biases. At least in Australia, however, the literature has identified evidence of an increase in annuity demand in recent years (Iskhakov et al., 2015, citing Plan For Life, 2014). Indeed, an inspection of recent annual and interim reports issued by Challenger, one of Australia's life insurers, evidences growth in annuity sales (see e.g. Challenger Limited, 2016, 2017a).

The culmination of these theoretical studies and empirical observations has been an expansion of the factors considered in the decumulation phase by theoretical lifecycle models. For example, Iskhakov et al. (2015) complete a comprehensive analysis of optimal annuitisation under a range of scenarios, by running simulations against a more sophisticated stochastic lifecycle model. One key contribution from this paper was a consideration of how access to means-tested social security payments—in Australia, the 'Age Pension'—crowd low-wealth households out of the annuity market completely.

Moreover, research by Bateman et al. (2017) has engaged directly with the hypothesis that cognitive biases influence financial decisions in retirement. As mentioned in Chapter 1, this study highlights the significant role that default options play in guiding the choices individuals make with regard to annuity choice. Specifically, Bateman et al. find that when allocating assets between life annuities and account-based pensions, individuals generally prefer some combination of the two. Crucially, certain types of people prefer to stick with the default allocation presented to them, while others follow simple heuristics (rules of thumb): either a 0–100%, 50–50% or 100–0% split. In this project on drawdown behaviours in phased withdrawal accounts, we similarly investigate the impact of default options and simple heuristics on behaviours—within account-based pensions, specifically.

Goda and Manchester (2013) draw similar conclusions regarding the powerful effect of default options in determining the choice of retirement fund. Where individuals are given a choice between a DB or DC fund to accumulate wealth for retirement, encountering a DC plan as the default option made individuals 60% more likely to 'choose' the DC fund.

Although DC schemes are becoming the standard for the accumulation phase of retirement, these increase the risk-management responsibilities of individuals—and not only during the decumulation phase. Ganegoda and Evans (2017) develop an economic scenario generator to observe the impact of shocks to investment returns within DC accumulation funds, specifically accounting for the possibility of low-frequency, high-impact market shocks. Depending on the timing of retirement relative to these shocks, individuals with otherwise similar accumulation behaviours can experience large differentials in wealth at retirement. To protect against this downside risk, they recommend option-like portfolio insurance strategies within the accumulation funds.

Furthermore, second-pillar asset decumulation behaviour is closely linked to the means-testing applied in determining eligibility for first-pillar safety nets such as Australia's Age Pension. Hulley et al. (2013) study this interaction by first simulating optimal asset decumulation strategies in retirement in the presence of the means-tested Age Pension, and subsequently investigating the empirical experience using the longitudinal HILDA dataset. Simulations suggest that individuals who are close to or within the eligibility criteria for receiving means-tested public pensions should decumulate their assets faster, and place a higher proportion of their wealth into risky assets. In this way, they maximise their entitlements to first-pillar income, while the government underwrites their private asset investment risk. Indeed, empirical data analysis confirms these theoretical results. Moreover, decumulation overall occurs at modest levels for less well-off retirees, while wealthier retirees tend to accumulate in early retirement by adoption of riskier investment strategies. Evidence emerging from the United Kingdom also shows that, far from beginning to decumulate immediately, more than 75% of individuals continue to increase their savings after retirement (Brancati et al., 2015).

In the same stream of literature, Asher et al. (2017) apply regression models to longitudinal data from Australian social security—'Centrelink'—payments to 10,000 Age Pension recipients. Overall, consumption appears to have been conservative, with a majority of pensioners passing on significant bequest sums on death. Further, the data show that consumption declined with age, instead of increasing in line with expectations of rising medical costs. Many pensioners even continued to accumulate in the early stages of retirement, a finding which resonates with that of Hulley et al. (2013) and Brancati et al. (2015) above. Asher et al. conclude that if bequest and precautionary motives are ignored, most pensioners could currently afford to spend more without exhausting their savings during retirement.

Critically, the Centrelink dataset is subject to a selection effect, only sampling from individuals receiving welfare payments. Additionally, the treatment of superannuation assets by the sampled individuals was not visible, which is the focus of the present study. Consequently, it will be insightful to compare the findings of this project, utilising a panel dataset on account-based pensions, with the findings from social security recipients above.

Interestingly, the effect of health and ageing shocks on retirement wealth depends greatly on country-level effects. This is made clear on comparing two similar studies on the evolution of household wealth throughout retirement: in the US by Coile and Milligan (2009); and in Australia by Spicer et al. (2016). In the US, the effect of health-related shocks has a significant impact on retirement wealth, and results in retirees liquidating housing and other assets. In contrast, Australians are impacted much more lightly by shocks to health, attributed to a more generous subsidised public healthcare system. Furthermore, Australians prove very reluctant to release housing wealth. Spicer et al. (2016) note also that a Dutch study by Van Ooijen et al. (2015), in which retirees face a similarly generous healthcare system, mirrors the Australian case, rather than that of the US.

2.2 Drawdown Behaviours in Phased Withdrawal Accounts

Of direct interest to this project is the existing body of theoretical and empirical work investigating the drawdown of second-pillar assets, especially within phased withdrawal products. Specifically, analysis of post-retirement drawdown habits is crucial for informing better financial management, product creation, and government policy design (Plan For Life, 2016).

Studies into how retirees 'should' draw down from phased withdrawal products can be traced back at least to the second "Pensionmetrics" paper from Blake et al. (2003). This paper was strongly tied to the regulatory situation effective at the time in the United Kingdom. Specifically, by age 75, retirees were required to annuitise any remaining balance within their DC fund accounts. Between regular retirement and age 75, individuals were able to use their retirement savings with greater freedom, including the ability to open a phased withdrawal account, similar to Australia's account-based pensions.

Blake et al. (Ibid) compare three options for an individual retiring at age 65: purchase of a level annuity for life; purchase of an investment-linked annuity until age 75, at which time the remaining value was converted to a lifetime annuity; or opening a phased withdrawal account and drawing down to generate income until 75, when the balance would be similarly converted to a lifetime annuity. Instead of searching for optimal drawdown strategies within the phased withdrawal product, however, the paper concludes that broadly equivalent outcomes can be generated within each of the three options considered, by varying the individual's exposure to equity returns in retirement. Additionally, within the latter two options, the age to annuitise is varied in an attempt to find the optimal annuitisation age. However, the observation that risk appetite—the willingness to expose oneself to risky returns—determines one's behaviour is important, and is a factor which we consider in this project.

With an increased interest in phased withdrawal products specifically, Horneff et al. (2008) adopt a utility-based framework with stochastic return rates and retiree lifetimes, to compare three drawdown strategies alongside the level payments implied by a guaranteed lifetime annuity. The strategies include: drawing a fixed proportion of the account balance annually; drawing a proportion equal to $1/T$, where T is defined as the theoretical maximum remaining lifetime; and drawing $1/E[T]$, where $E[T]$ is the new remaining life expectancy at each surviving year. Ultimately, Horneff et al. reposition their findings to seek the optimal age to annuitise, which is of less interest to the current project. An introduction of their aims, however, is instructive before reviewing the superseding work by Bateman and Thorp (2008).

Bateman and Thorp, similarly considering the above strategies within a stochastic lifecycle model, extend the work of Horneff et al. by including, as competing strategies, the newly-legislated set of minimum drawdown rates applying to account-based pensions in Australia. These begin at 4% for retirees under 65, and increase progressively with age in seven stages, reaching a maximum of 14% for individuals 95 and older. As a result, each strategy, including drawing at exactly the Australian minimum drawdown rates, could be directly compared with optimal drawdown behaviours, derived by simulation from the assumptions placed on an individual's utility function. On balance, the authors find that the legislated minimum drawdown rates are relatively close to the optimal behaviours. In many scenarios, however, a fixed-percentage drawdown rule increases simulated utility. Hence the literature on optimal drawdown behaviours in phased withdrawal products progressed substantially in the 2000s.

Despite this progress, a similarly substantial branch of literature into the empirical experience in phased withdrawal accounts has not yet emerged. Some attempts have been made, however these have not been adequate in fulfilling the needs outlined in Chapter 1, arising from the literature and from policymakers. Furthermore, there remains a gap where one would expect research providing the necessary link between the theoretical literature and reality.

Perhaps the attempt which has come the closest is the research by Poterba et al. (2013) into drawdowns from personal retirement accounts in the United States. Poterba et al. ran several statistical models to fit various dependent variables in the observed data. These included not only the drawdowns as both dollar amounts and proportions of account balances, but also binary choice models to estimate the probability that an individual makes any drawdown, in years where this is not compulsory.

Critically, the research by Poterba et al. was limited by two key factors. Firstly, the data available did not observe individuals over the duration of their sample period, and so several cross-sectional or shorter-panel datasets through time were pooled to create a "synthetic" panel (p7). As a result, the methods employed were unable to control for any unobserved heterogeneity in drawdown behaviours of individuals. Furthermore, drawdown behaviours, as they are defined in the context of this project, are observed over time, and not solely at one point in time. Achieving this research goal requires a panel dataset, tracking individuals over longer time periods. As will be detailed in the methodology, the panel dataset utilised by this project is an advancement in this respect. Secondly, the results of Poterba et al. do not differentiate between 'regular' drawdowns, which are nominated to be received over time as an income stream, and 'adhoc' drawdowns, which an individual can commute from their account balance to meet larger or unexpected costs. This desirable feature is another characteristic of the newly-available data. Consequently, it is argued that the literature requires a paper to fill the gap left by Poterba et al.

To the best of our knowledge, since 2013 there has not been a statistical attempt to complete this stream of the literature. Recently, a longitudinal dataset has been made available, but to date, only descriptive analytics have been performed on it, by Plan For Life (2016) and Sneddon et al. (2016). The former considers the data from APRA-regulated funds, while the latter analyses the data on self-managed super funds.

The Plan For Life report on superannuation fund data showed that in approximately 50% of cases, drawdown was done at the minimum level. The report also found that in the year preceding death, drawdown often became rapid and unsustainable, possibly to fund out-of-pocket medical expenses, suggesting a need for more long-term health and longevity insurance solutions. Notably, Plan For Life recognised the need for further work to be carried out on their data. Broadly, Sneddon et al. mirror the findings above, with most retirees in their 60s and 70s drawing close to the minimum amounts each year.

Despite reporting on the aforementioned panel dataset, the above sources lack a rigorous statistical methodology, instead limiting the analysis to descriptive statistics and summary data. Furthermore, there has been no attempt to exploit the panel nature of the data to identify patterns in the drawdowns over time. The benefits of estimating statistical models are twofold: it is possible to conduct robust inference on the statistical significance and signs of the parameters corresponding to all observed characteristics of the individuals; and models which prove successful at predicting out-of-sample results can be used to estimate the drawdown behaviours of retirees not captured in the panel. Hence our project remedies this gap in the empirical literature.

Consequently, this research contributes to two streams of literature. The first is the theoretical literature on drawdown behaviours in phased withdrawal accounts, which this research extends by exploring how observed drawdown patterns relate to the theoretical results. Second, the findings from this project complement other work in the empirical literature on the decumulation of wealth in retirement, including the Centrelink data analysis by Asher et al. (2017), as well as analysis of HILDA data by Hulley et al. (2013) and Spicer et al. (2016). Where these other studies have been unable to observe the rates at which retirees draw down their second-pillar assets within phased withdrawal accounts, we study this aspect of decumulation specifically. As a result, a richer view of the financial experience of retirees in Australia emerges.

2.3 Advanced Annuity Products

This section of the literature review serves to construct an image of what a developed market for retirement income products might resemble. In particular, one question underpins all the following papers: in theory, how 'could' retirees generate income from their accumulated wealth?

While the design of advanced retirement income products in Australia has been restricted in the past, other countries have successfully been using advanced products to manage the risks and meet the financial requirements of retirees, especially in the US, Asia and Europe (Asher, 2012; Clare, 2013; Institute of Actuaries of Australia, 2014). The Institute of Actuaries of Australia outlines the defining characteristics of several of these proposed solutions, including: Pooled Annuities and Group Self-Annuitisation Products (GSAs); Guaranteed Lifetime Withdrawal Benefit (GLWB) riders on Variable Annuities (VAs); With-Profit Annuities (WPAs); and Deferred Lifetime Annuities (DLAs). Three other noteworthy product designs, not included in the Actuaries Institute review, are: the Life Care Annuities suggested by Wu et al. (2016); the Longevity-Indexed Lifetime Annuities proposed by Denuit et al. (2011); and the Longevity-Indexed Deferred Annuities also from Denuit et al. (2015). The remainder of this section will provide an overview of the characteristics of these proposed products.

Qiao and Sherris (2013) extend the idea of GSA schemes introduced by Piggott and Detzel (2005), providing solutions to some shortcomings of the initial presentation. GSAs allow individuals to pool capital up-front, and use this capital to make regular annuity payments to surviving members, while funds suffice. In their original specifications, GSAs suffered from the limitation that as the pool matured, its size naturally shrank due to the death of self-annuitants. Correspondingly, the reduced pool size increased the variability of the received payments over time. Critically, one of the main motivations for annuitisation—longevity insurance against outliving savings—was undermined by GSAs, as the longest-surviving pool members became increasingly likely to exhaust the funds in the pool in the presence of high longevity experience.

Notably, Qiao and Sherris use simulated pool dynamics to suggest two simple improvements. First, the authors show that increasing the pool size is very effective at reducing the late-life benefit payment volatility. Second, and more significantly, allowing new cohorts to join the pool after commencement of the original scheme has a similar effect in the reduction of payment volatility for the longest-surviving members, and reduces the expected drop-off in benefit payments in the presence of improving longevity.

The contribution of Donnelly (2015) was to provide a detailed comparison of the Group Self-Annuitisation (GSA) scheme, the Pooled Annuity Funds (PAFs) of Stamos (2008), and the Annuity Overlay Fund (AOF) of Donnelly et al. (2014), which achieve similar risk-sharing goals through different mechanisms. In particular, Donnelly highlights conditions under which actuarial fairness is attainable for each style of annuity product, which serves to increase the desirability of the product to consumers.

As an alternative to risk-sharing by the pooling of funds by individuals, payments from an annuity provider can be indexed in reference to relevant characteristics. Existing papers by Denuit et al. (2011) and Richter and Weber (2011) argue that indexing variable annuity payments to longevity trends is one solution in managing longevity risk. Under this arrangement, some or all of the systematic risk component is shared between the insurer and the annuitants. Importantly, the annuitant still retains protection against outliving their assets, but benefits from a lower product cost due to the insurer's reduced capital requirements.

Denuit et al. (2015) also explore the impact of indexing the deferment period on longevity products such as deferred life annuities and reverse mortgages. In effect, this makes the sharing of longevity risk an intra-, rather than inter-, generational cost, with the insurer bearing interest rate and any idiosyncratic risks, and annuitants pooling their systematic longevity risk.

In contrast, annuity benefits can instead by indexed to the investment performance of a reference portfolio, allowing annuitants with higher risk appetites to link their benefit payments to the returns of risky assets.

Milevsky (2013) provides a comprehensive overview of this type of investment-linked variable annuity. Where sold, investment-linked annuities compete directly with phased withdrawal account-based products. While both investment-linked annuities and phased withdrawal accounts allow the satiation of risk appetite—resulting in periods of greater consumption when investment returns are favourable (and vice-versa)—investment-linked annuities forego access to a larger, liquid stock of wealth, in favour of guaranteed longevity insurance.

An individual need not necessarily choose only one of these two desirable features, however. A rider—an optional 'add-on'—increasingly common to investment-linked annuities are known as GLWBs—Guaranteed (Minimum) Lifetime Withdrawal Benefits (Ibid). For an additional cost, these riders insure a minimum level of liquid capital that can be accessed throughout the duration of the contract, creating a product which forms a compromise between investment-linked annuities and phased withdrawals.

Finally, in countries where healthcare and long-term care expenditure is insufficiently subsidised by the government, these costs may be a significant motivator for conservative consumption in retirement (De Nardi et al., 2015; Wu et al., 2016). A product proposed by Wu et al. is the 'Life Care Annuity', which combines the benefits of a traditional guaranteed lifetime annuity with insurance against late-life healthcare expenditure. The results indicate that this specification would increase the attractiveness of annuitisation, although the impact is contingent on the adequacy of a country's public healthcare system.

Consequently, following recent legislative changes, the Australian superannuation system is well placed to benefit from the design and implementation of more advanced retirement incomes solutions. Globally, nations are at different stages in the development of decumulation options and retirement income product markets. As these markets continue to mature, the literature surveyed suggests myriad products tailored to meet the heterogeneous needs of individuals in retirement.

2.4 Summary of Literature Review

The relevant literature on retirement savings and spending answers four questions: how retirees should, could, can, and do, draw down on their accumulated wealth. Moreover, this chapter has made clear that none of these streams exist in isolation. Instead, there is a complex interplay between all four questions.

Papers in the literature on optimal behaviours—'how should'—can be motivated by empirical observation—'how do'—or by government policy and the resulting development of financial markets for relevant insurance products—'how can'. The findings from the optimality literature, however, require the collection of richer data to test new hypotheses and identify the deviations from results derived by simulation against utility frameworks.

Legislation may take time to adapt to the rapid pace presented by the literature, but this conservative position may protect individuals from false positives or misconstrued results. Notably, different countries contend with a diverse range of contextual factors, and it is clear that responses to the challenges of population ageing are contentious and equally varied.

Ultimately, this chapter shows that a key gap in the literature remains to be filled. To date, theoretical work has studied optimal behaviours in phased withdrawal accounts in isolation from the impact of the Age Pension. Until now, empirical studies on retiree drawdowns from phased withdrawal products have been unable to provide adequate insights into the true behaviours within these accounts. Understanding these behaviours is critical as policymakers and financial product designers continue developing the menu of financial options available in retirement. In particular, they require a better understanding of how individuals prefer to draw down their second-pillar assets, which the existing decumulation literature has been unable to provide. An area of interest is the extent to which retirees need the flexibility of holding reserves of liquid capital while still deriving a stream of income, as phased withdrawal products allow. Moreover, CIPRs may contain default options—for example, regarding the allocation of superannuation assets to income streams and precautionary savings. Due to the power of defaults in gravitating individuals towards predetermined options, it is critical that these defaults be informed by empirical data.

CHAPTER 3

METHODOLOGY

This chapter presents three methodological components—panel regression models, cluster analysis and a categorical regression—that make effective use of the large panel dataset available. The first component focuses on how retiree characteristics influence drawdown rates at individual points in time; the second component segments panel members into distinct behavioural groups; and the third component investigates the characteristics that are significant in determining which group an individual belongs to.

3.1 Definitions

In this study, 'drawdown' refers to the withdrawal of account value—measured over a complete financial year. We classify drawdowns along three dimensions:

1. Amount or Rate
2. Nominal or Excess
3. Regular or Adhoc

Drawdown 'amounts' are the dollar figures withdrawn from the phased withdrawal account. The corresponding 'rates' are calculated by dividing the amount drawn down by the account balance at the beginning of the corresponding financial year.

$$\text{Drawdown 'rate'} = \frac{\text{Annual drawdown amount}}{\text{Account balance at financial year start}} \tag{3.1}$$

This convention for calculating annual drawdown amounts and rates aligns with the method used to determine the minimum annual drawdown requirements, as specified in the SISR.

These nominal amounts and rates must satisfy the legislated minima. We define 'excess' drawdown as the difference between the nominal drawdown and the corresponding minimum required. Note that since 1 July 2007, there has been no upper limit on the drawdown rate.

Prior to 1 July 2007, the minimum drawdown rate changed for each year of age up to age 100. SISR schedules 1A and 1AAB contain these tables. In 2007, the government simplified the minimum drawdown rates, leaving the more parsimonious rules contained in Table 3.1.

As made evident in Chapter 4, during financial years 2008 and 2009, adverse economic conditions significantly eroded account balances. To ameliorate the impact on retiree savings held in account-based pensions, the government introduced concessional minimum drawdown arrangements for several years following. In financial years ended 30 June 2009–11 inclusive, the concessional rates were 50% of the usual rates, while in financial years ended 30 June 2012 and 2013, the concessional rates were 75% of the usual rates. For example, a retiree aged 65 on 1 July 2012 faced a minimum drawdown rate of 3.75% for financial year 2013. The following year, their minimum drawdown rate was 5%.

Finally, retirees can nominate, in advance, the amounts and frequencies of the payments to be drawn from their account-based pension. We refer to this prospective drawdown allocation as the 'regular' drawdowns. One of the benefits of a phased withdrawal retirement income product—as compared to, say, a guaranteed or term life annuity—is the ability to withdraw lump sums at any point within the year, above and beyond the nominated pension payments. We call these drawdowns 'adhoc'.

3.2 Data Preparation

Several super funds provided data at the level of granularity required to support all three components of this methodology. Strategic Insight collected and cleaned the data as part of an ongoing survey initiated by the Institute of Actuaries of Australia. Subsequently, we combined the data to produce the aggregate dataset for analysis. We intend the sample used in this project to be representative of the population of Australian retirees holding phased withdrawal accounts in APRA-regulated superannuation funds.

The dataset analysed was extracted from the available data by taking panel members from two 'entry' cohorts: those observed from the financial year ended 30 June 2004; and those commencing accounts in financial years 2009–11, inclusive. The former represents the earliest available data provided by this fund, while the latter contains data for the newest 'type' of account—those opened on or after 20 September 2007. The first complete financial year observed for these new accounts commenced 1 July 2008 and ended 30 June 2009.

Table 3.1: Minimum Drawdown Rates – Effective Since 1 July 2007

Age	<65	65–74	75–79	80–84	85–89	90–94	95+
Minimum Drawdown Rate	0.04	0.05	0.06	0.07	0.09	0.11	0.14

As the cluster analysis relied heavily on observing as many drawdowns as possible over time for each individual, and since the observation period ended in financial year 2015 for all remaining members, aligning the first years of observation for members within each of the two account types maximised the number of time periods available to compare and contrast individual drawdown behaviours.

As individuals are free to transfer superannuation assets between competing funds, sample exit could occur for at least three reasons:

1. Death
2. Complete withdrawal of account balance
3. Transfer to another fund

We dealt with the first reason for exit by removing all individuals who died while under observation. We assumed that proximity to death has the potential to influence drawdown behaviours, and preferred to focus on the behaviours of surviving retirees in this study. The data for those dying in sample exists in a separate dataset for future analysis.

Secondly, a complete withdrawal of account balance was a behaviour of key interest, and so these individuals remained in-sample. We also retained retirees transferring to another fund in the sample, and study their behaviours while observed.

Overall, this resulted in a sample size of approximately $N = 44,000$ individuals, each observed for $T \in 1, 2, ..., 12$ years.

With account data provided in monthly records, a 'risk appetite' metric could be computed. Comparison of the monthly account investment returns with the S&P/ASX200 index showed extremely high correlation, confirming that investments in Australian equity drove a significant portion of account balance movements—or that where individuals had investments in other markets, these had a high correlation with Australian equity returns. In addition, retirees can customise their investment allocations, varying the proportions they hold in safe and risky assets away from fund defaults. We defined risk appetite as the magnitude of the average ratio between investment returns and corresponding index returns:

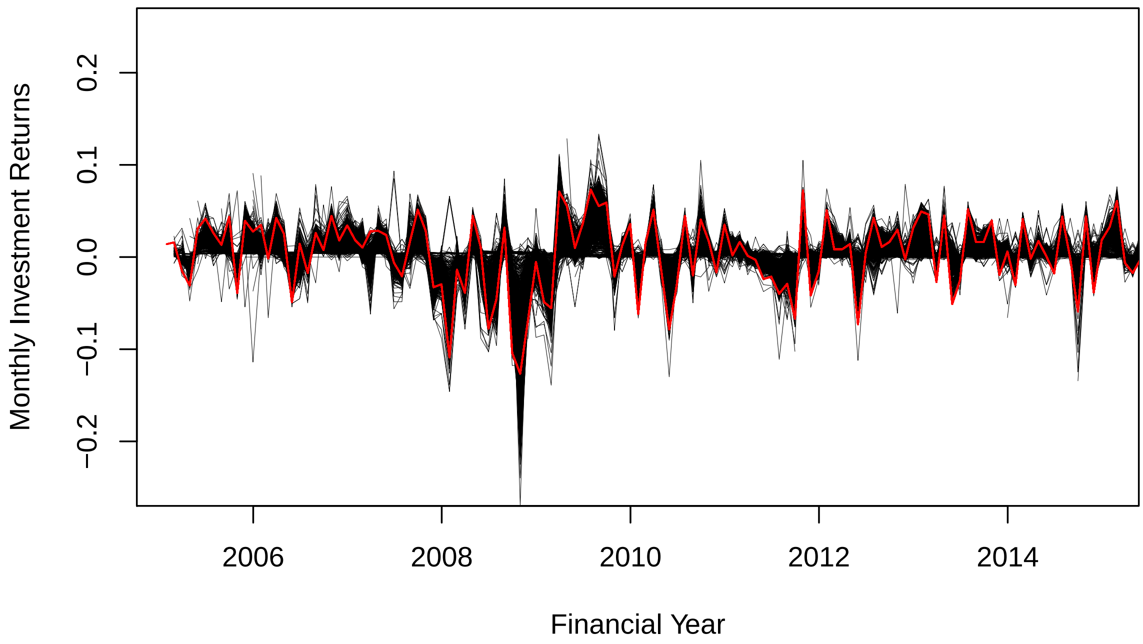
$$\text{Risk appetite} = \left| \text{average} \left(\frac{\text{Monthly investment returns in account}}{\text{Corresponding monthly S\&P/ASX200 index return}} \right) \right| \tag{3.2}$$

In this way, high risk appetites correlate with larger equity exposures, while low risk appetites represent smaller returns over time from less variable assets.

For illustrative purposes, Figure 3.1 plots a sample of individual investment return series against the S&P/ASX200 in red.

Other key data manipulations included aggregating the monthly data to 12-month periods corresponding to complete financial years, and transforming variables of interest using the natural logarithm (log) function for modelling purposes.

Figure 3.1: Monthly Investment Returns



3.3 Component 1: Panel Regression Models

The aim of this component of the methodology is to estimate the effect of the available regressors on an individual retiree's propensity to draw down from their account-based pension. Regression models achieve this by estimating coefficients for each included regressor, and observing their signs, magnitudes and statistical significance. The economic interpretations of interest are, for example, whether drawdown rates or decisions are significantly influenced by the available regressors—such as age, gender and account balance. In particular, regression analysis reports on the effects of regressors after controlling for the values of other included variables. This can disentangle the effects of regressors that are mildly correlated with each other and influence the dependent variable of interest.

Certain regression models can utilise the additional information inherent in data that observes panels—in our case, individual retirees—over time (Wooldridge, 2012, p449). Common panel regression specifications are the Pooled Cross-sectional (PC) regression model, the Fixed Effects (FE) model, and the Random Effects (RE) model.

For illustrative purposes, consider some dependent variable y_{it} which relates to an individual i and is observed through a time index $t = 1, 2, ..., T_i$. This variable could be, for example, the rate at which the individual draws down their account balance, annually. We observe some time-invariant regressors $\mathbf{z}_i$, and other, time-varying, $\mathbf{x}_{it}$. The notation $\mathbf{z}_i$ and $\mathbf{x}_{it}$ represent the column vectors $(z_{i,1}, z_{i,2}, ..., z_{i,K})'$ and $(x_{it,1}, x_{it,2}, ..., x_{it,L})'$, respectively, corresponding to K observed time-invariant characteristics and L time-varying.

3.3.1 Linear Models

In a linear model, we formulate the equation:

$$y_{it} = c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta} + e_{it} \tag{3.3}$$

Here, α_i represents the unobserved, individual-specific, time-invariant heterogeneity. This expression describes a base level of the dependent variable for individual i, attributed entirely to factors that we cannot observe. Crucially, as indicated by the subscripted i, this effect is, in general, not the same across different individuals. The visible regressors, then, influence how the observed dependent variable fluctuates from this baseline level—with respect to changes in the observed $\mathbf{z}_i$ and $\mathbf{x}_{it}$.

The coefficient vectors $\boldsymbol{\gamma}$ and $\boldsymbol{\beta}$ combine with the respective class of observed variables to represent linear combinations. That is, $\mathbf{z}_i'\boldsymbol{\gamma} = (\gamma_{i,1}z_{i,1} + \gamma_{i,2}z_{i,2} + ... + \gamma_{i,K}z_{i,K})$ and $\mathbf{x}_{it}'\boldsymbol{\beta} = (\beta_{i,1}x_{it,1} + \beta_{i,2}x_{it,2} + ... + \beta_{i,L}x_{it,L})$. c represents a universal intercept term in the model. Finally, the error term e_{it} absorbs all other unobserved determinants of the dependent variable. Without loss of generality, the error term has mean zero for some value of the constant term c.

Generally, regression models seek to find coefficient estimates which approximate the conditional expectation of the dependent variable given regressor values:

$$E[y_{it}|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i] = c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta} \tag{3.4}$$

PC models assume that all observations are independent across the time dimension—even successive observations on individual panel members. This assumption is only valid if the regressors capture all individual-specific factors that guide an individual towards some base level of drawdown. That is, the PC model assumes $\alpha_i = 0$. Due to the small set of available regressors, it would be imprudent to assume the data satisfies this condition.

In this respect, FE and RE regressions are more conservative. These models assume that the α_i are nonzero, and therefore induce autocorrelation of the drawdowns made by one individual through time. However, the FE and RE models differ in their treatment of this effect.

FE models remove α_i—and, unfortunately, the $\mathbf{z}_i$—algebraically through the 'within' transformation. First, the mean value of each covariate over the observation period is calculated as $\bar{x}_{i,k} = \frac{1}{T_i}\sum_{t=1}^{T_i} x_{it,k}$. Collectively, in vector notation, $\bar{\mathbf{x}}_i = \frac{1}{T_i}\sum_{t=1}^{T_i} \mathbf{x}_{it}$. A similar calculation is completed for $\bar{y}_i$ and $\bar{e}_i$. Subsequently, the transformed series is given by:

$$\dot{y}_{it} := (y_{it} - \bar{y}_i) = (c - c) + (\alpha_i - \alpha_i) + (\mathbf{z}_i - \mathbf{z}_i)'\boldsymbol{\gamma} + (\mathbf{x}_{it} - \bar{\mathbf{x}}_i)'\boldsymbol{\beta} + (e_{it} - \bar{e}_i) = \dot{\mathbf{x}}_{it}'\boldsymbol{\beta} + \dot{e}_{it} \tag{3.5}$$

More familiar terms for this procedure may be 'de-meaning', or 'centering'. Note that the $\boldsymbol{\beta}$

in equation 3.5 are exactly those from equation 3.4, which we initially intended to estimate. After transformation, the coefficient vector $\boldsymbol{\beta}$ can be obtained by Ordinary Least Squares (OLS) regression. The software program `Stata` can derive the FE estimates of the vector $\boldsymbol{\beta}$ using the `xtreg` command with the `fe` option.

Crucially, the coefficient estimates in a FE model are consistent (asymptotically correct). In our—very—large sample, we will rely on asymptotics in assuming that the FE estimates are the correct values.

