The Distribution of Augmented Wealth and the Australian Pension System from 2002 to 2018*

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Abstract

The omission of pension wealth potentially distorts the international comparison of wealth distributions. Private pension wealth is often included in households' wealth portfolios, while public pension claims are not. Augmented wealth, the sum of net worth and pension wealth, resolves this limitation by including the present value of social security pension wealth. This paper provides a detailed analysis of augmented wealth in Australia between 2002 and 2018, capturing the establishment of the compulsory private pension scheme, Superannuation, which was introduced in 1992. Moreover, I depict the interaction of Superannuation with the public scheme Age Pension and its implications for the wealth distribution. Augmented wealth in Australia is found to be less equally distributed than wealth in Germany or Switzerland, but more equally than in the United States.

Keywords: Augmented wealth; net worth; pension wealth; Household, Income and Labour Dynamics in Australia Survey

JEL Classifications: D31; H55; J32

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1 Introduction

The analysis of wealth distributions has gained more and more attention around the world throughout the last decade. A highly unequal distribution of wealth can negatively affect growth and innovation (Bagchi and Svejnar, 2015; Berg et al., 2018) and raises concerns about an unequal distribution in welfare (Stiglitz, 2012).

Pension wealth challenges the comparability of wealth data across countries (Bönke et al., 2019; Frick and Headey, 2009; Kuhn, 2020; Wolff, 1996). Private pension wealth is often included in wealth surveys and, therefore, in wealth distributions, while public pension entitlements are not. Several studies showed, however, that public pension wealth is an (imperfect) substitute for net worth (Attanasio and Brugiavini, 2003; Wolff, 2015a).[1] Hence, augmented wealth, i.e. net worth plus private and public pension wealth, contributes to a sincere comparison of international wealth distributions incorporating a more reliable measure of economic well-being (Wolff, 2015b; Bönke et al., 2019). Moreover, pension wealth aggregates are a helpful tool in a panel analysis to understand the distributional effects of pension policies.

Australia is particularly interesting for an assessment, as its pension system relies on two main schemes, i.e. the means-tested social security pension system, called Age Pension, and the private pension system, called Superannuation. Like many advanced economies, Australia struggled to provide a sustainable and effective pension scheme that secures a commensurate level of income, and, hence, consumption, during retirement. In 1992, the Australian government[2], therefore, introduced compulsory contributions by employers to the employee's Superannuation accounts as an addition to the established, tax-funded Age Pension. Superannuation is mostly a defined contribution scheme for employees and employers and it is designed to retain and guarantee the standard of living for future retirees (Superannuation (Objective) Bill, 2016).

This paper explores the evolution of augmented wealth aggregates in Australia over time including a policy analysis of the Australian pension system. The analysis comprises of three main components: first, it provides the evolution of augmented wealth in Australia between 2002 and 2018 by describing the growth and distribution of the wealth aggregates. Second, the results are compared to previous findings of Germany, Switzerland, and the United States, which have been analyzed similarly before.[3] Third,it yields an in-depth examination of the Age Pension and

[1] See Bönke et al. (2019) for further discussions.

[2] Henceforth, I will refer to the Australian government as an collective term for the different Coalition and Labor governments over time.

[3] Despite the increased data availability, the role of pension wealth in wealth distributions has been marginally studied. Harding (2002) analyzes pension wealth, especially Superannuation accounts in Australia, and finds that

Superannuation, including the analysis of dissaving patterns of Superannuation accounts and how they are affected by incentives from the Age Pension scheme. I use the Household, Income and Labour Dynamics in Australia survey, which provides five wealth modules at the household level between 2002 and 2018 (Watson and Wooden, 2002). Furthermore, it includes exhaustive pension information at the individual level.

This paper contributes to the existing literature by taking a first look at augmented wealth in Australia. Furthermore, I present a primary inter-temporal analysis of social security pension wealth. To the best of my knowledge, I am also the first who empirically assesses the dissaving behavior of a public pension scheme after retirement. Moreover, this paper also contributes to the understanding of the enrollment phase of a new private pension scheme, and the lessons to be learned for other economies.