In contrast to using FE, RE models can estimate coefficients on the $\mathbf{z}_i$, allowing inference on observed, time-invariant characteristics. However, researchers must take care in assessing the validity of RE models before interpreting the coefficient estimates—particularly due to the strict RE model assumptions, which require zero correlation between α_i and the regressors $\mathbf{z}_i$ and $\mathbf{x}_{it}$.

One can show through matrix algebra (see e.g. Wooldridge, 2010b, ch10) that fitting an RE model can be achieved using OLS estimation of a 'quasi-demeaned' equation:

$$(y_{it} - \theta_i \bar{y}_i) = (c - \theta_i c) + (\alpha_i - \theta_i \alpha_i) + (\mathbf{z}_i - \theta_i \mathbf{z}_i)'\boldsymbol{\gamma} + (\mathbf{x}_{it} - \theta_i \bar{\mathbf{x}}_i)'\boldsymbol{\beta} + (e_{it} - \theta_i \bar{e}_i) \tag{3.6}$$

In this equation, θ_i is given by:

$$\theta_i = 1 - \sqrt{\frac{\sigma_e^2}{T_i \sigma_\alpha^2 + \sigma_e^2}} \tag{3.7}$$

where σ_e^2 and σ_α^2 represent the variance of the random variables e_{it} and α_i in equation 3.4, respectively. `Stata` estimates σ_e^2 and σ_α^2 for unbalanced panels using the methodology of Swamy and Arora (1972).

Since the FE estimates for the coefficients of the $\mathbf{x}_{it}$ are consistent, to trust the RE model results it must prove capable of obtaining the same—or at least, statistically indistinguishable—coefficient estimates on these time-varying regressors. Thus, a crude way to evaluate whether the RE model is valid is to merely inspect how close in value the coefficients are on the $\mathbf{x}_{it}$. The Hausman specification test, however, formalises this comparison.

The Hausman test—implemented in software programs such as `Stata`—aggregates the differences in the coefficients between models, scaled by the relative differences in their precision. Denoting $\boldsymbol{b}$ and $\boldsymbol{B}$ to be the coefficients vectors on the time-varying coefficients derived from the FE and RE models, respectively, we can define:

$$C := (\boldsymbol{b} - \boldsymbol{B})'[(V_{\boldsymbol{b}} - V_{\boldsymbol{B}})^{-1}](\boldsymbol{b} - \boldsymbol{B}) \tag{3.8}$$

where $V_{\boldsymbol{j}}$ represents the variance-covariance matrix for a vector $\boldsymbol{j}$.

This produces a statistic, C, representing the overall dissimilarity between model estimates. Asymptotically, this statistic follows a χ^2 distribution with degrees of freedom equal to the number of compared coefficients, less one. The null hypothesis is that there is no systematic difference in the coefficient estimates between the two models. Rejecting this null indicates statistical evidence that they do differ, and if the FE coefficients are taken to be correct, this implies the RE model is misspecified.

When the data does not support validity of the RE model assumptions, the procedure of Hausman and Taylor (1981) (HT) provides an alternative method for estimating the effect of the time-invariant $\mathbf{z}_i$. By assuming that only some of the $\mathbf{z}_i$ and $\mathbf{x}_{it}$ are uncorrelated with α_i, these 'exogenous' regressors can control for the correlation between the remaining—'endogenous'—regressors and the unobserved effect α_i. Specifically, we may partition the available regressors vectors into exogenous and endogenous components—subscripted 1 and 2, respectively. Thus $\mathbf{x}_{it} = \mathbf{x}_{1it} + \mathbf{x}_{2it}$ and $\mathbf{z}_i = \mathbf{z}_{1i} + \mathbf{z}_{2i}$.

`Stata` implements the HT procedure from Hausman and Taylor (Ibid) as follows. As usual, the aim is to estimate parameters in the model:

$$y_{it} = c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta} + e_{it} \tag{3.9}$$

Similarly to RE regression, a quasi-demeaning factor θ_i is defined with form:

$$\theta_i = 1 - \sqrt{\frac{\sigma_e^2}{T_i\sigma_\alpha^2 + \sigma_e^2}} \tag{3.10}$$

Performing quasi-demeaning on equation 3.9:

$$(y_{it} - \theta_i\bar{y}_i) = (c - \theta_i c) + (\alpha_i - \theta_i\alpha_i) + (\mathbf{z}_i - \theta_i\mathbf{z}_i)'\boldsymbol{\gamma} + (\mathbf{x}_{it} - \theta_i\bar{\mathbf{x}}_i)'\boldsymbol{\beta} + (e_{it} - \theta_i\bar{e}_i) \tag{3.11}$$

Or more compactly:

$$\tilde{y}_{it} = \tilde{c} + \tilde{\alpha}_i + \tilde{\mathbf{z}}_i'\boldsymbol{\gamma} + \tilde{\mathbf{x}}_{it}'\boldsymbol{\beta} + \tilde{e}_{it} \tag{3.12}$$

To estimate this equation, `Stata` uses instrumental variable (IV) regression of the transformed $\tilde{y}_{it}$ on transformed $\tilde{\mathbf{z}}_i$ and $\tilde{\mathbf{x}}_{it}$. The instruments are exogenous variables $\dot{\mathbf{x}}_{it}$, $\bar{\mathbf{x}}_{1i}$ and $\mathbf{z}_i$—where $\dot{\mathbf{x}}_{it} = (\mathbf{x}_{it} - \bar{\mathbf{x}}_i)$ and $\bar{\mathbf{x}}_{1i} = \frac{1}{T_i}\sum_{t=1}^{T_i}\mathbf{x}_{1it}$. For a detailed review of instrumental variable regression, see for example Chapter 15 of Wooldridge (2012).

Similar to the validation of a RE model, a Hausman specification test can determine the suitability of the HT procedure. The test is conducted as before, but with the HT estimates used in place of the RE estimates.

Since the FE coefficient estimates are asymptotically correct, by comparing the relative signs, magnitudes and statistical significance of the coefficients on the time-varying regressors $\mathbf{x}_{it}$ amongst PC, FE, RE and HT models, we can infer which models fail to satisfy requisite assumptions.

3.3.2 'Nonlinear' Models

While regression equations of the form given in equation 3.4 are often suitable for modelling continuous dependent variables, a class of 'nonlinear' models are more appropriate for modelling non-continuous outcomes—for example, dependent variables taking discrete outcomes. Specifically, we will fit models on binary choice response variables and censored dependent variables.

Binary Choice Models

In binary dependent variable models, the observed response y_{it} is a choice. For example, in time period t an individual i may decide to draw at the minimum drawdown rate (encoded $y_{it} = 1$), or not ($y_{it} = 0$). Here, the conditional expectation of the variable y_{it}, given the values of the observed and unobserved characteristics, is identical to the probability of observing a response ($y_{it} = 1$):

$$E[y_{it}|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i] = 1 \times \Pr(y_{it} = 1|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i) + 0 \times \Pr(y_{it} = 0|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i) = \Pr(y_{it} = 1|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i) \tag{3.13}$$

We refer to the model as nonlinear because we estimate the predicted probability of a response as some general function F applied to a linear combination:

$$\hat{\Pr}(y_{it} = 1|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i) = F(c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta}) \tag{3.14}$$

One possible choice for the function F is the logistic—inverse logit—function:

$$F(.) = \text{logit}^{-1}(.) = \frac{\exp(.)}{1 + \exp(.)} \tag{3.15}$$

The logistic function transforms a variable on $(-\infty, \infty)$ to $(0, 1)$—making it suitable for translating an unrestricted linear combination into a meaningful probability value.

Coefficients in a logistic regression model are interpreted as changes in the log odds ratio—relative changes in the odds ratio—due to unit changes in the regressors.

Unfortunately, in nonlinear models, the within transformation used in linear FE models can no longer remove the unobserved α_i algebraically. RE methods can be extended to nonlinear models, however these inherit the main constraint of linear RE models: the strict assumptions require that the unobserved α_i is uncorrelated with the observed regressors $\mathbf{z}_i$ and $\mathbf{x}_{it}$. Furthermore, although it would be straightforward to estimate nonlinear models using PC, these models are misspecified whenever successive observations for a panel member are not independent over time.

To avoid both the PC model and the strong RE assumptions, we will use Correlated Random Effects (CRE) models—which use techniques to control for the potential correlation between the available regressors and the α_i. Wooldridge (2010a) attributes the CRE model in balanced panels to Chamberlain (1982) as a revision to the work of Mundlak (1978). Wooldridge also extends nonlinear CRE models to unbalanced panels.

CRE can be related to RE as follows. In the general nonlinear case, we have the regression model:

$$E[y_{it}|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i] = F(c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta}) \tag{3.16}$$

While RE would assume that the unobserved α_i follows some distribution—for example, Gaussian—with mean 0 and variance σ_α^2, CRE uses time-invariant information to control for any correlation between the α_i and the regressors $\mathbf{z}_i$ and $\mathbf{x}_{it}$. For the $\mathbf{x}_{it}$, which are time-varying, CRE uses the time-averaged level $\bar{\mathbf{x}}_i = \frac{1}{T_i}\sum_{t=1}^{T_i}\mathbf{x}_{it}$ to control for the correlation with α_i. Therefore, in a CRE model, the original α_i has been replaced with a new α_i with mean $\mathbf{z}_i'\boldsymbol{\gamma} + \bar{\mathbf{x}}_i'\boldsymbol{\delta}$ and variance σ_α^2. As a result, the $\mathbf{z}_i'\gamma$ terms in equation 3.16 move from being explanatory variables for the dependent variable y_{it} to being controls for the unobserved heterogeneity.

The new conditional expectation of the response variable becomes:

$$E[y_{it}|\mathbf{x}_{it}, \mathbf{z}_i, \alpha_i] = F(c + (\mathbf{z}_i'\boldsymbol{\gamma} + \bar{\mathbf{x}}_i'\boldsymbol{\delta}) + \mathbf{x}_{it}'\boldsymbol{\beta}) \tag{3.17}$$

with both $\mathbf{z}_i$ and $\bar{\mathbf{x}}_i$ being used to control for the level of α_i. For implementation purposes, this is identical to running a RE model—with the inclusion of the new time-averaged $\bar{\mathbf{x}}_i$ as regressors. `Stata` implements estimation of the RE Logit model via the command `xtlogit`.

Crucially, the $\boldsymbol{\gamma}$ and $\boldsymbol{\delta}$ coefficients estimated by CRE models do not have the desirable interpretation as partial effects on the response variable (Wooldridge, 2010a). Instead, only the $\boldsymbol{\beta}$ coefficients have the usual interpretation. This is one reason why we do not implement the CRE method for linear models: the $\boldsymbol{\beta}$ coefficients are readily available using the simpler FE estimation method.

Censored Regression Models

Dependent variables may also be censored, due either to limitations in data collection, or natural constraints on the range of a dependent variable. In either case, the presence of probability masses at certain values of the dependent variable distribution causes regular OLS techniques—which assume a continuous dependent variable with unrestricted support—to produce biased coefficients, due to the limited range of the dependent variable.

For illustrative purposes, assume an observed response variable y_{it} is censored from above and below by the values b and a, respectively. That is, the observed variable appears to be continuous on the interval (a, b), but contains significant probability masses at both a and b. Of economic interest is how changes in the values of the regressors $\mathbf{z}_i$ and $\mathbf{x}_{it}$ influence changes in the response y_{it}—which only has a meaningful interpretation for the continuous portion of the distribution.

To avoid biased OLS estimates in this scenario, we can specify a latent (underlying) variable y_{it}^* which is not censored:

$$y_{it}^* = c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta} + e_{it} \tag{3.18}$$

What we observe instead is the censored version of this true, underlying behaviour:

$$y_{it} = \begin{cases} a, & y_{it}^* \le a \\ y_{it}^* = c + \alpha_i + \mathbf{z}_i'\boldsymbol{\gamma} + \mathbf{x}_{it}'\boldsymbol{\beta} + e_{it}, & a < y_{it}^* \le b \\ b, & y_{it}^* > b \end{cases} \tag{3.19}$$

By estimating the coefficients of the latent variable model in equation 3.19, we obtain the desired partial effects.

With cross-sectional data, tobit models can estimate coefficients in situations where an otherwise continuous variable has significant probability masses at one or both edges of its support. For panel data, `Stata` implements tobit models through the command `xttobit`. In this case, censoring also prevents a within transformation from removing the unobserved α_i. Instead, we must rely on RE model estimation methods. However, as in the binary choice model, CRE models can correct for the correlation between the unobserved α_i and the regressors $\mathbf{z}_i$ and $\mathbf{x}_{it}$ through inclusion of $\bar{\mathbf{x}}_i$ as an additional regressor. Similar limitations on the interpretability of coefficients apply, as described for the binary choice models.

3.3.3 Model Validation

In addition to drawing statistical inference from regression output tables, we are interested in how much of the overall variability of the observed responses can be explained by the available regressors. For the linear and censored regression models, we will inspect residual diagnostics. In general, a model that fits the data well will have no discernible pattern in the residuals—both on aggregate and when plotted against the fitted values and individual regressors.

For the binary choice models, however, where the observed values are binary but the predicted values take a range of probabilities, the residuals are less meaningful. Instead, we will inspect the ability of the model to classify individuals—broadly, how often the model is correct when predicting a response or no response.

3.3.4 Regressors and Regressands

The panel models study five dependent variables of interest:

1. Decision to draw at the minimum rate in a given financial year, or not
2. Decision to make an adhoc drawdown in a given financial year, or not
3. The excess regular drawdown rate over a financial year, conditional on having drawn above the minimum
4. The unconditional regular drawdown rate over a financial year
5. The adhoc drawdown rate over a financial year, conditional on having made an adhoc drawdown

For each of these models, we consider the following list of available—or constructed—variables as candidate regressors, categorised as either time-varying (TV) or time-invariant (TI).

- Age at financial year start (TV)
- Account balance at financial year start (TV)
- The minimum drawdown rate—for that member in that financial year (TV)
- Financial-year dummy variables (TV)
- Gender (TI)
- Age at account open—a proxy for retirement age (TI)
- Risk appetite (TI)
- Age at 31 December 2015—the cohort effect (TI)

When including a set of dummy variables in standard, cross-sectional regression models, multicollinearity is avoided by dropping one variable in the set. In panel models, however, some situations require dropping more than one time dummy. This is because any variable that increases by one in each successive observation of an individual is indistinguishable from the passage of time (measured in years). If only one time dummy was dropped and we had one or more of these unit-incrementing variables, the multicollinearity issue would resurface.

In general, for each variable we include that increases by one between subsequent time indices—in our case, the 'age at financial year start' variable—we must drop one additional time dummy variable. As a result, although our complete set of financial year dummy variables covers 2004 to 2015 inclusive, we must drop two in our regression modelling, and this pair of years becomes the 'base case' against which we can compare the effect of the remaining years. As the earlier years in our sample exhibit more interesting effects than later years, we select 2014 and 2015 to be the base case, and include time dummy variables for the 2004 to 2013 financial years, inclusive.

The age definition is the age at the start of the relevant financial year, to reflect the rules in the legislation for determining which minimum drawdown rate applies to the individual during a particular financial year.

When modelling dependent variables using linear models, we will first transform nonzero drawdown rates—naturally constrained on (0, 1]—using the natural logarithm (log) function. This spreads out the support of the distribution, reduces skewness and increases symmetry—three changes which make the dependent variable more suitable to modelling by the techniques described in this section.

3.4 Component 2: Cluster Analysis and Identification of Behavioural Groups

The aim of this component is to allocate individuals in the sample into behavioural groups based on their observed drawdowns.

3.4.1 Manual Grouping

The presence of minimum drawdown rates as a default option immediately suggests a potential behavioural group. So too does the optimality literature, which suggests that drawing at level rates or level amounts might be heuristics retirees employ in decision-making. Thus, manual identification of some behavioural groups may be possible using filters on the observed data. For example, a rule which finds individuals drawing at or near the minimum drawdown rates for most observed periods would identify the members of one of these behavioural groups.

Specifically, we search for the following five groups in the data:

1. Draw at—or very near—the minimum drawdown rates in all—or most—observed periods
2. Similar to group 1, although do not adjust to the concessional minimum rates applying for financial years 2009–13 inclusive
3. Draw at—or very near—10% of their account balance annually. In Transition to Retirement Income Products (TRIPs), this is the maximum allowable rate of account drawdown
4. Draw the same dollar amount from their accounts in all—or most—observed periods
5. Draw at the same rate from their accounts in all—or most—observed periods, exclusive of individuals in groups 1, 2 or 3

3.4.2 Machine-Assisted Grouping

Where imagination and energy limit the extent of classification by a manual grouping method, a machine-assisted extension can add further value. Cluster analysis can create groups of individuals using observed characteristics (James et al., 2013), and of interest to the research is grouping individuals by their drawdown behaviours across the panel. This can be achieved by treating each annual drawdown rate as a separate variable ('characteristic') for the individual, and grouping based on the observed drawdown rates over time.

The problem can be visually expressed using the toy example in Figure 3.2. Drawdown rate, as a proportion of account balance, is given on the vertical axis, while the horizontal axis tracks each individual over time.

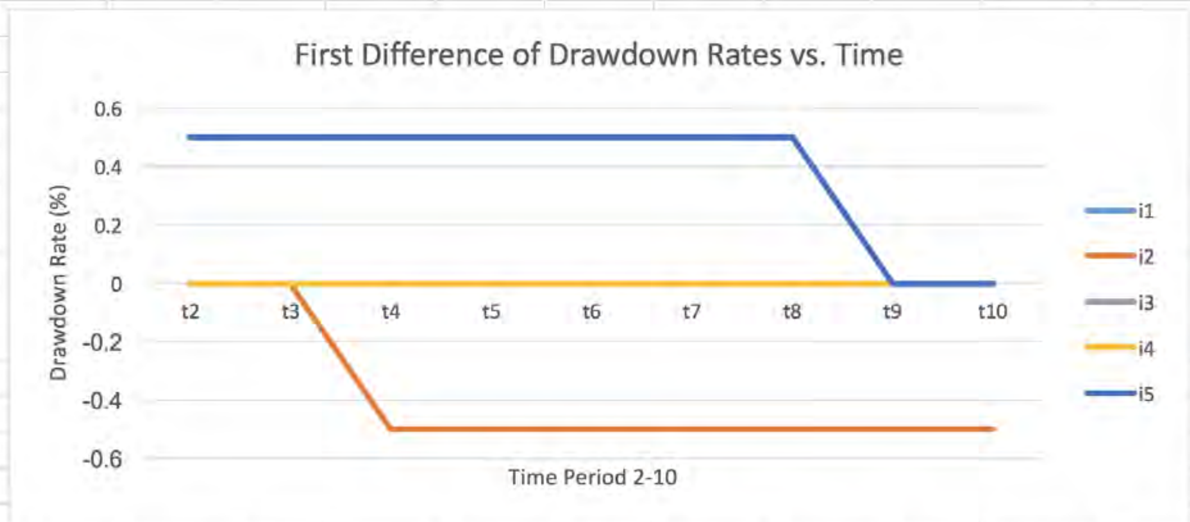
A successful cluster analysis would find four 'clusters' in the toy dataset. Individuals 1, 2, and 5 inhabit their own cluster, while individuals 3 and 4 comprise the fourth.

As well as clustering individuals based on patterns in the level of their drawdowns, it may prove instructive to remove the impact of the starting level. If the first differences are taken in the series, the 'shape' of the drawdown pattern forms the basis for clustering, rather than the actual dollar amount or proportion of account balance drawn. For illustrative purposes, consider Figure 3.3, where the underlying toy dataset is the same, but the series of interest is the first difference in the drawdown rates.

Figure 3.2: Toy Example for Cluster Analysis

individual	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10
i1	5	5	5	5	5	5	5	5	5	5
i2	8.5	8.5	8.5	8	7.5	7	6.5	6	5.5	5
i3		8	8	8	8	8	8	8	8	8
i4	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5		
i5	5	5.5	6	6.5	7	7.5	8	8.5	8.5	8.5

Figure 3.3: Toy Example for Cluster Analysis – First Differenced



individual	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10
i1	NA	0	0	0	0	0	0	0	0	0
i2	NA	0	0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
i3	NA	NA	0	0	0	0	0	0	0	0
i4	NA	0	0	0	0	0	0	0	NA	NA
i5	NA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	0

In this example, the three individuals drawing constant rates in Figure 3.2 would be grouped into one cluster, while the increasing and decreasing drawdowns would become two additional clusters.

In solving problems of this nature, two cluster analysis algorithms are common: k-means and hierarchical clustering (James et al., 2013). The k-means method requires a distance metric to be calculated across all applicable rows and columns. However, in the available dataset, not all accounts are observed for the entire sample duration, creating missing data. While the issue of missing data in k-means cluster analysis has some—arguably suboptimal—solutions, involving deletion or imputation of data, new algorithms like the `k-POD` `R` package present other compelling options for k-means analysis in the presence of missing data (Chi et al., 2016).

Alternatively, hierarchical clustering proceeds unhindered in the presence of missing data. In this procedure, a dissimilarity measure compares different individuals, while a linkage criterion allows computation of dissimilarities between clusters—which may be comprised of more than one individual. Crucially, the choice of linkage method can significantly impact the computational time of hierarchical cluster analysis as data sets grow in size (Murtagh, 1983). In the current methodology, we experiment with a variety of distance metrics and linkage methods. By visually inspecting the clustering results under different combinations, we find the combination which maximises within-cluster similarity and between-cluster dissimilarity. As the behaviours we seek require an economic interpretation, through inspection we naturally find the clustering parameters which provide the most meaningful behavioural results.

Consequently, we perform hierarchical clustering using the statistical software program `R` and the `cluster` package. Panel visualisations of individual drawdown trajectories through time will both motivate the exploration of particular clusters, and confirm sensible clustering results. Furthermore, as outlined in Chapter 2, we intend to compare the obtained clusters with the drawdown strategies suggested by Horneff et al. (2008) and Bateman and Thorp (2008).

3.5 Component 3: Categorical Regression for Behavioural Group Allocation

After allocating individuals into groups corresponding to their drawdown behaviours, the role of a categorical regression model is to comment on the statistically significant differences in the characteristics of retirees displaying disparate drawdown behaviours. Moreover, we are interested in how the available characteristics—including age, gender and account balance—determine the relative and absolute probabilities of adhering to one of the identified behaviours.

Specifically, individual i belonging to cluster j is denoted $C_i = j$. The probabilities estimated by the model will have the form:

$$\Pr(C_i = j|\mathbf{z}_i) = \theta_{ij}(\mathbf{z}_i), \quad j = 1, 2, ..., J \tag{3.20}$$

where $\mathbf{z}_i$ is a vector of length $k+1$ consisting of the constant 1 followed by k relevant explanatory variables available for individual i, i.e. $\mathbf{z}_i = (1, x_{i,1}, x_{i,2}, ..., x_{i,k})'$.

Figure 3.4 illustrates the intended outputs from the categorical regression model.

One method to construct the function θ_{ij} is by extending the functional form of a logistic binary choice regression to the multinomial case:

$$\theta_{ij}(\mathbf{z}_i) = \frac{\exp(\mathbf{z}_i'\boldsymbol{\beta}_j)}{\sum_{m=1}^{J}\exp(\mathbf{z}_i'\boldsymbol{\beta}_m)} \tag{3.21}$$

Here $\boldsymbol{\beta}_j$ is a vector of $k+1$ coefficients, and $\mathbf{z}_i'\boldsymbol{\beta}_j$ represents the linear combination $\beta_{j,0} + \beta_{j,1}z_{i,1} + \beta_{j,2}z_{i,2} + ... + \beta_{j,k}z_{i,k}$.

This model then uses the available regressors to predict the probability θ_{ij} of an individual i belonging to any one of the J clusters, conditional on the observed values of the regressors $\mathbf{z}_i$. Parameter estimation is achieved by Maximum Likelihood Estimation (MLE), where the joint likelihood L of the observed data is given by:

$$L = \prod_{i=1}^{N}\prod_{j=1}^{J}\{\theta_{ij}(\mathbf{z}_i)\}^{1_{\{C_i=j\}}} = \prod_{i=1}^{N}\prod_{j=1}^{J}\left\{\frac{\exp(\mathbf{z}_i'\boldsymbol{\beta}_j)}{\sum_{m=1}^{J}\exp(\mathbf{z}_i'\boldsymbol{\beta}_m)}\right\}^{1_{\{C_i=j\}}} \tag{3.22}$$

One crucial property of the θ_{ij} function as specified in equation 3.21 is the adherence to the law of total probability, $\sum_{j=1}^{J}\theta_{ij} = 1$. For this reason, one set of coefficients $\boldsymbol{\beta}_j$ are redundant—one group can be selected as the base case, and the corresponding predicted probability is known as $\theta_{i,\text{base}} = 1 - \sum_{j\neq\text{base}}\theta_{ij}$. Coefficients for other groups are then interpreted as relative changes in the log odds ratio of belonging to a particular cluster—relative to the base group.

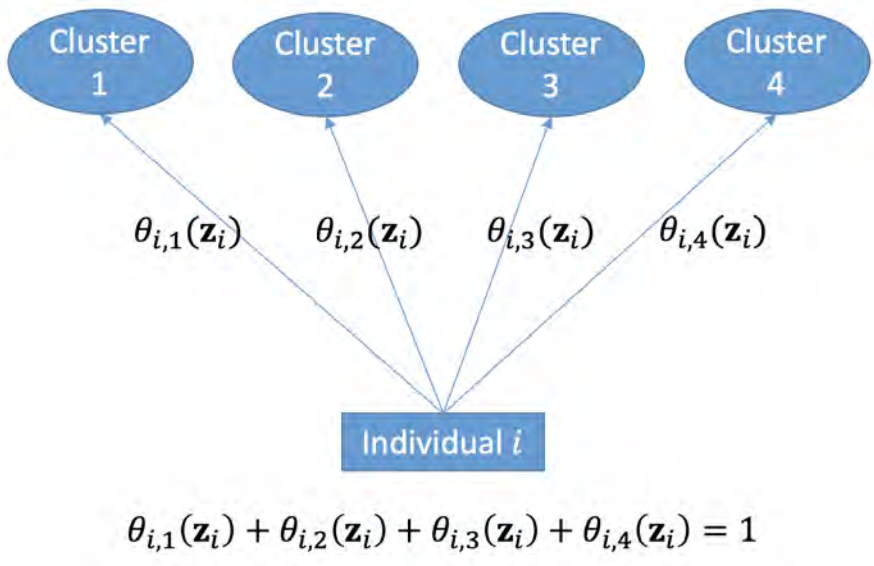
We use `Stata` to fit the model, providing coefficient estimates and standard errors.

This specification of θ_{ij}, which is based on the logistic function in the binary variable case, is not guaranteed to provide the best—or even a good—fit to the data. Consequently, after fitting the model, validation will uncover how often behaviours can be successfully explained or predicted using the available regressors.

One practical device to assess this fit is the 'confusion' matrix—an extension of the binary choice classification table. The number of individuals correctly predicted by the model to belong to a particular cluster is compared to two key quantities: how many predictions were made for that cluster, both correctly and erroneously; and how many individuals originated from that cluster in total.

A relevant conceptual point regarding the data used in components 1 and 2 deserves further elaboration. The fitting process requires observation of C_i, the group which the individual i was allocated to as a result of the cluster analysis. The cluster analysis therefore reduces the dimensionality of the observed 'behaviours' to 1, allowing this behaviour to become a time-invariant dependent variable for the individual, constructed using the drawdown experience

Figure 3.4: Visual Representation of Categorical Regression Model Prediction



over time. Consequently, in predicting which cluster an individual may belong to over time, only time-invariant variables, known at the beginning of the sample period, will be used as the independent variables for the multinomial regression. Hence the dependent and independent variables available for the multinomial regression are a subset of those listed earlier in Section 3.2 on Data Preparation—plus a time-invariant version of the account balance variable, captured in the first year of observation for each panel member.

- Observed response variable:
  - $C_i = j$, i.e. i belongs to behavioural group j, for $j = 1, 2, ..., J$
- Explanatory variables—time-invariant (RHS):
  - Account balance at first observation
  - Gender
  - Age at account open
  - Risk appetite
  - Age at 31 December 2015
- Estimated/Predicted response variable (LHS):
  - J probabilities for each individual, each corresponding to the probability of belonging to one of the J behavioural groups

3.6 Summary of Methodology

Our approach to analysing the drawdown data has three major components. First, panel regression modelling techniques relate observed drawdown rates to retiree characteristics. These models indicate the direction, magnitude and statistical significance of the effect of the regressors on the dependent variables. Second, a combination of manual grouping and machine-assisted cluster analysis allocates retirees into distinct behavioural groups—characterised by their observed drawdowns over time. Finally, a categorical regression model finds the statistical relationships between available characteristics and the likelihood of observing a specific behaviour within phased withdrawal arrangements.

CHAPTER 4

RESULTS

This chapter presents the results from all three methodology components, and further explores interesting features of the data.

4.1 Component 1: Panel Regression Models

4.1.1 Preliminary Analysis

First, we numerically and visually summarise the dependent variables of interest and the candidate regressors.

Drawdown at the Minimum Rates

Table 4.1 shows the aggregate proportion of drawdowns (44%) in sample which occur at the minimum drawdown rates effective since 1 July 2007. For the subsequent modelling, in years where concessional rates applied below the regular minima, we continue to use the unmodified minimum drawdown rates. In this way, we capture all individuals deciding to draw at the legislated minimum rates, regardless of whether they were aware of the temporary introduction of concessional rates. Additionally, ignoring the minimum rates allows easier comparison of our overall results with previous analytical work done by Plan For Life (2016). For comparison, Table 4.1 also displays the proportion of drawdowns (32%) made at the true effective minima, including the concessional rates applying to financial years ended 30 June 2009–13, inclusive.

Making Adhoc Drawdowns

Table 4.1 shows that 12% of the observed annual drawdowns in our sample contained an adhoc withdrawal.

Regular, Excess and Adhoc Drawdown Rates

Figures 4.1, 4.2 and 4.3 show distributions of the regular drawdown rates, excess regular drawdown rates, and adhoc drawdown rates, respectively. Note that the excess regular drawdown rate is conditional on observing drawdown above the minimum rates. Similarly, the adhoc drawdown rate is conditional on observing a nonzero adhoc drawdown. Note also that we right-censor the adhoc drawdown rate data at 90% of account balance. This is to reduce the noise created by individuals who make regular drawdowns, at or near the minimum rates, and then subsequently draw the remainder of their account balance ad hoc, during the same financial year.

Regressor Properties

In determining which of the candidate regressors may be suitable for inclusion in the modelling procedure, we are cautious of the pairwise correlations between several of our age-related variables. In regression modelling, high collinearity between several regressors reduces the precision with which we can estimate the effects of any one of the correlated set. The combined histogram, pairwise scatterplot and pairwise correlation matrix of Figure 4.4 assists with preventing the high collinearity issue.

We observe that the cohort effect 'Age at 31 December 2015' shows high pairwise correlation with the other age variables, as well as the minimum drawdown rate, which is a function of age. To avoid introducing high collinearity into our regression models, we omit the cohort effect.

The other large correlation statistic is between the time-varying age variable and the time-invariant age at which a member opens their account—a proxy for the retirement age. Modelling results did not suggest that including this variable impacted on the standard errors of the other regressors, and so we retained this variable in our modelling procedure. We also present numerical summary statistics on the candidate regressors in Table 4.2.

Table 4.1: Summary of Observed Binary Choice Outcomes

Behaviour	Observed Frequency
Draw at Minimum Rate (Concessional or Non-Concessional)	0.440
Draw at Minimum Rate (Concessional Only)	0.321
Make Adhoc Drawdown	0.124

Figure 4.1: Histogram of Regular Drawdown Rate

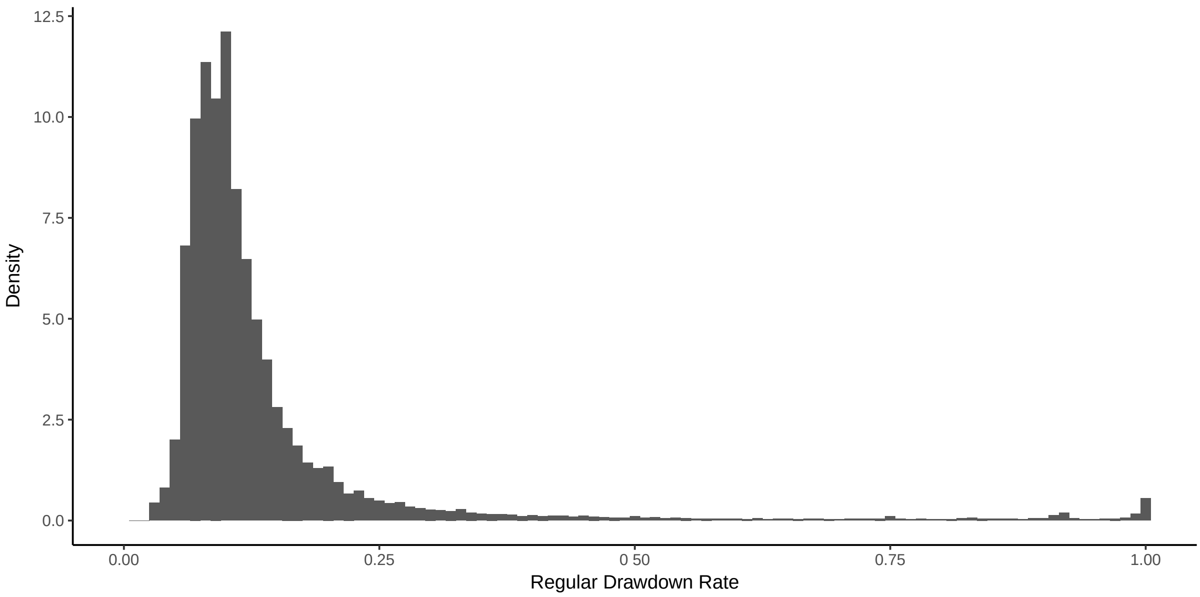


Figure 4.2: Histogram of Excess Regular Drawdown Rate

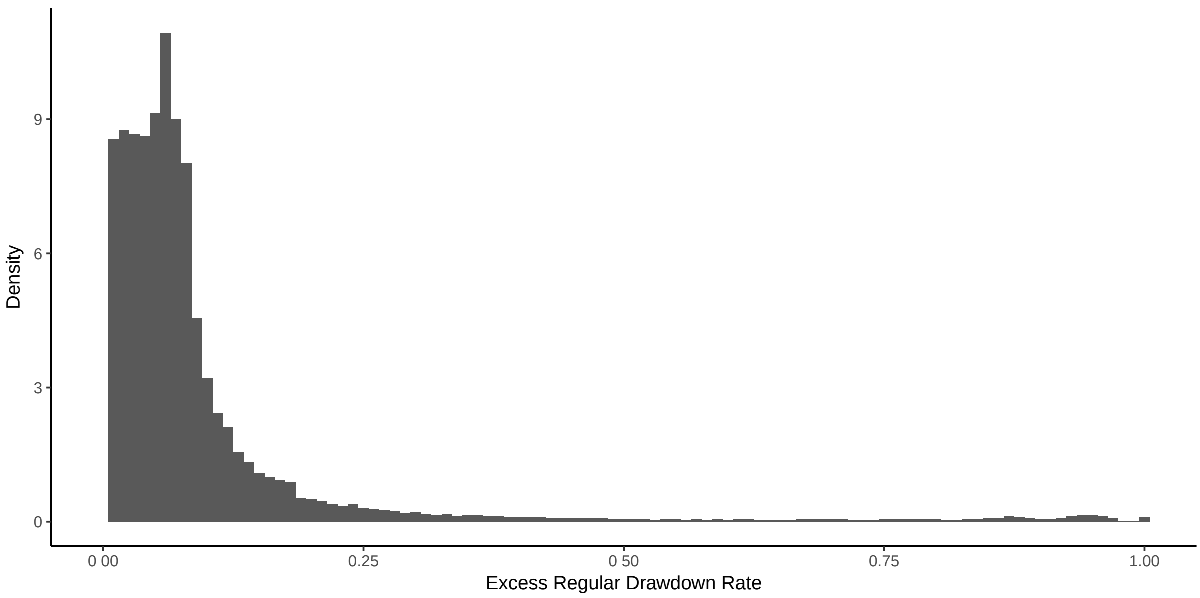


Table 4.2: Summary Statistics for Candidate Regressors – Panel Modelling

Variable	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Age	55	65	69	69.6	74	99
Account Balance	$0	$39,085	$73,086	$116,312	$136,037	$4,952,911
Risk Appetite	0.00	0.30	0.47	0.46	0.61	2.00
Age at Account Open	40.2	60.6	64.1	63.7	66.0	89.4
Age at 31 December 2015	57.7	72.4	77.7	76.94	81.7	103.8
Gender = Male	0	0	1	0.571	1	1
Legacy Account	0	1	1	0.650	1	1

Figure 4.3: Histogram of Adhoc Drawdown Rate

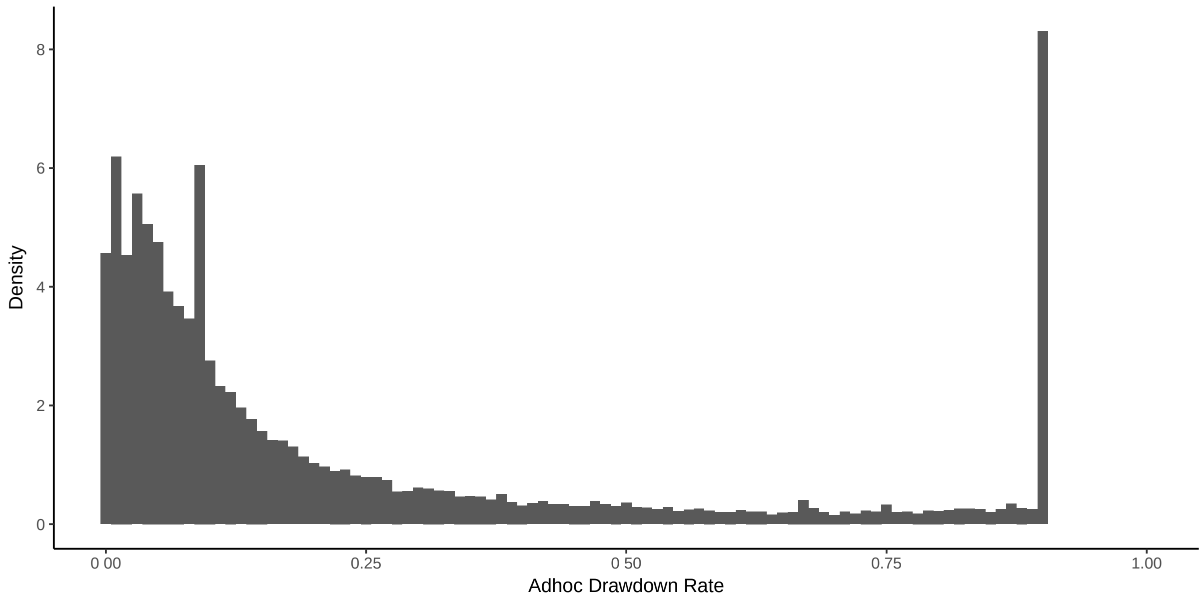
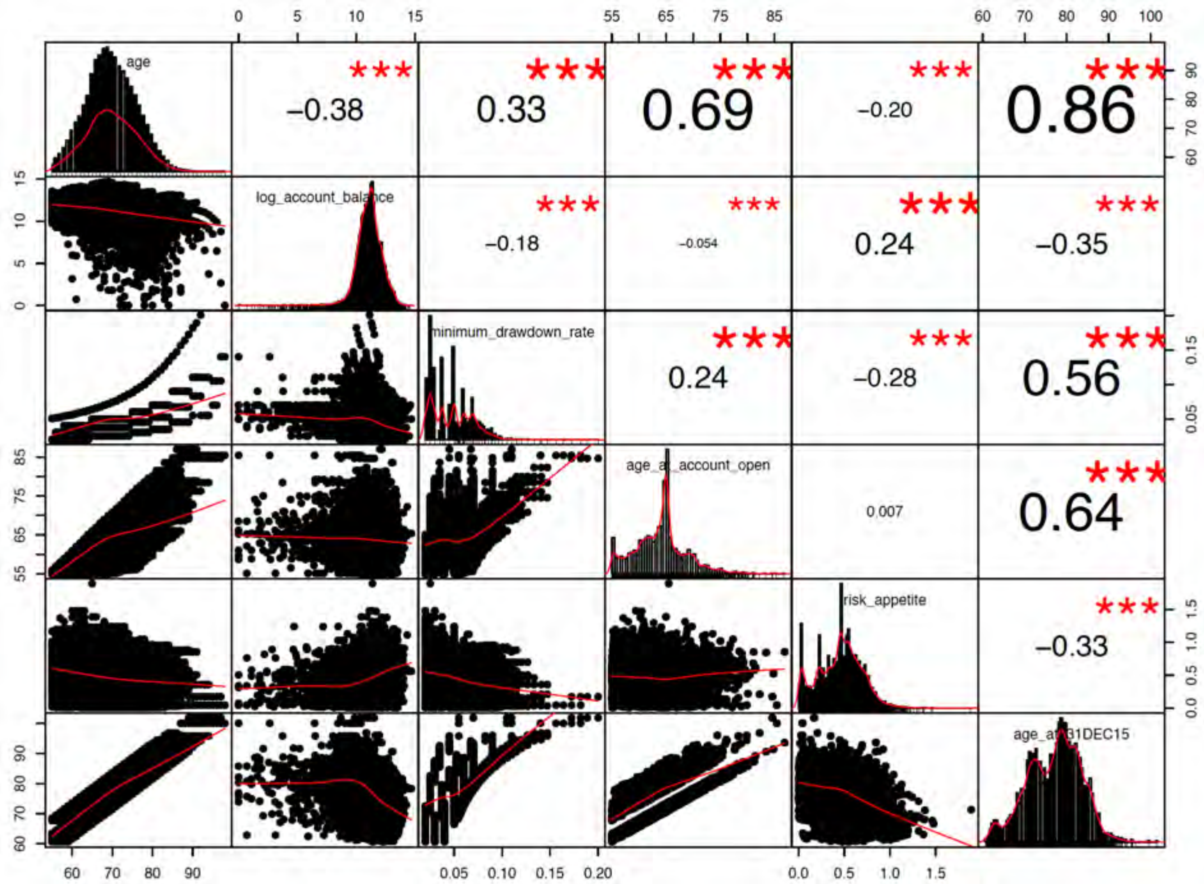


Figure 4.4: Pairwise Correlation Matrix of Candidate Regressors



4.1.2 Binary Choice Models

We model two pairs of binary choices, which members of the panel made during each year of observation:

1. Drawing at the minimum rate in a given financial year, or not
2. Making an adhoc drawdown in a given financial year, or not

For both of these pairs of choices, we aim to fit and evaluate a CRE Logit model. For comparison purposes, we also fit models of Pooled Cross-sections and (uncorrected) Random Effects. Although validity of these latter models requires stricter assumptions than our model is likely to meet, for completeness we provide them to show what the impact on our estimated coefficients would have been if we had not applied the more flexible CRE model.

Decision to Draw at Minimum Rate

Table 4.3 contains the Pooled Cross-sectional (PC), Random Effects (RE) and Correlated Random Effects (CRE) Logit model estimates. Using this, we can judge the statistical significance of the available regressors in estimating the probability that an individual draws at the minimum.

In Logistic regression models, regressor coefficients are interpreted as relative changes to the log odds ratio for a corresponding unit change in the regressor value. As these are not directly the changes to the response probability, in Table 4.4 we provide marginal effects that are directly interpretable as the change in probability of observing a response, given a unit change in the corresponding regressor. As the marginal effects in a Logit model depend not only on the value of the regressor of interest, but also on the level of all other variables in the model, we report the average marginal effects (AMEs). We obtain the AMEs using `Stata`'s `margins` command, with the `dydx` option. This approximates the marginal effects of a regressor of interest for each observation in the sample, given the level of the other regressors for that observation, and averages the resulting individual marginal effects across all observations. We interpret the reported marginal effects for several variables of interest.

For the age variable, only the linear effect is statistically significant at least at the 1% level. An incremental year of age implies an average increase of 2.1% in the probability of drawing at the minimum rates.

Although the coefficient on the log account balance is negative, the positive coefficient on its square term begins to dominate very early. Above approximately $9500, increasing the account balance increases the probability of drawing at the minimum. Moving from an account balance of $100,000 to $110,000 increases the probability of drawing at the minimum by approximately 0.6%, while moving from an account balance of $1,000,000 to $1,100,000 increases the same probability by about 1.1%. Thus while statistically significant, the effect on rising account balances is relatively insignificant economically.

Table 4.3: Draw at Minimum Rate – Binary Choice Regression Model Output

	PC Logit Model	RE Logit Model	CRE Logit Model
Age	0.0987***	0.0410	0.278**
	(0.0150)	(0.0813)	(0.105)
Age^2	−0.00103***	−0.00137*	−0.000997
	(0.000110)	(0.000616)	(0.000718)
Log Account Balance	−0.575***	−2.689***	−3.007***
	(0.0232)	(0.0900)	(0.136)
$(\text{Log Account Balance})^2$	0.0390***	0.151***	0.164***
	(0.00116)	(0.00490)	(0.00791)
Minimum Drawdown Rate	16.37***	42.16***	45.24***
	(1.244)	(5.006)	(5.329)
Financial Year = 2004	0.582***	0.938***	3.984***
	(0.0479)	(0.204)	(0.302)
Financial Year = 2005	0.789***	1.517***	4.272***
	(0.0472)	(0.201)	(0.283)
Financial Year = 2006	0.902***	1.874***	4.355***
	(0.0471)	(0.198)	(0.265)
Financial Year = 2007	0.999***	2.151***	4.341***
	(0.0471)	(0.197)	(0.249)
Financial Year = 2008	−2.252***	−5.138***	−3.168***
	(0.0461)	(0.125)	(0.186)
Financial Year = 2009	−0.842***	−2.038***	−0.273
	(0.0394)	(0.137)	(0.205)
Financial Year = 2010	−0.265***	−0.607***	0.842***
	(0.0370)	(0.131)	(0.184)
Financial Year = 2011	−0.0259	−0.0709	1.054***
	(0.0362)	(0.129)	(0.169)
Financial Year = 2012	−0.0704**	−0.165*	0.624***
	(0.0254)	(0.0721)	(0.0987)
Financial Year = 2013	0.00264	0.000984	0.481***
	(0.0261)	(0.0700)	(0.0840)
Risk Appetite	−0.342***	−1.330***	−1.422***
	(0.0239)	(0.125)	(0.128)
Gender = Male	−0.241***	−0.727***	−0.673***
	(0.0103)	(0.0550)	(0.0540)
Age at Account Open	0.0643***	0.208***	0.189***
	(0.00274)	(0.0135)	(0.0145)
Legacy Account	−0.624***	−1.416***	−1.168***
	(0.0275)	(0.137)	(0.188)
($\bar{\mathbf{x}}_i$ omitted)	.	.	.
Constant	−4.848***	0.860	−47.15***
	(0.519)	(2.754)	(3.791)
Observations	199334	199334	198696

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.4: Draw at Minimum Rate – Binary Choice Model Average Marginal Effects

	CRE Average Marginal Effects	
Age	0.0210**	(0.00793)
Age^2	−0.0000753	(0.0000542)
Log Account Balance	−0.227***	(0.00990)
(Log Account Balance)^2	0.0124***	(0.000580)
Minimum Drawdown Rate	3.417***	(0.400)
Financial Year = 2004	0.301***	(0.0225)
Financial Year = 2005	0.323***	(0.0210)
Financial Year = 2006	0.329***	(0.0196)
Financial Year = 2007	0.328***	(0.0184)
Financial Year = 2008	−0.239***	(0.0141)
Financial Year = 2009	−0.0206	(0.0155)
Financial Year = 2010	0.0636***	(0.0139)
Financial Year = 2011	0.0796***	(0.0127)
Financial Year = 2012	0.0471***	(0.00742)
Financial Year = 2013	0.0363***	(0.00631)
Risk Appetite	−0.107***	(0.00958)
Gender = Male	−0.0509***	(0.00403)
Age at Account Open	0.0143***	(0.00107)
Legacy Account	−0.0882***	(0.0142)
Observations	198696	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Increasing the minimum drawdown rate by 0.01—for example moving from a minimum drawdown rate of 5% to 6% of account balance—increases the probability of drawing at the minimum by 3.4% on average.

Compared to the base case financial years 2014 and 2015, drawdowns were roughly 30–33% more likely to occur at the minimum in financial years 2004 through 2007. In financial year 2008, drawdowns were about 24% less likely to be at the minimum. In other financial years, the relative probabilities were more modest in magnitude.

In a CRE model, the coefficients of the time-invariant regressors—such as Gender and Age at Account Open—cannot be directly interpreted as impacting the dependent variable of interest. Instead, these regressors act—alongside the average of the time-varying regressors—as controls for the unobserved heterogeneity α_i.

To evaluate how well the CRE Logit model classifies the in-sample responses, we inspect the classification results in Table 4.5. The columns represent the number of data points at which people did draw above the minimum and at the minimum, respectively. The rows indicate the number of observations that the model predicted in-sample to draw above the minimum and at the minimum, respectively. Collectively, this matrix can be used to derive the Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and Overall Accuracy provided in Table 4.6. These four quantities are defined as follows:

- Sensitivity = Pr(predict response | observe response)
- Specificity = Pr(predict no response | observe no response)
- Positive Predictive Power = Pr(observe response | predict response)
- Negative Predictive Power = Pr(observe no response | predict no response)

To translate the predicted probabilities that emerge from the model into the binary choice outcome, a cutoff value of 0.5 was used. Predicted probabilities at least as large as 0.5 were classified as a response (drawing at the minimum), and vice-versa for no response (drawing above the minimum). Varying this cutoff value from 0.5, we were unable to find a cutoff point that materially raised the Overall Accuracy of the model.

These in-sample classification results show that our selection of mainly administrative variables could not capture most of the variation in the decisions made, even after using the Correlated Random Effects model to approximate the contribution of each individual's unobserved heterogeneity.

Table 4.5: Draw at Minimum Rate – Binary Choice Classification Table

	Observed		
Predicted	Draw Above Minimum	Draw At Minimum	Total
Draw Above Minimum	75,886	26,333	102,219
Draw At Minimum	35,701	61,418	97,119
Total	111,587	87,751	199,338

Table 4.6: Draw at Minimum Rate – Binary Choice Classification Diagnostics

Metric	Value
Sensitivity	.700
Specificity	.680
PPV	.632
NPV	.742
Overall Accuracy	.665

Decision to Make Adhoc Drawdown

In this subsection, we use the above procedure to study the binary choice relating to making an adhoc drawdown alongside the income stream generated by one's chosen regular drawdown amounts.

Running the CRE model alongside the PC and RE models for comparison, we can again determine which variables significantly impact on the probability of making an adhoc drawdown. In addition, the signs on the coefficient estimates represent the direction of this influence on the estimated probability relative to increases in the regressor values, although these are not directly interpretable from the raw model output.

As before, in Table 4.8 we make use of `Stata`'s estimation of the average marginal effects to understand broadly how unit changes in the regressor values change the probability of observing an adhoc drawdown.

This time, the age effect is significant in both the linear and quadratic terms. At age 65, an incremental year of age increases the probability of making an adhoc drawdown by approximately 1.2%. The negative sign on the squared age variable creates concavity in the age effect. At the more advanced age of 85, the effect of ageing is lower at 0.7%. The model estimates that at approximately age 115, the marginal effect of ageing would become zero.

Again, although statistically significant, the account balance effect proves to be economically insignificant. The composite effect of the linear and square term becomes positive for non-trivial account balances greater than $200. Even at an account balance of $1,000,000 however, the effect of moving to an account balance of $1,100,000 is only a 0.7% increase in the probability of making an adhoc drawdown.

The minimum drawdown rate has a mild effect, decreasing the probability of an adhoc drawdown by about 0.5% for each increment of 0.01, or 1% of account balance.

Finally, adhoc drawdowns were roughly 4-7% more common until financial year 2008, compared to the base case years of 2014 and 2015.

In-sample classification results, using a cutoff value of 0.5 for predicting a response, are in Table 4.9. The corresponding classification breakdown is in Table 4.10. We see that a cutoff of 0.5 does not provide any sensitivity to true responses. Furthermore, the overall accuracy is not far from what we would expect from using the decision rule 'classify all records as no

Table 4.7: Make Adhoc Drawdown – Binary Choice Regression Model Output

	PC Logit Model	RE Logit Model	CRE Logit Model
Age	0.434***	0.359***	0.438***
	(0.0293)	(0.0638)	(0.102)
Age^2	−0.00445***	−0.00413***	−0.00190**
	(0.000216)	(0.000463)	(0.000671)
Log Account Balance	−0.0670*	0.177**	−0.750***
	(0.0313)	(0.0652)	(0.0865)
(Log Account Balance)^2	−0.00386*	−0.00386	0.0713***
	(0.00157)	(0.00332)	(0.00550)
Minimum Drawdown Rate	−4.011	−7.039*	−7.761*
	(2.114)	(3.279)	(3.903)
Financial Year = 2004	−1.400***	−2.348***	0.685
	(0.0816)	(0.150)	(0.419)
Financial Year = 2005	−1.018***	−1.813***	0.888*
	(0.0790)	(0.143)	(0.382)
Financial Year = 2006	−0.692***	−1.314***	1.080**
	(0.0773)	(0.137)	(0.345)
Financial Year = 2007	−0.490***	−1.035***	1.006**
	(0.0766)	(0.131)	(0.309)
Financial Year = 2008	−0.433***	−0.991***	0.680**
	(0.0496)	(0.0859)	(0.257)
Financial Year = 2009	−1.411***	−2.131***	−0.711**
	(0.0625)	(0.102)	(0.239)
Financial Year = 2010	−1.219***	−1.724***	−0.471*
	(0.0586)	(0.0942)	(0.201)
Financial Year = 2011	−0.546***	−0.992***	−0.0863
	(0.0556)	(0.0886)	(0.167)
Financial Year = 2012	−0.344***	−0.658***	−0.0168
	(0.0361)	(0.0553)	(0.110)
Financial Year = 2013	−0.195***	−0.398***	0.0212
	(0.0365)	(0.0525)	(0.0794)
Risk Appetite	−0.315***	−0.588***	−0.315***
	(0.0338)	(0.0866)	(0.0867)
Gender = Male	0.0721***	0.0947*	0.0993**
	(0.0141)	(0.0370)	(0.0360)
Age at Account Open	0.121***	0.127***	0.161***
	(0.00475)	(0.0108)	(0.0115)
Legacy Account	−0.280***	−0.306**	−1.646***
	(0.0458)	(0.102)	(0.138)
($\bar{\mathbf{x}}_i$ omitted)	.	.	.
Constant	−16.10***	−16.22***	−24.83***
	(0.988)	(2.169)	(2.878)
Observations	205448	205448	204783

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.8: Make Adhoc Drawdown – Binary Choice Model Average Marginal Effects

	CRE Average Marginal Effects	
Age	0.0274***	(0.00636)
Age^2	−0.000119**	(0.0000420)
Log Account Balance	−0.0470***	(0.00543)
$(\text{Log Account Balance})^2$	0.00447***	(0.000344)
Minimum Drawdown Rate	−0.486*	(0.245)
Financial Year = 2004	0.0429	(0.0263)
Financial Year = 2005	0.0556*	(0.0239)
Financial Year = 2006	0.0677**	(0.0216)
Financial Year = 2007	0.0630**	(0.0194)
Financial Year = 2008	0.0426**	(0.0161)
Financial Year = 2009	−0.0445**	(0.0149)
Financial Year = 2010	−0.0295*	(0.0126)
Financial Year = 2011	−0.00541	(0.0104)
Financial Year = 2012	−0.00105	(0.00688)
Financial Year = 2013	0.00133	(0.00498)
Risk Appetite	−0.0197***	(0.00543)
Gender = Male	0.00622**	(0.00225)
Age at Account Open	0.0101***	(0.000722)
Legacy Account	−0.103***	(0.00853)
Observations	204783	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

response'—since adhoc drawdown occurs 12.4% of the time.

To try improve the classification results, we tested decision rules based on other cutoff values. However, we did not find a cutoff value that made the classification results more satisfactory.

4.1.3 Continuous Dependent Variable Models

The three (roughly) continuous dependent variables we model are:

1. The excess regular drawdown rate over a financial year, conditional on having drawn above the minimum
2. The unconditional regular drawdown rate over a financial year
3. The adhoc drawdown rate over a financial year, conditional on having made an adhoc drawdown

We fit a sequence of linear panel models where possible: the Pooled Cross-sectional, Fixed and Random Effects, and Hausman-Taylor models. Comparing across these model results sheds insight into the misspecification issues that can be avoided by utilising panel models.

As an inspection of the histograms of these dependent variables and their log transforms will reveal, the first two dependent variables listed are continuous enough to model using linear panel models. By contrast, the third exhibits a significant probability mass, motivating the use of a censored regression model.

Excess Regular Drawdown Rate

We study the excess drawdown rate variable conditional on the retiree drawing above the minimum rates—omitting the probability mass formed at the excess drawdown rate of 0%. Consequently, the results from the models featuring this dependent variable explain the effects of the regressors on the excess drawdown rate, but only for individuals who have elected to draw above the minima.

As a proportion of the account balance, the excess regular drawdown rate is roughly constrained on the interval (0, 1), with the exact upper limit depending on the minimum drawdown rate faced by the individual. For example, an upper limit for the excess regular drawdown rate of 0.95 may be standard for a 65-year-old retiree facing a 5% annual minimum drawdown rate. Since a support of (0, 1) would not be appropriate for a linear model with

Table 4.9: Make Adhoc Drawdown – Binary Choice Classification Table

	Observed		
Predicted	Draw Regular Only	Draw Adhoc	Total
Draw Regular Only	179,599	24,377	203,976
Draw Adhoc	1,271	1,131	2,402
Total	180,870	25,508	206,378

Table 4.10: Make Adhoc Drawdown – Binary Choice Classification Diagnostics

Metric	Value
Sensitivity	.044
Specificity	.993
PPV	.471
NPV	.880
Overall Accuracy	.876

Gaussian errors, we take the natural logarithm of the rates and show the transformed rate histogram in Figure 4.5 and Table 4.11.

The median log excess regular drawdown rate of -2.81 translates to a rate of approximately 6% on the unit scale. We observe a slight peak near 0 on the log scale, corresponding to excess regular drawdown rates nearing 100%. Despite this, we proceed with linear models for this dependent variable, noting that the model may not fit well in the upper tail.

Expanding this pooled histogram through the time dimension in Figures 4.6 and 4.7, we see that the distribution of the transformed dependent variable changes through time.

As these three figures suggest, by incorporating financial year dummy variables to control for financial year effects, it may be reasonable to attempt fitting linear models against this dependent variable.

Table 4.12 provides the model estimation output for the four fitted models for the excess regular drawdown rate. The PC model is *a priori* unlikely to be appropriate, as it assumes there are no unobserved, individual-specific, time-invariant factors that would cause successive observations of the same individual through time to be autocorrelated. By contrast, the FE model removes any time-invariant effects, observed or unobserved, and obtains consistent estimates of the coefficients against the time-varying regressors—the first five regressors and the financial year time dummies. It is in these FE coefficient values that we can be most confident.

On inspecting the RE model coefficients on these time-varying regressors, we notice sizeable discrepancies between the FE and RE models on variables such as Age and Log Account Balance. The Hausman specification test results in Table 4.13 strongly reject the idea that these coefficients are the same at any significance level, and thus we must assume the Random Effects model is unsuitable for drawing inference on the regressors.