I find that Australian households, especially those with a household head aged 50 and older, realized significant wealth gains between 2002 and 2018. Despite large wealth increases, inequality remains stable in Australia. After housing wealth, Pension wealth has an equalizing effect, as the Gini index in 2018 reduces from 0.66 for net worth to 0.571 for augmented wealth. Comparing my findings to Germany, Switzerland, and the United States (US) (Bönke et al., 2019; Kuhn, 2020), Australia's Gini index of augmented wealth is the second highest after the US. Furthermore, I find evidence for behavioral responsiveness from the interaction between Superannuation and Age Pension, as individuals dissave Superannuation accounts faster if they are potentially eligible for Age Pension. My results also raise concerns as to whether the retiree population will diverge between those depending on Age Pension and those relying on Superannuation.

The remainder of this paper is as follows: Section 2 describes the Australian pension system in detail, Section 3 provides the applied methodology, Section 4 depicts the data, Section 5 presents the empirical findings, and Section 6 concludes.

the scheme reduces wealth inequality while overall wealth inequality remained constant between the 1980s and the 1990s. Frick and Headey (2009) compare Australian and German augmented wealth for the retired population in 2002 and find that including pension wealth reduces the observed inequality in both countries. More recently, Bönke et al. (2019) analyze augmented wealth in Germany and the US. They estimate that pension wealth accounts for 48 (61) percent of the US (German) household wealth. They also find an equalizing effect of pension wealth with a net worth Gini coefficient of 0.889 (0.755) compared to an augmented wealth Gini coefficient of 0.700 (0.508) in the US (Germany). Kuhn (2020) analyzes augmented wealth in Switzerland and finds similar results as in Germany.

2 Australian Pension System

This chapter provides an overview of the Australian pension system. It builds on two main pillars: the social security scheme Age Pension and the private Superannuation scheme.[4] The Australian pension system contains several unique features. First, the means-tested social security pension is tax-funded, which does not rely on individuals employment history, but on an income and asset test at retirement. Second, the private occupational pension scheme Superannuation became compulsory in 1992 to provide additional incentives to built up private pension wealth (Australian Government, 1992). Third, Age Pension and Superannuation are not independent, but interact with each other. Wealth and returns from Superannuation alter an individual's eligibility to Age Pension.

In this section, I describe the institutional settings of the different schemes and what has changed between 2002 and 2018.[5]

2.1 Age Pension

General information The Age Pension scheme is a tax-funded, means-tested social security scheme. Individuals or households, who pass the income and asset test, are eligible to Age Pension at the age of 65 to 67. Additional to the full basic rate, which was \$629[6] for singles and \$834.40 for couples per fortnight in 2018, the Australian government provides several further payments, i.e. Rent Assistance, Energy Supplement, and Pension Supplement.[7] Moreover, individuals are entitled to the Pensioner Concession Health Card, providing higher refunds for health care costs. Depending on the state, local councils also offer additional discounts on property and water rates, public transport fares or motor vehicle registration.

Eligibility conditions The first hurdle for being eligible to Age Pension is the retirement age and the residency in Australia. In 2018, the retirement age was 65 for both genders, i.e. cohorts born in 1953 or earlier. The residency rules demand that an individual has been living

[4] Some sources also report three pillars, meaning Age Pension, compulsory contributions to Superannuation funds and voluntary savings, which includes additional investment into the Superannuation accounts or other investment vehicles. In the analysis, I focus on the two major schemes. Superannuation henceforth includes both private and voluntary contributions.

[5] The information presented in this section is based on several documents and websites provided by the Australian Government (2018, 2021a).

[6] 1 AUD = 0.7405 USD = 0.6325 EUR in 30th June 2018.

[7] In 2018, Rent Assistance added up to \$128.00 (\$135.80) for singles (couples) per fortnight, Energy Supplement another 10.60 (\$14.10) , and Pension Supplement \$51.10 (\$67.80) . For more information, the Table A1 in the Appendix.

in Australia for at least ten years in total, with five of these years without a break (Australian Government, 2018).