The Hausman-Taylor procedure, however, produces estimates of these coefficients which seem much closer to the Fixed Effects model values. Indeed, running the Hausman specification test

Table 4.11: Summary Statistics for Log Excess Regular Drawdown Rate

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Log Excess Regular Drawdown Rate	−5.30	−3.39	−2.81	−2.85	−2.38	0

Figure 4.5: Histogram of Log Excess Regular Drawdown Rate

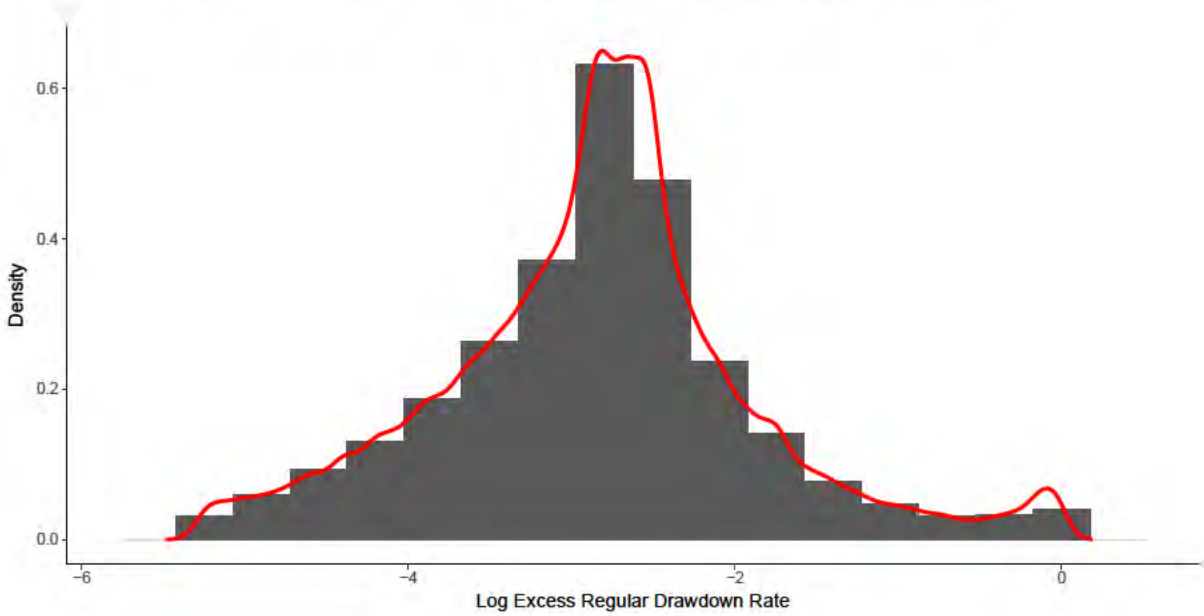


Figure 4.6: 3D Histogram of Log Excess Regular Drawdown Rate over Time

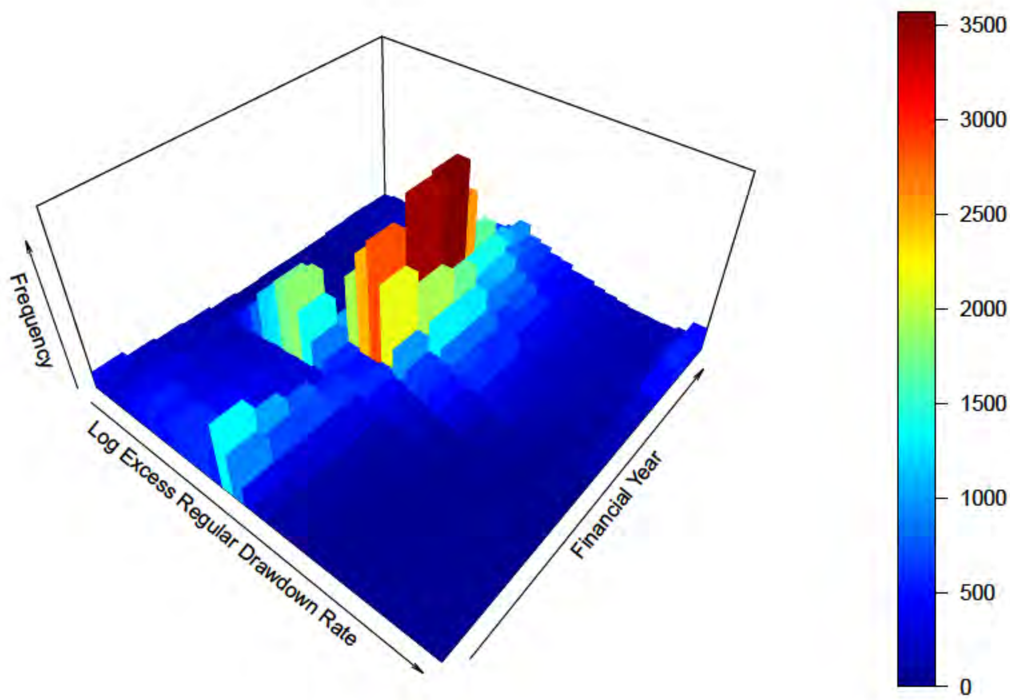


Table 4.12: Log Excess Regular Drawdown Rate – Regression Model Output

	Pooled Cross-Sectional	Fixed Effects	Random Effects	Hausman-Taylor
Age	-0.181^{***}	-0.332^{***}	-0.284^{***}	-0.326^{***}
	(0.00649)	(0.0177)	(0.0131)	(0.0177)
Age^2	0.00141^{***}	0.00221^{***}	0.00205^{***}	0.00220^{***}
	(0.0000466)	(0.000114)	(0.0000934)	(0.000114)
Log Account Balance	-0.493^{***}	0.741^{***}	0.319^{***}	0.744^{***}
	(0.0189)	(0.0296)	(0.0194)	(0.0297)
(Log Account Balance)^2	0.00579^{***}	-0.0671^{***}	-0.0388^{***}	-0.0674^{***}
	(0.000891)	(0.00187)	(0.00108)	(0.00187)
Minimum Drawdown Rate	-1.384^{*}	-3.510^{***}	-3.904^{***}	-3.513^{***}
	(0.610)	(0.591)	(0.579)	(0.591)
Financial Year = 2004	-0.557^{***}	-0.982^{***}	-0.855^{***}	-0.938^{***}
	(0.0202)	(0.0626)	(0.0273)	(0.0615)
Financial Year = 2005	-0.534^{***}	-1.007^{***}	-0.895^{***}	-0.967^{***}
	(0.0205)	(0.0572)	(0.0260)	(0.0563)
Financial Year = 2006	-0.449^{***}	-0.963^{***}	-0.873^{***}	-0.927^{***}
	(0.0207)	(0.0521)	(0.0248)	(0.0513)
Financial Year = 2007	-0.409^{***}	-0.935^{***}	-0.868^{***}	-0.902^{***}
	(0.0214)	(0.0471)	(0.0239)	(0.0464)
Financial Year = 2008	-0.579^{***}	-0.564^{***}	-0.585^{***}	-0.537^{***}
	(0.0116)	(0.0383)	(0.0160)	(0.0377)
Financial Year = 2009	0.144^{***}	0.0662	0.0486^{*}	0.0887^{*}
	(0.0189)	(0.0354)	(0.0208)	(0.0349)
Financial Year = 2010	0.349^{***}	0.169^{***}	0.194^{***}	0.187^{***}
	(0.0187)	(0.0300)	(0.0198)	(0.0296)
Financial Year = 2011	0.343^{***}	0.195^{***}	0.206^{***}	0.210^{***}
	(0.0187)	(0.0254)	(0.0188)	(0.0252)
Financial Year = 2012	0.207^{***}	0.0940^{***}	0.104^{***}	0.105^{***}
	(0.0128)	(0.0164)	(0.0115)	(0.0162)
Financial Year = 2013	0.245^{***}	0.163^{***}	0.176^{***}	0.170^{***}
	(0.0133)	(0.0119)	(0.0105)	(0.0118)
Risk Appetite	0.117^{***}		0.0981^{***}	0.169^{**}
	(0.0108)		(0.0231)	(0.0583)
Gender = Male	0.113^{***}		0.145^{***}	0.449^{***}
	(0.00436)		(0.00958)	(0.0270)
Age at Account Open	-0.00734^{***}		0.00134	-0.297^{***}
	(0.00111)		(0.00238)	(0.0159)
Legacy Account	-0.0428^{***}		-0.0247	-0.312^{***}
	(0.0112)		(0.0232)	(0.0619)
Constant	7.995^{***}	9.822^{***}	8.188^{***}	28.13^{***}
	(0.237)	(0.752)	(0.435)	(1.085)
Observations	111585	111585	111585	111585

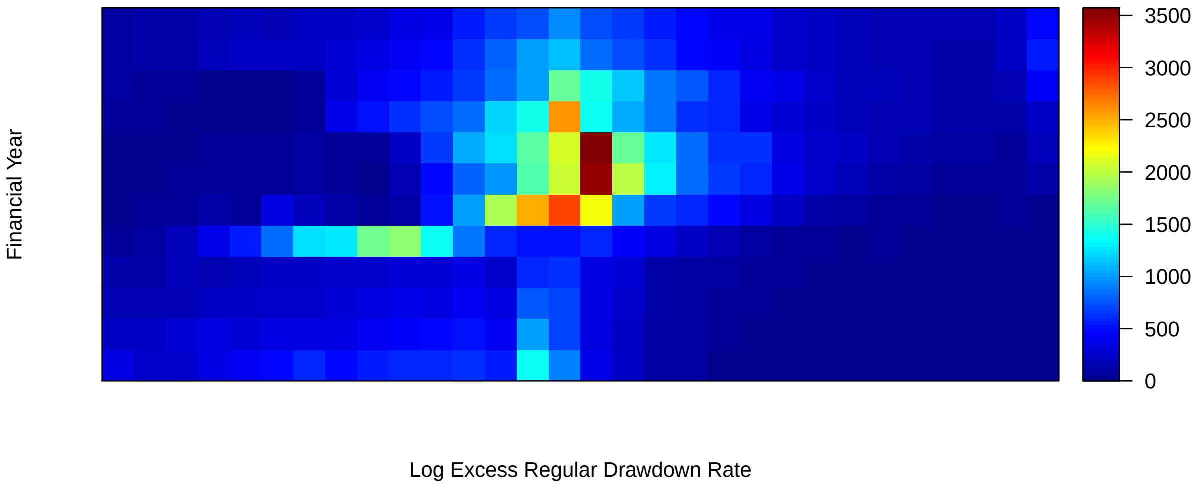
Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.13: Log Excess Regular Drawdown Rate – Hausman Test: FE vs RE

Metric	Value
χ^2_{14} Test Statistic	8198.48
p-value	0.0000

Figure 4.7: Heatmap of Log Excess Regular Drawdown Rate over Time



between these two models fails to reject the null hypothesis that these coefficients differ systematically, at any significance level smaller than 91%. Results from this second Hausman test are in Table 4.14.

This failure to reject implies that the HT model may not be inappropriate, and so we use these coefficient estimates to perform inference on all regressors, including the time-invariant $\mathbf{z}_i$.

Positive signs represent effects that increase the conditional expectation of the dependent variable as the corresponding regressor increases, and vice-versa. As the dependent variable is the log-transformed excess regular drawdown rate, the values of the coefficients reflect proportional changes in the excess regular drawdown rate for unit increases in the regressor values. For example, comparing a male and a female who are identical in all other regressors and who both make drawdowns above the minimum, the excess drawdown rate for the male can be expected to be that of his female counterpart multiplied by approximately $e^{0.449} = 1.57$. Similarly, for each year of age retirement is delayed, drawdown rates in excess of the minimum tend to reduce through multiplication by a factor of approximately $e^{-0.297} = 0.74$. While these proportional factors appear large in magnitude, they apply only to the rate of excess drawdown, which has a median value of 6%.

An incremental year of age for a 65-year-old scales the expected excess regular drawdown rate

Table 4.14: Log Excess Regular Drawdown Rate – Hausman Test: FE vs HT

Metric	Value
χ^2_{14} Test Statistic	7.54
p-value	0.9119

down by 4%, while the same increase at age 85 scales the expected rate up by approximately 5%. The turning point for this parabolic effect occurs around age 74. Comparatively, the effect of account balance is to decrease the excess regular drawdown rate, as the negative coefficient on the square term dominates for any account balances greater than $250. At an account balance of $100,000, an increase in the account balance by 10% to $110,000 scales the expected drawdown rate down by approximately 7.7%. At a balance of $1,000,000, the same proportional increase results in a scaling down by 10.7%.

Other notable results include: the negative signs of financial years 2004–7, where drawdown at the minimum was more common; the negative sign of financial year 2008, where there was a spike in the number of small excess drawdowns—corresponding to individuals leaving the minima for the first time; the negative sign for legacy accounts, which are more likely to draw at the minima; and the positive effect of increasing risk appetite.

Aside from inferring the effects of the available regressors on excess regular drawdown rates, we also inspect some model diagnostic plots in Figure 4.8, to determine how well the model assumptions are satisfied.

The top two panels indicate that the residuals are not exactly Normally distributed, which means that the model assumptions do not hold precisely. In addition, the plot of residuals vs. fitted values shows a prominent linear trend, whereas the ideal plot would have a horizontal trend. Plotting residuals against individual explanatory variables shows multiple instances of heteroscedasticity and linear trending. Overall, we are convinced that there are still relevant, omitted variables that are correlated with at least some of our regressors and have a significant effect on the dependent variable.

Regular Drawdown Rate

Our second set of continuous dependent variable models examine the effect of the available regressors on the unconditional regular drawdown rate—that is, including all individuals drawing at and above the minimum drawdown rates.

The regular drawdown rate is bounded from above by 100%, corresponding to a value of zero on the log scale. Additionally, the smallest concessional minimum drawdown rate attainable during the sample period was 2%, for a retiree younger than 65 and during financial years 2009–11, inclusive. Furthermore, where a retiree makes one or more adhoc drawdowns during a financial year, they can reduce their regular drawdown amounts such that the annual regular drawdown rate is less than the legislated minimum rates, while still keeping their total rate of drawdown at or above the minima. Total drawdown rates below the minima are possible, but likely to be rare because they attract penalties through the taxation system. Figure 4.9 and Table 4.15 reveal the distribution of the log regular drawdown rates.

Here, the median value of -2.57 on the log scale corresponds to drawdown rates of approximately 7.7% on the unit scale. Inspection suggests that the probability masses at the endpoints are mild. We proceed with linear modelling techniques, although aware that the fit in the tails

Figure 4.8: Log Excess Regular Drawdown Rate – Hausman-Taylor Model Residual Diagnostics

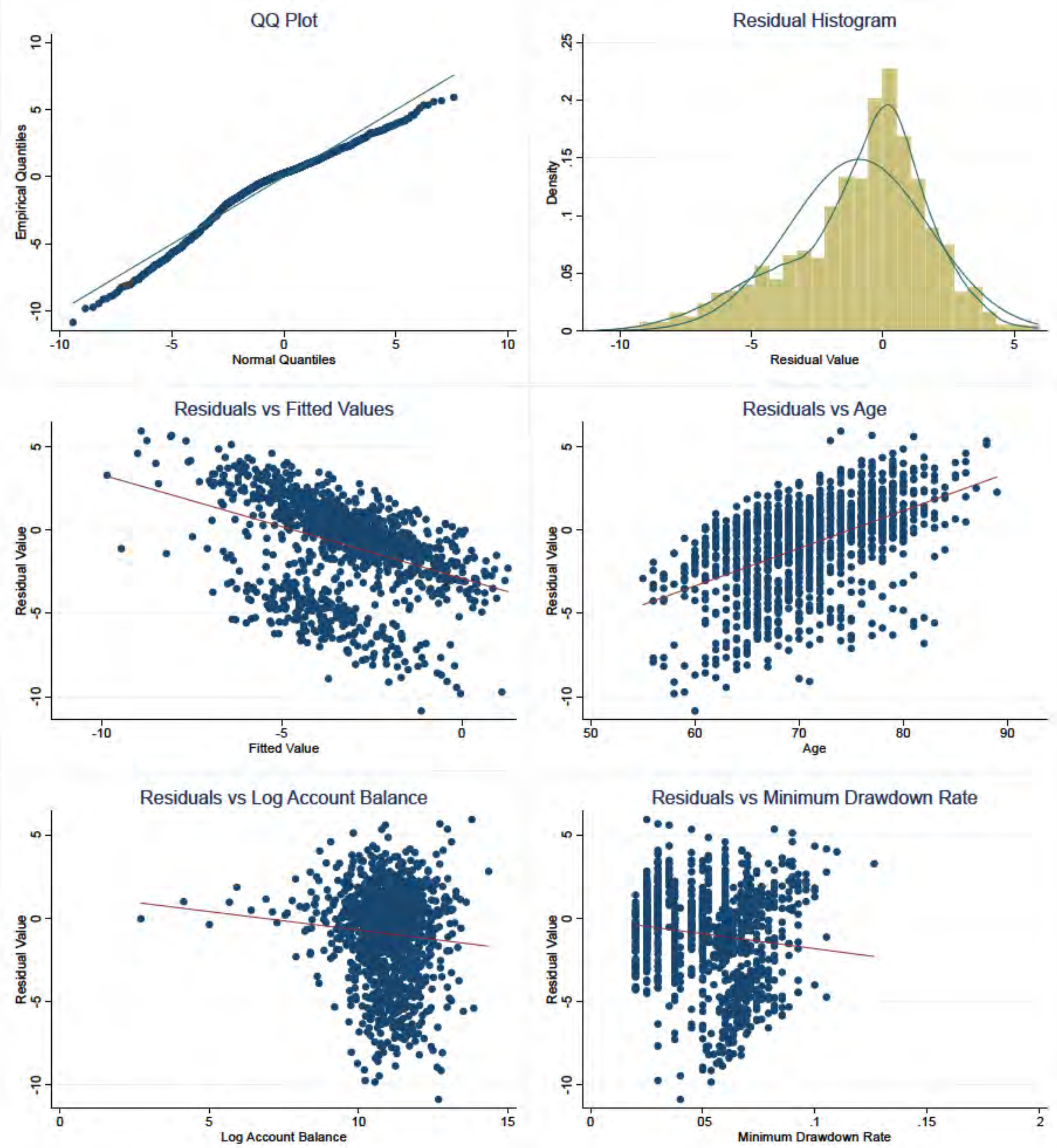
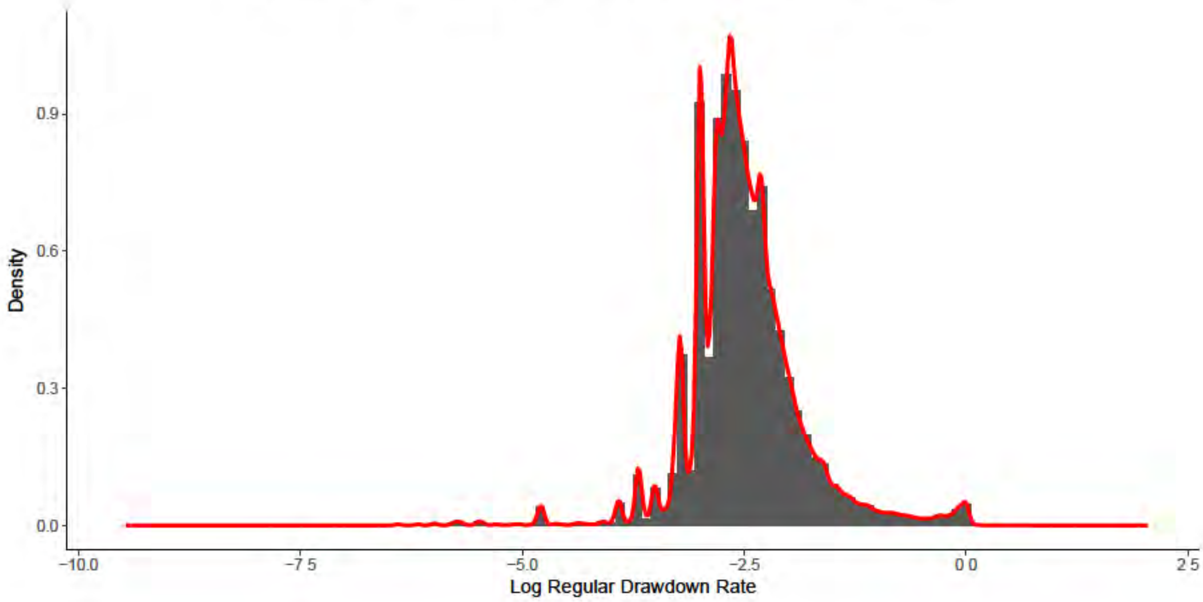


Table 4.15: Summary Statistics for Log Regular Drawdown Rate

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Log Regular Drawdown Rate	-9.37	-2.82	-2.57	-2.50	-2.23	0

Figure 4.9: Histogram of Log Regular Drawdown Rate



may suffer as a result.

Figures 4.10 and 4.11 spread the dependent variable over the time index. In this case, the location of the dependent variable seems stable, although its spread appears to increase through time.

Table 4.16 contains the regression estimates of the PC, FE, RE and HT models for the log regular drawdown rate. Again, we assume the FE estimates to be the most correct, and include the PC model output for completeness only.

As before, the Hausman test result provided in Table 4.17 strongly rejects, at any level of significance, the hypothesis that the FE and RE model estimates are the same. By contrast, Table 4.18 shows that the Hausman test fails to reject the same hypothesis when comparing the FE and HT estimates, at any level of significance. Consequently, we use the HT model results for inference on the effects of the regressors on the regular drawdown rate.

Except for the 2013 financial year effect, all regressors are statistically significant at least at the 5% level. After controlling for other available regressors, drawdown rates are, on average, higher for retirees with higher derived risk appetites, and for individuals retiring older. Compared to their female counterparts, male retirees draw at rates that are larger by a multiplicative factor of 1.13. Naturally, increasing minimum drawdown rates cause expected drawdown rates to increase.

The effect of increasing age over time is broadly negative, but with some convexity. An incremental year of age for a 65-year-old decreases the expected regular drawdown rate by a scaling factor of about 2.9%, while the same increment at age 85 only decreases the expected drawdown rate by a scaling factor of 0.1%. At age 86, the effect is zero.

Despite the positive coefficient on the linear age term, the quadratic effect dominates for all

Figure 4.10: 3D Histogram of Log Regular Drawdown Rate over Time

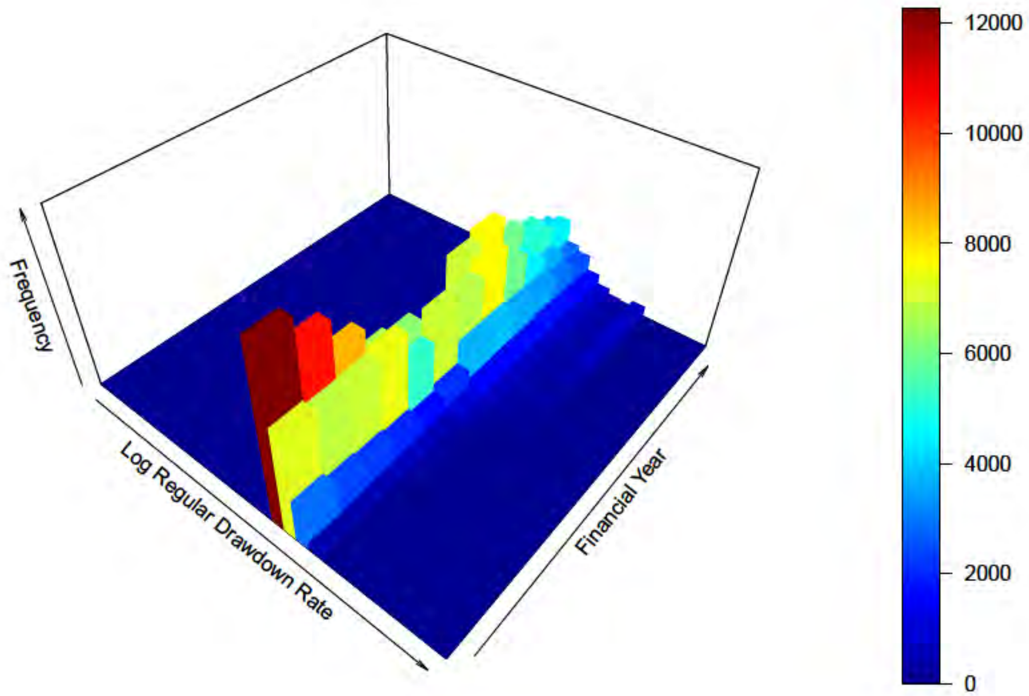


Figure 4.11: Heatmap of Log Regular Drawdown Rate over Time

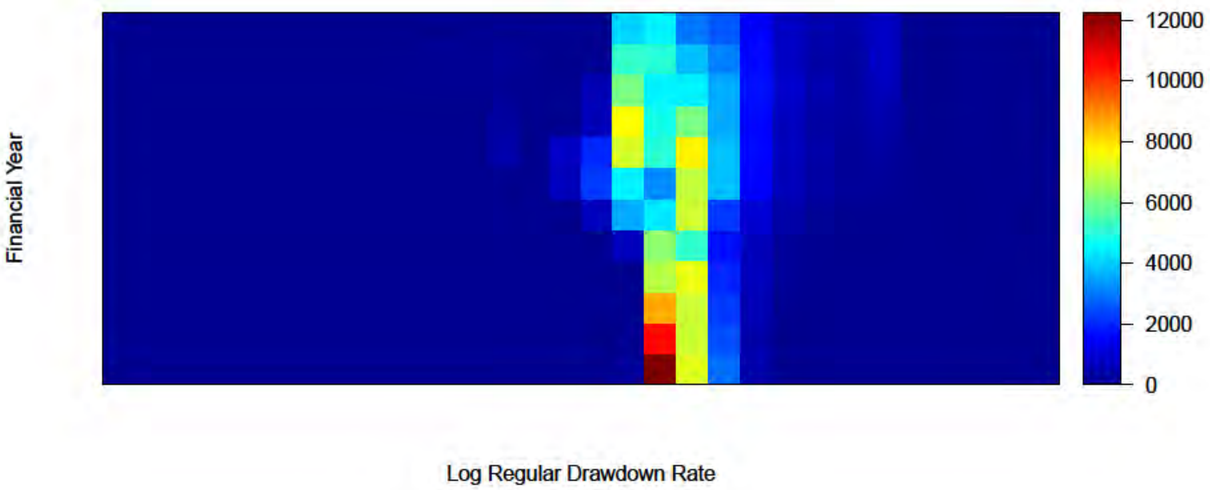


Table 4.16: Log Regular Drawdown Rate – Regression Model Output

	Pooled Cross-Sectional	Fixed Effects	Random Effects	Hausman-Taylor
Age	-0.0425^{***}	-0.118^{***}	-0.0815^{***}	-0.118^{***}
	(0.00390)	(0.00869)	(0.00703)	(0.00869)
Age^2	0.000428^{***}	0.000684^{***}	0.000621^{***}	0.000684^{***}
	(0.0000282)	(0.0000553)	(0.0000519)	(0.0000553)
Log Account Balance	-0.673^{***}	0.220^{***}	-0.0507^{**}	0.220^{***}
	(0.0160)	(0.0229)	(0.0174)	(0.0229)
(Log Account Balance)^2	0.0218^{***}	-0.0299^{***}	-0.0123^{***}	-0.0299^{***}
	(0.000727)	(0.00140)	(0.000955)	(0.00140)
Minimum Drawdown Rate	4.805^{***}	3.524^{***}	3.323^{***}	3.524^{***}
	(0.251)	(0.310)	(0.301)	(0.310)
Financial Year = 2004	-0.136^{***}	-0.459^{***}	-0.231^{***}	-0.459^{***}
	(0.0103)	(0.0344)	(0.0165)	(0.0344)
Financial Year = 2005	-0.150^{***}	-0.427^{***}	-0.227^{***}	-0.427^{***}
	(0.0101)	(0.0315)	(0.0157)	(0.0315)
Financial Year = 2006	-0.146^{***}	-0.376^{***}	-0.206^{***}	-0.376^{***}
	(0.0100)	(0.0286)	(0.0150)	(0.0286)
Financial Year = 2007	-0.146^{***}	-0.326^{***}	-0.185^{***}	-0.326^{***}
	(0.00988)	(0.0259)	(0.0143)	(0.0259)
Financial Year = 2008	-0.0804^{***}	-0.242^{***}	-0.138^{***}	-0.242^{***}
	(0.00616)	(0.0214)	(0.00904)	(0.0214)
Financial Year = 2009	0.0950^{***}	-0.120^{***}	-0.0262^{**}	-0.120^{***}
	(0.00783)	(0.0191)	(0.00913)	(0.0191)
Financial Year = 2010	0.103^{***}	-0.126^{***}	-0.0310^{***}	-0.126^{***}
	(0.00818)	(0.0159)	(0.00891)	(0.0159)
Financial Year = 2011	0.0655^{***}	-0.0806^{***}	-0.0156	-0.0806^{***}
	(0.00833)	(0.0134)	(0.00847)	(0.0134)
Financial Year = 2012	0.0412^{***}	-0.0541^{***}	-0.00806	-0.0541^{***}
	(0.00644)	(0.00868)	(0.00518)	(0.00868)
Financial Year = 2013	0.0659^{***}	-0.0116	0.0225^{***}	-0.0116
	(0.00690)	(0.00610)	(0.00478)	(0.00610)
Risk Appetite	0.0715^{***}	0	0.0876^{***}	0.0996^{***}
	(0.00626)	(.)	(0.0150)	(0.0158)
Gender = Male	0.0799^{***}	0	0.109^{***}	0.118^{***}
	(0.00238)	(.)	(0.00592)	(0.00623)
Age at Account Open	-0.00732^{***}	0	0.00394^{**}	0.0306^{***}
	(0.000555)	(.)	(0.00128)	(0.00395)
Legacy Account	0.181^{***}	0	0.188^{***}	0.297^{***}
	(0.00610)	(.)	(0.0130)	(0.0342)
Constant	3.184^{***}	3.693^{***}	1.696^{***}	1.437^{***}
	(0.155)	(0.383)	(0.238)	(0.261)
Observations	204221	204221	204221	204221

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.17: Log Regular Drawdown Rate – Hausman Test: FE vs RE

Metric	Value
χ^2_{14} Test Statistic	6499.40
p-value	0.0000

Table 4.18: Log Regular Drawdown Rate – Hausman Test: FE vs HT

Metric	Value
χ^2_{14} Test Statistic	0.00
p-value	1.0000

nontrivial account balances. At a balance of \$100,000, a 10% increase in account balance drives a reduction in the drawdown rate by a factor of 4.5%, while the same proportional increment at a balance of \$1,000,000 scales the drawdown rate down by a factor of 5.8%.

In general, retirees drew at higher rates in later financial years, with financial years before 2008 exhibiting substantially lower relative rates.

We turn to the residual diagnostics in Figure 4.12. The empirical distribution of residuals shows a left tail much heavier than a comparison Normal distribution. Moreover, the residual series plotted against fitted values and some regressors indicate there are still unobserved, relevant factors that our model is not incorporating. Specifically, at smaller account balances, we systematically overestimate the drawdown rate, and vice versa for higher account balances.

Adhoc Drawdown Rate

Finally, we examine the rate at which adhoc drawdowns deplete account balances, for those who use their account to make adhoc withdrawals. Figure 4.13 and Table 4.19 describe the distribution of the adhoc drawdown rate after taking the natural logarithm.

The median value of -2.27 on the log scale translates to a drawdown rate of approximately 10%. However, the most interesting feature of this distribution is the significant probability mass sitting at a value close to 0 on the log scale, corresponding to a complete withdrawal of the account balance as a lump sum. Roughly 8% of all adhoc drawdowns are used to completely withdraw the account balance out of the superannuation system. This probability mass near zero motivates our subsequent use of a censored regression model.

Spreading the log adhoc drawdown rate through the time dimension in Figures 4.14 and 4.15, we observe that over time, an increasing number of adhoc drawdowns draw down the entire account balance.

We use the tobit censored regression model, estimating by CRE. For comparison purposes, Table 4.20 provides the PC and standard RE model coefficients alongside the CRE estimates.

These coefficients are the marginal effects on the dependent variable relative to unit increases in the corresponding regressors. As the dependent variable is on the log scale, these coeffi-

Table 4.19: Summary Statistics for Log Adhoc Drawdown Rate

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Log Adhoc Drawdown Rate	−12.88	−3.15	−2.27	−2.28	−1.15	−0.11

Figure 4.12: Log Regular Drawdown Rate – Hausman-Taylor Model Residual Diagnostics

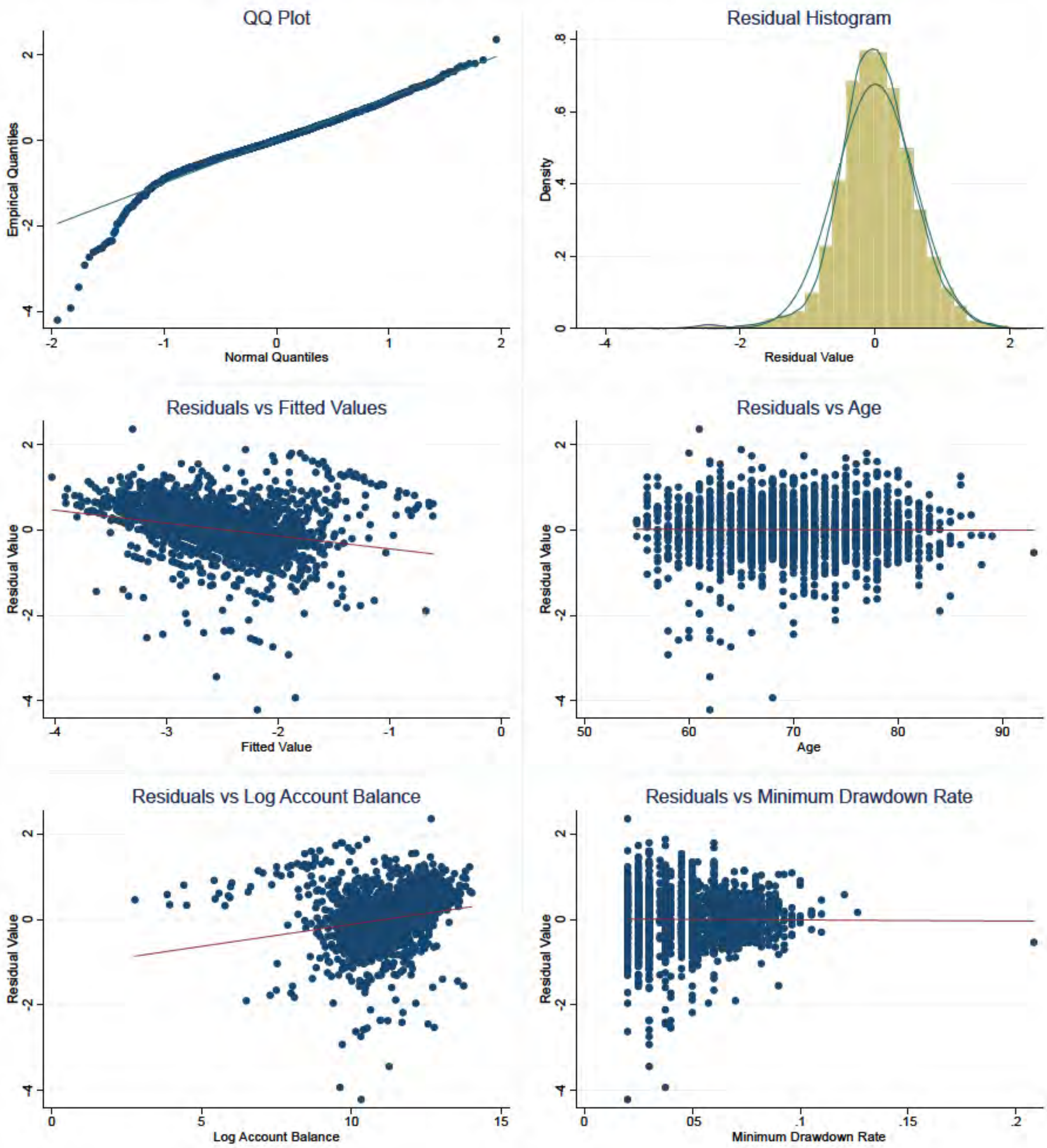


Figure 4.13: Histogram of Log Adhoc Drawdown Rate

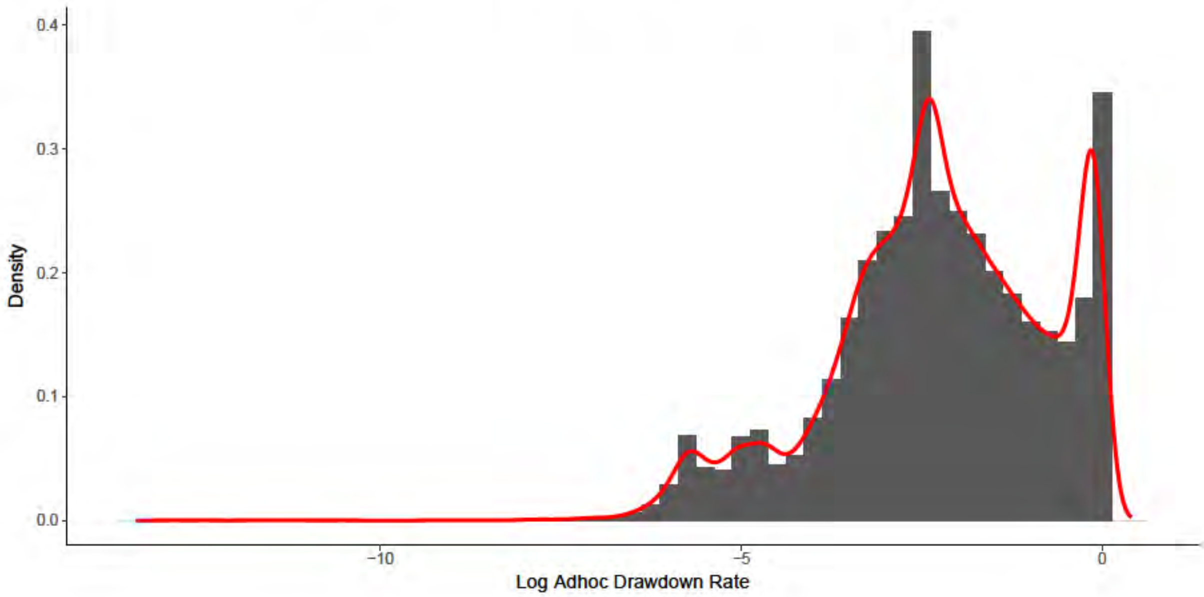


Figure 4.14: 3D Histogram of Log Adhoc Drawdown Rate over Time

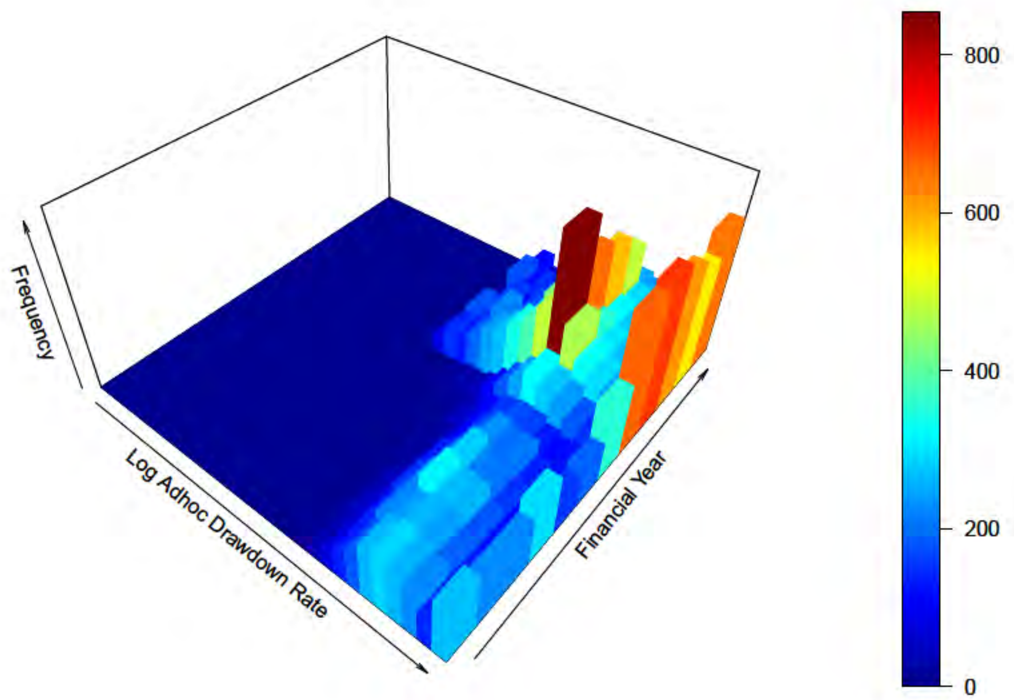


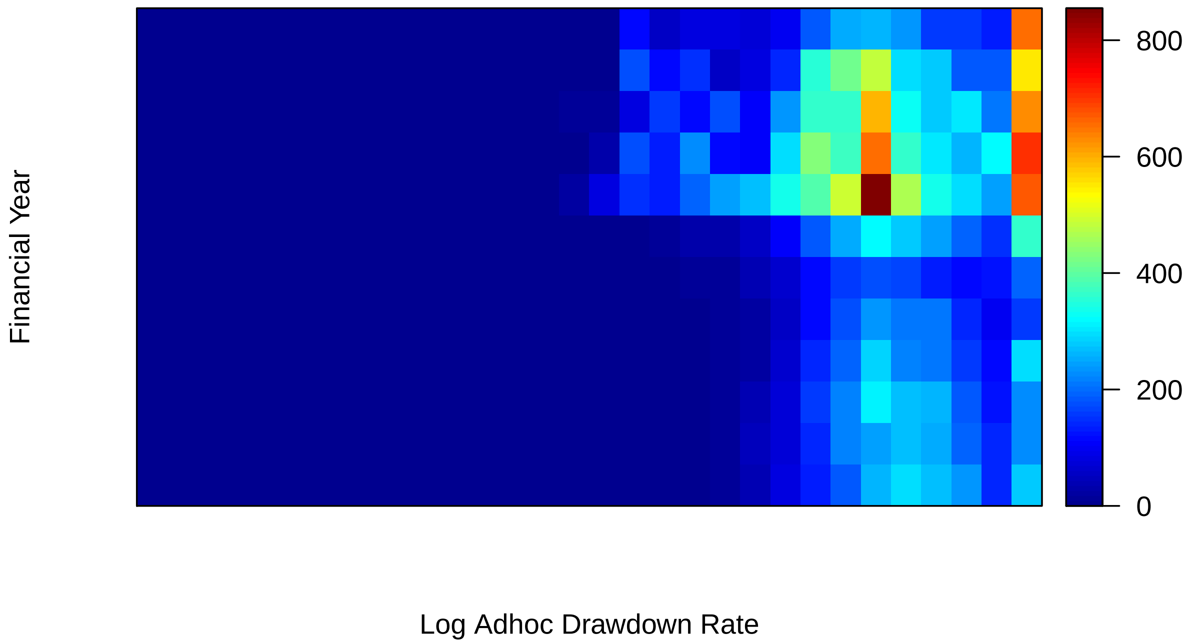
Table 4.20: Log Adhoc Drawdown Rate – Regression Model Output

	PC Tobit Model	RE Tobit Model	CRE Tobit Model
Age	-0.0909^{**}	-0.0198	0.125^{*}
	(0.0312)	(0.0349)	(0.0550)
Age^2	0.00128^{***}	0.000817^{**}	-0.000281
	(0.000232)	(0.000252)	(0.000339)
Log Account Balance	0.189^{***}	0.212^{***}	-0.275^{***}
	(0.0335)	(0.0299)	(0.0342)
(Log Account Balance)^2	-0.0223^{***}	-0.0115^{***}	0.0287^{***}
	(0.00168)	(0.00162)	(0.00200)
Minimum Drawdown Rate	-18.81^{***}	-7.934^{***}	-6.215^{**}
	(2.649)	(2.231)	(2.393)
Financial Year = 2004	0.865^{***}	0.144	-0.842^{**}
	(0.101)	(0.104)	(0.293)
Financial Year = 2005	1.018^{***}	0.238^{*}	-0.708^{**}
	(0.0977)	(0.0984)	(0.267)
Financial Year = 2006	0.975^{***}	0.235^{*}	-0.643^{**}
	(0.0964)	(0.0942)	(0.240)
Financial Year = 2007	1.042^{***}	0.308^{***}	-0.519^{*}
	(0.0963)	(0.0907)	(0.215)
Financial Year = 2008	0.464^{***}	0.0620	-0.665^{***}
	(0.0654)	(0.0629)	(0.180)
Financial Year = 2009	0.116	-0.198^{**}	-0.887^{***}
	(0.0808)	(0.0715)	(0.162)
Financial Year = 2010	0.236^{**}	-0.0275	-0.485^{***}
	(0.0744)	(0.0648)	(0.135)
Financial Year = 2011	-0.298^{***}	-0.152^{**}	-0.399^{***}
	(0.0687)	(0.0587)	(0.109)
Financial Year = 2012	0.0188	-0.0121	-0.210^{**}
	(0.0451)	(0.0366)	(0.0734)
Financial Year = 2013	-0.0646	0.00369	-0.0630
	(0.0455)	(0.0348)	(0.0514)
Risk Appetite	-0.273^{***}	-0.423^{***}	-0.111^{*}
	(0.0371)	(0.0527)	(0.0482)
Gender = Male	0.183^{***}	0.101^{***}	0.111^{***}
	(0.0182)	(0.0259)	(0.0229)
Age at Account Open	-0.0567^{***}	-0.0772^{***}	0.0176^{*}
	(0.00592)	(0.00790)	(0.00766)
Legacy Account	-0.181^{**}	0.155^{*}	-0.343^{***}
	(0.0580)	(0.0745)	(0.0930)
($\bar{\mathbf{x}}_i$ omitted)	.	.	.
Constant	3.039^{**}	-0.0839	8.027^{***}
	(1.033)	(1.141)	(1.600)
σ_α		1.210^{***}	1.026^{***}
		(0.0107)	(0.00963)
σ_e		0.802^{***}	0.792^{***}
		(0.00504)	(0.00490)
Observations	25076	25076	24947

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 4.15: Heatmap of Log Adhoc Drawdown Rate over Time



cients represent proportional changes in the adhoc drawdown rate. For example, increasing the minimum drawdown rate by 0.01, or 1% of account balance, multiplies the expected drawdown rate by a factor of approximately 0.94.

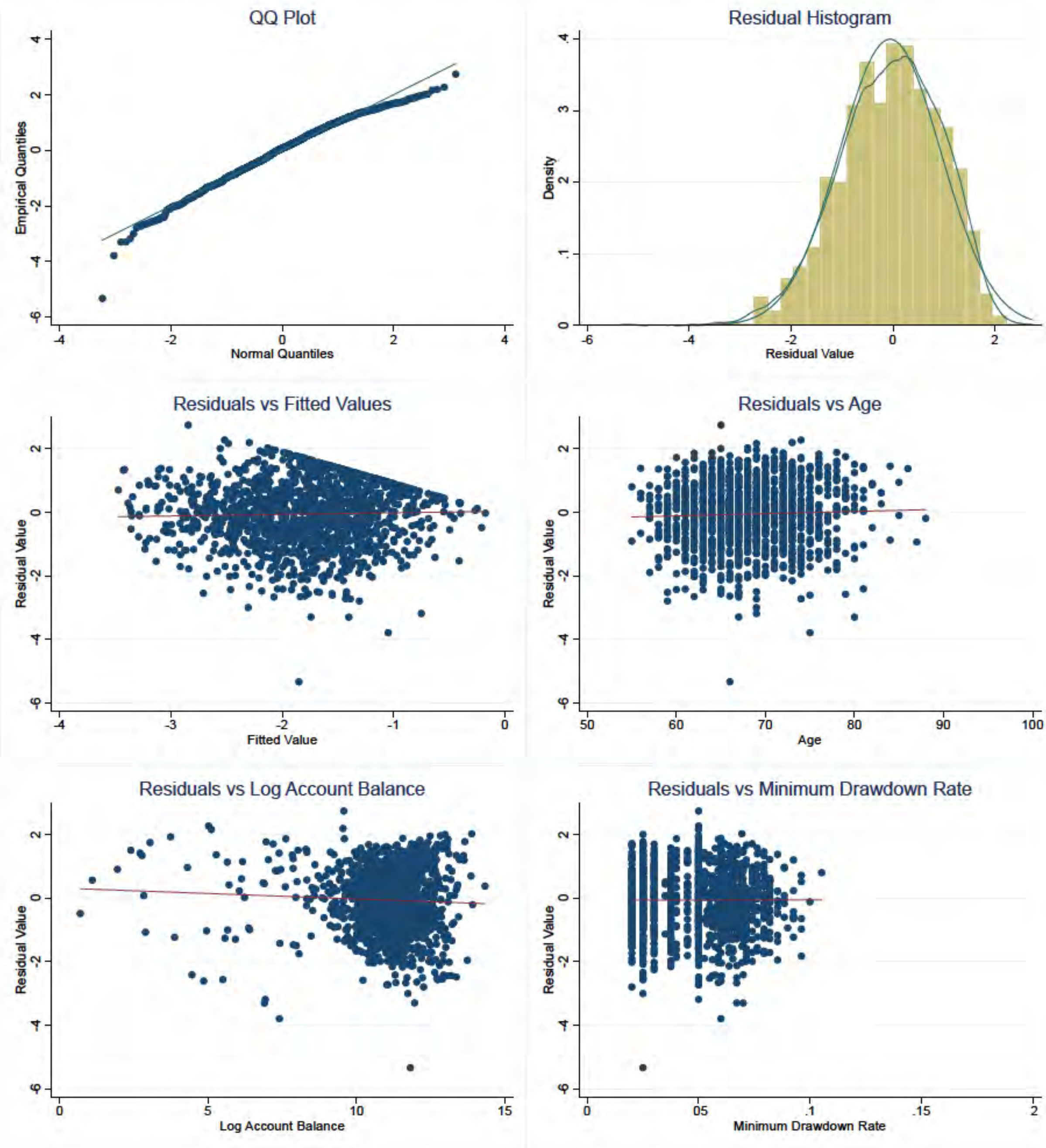
The effect of ageing is only significant in the linear term. An incremental year of age scales the expected adhoc drawdown rate up by a factor of 12.5%. The square term on the log account balance variable dominates for all reasonable account balances, in the positive direction. At $100,000, a 10% increase in account balance drives an expected 3.6% proportionally larger drawdown rate, while at a balance of $1,000,000 a 10% increase can expect to scale the adhoc drawdown rate up by 4.9%.

In Figure 4.16, we inspect residual diagnostic plots for the current model. There is heteroscedasticity in the residuals with respect to the log account balance, but broadly these diagnostics seem better than in the previous two continuous dependent variable models.

4.1.4 Summary of Panel Regression Model Results

Overall, the panel regression models estimate statistical relationships between several dependent variables of interest and the available regressors. These include the binary choice observations of drawing at the minimum rates and making an adhoc drawdown, as well as models for the rate of regular and adhoc drawdowns.

Figure 4.16: Log Adhoc Drawdown Rate – CRE Tobit Model Residual Diagnostics



Although these models provide insights into the impact of the regressors on drawdowns, the model diagnostics convince us that much of the variation in observed outcomes remains uncaptured using administrative data alone. Motivated by hypotheses drawn from the theoretical literature, and permitted by the panel nature of our data, we proceed to study drawdowns over time by adding a behavioural dimension to the analysis.

4.2 Component 2: Cluster Analysis

In this section, panel data visualisations inspire the manual and machine-assisted procedures to identify groups that are similar in their observed drawdown behaviours over time.

4.2.1 Panel Visualisations

A quantity of particular interest is the rate at which individuals intend to draw down their accounts, exclusive of their adhoc drawdowns. Figure 4.17 shows the regular drawdown rates for all 44,000 accounts which joined the sample in financial years 2004 and 2009–11. Each line segment represents an individual's trajectory in the dependent variable through time.

Immediately, two aspects to the data become clear. First, since the latest minimum drawdown rules came into effect on 1 July 2007, many individuals are able to draw from their accounts at constant rates. Second, groups suggest themselves visually, through inspection alone.

As individuals face different minimum drawdown requirements at different ages and in different financial years, Figure 4.18 visualises how these rates translate into excess regular drawdown rates. Here, people at the zero line are drawing exactly at their respective minimum rates, while drawdowns above the minimum have a nonzero value on the vertical axis.

In making decisions as to their regular drawdowns, individuals may focus on the dollar amount taken, rather than the rate this represents. The regular drawdown amount for all accounts, in nominal dollar terms, is given in Figure 4.19. This plot makes visible the tendency for many retirees to draw down level amounts over time.

In determining a drawdown rate, the account balance as the denominator is highly influential—especially for individuals who tend towards level drawdown amounts over time. To observe any patterns in account balances over time that would directly affect drawdown rates, Figure 4.20 is useful. The decline in the balances for 2009 and 2010 is evident. Note, however, that as the account balances plotted are as at the start of the relevant financial year, the corresponding declines in account balances occurred during financial years ended 30 June 2008 and 2009. This effect may have at least partly caused observed increases in the regular—and excess regular—drawdown rates plotted for financial years 2009 and 2010. In the prior regression modelling, including the account balance and financial year dummies as regressors controlled for the influence of the account balances and financial year-specific effects on the drawdown rates. This allowed the inference on the remaining regressors to be free from these effects.

Figure 4.17: Regular Drawdown Rate Panel Visualisation

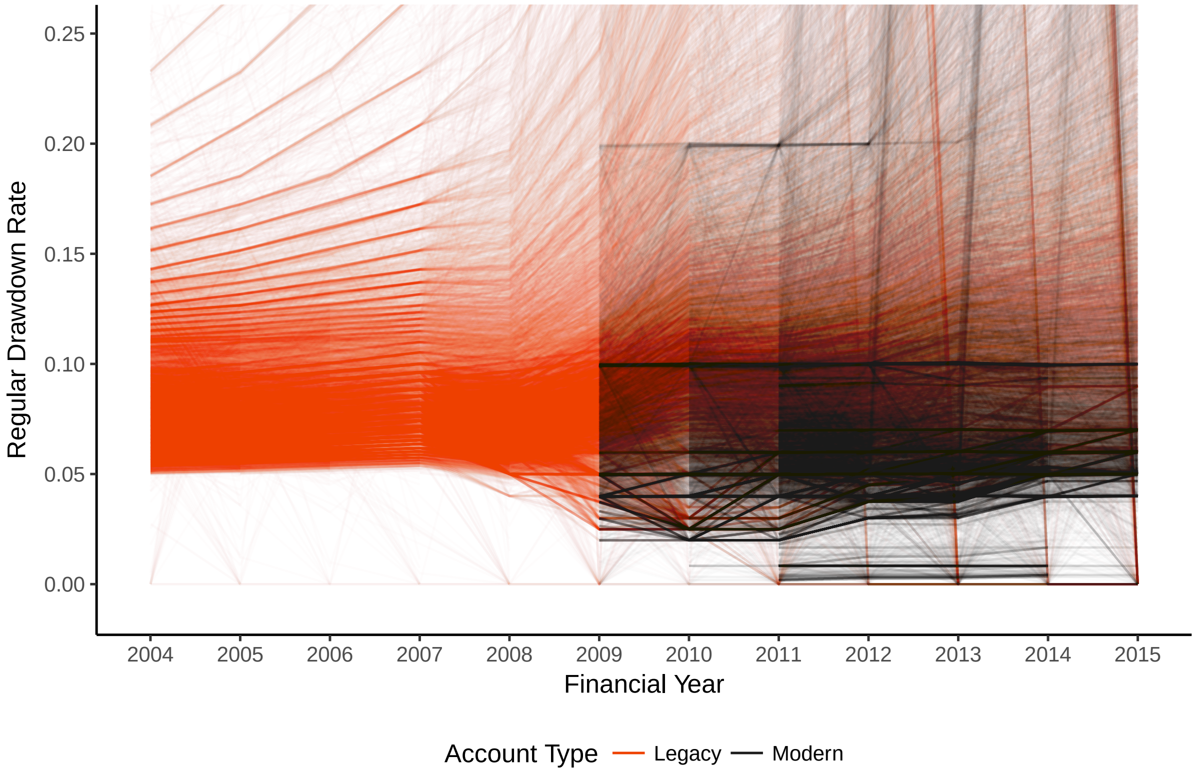


Figure 4.18: Excess Drawdown Rate Panel Visualisation

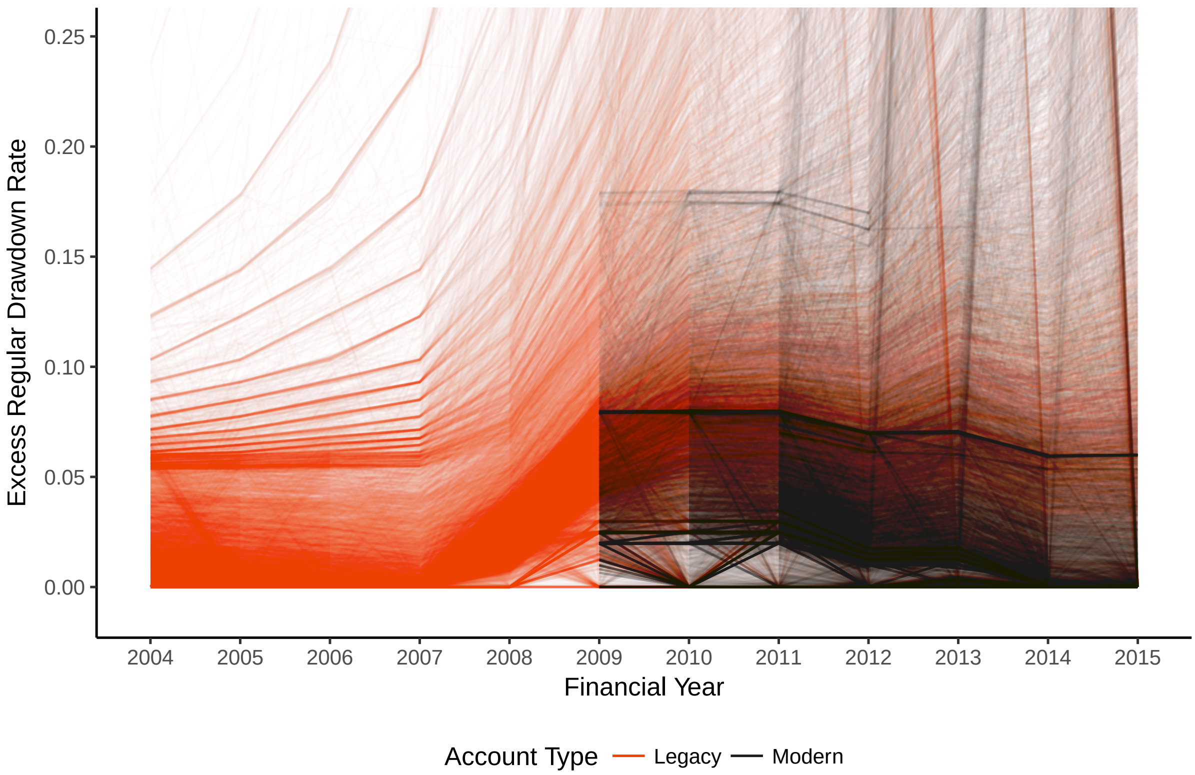


Figure 4.19: Regular Drawdown Amount Panel Visualisation

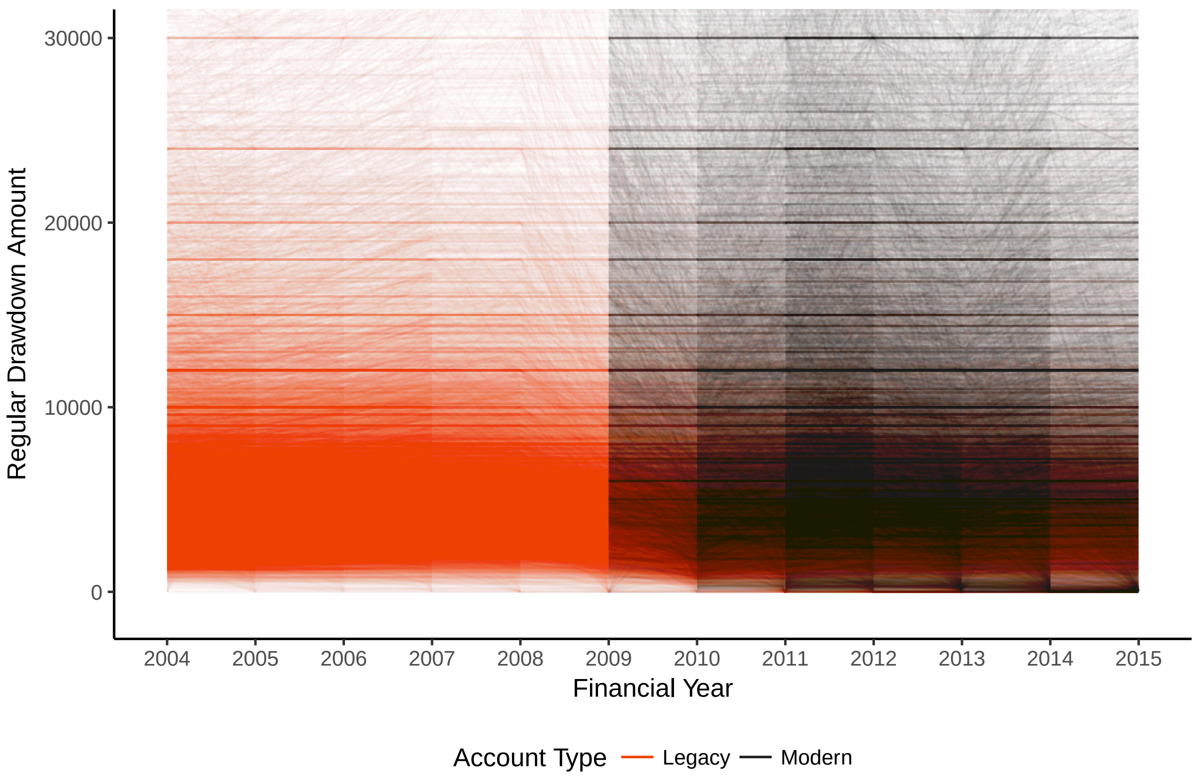
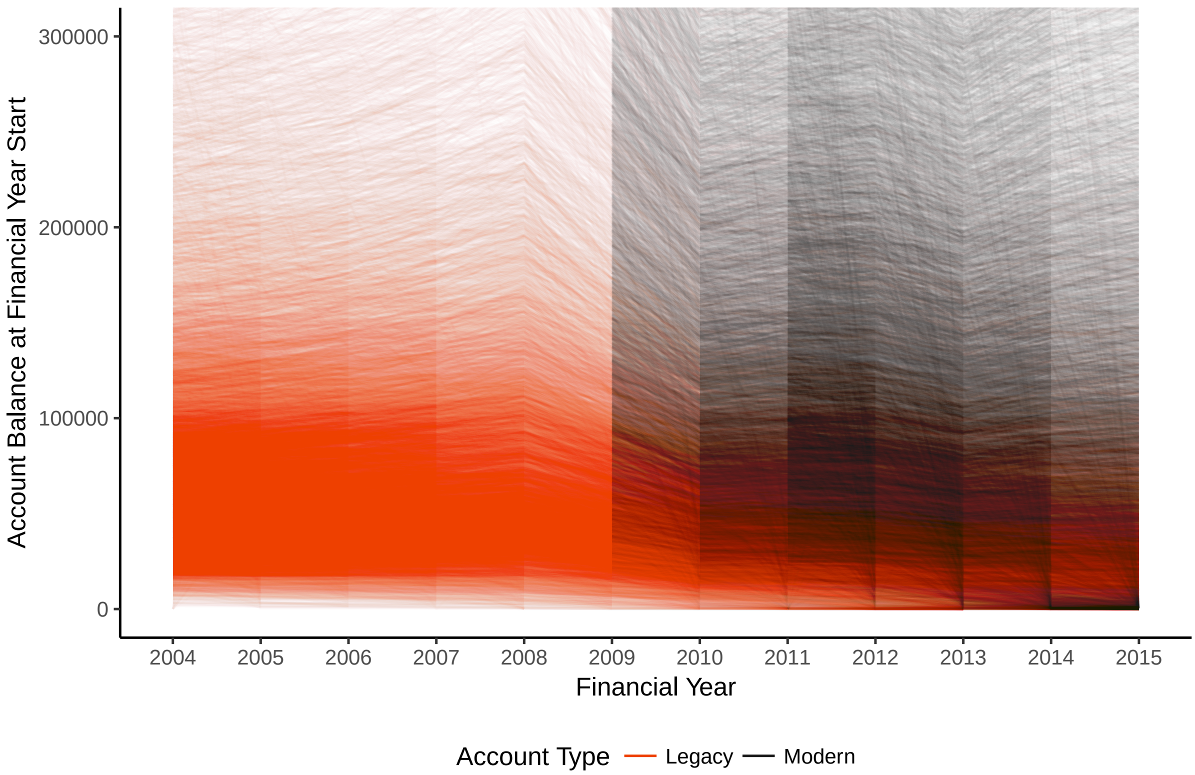


Figure 4.20: Account Balance at Financial Year Start Panel Visualisation



4.2.2 Manual Grouping

The panel visualisations suggest five groups that we can capture directly by applying filters to the underlying data. In section 4.2.4, we provide a sense of how large each of these groups are, both in terms of the number of retirees captured and in the proportion of the total sample this represents.