Income and asset test Singles or couples, who reached the retirement age and meet the residency rules, are eligible to Age Pension, if they pass the income and asset test. The income test includes gross labor earnings, pensions, received gifts, rental income, as well as financial gains. Retirees are allowed to work during retirement, but labor income above the work bonus, i.e. \$250 per fortnight, is included in the income test. The income test does not consider realized, financial returns, but imputed, "deemed" returns on the basis of total financial assets (Australian Government, 2021a).[8] The Australian government provides low and high interest rates[9], which are multiplied with the value of the financial assets below and above the threshold, respectively. The deeming rates are adjusted on a non-regular basis by the Australian tax authorities (Australian Government, 2021b). The asset tests inquire the level of net worth, including real estate, business assets, financial wealth, Superannuation accounts, and valuables. Real estate does not include the principle home, however different thresholds apply for homeowners and non-homeowners, providing a higher allowance for the latter. In 2018, the total wealth threshold for the full pension for singles (couples), without owning their home, was at \$465,500 (\$594,500), whereas home-owners were allowed to own \$258,500 (\$387,500).[10]

Full vs partial pension Individuals and couples can qualify for a full or partial pension, depending on their level of income and wealth. Once they earn more than the first threshold, i.e. \$172 (\$304) per fortnight in 2018, every additional dollar reduces the payment by a reduction rate, which was for singles (couples) 0.5 (0.25) in 2018. The wealth thresholds for the partial pension are considerably higher than those for the full pension, which were \$771,000 (\$1,055,000) for non-homeowners, and were \$564,000 (\$848,000) for homeowners. There are strong incentives to be at least partially eligible to Age Pension, even if the payment is low, as they are eligible to the benefits of the Pensioner Concession Health Card.

Changes between 2002 and 2018 There were several policy changes and adjustments in the Age Pension scheme. The Age Pension benefits, as well as the income and asset test thresholds,

[8] The corresponding asset base includes the market value of savings accounts and term deposits, managed investments, loans and debentures, listed shares and securities, gifts, and Superannuation accounts.

[9] Also called deeming rates: lower rate was 1,75 percent, higher rate was 3.25 percent per year in 2018.

[10] This shows that the scheme considers sharing resources of couples, and therefore provides lower payment and lower threshold, compared to two single individuals.

Table 1. Eligibility

Type	2002	2006	2010	2014	2018
			Eligibility Testing		
Income Test					
single threshold full	116	128	146	160	172
couple threshold full	204	228	256	284	304
single threshold partly	1,185	1,391.75	1,578.20	1,868.60	2,004.60
couple threshold partly	1,979	2,328.50	2,415.20	2,860	3,066.80
work bonus	0	0	250	250	250
reduction rate single	0.4	0.4	0.5	0.5	0.5
reduction rate couple	0.2	0.2	0.25	0.25	0.25
Deeming					
cash free	500	500	500	500	500
interest rate low	0.025	0.03	0.03	0.02	0.0175
interest rate high	0.04	0.05	0.045	0.035	0.0325
single threshold	34,400	38,400	43,200	48,000	51,200
couple threshold	57,400	63,800	72,000	79,600	85,000
Asset Test					
single w. house full	145,250	161,500	181,750	202,000	258,500
single no house full	249,750	278,500	313,250	348,500	465,500
couple w. house full	206,500	229,000	258,000	286,500	387,500
couple no house full	311,000	346,000	389,500	433,000	594,500
single w. house partly	288,000	330,000	659,250	771,750	564,000
single no house partly	392,500	447,000	790,750	918,250	771,000
couple w. house partly	443,500	509,500	978,000	1,145,500	848,000
couple no house partly	548,000	626,500	1,109,500	1,292,000	1,055,000
reduction rate	3 per 1,000	3 per 1,000	3 per 1,000	3 per 1,000	3 per 1,000
Year of Birth for Eligibility					
Female	1940	1944	1948	1949	1953
Male	1937	1941	1945	1949	1953
			Payments per fortnight		
Age Pension					
pension single p. ft.	352.10	402.40	496.30	585.50	629.00
pension couple p. ft.	421.80	478.50	658.40	776.70	834.40

Notes: Table provides thresholds for the income and asset test, deeming, and payments for Age Pension. Further payments are provided in Appendix A. All values are provided in AUD. As the numbers represent the thresholds of the respective years, they are not adjusted for inflation. Following the official approach, most values, apart from the Asset Test and Deeming, are calculated per fortnight.
Source: Information is taken from Australian Government (2018, 2021a).

are adjusted bi-annually.[11] Table 1 depicts the changes of rates and thresholds valid in July of the years included in my analysis. The threshold for income tests increased steadily over the years, however, those for the partial pensions nearly doubled for singles, whereas those for couples increased by around two-thirds. The asset thresholds increased relatively steadily too, but were actively adjusted by the Federal Government in 2017: the full pension thresholds were increased, while the thresholds for the partial pension were reduced, explaining the difference

[11] Until 2007, this was done on the basis of the Consumer Price Index (CPI). After the introduction of the Pensioner and Beneficiary Living Cost Index (PBLCI), the rates are increased by whichever index is greater.

between 2014 and 2018, provided in Table 1. Between 2006 and 2010, the reduction rate for the partial pension increased from 0.4 to 0.5 (0.2 to 0.25 for couples). The Age Pension payments were additionally increased in 2009 (Australian Government, 2009).

At the beginning of the observed period, in 2002, women could qualify earlier for Age Pension than men. The transition of the retirement age for women increased from 60 to 65 by 2014. Another transition for both women and men started in 2018, which will gradually raise the retirement age to 67 by 2024. The 2018 wave is partially affected, as the retirement age for those born after July 1952 and before 1954 can retire at the age of 65 and a half.

2.2 Superannuation

General information The Superannuation scheme represents, for most Australians, an investment in an accumulation fund.[12] The fund can be managed by financial institutions (retail funds), by the employing company (corporate funds) or industry (industry funds), by the public sector for civil servants (public sector funds) and by the individuals themselves (self-managed funds).[13] The total wealth in Superannuation accounts was $2.9 trillion in 2019 (ASFA, 2021), i.e. 1.3 times the annual Australian GDP.

The choice of the Superannuation fund is not always subject to the employee, since enterprise agreements can specify the fund type.[14] The Australian government sets standards for contributions by employees and compulsory monthly contributions for employers, i.e. the Superannuation Guarantee, which is at least 9.5 percent of the monthly wage in 2018.[15] Additionally, individuals can invest further savings from their gross or net income. The withdrawal after the preservation age, i.e. 60 in 2018, is unlimited and free from income taxes.[16] Low income earners qualify to a governmental supplement contribution match of 50 percent, capped at $500 per year. Superannuation savings are liable to tax (Australian Tax Office, 2021). The tax rate depends

[12]Even though Australians potentially possess several Superannuation funds, I refer to them in singular.

[13]Industry and retail funds include more than 11 million members each out of a total 27.4 million accounts, and are the most dominant fund categories in 2019 (Australian Prudential Regulation Authority (APRA), 2021).

[14]This affects around 30 percent of all receivers (Australian Government, 2021a). Theoretically, employees could set up their own fund and transfer the money from the default fund. However, this is costly. I gratefully thank Roger Wilkins for this remark.

[15]The term "Guarantee" can be misleading, as it may imply a defined benefit later in retirement. However, it describes the monthly contribution to the Superannuation scheme and does not represent a "guaranteed" income flow during retirement.

[16]Exceptions apply for individuals holding an untaxed super fund (contributions are not taxed), which can occur in the case of a public sector fund. However, the tax rate does not depend on the withdrawal sum for retired Australians.

on the type of contribution. Most commonly, contributions are taxed lump-sum at 15 percent. These are "concessional" contributions including the compulsory payments by the employer.[17]

Changes between 2002 and 2018 In the beginning year of my analysis, the compulsory Superannuation scheme was ten years old and therefore relatively new. Several policy changes and adjustments have been made in the successive years, of which several were of a larger scale. This includes the raise of the preservation age, changes to the concessional contributions cap, the abolition of Reasonable Benefit Limits, the end of the Superannuation surcharge in 2005, and the introduction of the Division 293 tax.