First are individuals who gravitated towards their respective minimum drawdown rates for all or most of the sampled time periods—shown in Figure 4.21. We allocated individuals to this group even if they lagged a year in adjusting to changes in the minimum drawdown rules or concessional rates, or if they strayed for one year briefly but otherwise faithfully followed this strategy.

Second, in Figure 4.22 we found a group of people that appeared to use the minimum drawdown rates as a strategy, but did not revise down their drawdown rates in years where concessional minima applied—financial years ended 2009–13. Again, some of these individuals lagged in adjusting to the new rules applying from 1 July 2007, and some drew at higher rates in some years but quickly returned to the non-concessional minima. Others seemed to be aware of the concessional minima, evidenced by their drawing below the non-concessional minima in some years—corresponding to rates below the zero line in this figure. These retirees seemed to prefer the non-concessional arrangements, however, and quickly returned to these rates.

Third, we find a group of retirees drawing regularly at a rate of 10% of their account balance annually, shown in Figure 4.23. 48% of this group was comprised of members with a TRIP, within which the maximum allowable drawdown rate is 10%.

A fourth group, visualised in Figure 4.24, are those who have a strong tendency to draw level income streams—except when they occasionally revise this level amount up or down.

Finally, after allocating the previous four groups, a very small number of the remaining retirees show a tendency to draw the same annual rate from their account for several successive years. Figure 4.25 shows this group.

Thus apart from the case of drawing the minimum drawdown rates, which can stay constant for several years in succession depending on the financial year and the age of the retiree, the tendency to draw at constant rates is exceedingly rare to observe in practice.

4.2.3 Machine-Assisted Grouping

After manually identifying the previous five groups, we apply a hierarchical clustering methodology to classify the remaining individuals. On experimenting with different distance metrics and linkage methods, the most successful combination proved to be the Euclidean distance combined with the `R` implementation of Ward's linkage method (for details, see Ward Jr, 1963; Murtagh and Legendre, 2014). We performed clustering on the observed values of several dependent variables, including:

Figure 4.21: Manual Grouping – Follow Minima

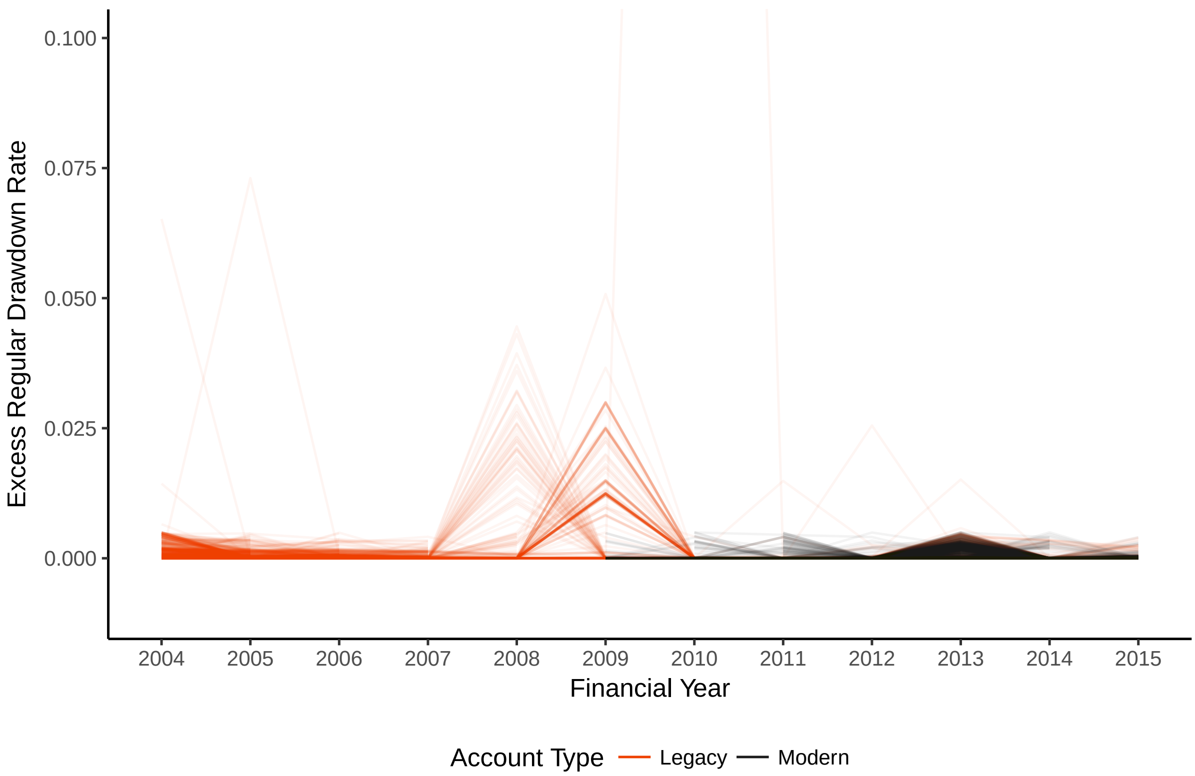


Figure 4.22: Manual Grouping – Follow Non-Concessional Minima

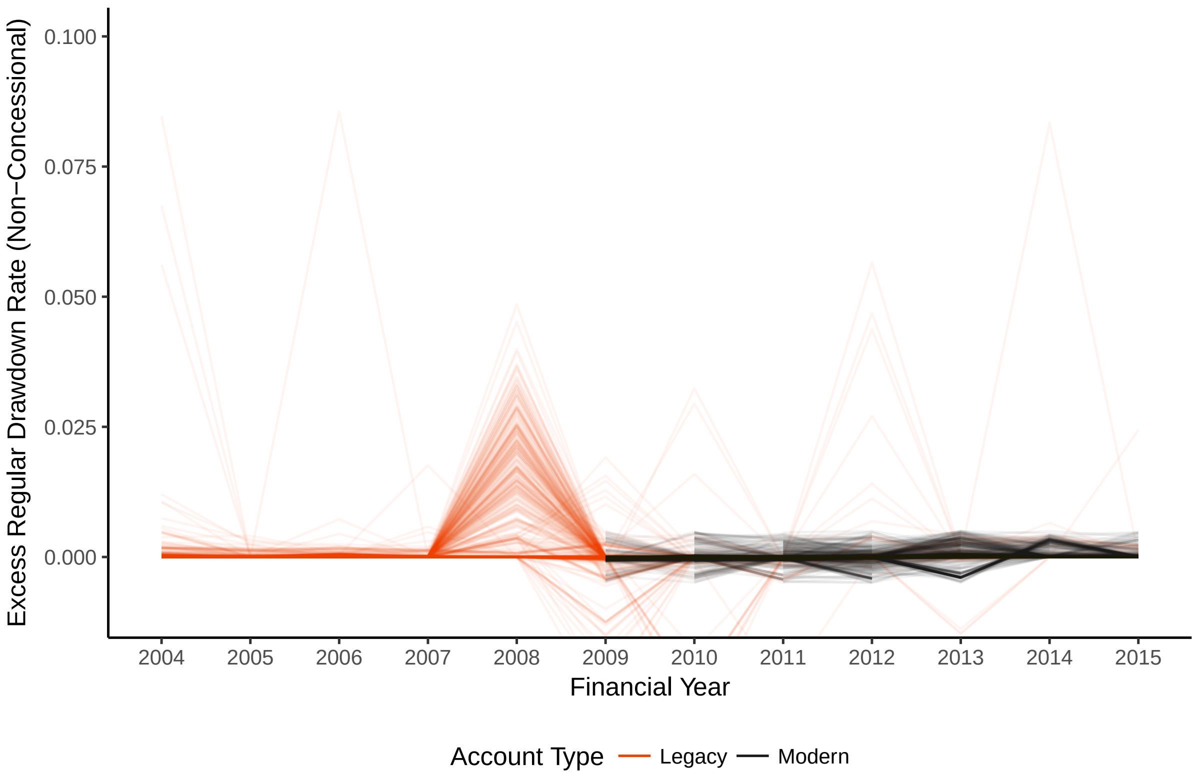


Figure 4.23: Manual Grouping – Draw 10%

Figure 4.24: Manual Grouping – Prefer Level Amount

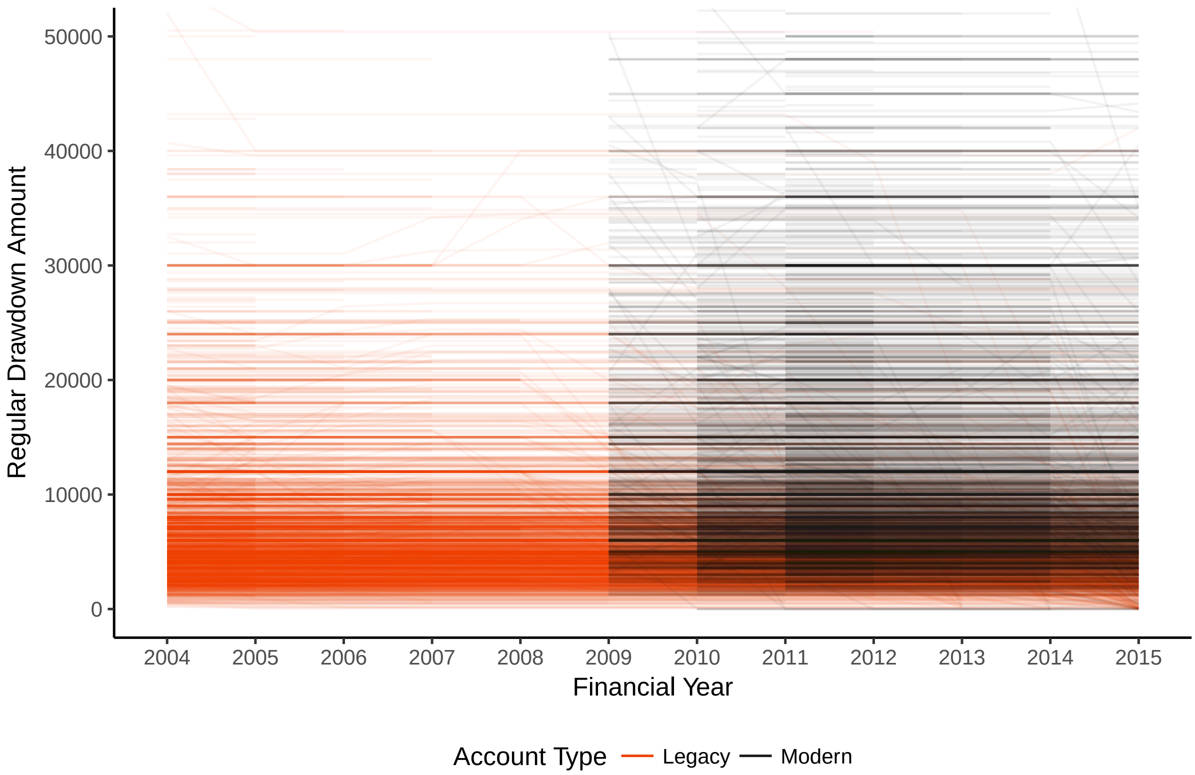
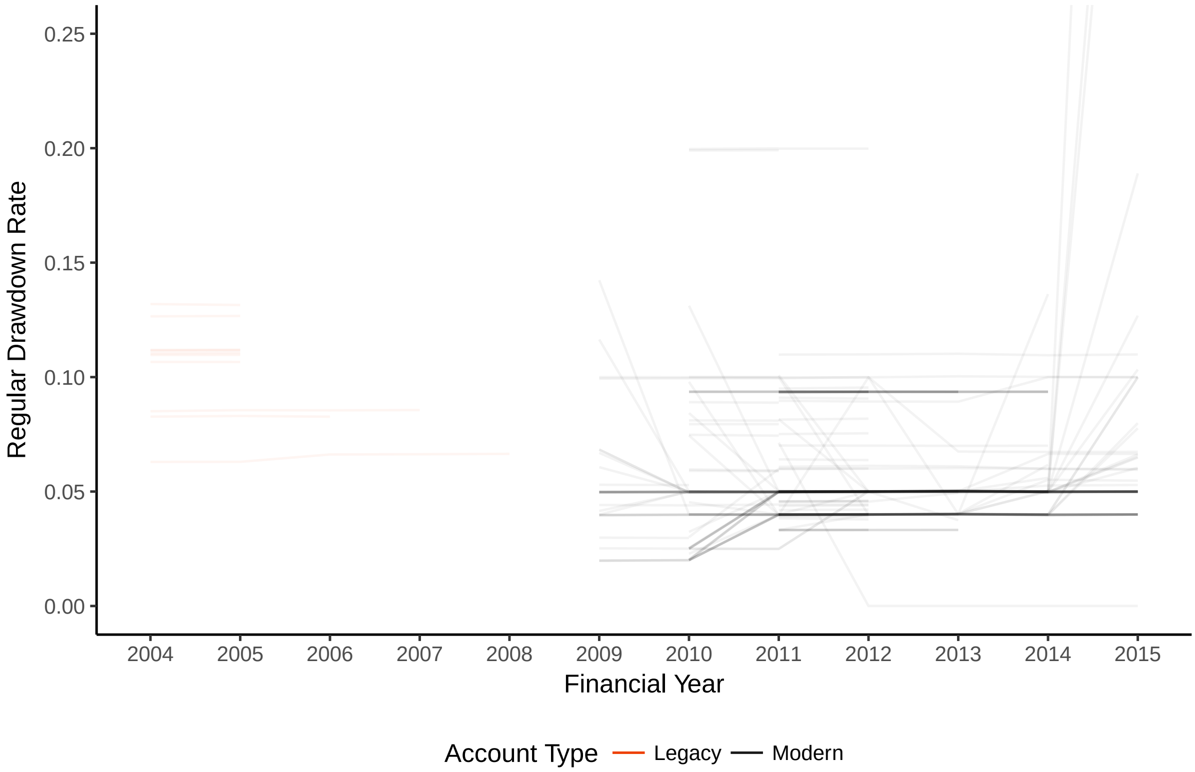


Figure 4.25: Manual Grouping – Prefer Level Rate



- The excess regular drawdown rate, ignoring the concessional rates applying in financial years ended 30 June 2009–13
- The excess regular drawdown rate, accounting for the concessional rates
- The first difference of the regular drawdown dollar amount
- The total drawdown rate, inclusive of regular and adhoc drawdowns

After the hierarchical clustering procedure grouped individuals who behaved similarly to each other into clusters, we inspected the results to determine against which we could attribute behavioural explanations. These individuals were allocated into the resulting 'clusters'.

Figure 4.26 shows multiple panels for individuals who used a combination of the concessional and non-concessional minimum drawdown rates as a guide. The vertical axis is the excess regular drawdown rate, ignoring concessional rates. As before, we allowed individuals a grace period around the time the rules changed, if they subsequently displayed a strong tendency to use the minima.

Figure 4.27 portrays a group primarily focused on the non-concessional minimum drawdown rates. Some of these individuals are not necessarily distinguishable from the previous cluster, however for the final allocation we aggregate these two clusters into the same behavioural group driven by one heuristic.

Figure 4.28 finds another group of retirees that try to draw at the minimum drawdown rates for most observed periods. These differ from those found using the manual rules in that they

Figure 4.26: Machine-Assisted Grouping – Use Concessional and Non-Concessional Minima

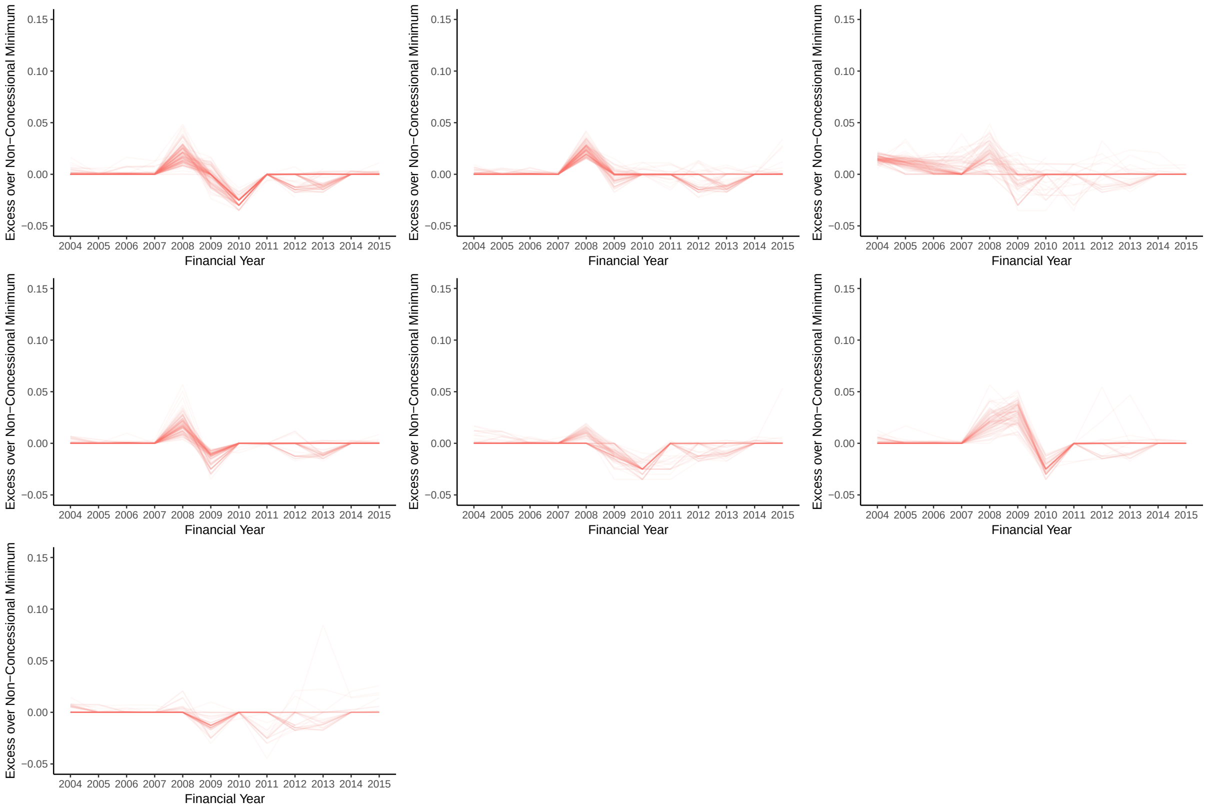


Figure 4.27: Machine-Assisted Grouping – Use Non-Concessional Minima

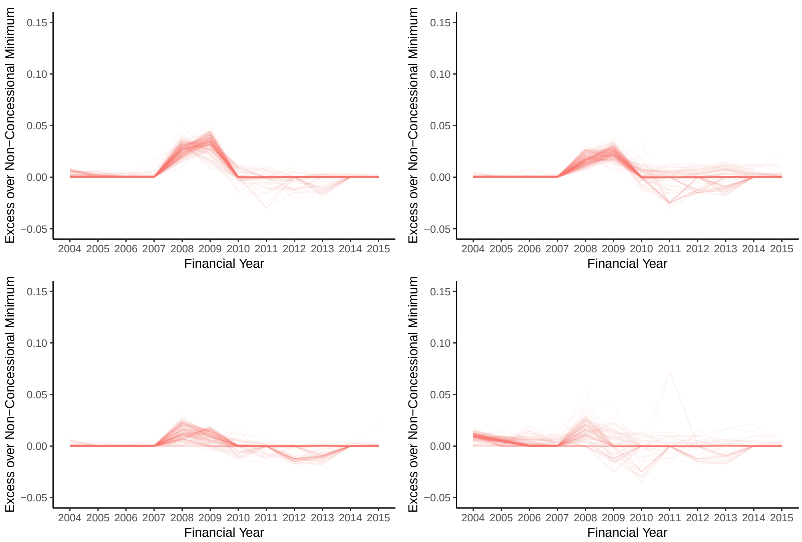
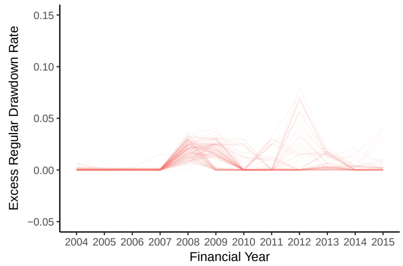


Figure 4.28: Machine-Assisted Grouping – Use Concessional Minima



struggled longer and harder with the change in rules or the impact of the GFC. However they still exhibit the same tendency to follow the minimum rates, especially prior to the 2008 financial year.

Another group that seemed intent on drawing at or very close to the minimum rates prior to 2008 is shown in Figure 4.29. These retirees were unable to recover after the GFC as quickly as others who followed the minimum rules. In part, this may be due to a large reduction in account balances over financial years 2008 and 2009, leaving them with a much smaller denominator from which to form the drawdown rate.

Many retirees held a level drawdown amount over time. Figure 4.30 plots the first difference of the regular drawdown amount in dollar terms, such that the zero line represents a level income stream.

Another common, related behaviour, seen in Figure 4.31, was to draw the same dollar amount for most of the observed periods, but revising down the level amount at one stage. The dips correspond to the years in which retirees reduced the amount of their level income stream, and subsequently held the drawdowns level at this lower amount.

Figure 4.32 shows the less common, inverted behaviour: a level income stream with an upwards revision.

Similar to the group of individuals who were able to maintain the minimum drawdown rates until financial year 2008, we found a group which was able to draw a level amount until at least the 2007 financial year, but thereafter lost the ability or desire to hold a constant income stream. These retirees are visualised in Figure 4.33.

Finally, after allocating individuals into the above clusters, we identified a group of people who completely drew down their account balances while under observation. We see these retirees in Figure 4.34, where the total drawdown rate is on the vertical axis. Dropping down to a zero—or near-zero—drawdown rate after a near-complete liquidation of the account balance is possible since minimum drawdowns are only enforced if the dollar amount required exceeds $10.