In 1999, the preservation age was gradually increased from age 55 to 60. Those born before 1960 could access their Superannuation savings at 55, however the preservation age increased year by year to 60 for those who were born after June 1964. This means that from 2015 onward, individuals access their accounts a year later. An even more substantial change could be the reduction of the concessional contribution cap. As shown in Table 2, the cap was reduced from $100.000 to $25.000 in the 2010s. Moreover, the age specific caps were abolished. As a consequence, the potential tax advantages per year for Superannuation savings are significantly lower compared to end of the previous decade. On the other hand, the Reasonable Benefit Limits were abolished in 2007, which conditioned the concessional tax rate limits to wealth levels in Superannuation accounts.[18] Another considerable change was the abolition of the Superannuation Surcharge in 2005, which increased the tax rate by 12.5 percent, applied to contributions from individuals earning more than $121,075. Nonetheless, in 2012, a new type of surcharge tax was introduced, the Division 293 tax. It increases the Superannuation tax rate by 15 percent for individuals earning more than $250,000 ($300,000 until 2017). In July 2017, the Australian Tax Office introduced the $1.6 million cap to the tax-exempt status, with a 15 percent tax rate for the amount above.[19]

[17] A detailed discussion on the taxation of Superannuation funds is provided in Appendix C

[18] The non-concessional, tax-free tax rate is still limited at $1.6 million.

[19] There were smaller adjustments in the 2002 to 2018 period. The introduction of the excess concessional contributions charge was introduced in 2013, which declined gradually from 5.82% to 4.96% until 2018. The governmental supplement contribution started in the same year.Originally, the contribution per invested $ 1 was $1.5, but reduced to $0.5 in 2018.The Superannuation Guarantee increased moderately from 9 percent, to 9.25 percent in 2013, and to 9.5 in 2014.

Table 2. Concessional Contributions Cap

Age	2009	Age	2010	Age	2014	Age	2018
<50	50.000	<50	25.000	<59	25.000	all	25.000
>50	100.000	>50	50.000	>59	35.000	ages	

Notes: Table shows the change of the concessional contribution cap over time. Values in earlier years were the same as in 2009. All monetary values are in AUD and not adjusted for inflation.
Source: Information is taken from Australian Tax Office (2021).

2.3 Interactions between Superannuation and Age Pension

The Superannuation system was introduced to address the aging population in Australia, as in most advanced economies. An aging society with increasing live expectancy could bring a singular tax-based pension scheme as Age Pension to its limits. Superannuation was set as an additional pillar to support private wealth accumulation (Australian Government, 1992). Consequently, Superannuation wealth affects Age Pension eligibility twofold: deemed income from Superannuation wealth is included in the income test and the total wealth in Superannuation accounts is included in the asset test. In 2016, the Australian government projected in the Superannuation (Objective) Bill (2016) that the proportion of retirees receiving no Age Pension will remain stable until 2050 at 20 percent of the population. Due to the maturity of the Superannuation scheme, they expect a shift away from full to partial pensions.

These interactions are highly relevant for understanding how the introduction of the private pension scheme affects its public counterpart. Individuals face new inter-temporal consumption decisions through their accumulation and retirement phase. Phasing out regulated Age Pension payments by individually chosen private annuities from Superannuation causes new dissaving decisions, which are affected by the incentives set by the two pension schemes. An assessment of this behavioral responsiveness is of interest for policy implications beyond the Australian case, as policy makers in other countries may learn from it. This paper provides a first analysis of these dissaving decisions.[20]

3 Methodology

In this Section, I provide the definition of augmented wealth and its underlying aggregates following Bönke et al. (2019), and Wolff (2015b). I apply the accrual method, i.e. basing pension entitlements on the household's socio-economic characteristic at the observed point in

[20]There are further smaller pension schemes, which are detailed in Appendix B.

time. Finally, I present the methodology for analyzing the dissaving patterns of Superannuation accounts during retirement.

3.1 Wealth Aggregates

The augmented wealth definition applied here is closely related to the definition established by Bönke et al. (2019). I define the same 15 wealth aggregates as listed in Table 3. The gross wealth (w6) is the sum of w1 to w5, including owner occupied property (w1), other additional real estate (w2), tangible assets (w3), business assets (w4), and financial assets (w5). Subtracting debts, i.e. debts from owner-occupied property (w7), from other real estate (w8), and consumer debts (w9), from gross wealth, I receive net worth (w10). Statutory pension wealth without (w11), from (w11s) survivor benefits, and after dissaving pension wealth (w11d)[21] add up to the social security pension wealth (w12). Pension wealth (w14) is, therefore, the sum of social security pension wealth (w12) and occupational and private pension wealth (w13). Augmented wealth (w15) is the sum of net worth (w10) and pension wealth (w14).