Figure 4.29: Machine-Assisted Grouping – Follow Minima 2004–7

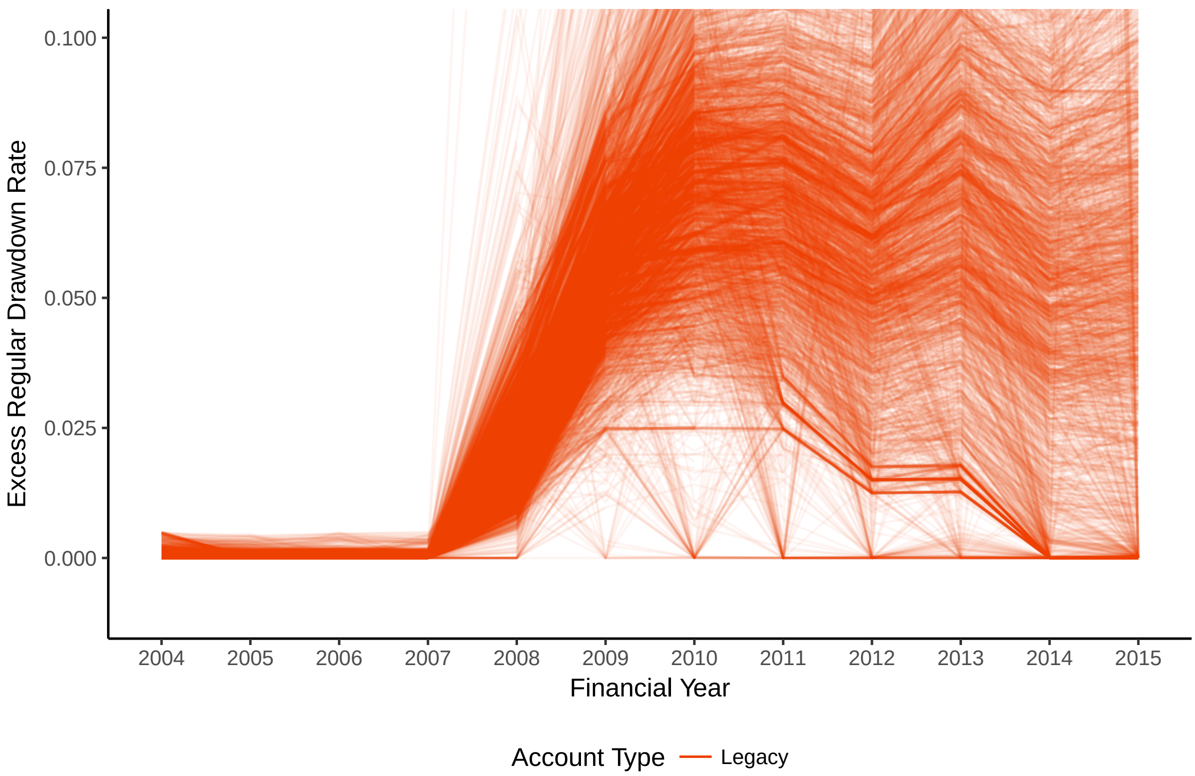


Figure 4.30: Machine-Assisted Grouping – Prefer Level Amount

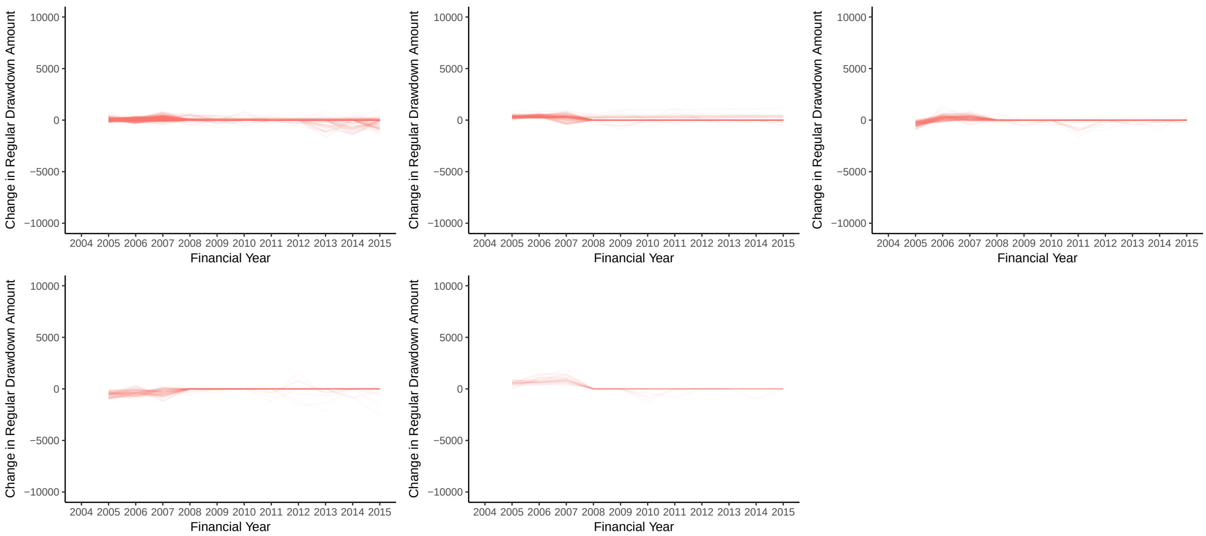


Figure 4.31: Machine-Assisted Grouping – Level Amount with Step Down

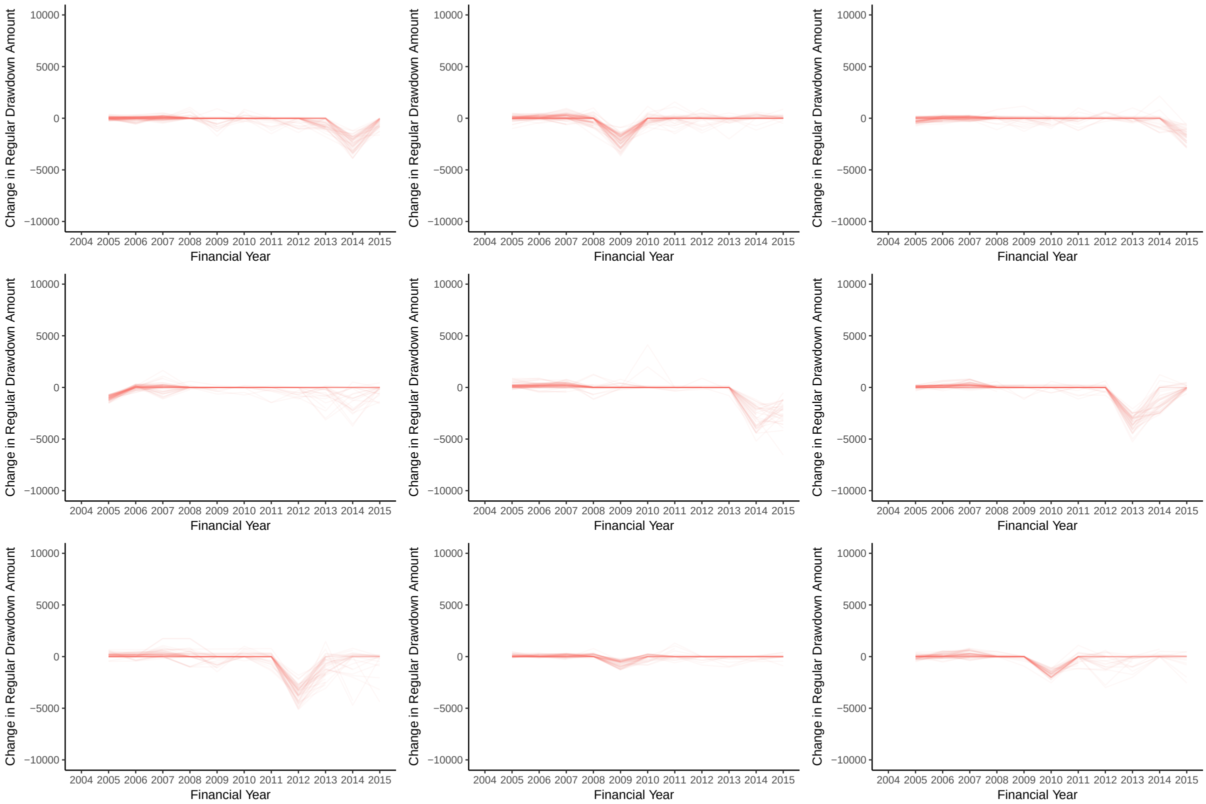


Figure 4.32: Machine-Assisted Grouping – Level Amount with Step Up

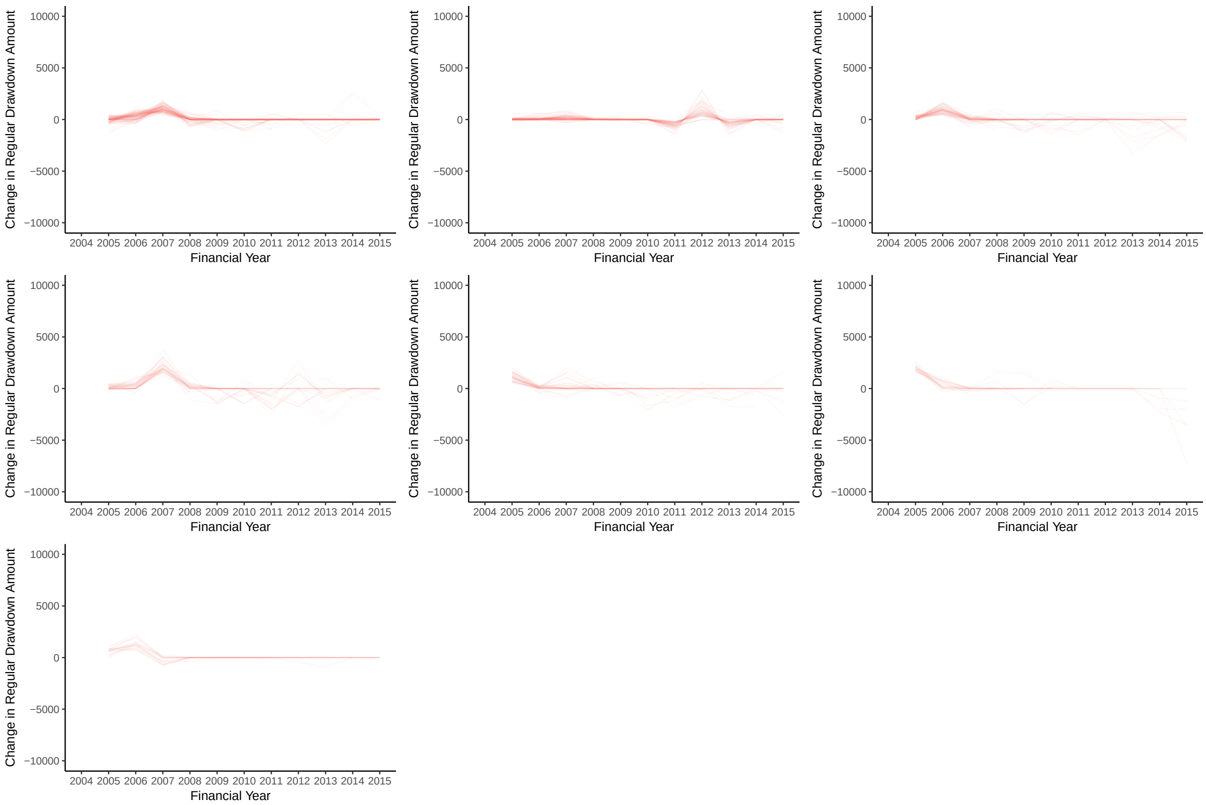


Figure 4.33: Machine-Assisted Grouping – Level Amount 2004–7

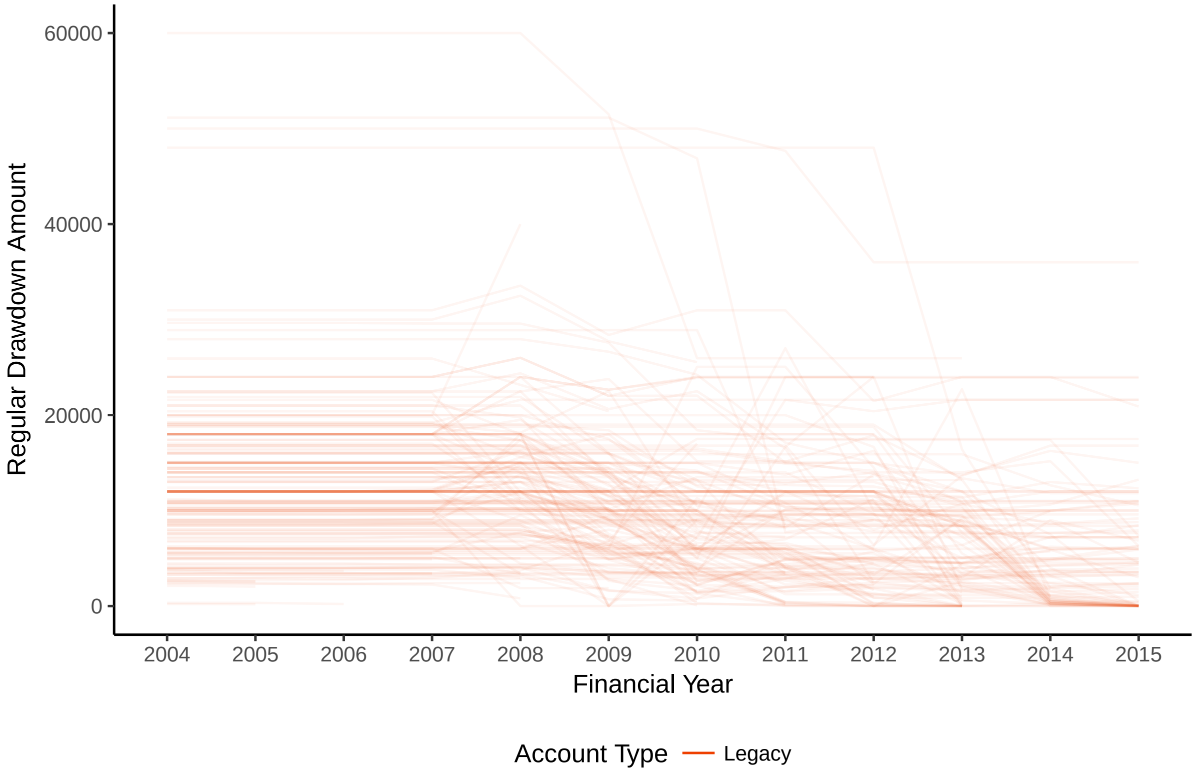


Figure 4.34: Manual Grouping – Complete Account Drawdown In-Sample

4.2.4 Final Cluster Allocation

After completing the manual and machine-assisted clustering procedure, we obtain the cluster allocation given in Table 4.21, where each cluster has its own unique economic interpretation. 17% of the sample remains unallocated to a discernible drawdown strategy.

However, we suggest that several of these clusters relate to identical heuristics, despite some variation in the execution. For example, for all clusters where the minimum drawdown rates—either concessional or non-concessional—are used as the chosen drawdown rates for multiple successive years, we attribute the same heuristic to describe the behaviour: using the minimum drawdown rates as a guide.

On aggregating these economically similar clusters into 'cluster groups', we arrive at the cluster group allocation shown in Table 4.22. Perhaps unsurprisingly, almost half of our (large) sample defaults to following the legislated minimum drawdown rates for a significant proportion of the observation period. Furthermore, more than a quarter of the sample prefers to draw the same amount in consecutive years—except for instances in which they choose to revise the level of their constant income stream. Such revisions are seldom in pursuit of a higher drawdown amount.

Importantly, none of these individuals appear to be protecting their regular income streams from inflation—in fact, using our methodology, we did not find evidence for inflation-adjusting behaviour at all. This is not necessarily indicative of diminishing purchasing power of retirees, as we are only able to observe the portion of their retirement income derived from an account-based pension. Other possible sources of income, such as their Age Pension entitlement, or investment income originating outside of their account-based pensions, may naturally grow at least as fast as inflation. Despite this, superannuation funds and financial advisors might be able to provide a better service to retirees by assisting them to draw inflation-adjusted income streams.

A small portion (4%) of our sample corresponds to younger retirees using transition to retirement accounts at their maximum allowable rate of drawdown: 10% per annum. Furthermore, after removing all other explicable behaviours, another 4% of the sample completely drew down their account balance while under observation.

4.3 Component 3: Categorical Regression Modelling

After constructing the cluster group allocation, the sample is split into four behavioural groups, as well as an unallocated group—representing 'noise'.

We report summary statistics for the time-invariant regressors in Table 4.23. To investigate how these groups differ statistically in the available time-invariant regressors, we perform a categorical regression using the multinomial logistic model. Table 4.24 summarises the regression output.

Table 4.21: Final Cluster Allocation Table

Cluster ID	Cluster Name	Cluster Size	Proportion of Sample
1	At Minima	7236	0.17
2	At Minima ('04–07)	4895	0.11
3	At Non-Concessional Minima	6891	0.16
4	10%	1811	0.04
5	Quickdraw	1549	0.04
6	Level Amount	6784	0.15
7	Level Amount ('04–07)	187	0.00
8	Level + Step Down	4331	0.10
9	Level + Step Up	715	0.02
10	Level Rate	172	0.00
11	Below Non-Concessional Minima	1786	0.04
12	Unallocated	7438	0.17

Table 4.22: Final Cluster Group Allocation Table

Cluster Group ID	Cluster Group	Cluster Size	Proportion of Sample
1	10%	1811	0.04
2	Quickdraw	1549	0.04
3	Follow Minima	20808	0.48
4	Level	12189	0.28
5	Unallocated	7438	0.17

Table 4.23: Summary Statistics for Candidate Regressors – Categorical Modelling

Variable	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Account Balance (First Year)	$0	$53,932	$95,541	$149,341	$181,114	$4,537,708
Risk Appetite	0.00	0.29	0.49	0.48	0.66	2.00
Age at Account Open	40.2	60.3	63.8	63.6	66.0	89.4
Age at 31 December 2015	57.8	70.9	75.8	75.6	80.5	103.8
Gender = Male	0	0	1	0.571	1	1
Legacy Account	0	1	1	0.534	1	1

Table 4.24: Cluster Group Allocation – Multinomial Logit Regression Model Output

	Multinomial Logit Model	
10%		
Gender = Male	0.719***	(0.0640)
Log Account Balance (First Year)	−0.637***	(0.0387)
Age at Account Open	−0.213***	(0.00747)
Risk Appetite	0.767***	(0.127)
Legacy Account	−2.521***	(0.0953)
Constant	18.25***	(0.720)
Quickdraw		
Gender = Male	0.297***	(0.0630)
Log Account Balance (First Year)	0.272***	(0.0406)
Age at Account Open	−0.0377***	(0.00633)
Risk Appetite	−0.414**	(0.147)
Legacy Account	−0.957***	(0.0844)
Constant	−2.889***	(0.679)
Follow Minima (base outcome)		
Gender = Male	0	(.)
Log Account Balance (First Year)	0	(.)
Age at Account Open	0	(.)
Risk Appetite	0	(.)
Legacy Account	0	(.)
Constant	0	(.)
Level		
Gender = Male	0.194***	(0.0270)
Log Account Balance (First Year)	−0.371***	(0.0175)
Age at Account Open	−0.0286***	(0.00282)
Risk Appetite	0.231***	(0.0591)
Legacy Account	−0.189***	(0.0331)
Constant	5.484***	(0.291)
Unallocated		
Gender = Male	0.304***	(0.0340)
Log Account Balance (First Year)	0.374***	(0.0222)
Age at Account Open	−0.0433***	(0.00357)
Risk Appetite	0.583***	(0.0753)
Legacy Account	−0.553***	(0.0445)
Constant	−2.902***	(0.371)
Pseudo-R^2	0.0581	
Observations	32280	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The base group is those retirees who closely follow the legislated minimum drawdown rates—which represents the default option in the fund. The estimated coefficients for the remaining four groups represent changes to the log odds ratio—relative changes to the odds ratio—of being in the respective group, relative to the base group, for unit increases in the available regressors.

As with the binary logistic regression models from section 4.1.2, the regression output does not translate directly into the change in probability of belonging to a selected group. Furthermore, in this nonlinear model, this change in probability relative to a unit change in a regressor also depends on the level of all the other regressors. Thus, as in the binary choice models, we will approximate the average marginal effects of each regressor on the total probability of belonging to each cluster.

The regression output table does, however, provide one especially interesting insight: how the two largest groups—those who follow the minima and those who maintain a level income stream—differ statistically in the available covariates. By observing the signs and statistical significance of the coefficients for the latter group, we can conclude that: males are more likely to be found in the group drawing a constant dollar amount; those with larger account balances are more likely to be in the group following the minima; delaying retirement increases the probability of following the minima; riskier investment allocations increase the probability of drawing a constant amount; and accounts opened before the current drawdown rules came into effect on 1 July 2007 were more likely to follow the minimum rates.

To examine the overall magnitude of the regressor effects, rather than the direction of the change as compared to a base case, Table 4.25 provides the average marginal effects. These are directly interpretable as the change in probability of belonging to a particular group relative to changes in the regressor values.

Most of these average marginal effects are quite modest in magnitude. For example, each year an individual delays retirement, the probability of following the minimum drawdown rates increases by about 1.1%, while a doubling of one's account balance in the first year of observation only increases the probability of consistently drawing at minima by approximately 3.0%.

Table 4.25: Cluster Group Allocation – Multinomial Logit Model Average Marginal Effects

	10%	Quickdraw	Follow Minima	Level	Unallocated
Gender = Male	0.0205***	0.00494*	−0.0644***	0.0156**	0.0234***
	(0.00220)	(0.00209)	(0.00554)	(0.00505)	(0.00409)
Log Account Balance (First Year)	−0.0218***	0.0111***	0.0297***	−0.0853***	0.0662***
	(0.00130)	(0.00132)	(0.00356)	(0.00311)	(0.00261)
Age at Account Open	−0.00683***	−0.000356	0.0109***	−0.00123*	−0.00246***
	(0.000269)	(0.000201)	(0.000570)	(0.000513)	(0.000415)
Risk Appetite	0.0208***	−0.0215***	−0.0790***	0.0176	0.0621***
	(0.00432)	(0.00492)	(0.0124)	(0.0110)	(0.00904)
Legacy Account	−0.0812***	−0.0226***	0.119***	0.0218***	−0.0370***
	(0.00344)	(0.00279)	(0.00677)	(0.00606)	(0.00531)
Observations			32280		

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Legacy accounts, however, were on average 12% more likely to follow the minimum drawdown rates for an extended period of time, after controlling for the other regressors.

Finally, we examine some model diagnostics for overall fit. One indicator is the Pseudo-R^2 of the model, which is low at 5.8%. To investigate the poor fit, in Table 4.26 we derive a multinomial extension of the classification table used to assess the overall explanatory power of binary choice models. In the multinomial case, the decision rule for predicting cluster allocation was to place the individual in the cluster which had the highest predicted probability of adherence, across the five possible outcomes.

This table, referred to as the confusion matrix, shows poor classification ability. Although the model correctly classifies approximately 93% (14092/15192) of the individuals in the group using the minimum drawdown rates into this group (sensitivity), only 48% (14092/29416) of the total predictions for an individual belonging to this group are accurate (positive predictive power—PPV). For the group which tended towards level income streams, the sensitivity is only 6.5% (617/9435) and the PPV is 43% (617/1438). The group who drew through their entire account balances while under observation, representing the 4% of the sample, had no individuals allocated to it by the model.

Consequently, we are confident that the available administrative data does not capture the majority of the variation in the observed cluster allocations. To further explore the reasons which may drive an individual to belong to a particular behavioural group, this area of the literature will either need to collect a richer set of demographic data on the individuals, or turn to studies which directly survey individuals to find reasons for their behavioural responses.

4.4 Other Results and Illustrations

In this section we investigate other data-driven insights into how our sampled retirees utilise their flexible account-based pensions. In particular, product designers should consider these important results when designing more appropriate income products tailored to this group of retirees.

Table 4.26: Cluster Group Allocation – Multinomial Logit Model Confusion Matrix

	Observed					
Predicted	10%	Quickdraw	Follow Minima	Level	Unallocated	Total
10%	145	12	150	77	69	453
Quickdraw	0	0	0	0	0	0
Follow Minima	985	1,046	14,092	8,606	4,687	29,416
Level	105	28	565	617	123	1,438
Unallocated	77	59	385	135	317	973
Total	1,312	1,145	15,192	9,435	5,196	32,280

4.4.1 Comparing Regular and Adhoc Drawdown Utilisation Rates

Broadly, 70% of all dollars drawn from account based pensions in our sample were derived from regular drawdowns, while the remaining 30% is attributed to the adhocs. Table 4.27 provides the breakdown.

Within the cluster group seeking to draw constant regular amounts through time, this proportion differed. As seen in Table 4.28, for this large group, covering 28% of all retirees observed, the respective allocation to regular and adhoc drawdowns is 82% and 18%. For all other retirees observed, the breakdown is seen in Table 4.29, where the allocation is approximately 66–34%.

We conclude that retirees who decide to use their accounts to provide a level income stream throughout retirement—with the level amount possibly revised after commencing—use less of their account balance on adhoc drawdowns, compared to the rest of the sample. These individuals—self-annuitisers—display a stronger desire for a relatively constant income stream, and rely less on their account balances for lump-sum withdrawals.

Modest Self-Annuitisation

We investigate further the level income streams generated by these self-annuitisers in Figure 4.35 and Table 4.30. Together, these illustrate that 50% of this group are generating level income streams of less than $5800. This is a surprising and profound discovery, as it voids one possible reason offered for why Australia observes very low levels of lifetime annuity sales: that there is no demand for modest income streams. As at 16 October 2017, Challenger offered 65-year-old females a guaranteed lifetime nominal income stream of roughly $7000 per year in exchange for a $100,000 up-front payment, and approximately $7400 for 65-year-old males (Challenger Limited, 2017b). Figure 4.36 and Table 4.31 show that for the 1171 retirees who are both in the level drawdown amount group and aged 65 in their first year of observation, approximately 50% have a balance between $54,000 and $154,000 in this year of age.

In fact, for this middle 50%, the equivalent guaranteed lifetime annuities Challenger could provide at a rate of 7% ($3780 and $10,780) correspond closely to the middle 50% of the level drawdown amount distribution in Table 4.30 ($3400 and $9500). Clearly, the level amounts that insurers can guarantee for life are of comparable magnitudes to those which retirees in account-based pensions already generate for themselves. Moreover, the up-front costs of these guaranteed annuities are of equally comparable magnitude to the account balances these individuals use to generate their own income streams.

Consequently, this empirical data analysis does not support the argument that retirees avoid

Table 4.27: Aggregate Regular and Adhoc Drawdown Breakdown – Entire Sample

Aggregate Regular Drawdowns	Aggregate Adhoc Drawdowns	Proportion Regular	Proportion Adhoc
$2,280,307,703	$970,617,135	0.70	0.30

Table 4.28: Aggregate Regular and Adhoc Drawdown Breakdown – 'Level' Cluster Group Only

Aggregate Regular Drawdowns	Aggregate Adhoc Drawdowns	Proportion Regular	Proportion Adhoc
$688,147,775	$155,750,943	0.82	0.18

Table 4.29: Aggregate Regular and Adhoc Drawdown Breakdown – Excluding 'Level' Cluster Group

Aggregate Regular Drawdowns	Aggregate Adhoc Drawdowns	Proportion Regular	Proportion Adhoc
$1,592,159,928	$814,866,192	0.66	0.34

Figure 4.35: Histogram of Regular Drawdown Amount – 'Level' Cluster Group Only

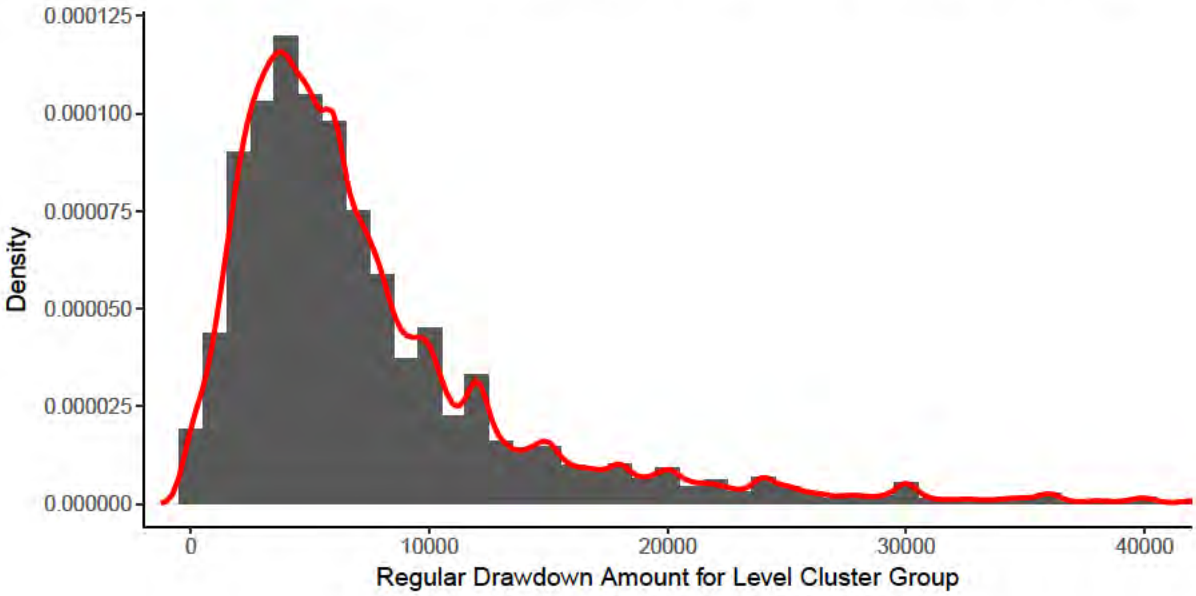


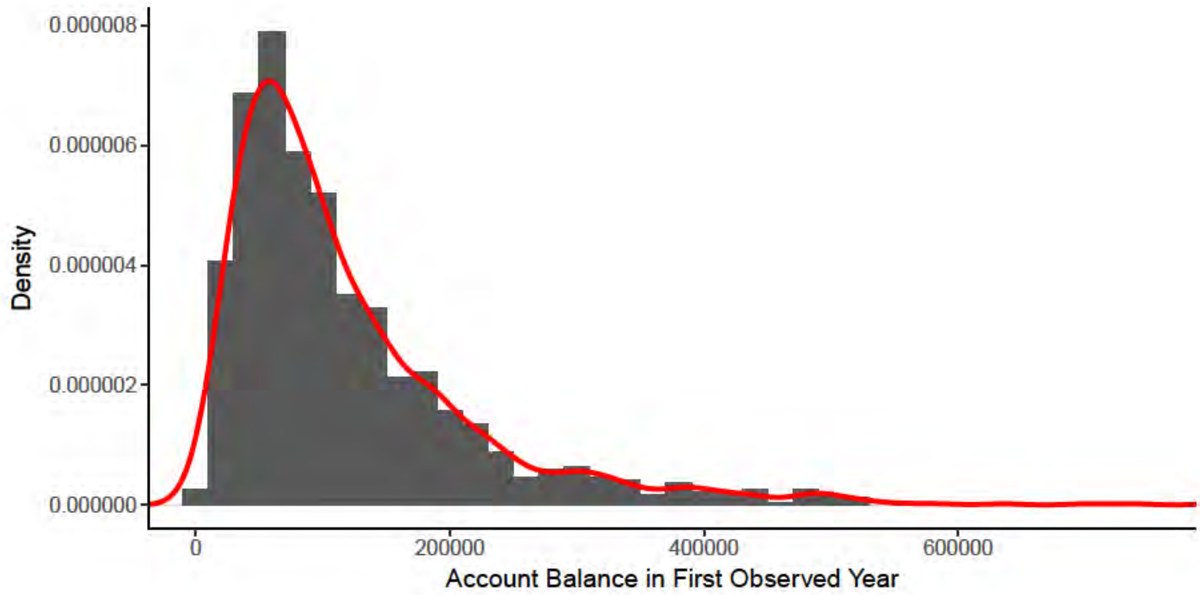
Table 4.30: Summary Statistics for Regular Drawdown Amount – 'Level' Cluster Group Only

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Regular Drawdown Amount	0	$3444	$5760	$7823	$9492	$120,000

Table 4.31: Summary Statistics for Account Balance in First Observed Year – 'Level' Cluster Group and Over Age 65 Only

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Account Balance	0	$53,980	$90,097	$123,771	$154,000	$1,344,842

Figure 4.36: Histogram of Account Balance in First Observed Year – 'Level' Cluster Group and Over Age 65 Only



lifetime annuities due to a mismatch between their available superannuation assets and their desired income stream amounts—or that the rate of return on investment for lifetime annuities is too low. Instead, it is more likely that these individuals have used their superannuation assets to open an account-based pension due to other factors—such as the flexibility of future income amounts, and the ability to make adhoc withdrawals.

Adhoc Utilisation Rates

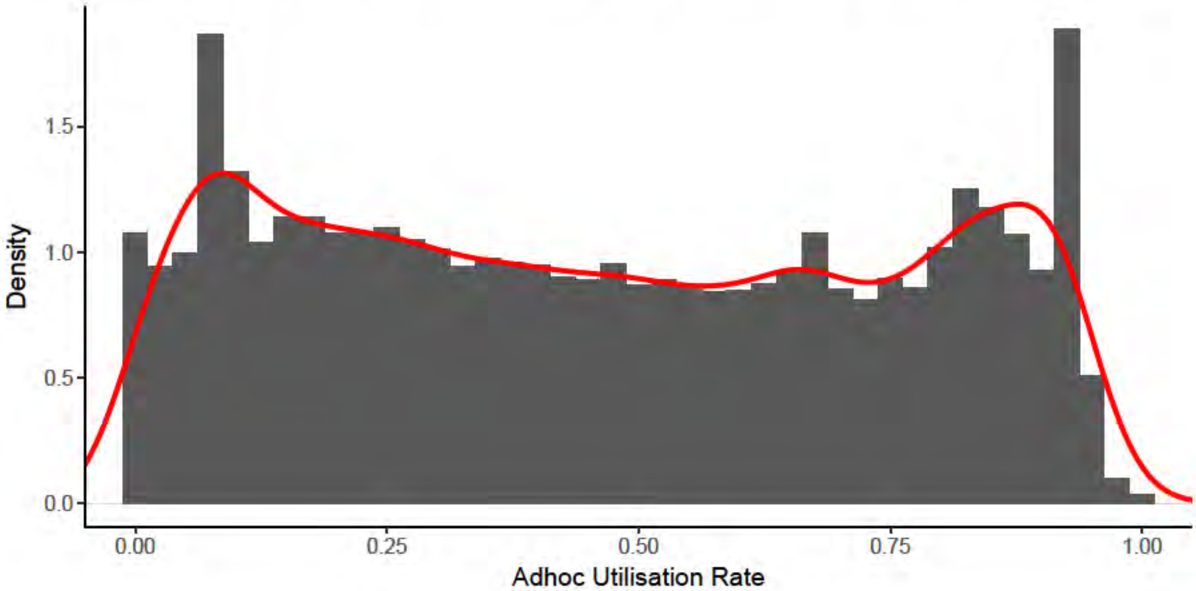
In our sample, 35% of individuals make at least one adhoc drawdown while under observation. By summing each individual's regular and adhoc drawdowns made while observed, we can calculate the proportion of their overall drawdown amounts attributed to adhocs—and call this the adhoc utilisation rate for each account. The distribution of this variable is summarised in Figure 4.37 and Table 4.32.

For those who make adhoc drawdowns, the distribution of the utilisation rate appears broadly uniform for most of the interval $(0, 1)$. Reaching a utilisation rate approaching 100% is rarer, and represents individuals who draw through their accounts quickly—relative to their nominated regular drawdowns—using adhocs.

Table 4.32: Summary Statistics for Adhoc Utilisation Rate

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Adhoc Utilisation Rate	0.00	0.20	0.45	0.46	0.73	1.00

Figure 4.37: Histogram of Adhoc Utilisation Rate



Adhoc Drawdown Strain

Finally, we look at the distribution of the adhoc drawdown amounts made during the observation period in Figure 4.38 and Table 4.33.

There is a visible tendency for retirees to draw adhoc amounts in multiples of \$5000. As these nominal amounts do not provide a view into what strain these adhocs place on the remaining account balance, we manipulate the data to obtain this perspective. Only for individuals observed for at least 7 years and making at least one adhoc drawdown in this period, we average the proportion of account balance drawn as adhocs over this period to create a time-averaged adhoc drawdown rate—interpreted as the average annual strain placed on account balances to fund adhoc drawdowns. This adhoc drawdown strain variable has distribution as per Figure 4.39 and Table 4.34. For those who make adhoc drawdowns, the median level of adhoc drawdown strain contributed to a reduction in account balances over time at the rate of 4% per year on average.

Table 4.33: Summary Statistics for Adhoc Drawdown Amount

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Adhoc Drawdown Amount	\$1	\$3039	\$9000	\$29,583	\$20,620	\$2,730,756

Figure 4.38: Histogram of Adhoc Drawdown Amount

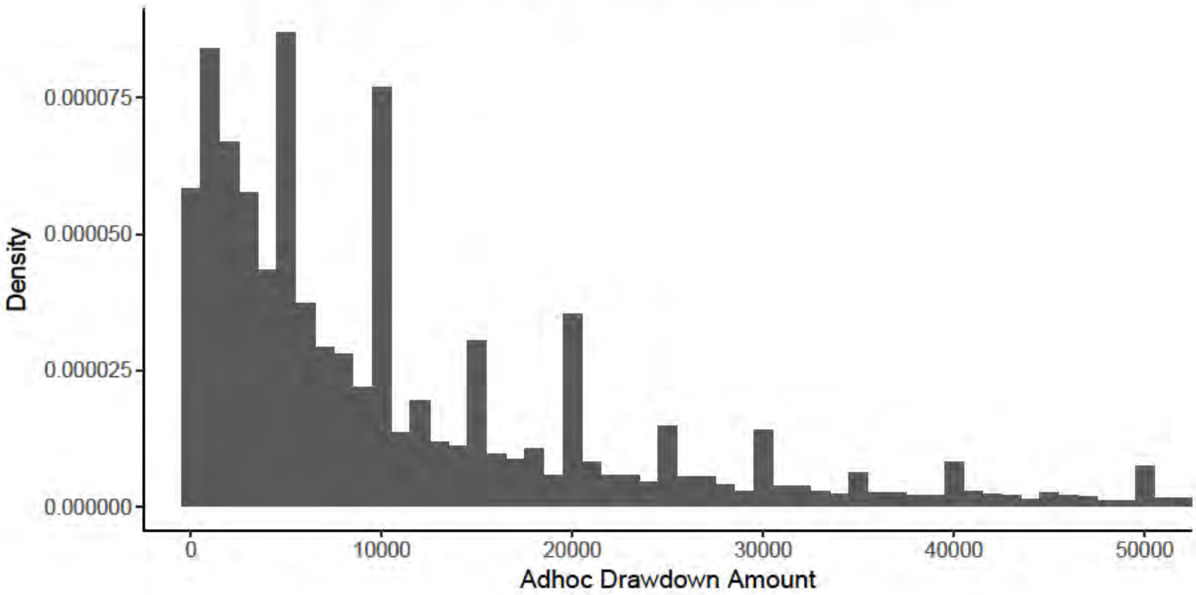
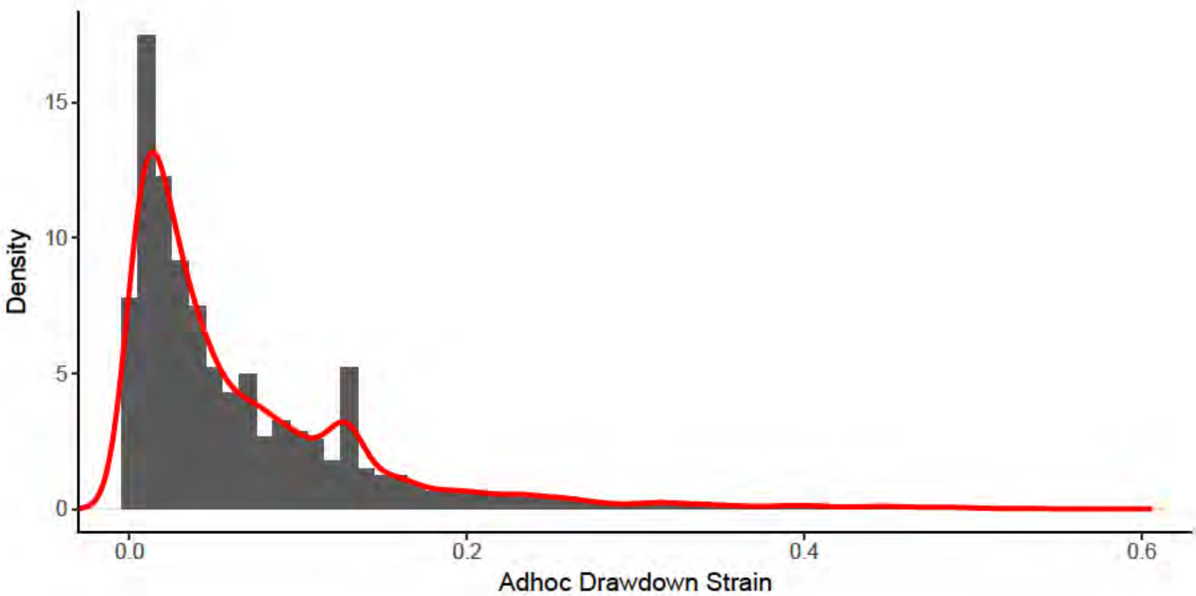


Table 4.34: Summary Statistics for Adhoc Drawdown Strain

	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Adhoc Drawdown Strain	0.00	0.01	0.04	0.07	0.10	0.58

Figure 4.39: Histogram of Adhoc Drawdown Strain



CHAPTER 5

DISCUSSION

The previous chapter presented and explored the results derived from the three components of the methodology. A series of panel regression models estimated the statistical relationship between the available characteristics and several dependent variables of interest. After fitting these models, limited explanatory power motivated a deeper analysis.

To introduce a behavioural dimension to the panel data, manual grouping and machine-assisted cluster analysis on the observed drawdowns through time found a small number of relatively large groups which appeared to follow very simple drawdown patterns.

With distinct behavioural patterns identified and qualitatively interpreted, a categorical regression model highlighted statistically significant differences in the distribution of characteristics displayed by members of these groups. In addition to the statistical components of the methodology, descriptive analysis provided other insights that policymakers, financial advisors and retirement income product designers can leverage in their work.

This chapter discusses the results and their implications within both academic and industry contexts.

5.1 Limitations

Unobserved Characteristics

Foremost, our dataset lacked several key variables that are not only interesting to study, but also prevalent in the retirement savings and decumulation literature. These include: marital—or spousal—status; health indicators; wealth not held in the retiree's phased withdrawal account; and income derived from other sources, such as the means-tested Age Pension and other investment income.

While panel modelling techniques can control for the unobserved, time-invariant characteristics—α_i—that influence drawdowns, and although we relied on asymptotic results in our large sample, at least two issues remain when missing these other key variables. First, no matter how robust our estimation techniques are, we cannot perform inference on the unobserved factors—and the effects of health and other wealth are of particular interest to the academic literature and the retirement incomes industry.

Second, the effects of the observed regressors are entangled with the effects of the unobserved, time-varying regressors—such as health and other wealth—that share correlation with both the dependent variables of interest and the observed regressors. For example, health may deteriorate with rising age, and therefore have a negative correlation with our observed age variable. Thus, when an age variable is statistically significant in determining drawdown rates, the partial effect of rising age is confounded with the partial effect of deteriorating health status. Although this limits prediction at the level of the individual, it does not limit the accuracy of the estimated effect of ageing as it applies to groups of retirees more broadly.

In the categorical regression model, a similar issue prevailed. Although able to find statistically significant regressors from the set of available characteristics, many unobserved factors might provide further insights into why retirees follow the observed behaviours.

Although not analysed in this project, the available dataset does contain information that might comment on the influence of deteriorating health on drawdown behaviours. A separate analysis on the individuals who died while under observation would uncover whether a 'proximity to death' variable significantly changes observed behaviours. Potentially, this could rival other imperfect health indicators, such as subjective health reported or healthcare expenditure. This remains for future work to determine.

One Asset Class

We reiterate that the current dataset on account-based pensions exists in isolation from information on members' other wealth and income. These factors likely also play a significant role in determining drawdown behaviours and rates. For example, when retirees can derive income from assets held outside of the superannuation system, they may draw on these with preference. In general, investment income earned on assets within the superannuation system is concessionally taxed. Moreover, during the observation period, for retirees aged 60 and over, investment earnings on superannuation assets incurred no tax. Consequently, drawing at the minimum retained more wealth within the low-tax superannuation environment.

This does imply that drawdowns at the minimum are not indicative of overall consumption patterns during retirement. However, drawdowns above the minimum are likely to represent consumption needs, assuming retirees only withdraw in excess of the minimum rates when they require the excess to fund consumption habits.

For the purposes of this project, which focused on the second pillar of Australia's retirement system, having observed only assets held in account-based pensions does not limit the relevance of the findings. The behaviours within these accounts were still identified and differentiated based on the observed characteristics, and subsequent sections will discuss the academic and social contributions of these findings.

Modelling Rates

The dependent variables of interest in this research were the rates at which retirees are drawing down from their phased withdrawal accounts. These have a useful interpretation in terms of the relative speeds of decumulation, something which modelling dollar amounts alone could not capture. However, a drawback to modelling rates—which are naturally constrained between 0 and 1—is that they are less likely to satisfy the assumptions of standard linear models.

As we demonstrated in Chapter 4, simple transformations allowed the rate variables to adhere more closely to the assumptions underlying these linear models. In other cases, where the dependent variable was discrete or contained significant probability masses, we employed nonlinear models, but at a cost—we lost the ability to directly interpret the coefficients on time-invariant characteristics, such as gender or our derived risk appetite metric.

Grouping Methodology

Broadly, the second component of our methodology—grouping individuals by observed behaviours over time—relied on classification using observed drawdowns, rather than directly surveying individuals. The behaviours identified by the manual grouping procedure are convincing, both visually and because they are inspired by economic reasoning and the theoretical literature.

In contrast, the machine-assisted cluster analysis results are less convincing. Hierarchical clustering is guaranteed to find as many groups in the dataset as desired, including patterns that may not necessarily represent members following a specific rule. Correspondingly, we only incorporated the results of the cluster analysis into the behavioural grouping if we could determine a clear rule underlying the trajectory of the drawdown rates displayed by each cluster. Consequently, it is possible that within the 'unallocated' cluster, there remain behavioural groups that evaded both manual and machine-assisted attempts at identification and classification.

5.2 Academic Contributions

5.2.1 Panel Modelling Contributions

As explored in Chapter 2, the empirical literature on behaviours within phased withdrawal accounts is underdeveloped—despite a theoretical body of literature exploring the optimal drawdown behaviours in these accounts. Until now, a lack of appropriate data was a limiting factor, but this paper shows that a panel dataset on mostly administrative variables can provide insights into the statistically and economically significant effects of characteristics such as age, gender and account balance on determining the rate of drawdown. Here, we summarise key findings from Chapter 4.

Members more likely to draw at the minimum rates:

- Are older
- Face higher minimum drawdown rates

Those more likely to make adhoc drawdowns:

- Are older
- Face lower minimum drawdown rates

Retirees drawing at higher rates tend to:

- Be male
- Be younger
- Have smaller account balances
- Have higher risk appetites
- Have retired older
- Be facing higher minimum drawdown rates

Members who put more strain on their account balances through adhoc drawdowns:

- Are older
- Have larger balances
- Face lower minimum drawdown rates

5.2.2 Behavioural Contributions

As well as better explaining drawdown rates over individual financial years, a second key advantage to having panel data is the ability to track individuals over time—identifying and distinguishing between observed behaviours.

A powerful finding, especially given our large sample size, is that two very simple rules explained the drawdown behaviours of more than three quarters of our sample. Almost one half (48%) of the observed retirees used the minimum drawdown rates as an anchor, while more than one quarter (28%) tended towards drawing level dollar amounts. Within this second group of retirees, at least 35% revised down the level of their income stream while observed—and others may still behave similarly in later, unobserved years.

Those following the minimum drawdown rates were more likely to:

- Be female
- Have larger account balances
- Have lower risk appetites

- Have retired later

By contrast, those drawing level amounts were more likely to:

- Be male
- Have smaller account balances
- Have higher risk appetites
- Have retired younger

These differences, while statistically significant, were relatively small in magnitude. However, members with accounts opened before the current minimum drawdown rates came into effect were, on average, 12% more likely to draw at the minimum, and 2% more likely to draw constant amounts—compared to their counterparts with newer accounts.

Two smaller groups collectively accounted for 8% of the sample. One of these—4% of the sample—was comprised of retirees drawing at or near 10% for all or most of their observed years. 88% of these accounts were TRIPs, which are subject to a maximum drawdown rate of 10% and can only be opened by retirees younger than 65. For the remaining 12% of this small behavioural group, the 10% rule may simply have been an attractive heuristic.

The second of the smaller groups corresponded to individuals drawing through their entire account balance while under observation. These individuals seemed uninterested in using their phased withdrawals to generate income for all or most of their retirement.

17% of our sample remained unallocated into any discernible behavioural group. While exploring this group in further detail is of economic interest, it remains for future work to investigate.

We can relate these findings directly to previous theoretical studies on optimal drawdowns, particularly the work of Bateman and Thorp (2008) reviewed in Chapter 2. One of the findings from their paper is that the legislated minimum drawdown rates—which came into effect on 1 July 2007—are a good guide to the simulated optimal drawdown pattern through retirement for a variety of assumed parameters in their calibrated utility functions. However, Bateman and Thorp showed that for some parameter values, a fixed drawdown rate heuristic provided higher income in earlier years of retirement, and increased utility relative to following the minima.

Observing that almost half of our sample used the minimum drawdown rates as a guide is consistent with these findings. Whether due to soft compulsion (default options), anchoring effects (fixating on numerical figures), sound financial advice, retiree introspection, or any other postulated reason, something is successfully driving individuals to follow the minima—which this literature finds is not far from the optimal behaviour.

By contrast, we did not find a prominent group of individuals attempting to draw through their account balance at a constant rate. After accounting for minimum drawdowns, the only evidence for constant drawdown rates was at the 10% level—and most of this was due to younger retirees maximising the value of a TRIP. However, the large group of individuals drawing constant *amounts*—at rates higher than the minima—suggest that many retirees behave consistently with results from the optimality literature—in that drawdown above the minimum is favourable during earlier years of retirement. Observing the common downwards revision of the level income streams generated by these individuals suggests that higher income is preferable in early retirement. This idea is consistent with research by Aegon (2016), finding that consumption levels are higher in the early years of retirement, but decrease by age 75.

Alternatively, Asher et al. (2017) and Hulley et al. (2013) find that retirees within the taper region of the Age Pension means test are more likely to decumulate their assets faster. It is generally preferable—from a tax-minimisation perspective—to retain as much money as possible in the tax-favourable superannuation system, decumulating other assets first. However, some individuals subject to the means test taper may have the majority of their wealth held in superannuation assets. Consequently, these members may be decumulating at higher rates earlier in retirement due to incentives introduced by the Age Pension means test.

As for not observing many retirees using a constant drawdown rate heuristic, our analysis of the data inspires the following suggested explanation: due to the volatility experienced by account balances over time, especially during economic downturns, drawing from these accounts at a constant proportion of the account balance may introduce undesirable volatility into a retiree's income streams. Research on consumption preferences suggests that realistic utility functions penalise volatility in incomes over time. For a discussion on the relationship between risk aversion and consumption smoothing over time, see Garcia et al. (2006). Our observations are consistent with the utility literature in that most retirees who deviate from the default minimum drawdown rates elect to draw constant dollar amounts.

Finally, it is worth noting that while drawing level dollar amounts over an extended period of time was a popular strategy, we did not observe a group of individuals protecting themselves from inflation by steadily increasing their drawdown amounts over time. That is, retirees are not protecting themselves from the erosion of spending power by inflation—at least, not through their account-based pensions. Over the period 2004 to 2015, the approximate cumulative effect of inflation was a 33% rise in the cost of living (derived from Australian Government Australian Bureau of Statistics, 2017). In this light, even retirees drawing level amounts for the entire observation period are, in real terms, decreasing their drawdown amount—although perhaps not intentionally. However, as Age Pension payment amounts are indexed to inflation, and we do not observe any income retirees derive from their other assets, we cannot comment on the overall erosion of their consumption power over time.

5.3 Social Implications

5.3.1 Policy

Minimum Drawdown Rates

Whether intended as soft-compulsion or simply as a conservative lower bound, the default option of drawing at the legislated minimum drawdown rates proved very popular amongst around half of the members in the analysed fund. This is consistent with findings from the behavioural economics literature, suggesting that default options strongly influence financial decisions relating to retirement incomes. As discussed in Chapter 2, Bateman et al. (2017) present a recent example.

As a result, we think it becomes clear that government decisions to change—or not change—the minimum drawdown rates do impact a large number of individuals throughout the duration of their retirement.

5.3.2 Retirement Income Product Design

On 1 July 2017, the Australian government relaxed the restrictive regulations that determine which retirement income products can retain favourable taxation treatment within the superannuation system—previously only afforded to traditional guaranteed lifetime and term annuities, and account-based pensions. Our findings suggest a suitable income product that insurers can now design for the Australian market, explored below.

Stepped Annuities

A nontrivial portion (10%) of our sample drew an income stream that resembled a 'stepped annuity'—an otherwise level income stream subject to a downwards revision in the level.

One interpretation for this behaviour is that members may desire a higher annual income earlier in retirement. Alternatively, members may revise down not because they want to spend less, but because they would like their income stream to last longer into the future.

In either case, the benefit of purchasing annuity products from a life insurer, as opposed to self-annuitising, is the longevity insurance an insurer can provide through guaranteed lifetime income. Beyond this, retirees may wish for annuity income to be higher initially, at the cost of reduced income later in retirement. The observed drawdown behaviours within account-based pensions suggest there may be demand for this. As a result, insurers should develop stepped annuities to be offered in the Australian market.

CIPR Options

An important finding from the analysis of the proportion of drawdown amounts attributed to adhocs is discovering the considerable heterogeneity in adhoc drawdown utilisation. At the aggregate level, adhocs account for 30% of the dollar amounts drawn down from account-based pensions. However, this single figure masks two key properties of the underlying distribution.

Foremost, we only observe 35% of our sample making at least one adhoc drawdown during the observation period—although this rate might become higher across a retirement time horizon of 20–30 (or more) years. Furthermore, within this group of members who make adhoc drawdowns, the adhoc-to-regular drawdown ratio is, roughly, uniformly distributed between 0 and 100%.

These results have implications for the development of CIPRs. As suggested by Treasury, funds could design CIPRs to provide both a longevity-protected income stream and an allowance for adhoc withdrawals throughout retirement (Australian Government The Treasury, 2016a). Prior to this research, a reasonable suggestion for presenting this option to members may have been to specify a default split of superannuation assets—a percentage which purchases a lifetime income stream, and the remainder placed in a liquid account. However, our analysis finds that the majority of retirees make no adhoc drawdowns over at least a 12-year period, while the remainder utilise this facility to highly variable extents. Consequently, no default option for this split would suit any more than, by chance, a handful of retirees.

Since we know defaults are powerful behavioural anchors, it may be more prudent to not specify a default split. Instead, funds should require members to make the decision with regard to their own expected needs in retirement, and provide financial advice to support them in this decision. CIPRs themselves could become default options for accessing accumulated wealth in DC accounts after retirement in Australia. In this eventuality, discussions with members as to their needs would be critical to ensure appropriate allocation of assets.

Finally, a barrier to the widespread appeal of these more advanced decumulation arrangements may be the inherent unpredictability members feel when considering a retirement time horizon of 30 years. For this reason, account-based pensions may retain their popularity as a flexible means of decumulation—albeit unprotected from investment, inflation and longevity risks.

5.3.3 Financial Advice

Financial advisors can also leverage our research findings in guiding retiree decision-making. Chapter 4 showed that within the group of retirees favouring level or stepped drawdown amounts, 50% generate modest income streams of less than $5,800 annually. Presumably, the appeal of phased withdrawal accounts for these retirees lies in some combination of: investment freedom; bequest potential; precautionary savings; or other reasons. Regardless, using a phased withdrawal account to generate level or stepped income streams exposes the retiree to the risk of exhausting their account balance during retirement—due to favourable longevity experience or negative investment returns later in retirement.

Notably, in the absence of stepped annuities in the market, retirees can create an identical income stream arrangement through the purchase of two annuities: one guaranteed lifetime annuity at the 'stepped down' level, and a term annuity commencing immediately to generate higher income in earlier years. Alternatively, purchasing a term annuity and a deferred annuity, with different guaranteed levels of income, generates the same effect.

Moreover, the intention behind CIPRs is to design products that balance these needs for income, flexibility and risk management. Once superannuation funds begin offering CIPRs, financial advisors should assist members in planning the appropriate mixture of income streams and precautionary savings to adopt within these products.

5.4 Future Work

5.4.1 Extensions on Available Data

While this paper investigated the available data from APRA-regulated superannuation funds, a similar panel dataset produced by the Australian Tax Office covers a large sample of self-managed superannuation fund (SMSF) members. Applying the methodology from this paper to the SMSF data would allow researchers to comment on whether the findings from this project generalise to SMSF members.

To extend our methodology, future work can attempt to fit mixture models to the clustered data. Briefly, a mixture model would allow each cluster to have its own parametrisation of the regressors. For the group of individuals drawing 10% annually, for example, the regression equation would collapse down to a constant term with a value of 10%. In the level drawdown rate and unallocated cluster groups, however, the results would be nontrivial. Alternatively, researchers could obtain similar results by fitting, in turn, panel regression models to subsets of data for each of the observed clusters. Comparing the regression results across different clusters could then determine how the available regressors influence drawdown rates within a specific cluster.

As mentioned in Chapter 3, we removed from the dataset those individuals who died while under observation. Analysing drawdown behaviours in years immediately preceding death, and comparing the results against that of the surviving retirees in our sample, may reveal whether proximity to death significantly influences drawdowns.

Similarly, we calculated investment returns throughout retirement to construct the risk appetite metric as a time-invariant regressor. However, studying the evolution of investment returns within individual accounts throughout retirement may generate insights into how risk preferences change during retirement.

5.4.2 Remaining Gaps

A remaining gap is to determine how characteristics such as couple status, health and other wealth, which were not present in this study, influence financial decision-making in retirement. As superannuation funds are unlikely to collect or retain these variables, a more feasible approach would involve analysing data from Centrelink—the Australian government's welfare distribution service. Although drawdowns from account-based pensions may not be directly visible to the government, Centrelink may be able to combine information on the level of superannuation assets with the variables of interest, as well as Age Pension entitlements. A panel dataset of this nature could draw the link between the research in this paper on second-pillar behaviours with existing work on social security benefits in retirement (see e.g. Asher et al., 2017).

Furthermore, our results show that behavioural economics still has an important role to play in describing drawdown behaviours. Most owners of account-based pensions follow simple drawdown rules, and most members do not fully utilise the flexibility available in the product. Drawdown amounts rarely change in an inexplicable fashion, and the majority of members do not make adhoc drawdowns. These interesting behaviours motivate further explanation, and it is plausible that no selection of collected regressors could adequately predict adherence to a particular behavioural group. Instead, we support progressing the literature which empirically tests popular behavioural hypotheses, such as the impact of default options on financial decisions in retirement (see e.g. Bateman et al., 2017). In addition, collecting survey data on individuals who make adhoc drawdowns—why, when and how much—would provide a valuable contribution in explaining the large variability observed in the adhoc drawdown behaviours.

CHAPTER 6

CONCLUSION

6.1 Addressing Research Aim, Questions and Hypotheses

This paper began with the following aim:

Identify and explain drawdown behaviours in phased withdrawal products

Successfully achieving this aim is important for two reasons. First, it progresses the academic literature on drawdown behaviours within phased withdrawal accounts, which until now had relied primarily on theoretical studies into optimal behaviours, and lacked feedback from empirical studies. Second, it provides timely insights into appropriate policy decisions, retirement income product design, and financial advice, during a transitional period for Australia's retirement system.

By fulfilling this aim, we can now answer the three research questions posed initially.

1. *What drawdown behaviours are observed in account-based pensions?*
   The two most popular behaviours identified were: the default option of closely following the minimum drawdown rates; and drawing a level dollar amount over time, sometimes subject to downward revisions. Two other behaviours were present, although observed much less frequently. One of these involved drawing at a rate of 10% per year, which for some younger members is the upper bound on allowable drawdowns from TRIPs, and for other retirees may simply be an attractive heuristic. The second of the smaller behavioural groups was characterised by a complete drawdown of account balance while under observation.
2. *Are statistical models effective at predicting drawdown rates and behaviours?*
   Both panel data models and categorical regression models can provide insights into how member characteristics influence observed behaviours. However, there remains a large

portion of the total variation in observed drawdown rates and behaviours that could not be explained by the available characteristics.

3. *Which income products and policy design recommendations would suit the identified groups of retirees?*
   Retirees with a preference for level income streams, whether constant throughout retirement or subject to downwards revisions, could benefit from partial annuitisation, protecting them against the risk of outliving the assets supporting their income stream. By retaining a portion of their assets in a more liquid cash or investment account, they would still have money available to bequeath in case of early death, or alternatively as a source of wealth for adhoc withdrawals.
   Policymakers must recognise that the minimum drawdown rates strongly guide drawdown behaviours. Regular review of these rates is of paramount importance, as is caution when considering changes to the rates.

Furthermore, our methodology investigated several hypotheses, originating from the existing body of research. Here, we comment on these hypotheses with respect to the results found.

Annual Drawdown Rates

1. *Older individuals draw down less in excess of the minimum rates, compared to younger retirees*
   The behaviour appears to be different for different age ranges. Between the ages of 65 and 74, ageing decreases the excess regular drawdown rate, conditional on drawing in excess of the minimum rates. Beyond age 74, drawdowns in excess of the minima tend to occur at higher rates for older members. Note, however, that ageing concurrently decreases the likelihood of drawing above the minimum rates in the first place.
2. *Individuals with larger account balances draw less in excess of the minimum rates, compared to retirees with smaller account balances*
   Yes. Larger account balances give rise to smaller regular drawdown rates, and also smaller excess drawdown rates when drawdown is above the minimum. However, when members make adhoc drawdowns, those with larger account balances tend to have higher adhoc drawdown rates.
3. *Females draw more slowly through their account balances than males, after controlling for factors such as account balances*
   Yes.
4. *In financial years following the GFC, drawdowns in excess of the minimum rates decreased*
   No. In the financial years following the GFC, drawdown in excess of the minimum rates became more likely. Additionally, drawdown rates overall have tended to be higher since the GFC.
5. *In financial years following the GFC, the temporarily lower (concessional) minimum drawdown rates encouraged many retirees who had been drawing at the previous minimum rates to reduce their drawdowns to the concessional levels*
   Many, but not a majority. Just over one-third of retirees who used the minimum draw-

down rates as a guide reduced their drawdowns to the concessional minima when they applied in financial years 2009–13. The remainder either preferred some combination of the concessional and non-concessional minima, or began to draw at much higher rates directly following the GFC.

Behavioural Groups in the Drawdown Series

1. *A substantial portion of retirees will draw consistently at minimum rates*
   Yes. Almost 50% of the observed members made close reference to the minimum drawdown rates. A quarter of these individuals, however, were disrupted around the time of the GFC, and were not able to recover.
2. *A group will attempt to draw at a constant rate, for example 7% per year*
   Few members drew at a constant rate over time, after accounting for drawdowns at the minimum rates. Within the 4% of our sample who drew regularly at a rate of 10%, 88% were in TRIPs, where this is the maximum allowable drawdown rate.
3. *Some will draw a constant nominal—not rising with inflation—dollar amount throughout retirement*
   Yes. Drawing level amounts was the second-most common drawdown behaviour.
4. *A group will draw a constant real—rising with inflation—dollar amount*
   No. We did not find evidence for this behaviour within account-based pensions.
5. *Some retirees will spend more than the minimum rates initially, but over time reduce drawdowns*
   Yes. Of those preferring to draw level amounts over time, just over one third revised down the level of their income stream during observation. Furthermore, for those not drawing level income streams, drawing at the minimum rates became more likely as members aged—even after controlling for the effect of rising minimum drawdown rates. Many plausible explanations exist for this behaviour, including: reduced consumption at older ages; desire to preserve capital for older ages; and bequest motives.

6.2 Summary

Chapter 1 opened this paper by contextualising the decumulation phase of retirement. In recent decades, demographic trends have driven larger employers to shift the responsibility of financial risk management in retirement to the former employees themselves. Several factors compound the difficulty inherent in making suitable choices on the threshold of retirement—including myopic thinking, financial illiteracy and susceptibility to cognitive biases. Due to the widespread use of phased withdrawal accounts, the study of behaviours within these products plays a key role in understanding the decumulation of assets in retirement. In addition, the Australian government has begun to focus on increasing levels of annuitisation by relaxing regulations and promoting CIPRs—which encourage a longevity-protected income component. Consequently, policymakers, financial advisors, and retirement income product designers can benefit from deeper insights into how retirees behave within account-based pensions. Collectively, these contextual factors motivated this research.

Next, Chapter 2 examined a broad literature on the decumulation phase of retirement. In particular, the studies in this field have investigated how retirees should, can, and do, draw down their accumulated wealth in retirement. Crucially, this chapter identified a gap in the literature. Despite several papers exploring suggested behaviours in phased withdrawal products, there has been a lack of adequate statistical analysis of the empirical drawdown rates and behaviours within these products. This analysis is necessary to determine the extent to which individuals utilise the heuristics suggested by the literature, and to identify any behaviours not yet considered. The identification of novel behaviours in retirement extends the theoretical literature by motivating further study into how retiree preferences drive the uncovered behaviours.

Chapter 3 detailed a methodology to fulfil the research aims and fill this literature gap, and Chapter 4 presented the results of applying this methodology to the available industry-level data from Australian superannuation funds. First, panel regression models relate drawdown rates to member characteristics. These models indicate the direction, magnitude and statistical significance of the effects of the regressors on several dependent variables. Second, a cluster analysis allocates members into distinct behavioural groups—characterised by their observed drawdowns over time. Third, a categorical regression model finds the statistical relationships between member characteristics and the likelihood of belonging to the identified behavioural groups. Additionally, investigations into the distribution of regular and adhoc drawdowns within particular groups reveal further insights into drawdown behaviours.

Finally, Chapter 5 discussed the results with respect to filling the identified gap in the literature, as well as the immediate social impact of these findings. Broadly, older retirees are more likely to draw at the minimum rates, and more likely to make adhoc drawdowns. They draw at slower rates when making regular drawdowns, but put more strain on their account balances when making adhoc drawdowns. Retirees with higher account balances tend to have slower regular drawdown rates, but draw through balances faster when making adhoc drawdowns. When facing higher minimum drawdown requirements, members are more likely to draw at the minima and less likely to make adhoc drawdowns. Their regular drawdown rates are higher, and they put less strain on account balances via adhoc drawdowns. In general, males draw down their account balances at faster rates than females, as do individuals with higher risk appetites and those who retired older.

Within the literature on drawdown behaviours, a valuable contribution from this work is finding that the large majority of our sample used two simple rules in retirement: following the minimum drawdown rates; or drawing level dollar amounts. Members who referenced the minima were more likely to be female, have larger account balances, a lower risk appetite, and have retired later. By contrast, retirees who drew constant amounts were more likely to be male, have smaller balances, a higher risk appetite, and have retired younger. These differences, while statistically significant, were relatively small in magnitude. However, members with older accounts were noticeably more likely to draw at the minimum than members who had opened their accounts since the latest drawdown rules came into effect. Additionally, two smaller behavioural groups exist in the sample: those who drew 10% annually; and those drawing down their entire account balance while under observation.

These findings have implications for policymakers, retirement income product designers, and financial advisors. On the policy side, it is clear that the magnetism of the minimum drawdown rates—or their use as the default option by superannuation funds—draws a large proportion of retirees to use them as guides. As a result, the government must continue to regularly review these minima, and realise the widespread impact of changing them.

For the design of more advanced retirement income products, it is clear that stepped annuities could play an important role in the market, as a large group of retirees construct their own equivalents within account-based pensions already. Furthermore, super funds creating CIPRs should cautiously avoid setting defaults for determining the proportion of assets which will support income streams versus an allowance for adhoc withdrawals. Most individuals do not appear to make adhoc drawdowns at all—while amongst those who do, there is huge variability in the proportion of assets withdrawn ad hoc versus regularly.

Finally, many retirees show a clear preference for drawing level income streams from their accounts, but are missing out on the potential longevity insurance provided by partial annuitisation of their superannuation wealth. These individuals in particular could benefit from financial advice directing them to allocate a portion of their accumulated superannuation assets into an income stream—either level, or level with a step down later in retirement.

APPENDIX A

GLOSSARY

Term	Definition
DB	Defined-Benefit
DC	Defined-Contribution
SISR	*Superannuation Industry (Supervision) Regulations* 1994
GFC	Global Financial Crisis
Legacy Account	Accounts opened prior to 20 September 2007
CIPR	Comprehensive Income Product for Retirement
OLS	Ordinary Least Squares
PC	Pooled Cross-sectional
FE	Fixed Effects
RE	Random Effects
HT	Hausman-Taylor
CRE	Correlated Random Effects
TRIP	Transition to Retirement Income Product
AME	Average Marginal Effect
SMSF	Self-managed super fund

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