Table 3. Wealth Aggregates

Acronym	Variable
w1	Owner-occupied property
w2	Other real estate
w3	Tangible assets (collectibles)
w4	Business assets
w5	Financial assets
w6	**Total gross wealth (sum up w1 to w5)**
w7	Mortgage debts - owner-occupied property
w8	Mortgage debts - Other real estate
w9	Consumer debts
w10	**Net worth (w6-(w7 + w8 + w9))**
w11	Statutory pension wealth without survivor benefits
w11s	Statutory pension wealth from survivors benefits
w11d	Statutory pension wealth after dissaving Superannuation accounts
w12	**Social security pension wealth (w11 + w11s + w11d)**
w13	**Occupational and private pension wealth**
w14	**Pension Wealth (w12 + w13)**
w15	**Augmented wealth (w10 + w14)**

Notes: Description of the 15 wealth aggregates according to Bönke et al. (2019), p.12. This analysis adds w11d, which includes statutory pension wealth, which households may are eligible to after dissaving their Superannuation account.

While aggregates w1 to w10 are standard for the distributional analysis of wealth, aggregates w11 to w15 allow for a broader perspective on wealth endowments. Private pension wealth, w13, represents wealth in Superannuation funds, which potentially is included in financial assets in standard wealth analysis. The w12 aggregate represents the present value of discounted income

[21] This is the only deviation from Bönke et al. (2019) and is explained later in this section.

flows from social security pensions, listed in Table A2 above. In other words, the value considered as social security wealth is the actuarially fair, discounted price to which an individual would sell their social security pension claims on complete capital market. Hence, the measure incorporates social security entitlement as the present value of pension p for individual i in year y, and is defined as

$$PV^{p}_{i,y} = \sum_{t=0}^{T}[\frac{1}{(1+r)^t} \sum_{p} \sum_{t} d^{P}_{t,i,y} \times pension^{p}_{t,i,y} \times \sigma_{t,g,c,y}], \tag{1}$$

where T is the "end-of-life" period, when the individual reaches the age of 100, r is a constant discount rate, i.e. 2 percent. $d^{P}_{t,i,y}$ is equal to 1 if individual i is eligible for pension p in period t. $pension^{p}_{t,i,y}$ represents the pension entitlement and $\sigma_{t,g,c,y}$ is the probability of staying alive in period t depending on gender g in cohort c in year y. The survival probability is provided by Australian Bureau of Statistics (2021a) for the waves under analysis.

I assume that individuals who receive social security pension in year y remain eligible throughout the rest of their life cycle. This assumption is realistic for individuals receiving less common pension types, e.g. Disability Pension, Disability Support Pension, Service Pension, or War Widow Pension. Individuals receiving Age Pension could potentially lose their eligibility, from one period to the next, if they failed the income and asset test, e.g. by starting to work or having increased capital gains. This is however rare.[22] A reasonable concern could be that individuals lose their Age Pension eligibility due to policy adjustments. As the accrual method relies on the expected value of futures pension schemes, it does not include future policy changes in year y. Once these changes are introduced, they affect the present value calculation.

The statutory pension wealth from survivors pension (w11s) includes the Widow Allowance, the only scheme where the payment $pension^{p}_{t,i,y}$ depends on the male partner's survival probability. Eligibility is conditioned on being female, born on or before 1 July 1955, being widowed, divorced or separated since turning 40. Women have to meet the requirements of the income and assets test and meet residence rules, i.e. living in Australia for at least 10 years. In equation 1, this means that the survival probability is, therefore, $(1 - \sigma_{t,m,c,y}) \times \sigma_{t,f,c,y}$.[23] The economic relevance remains small, as only 0.2 percent of the whole population was eligible in 2014, and the program stopped in 2018.

[22] I provide more evidence for this in Section 4 and 5

[23] I refrain from including divorce rates and focus on survival probabilities.

Including social security pension wealth and its effect on Australian wealth inequality builds the basis of the contributions of this paper. As social security pension wealth is financed with taxes, the contribution to the tax system is indirectly included in the classical wealth analysis. Social security pension wealth increases tax rates, which potentially reduces household net incomes and, eventually, hinders wealth accumulation compared to a situation without a tax-based pension scheme. It potentially affects the wealth aggregate directly, as it reduces net-wealth. Incorporating social security pension wealth, therefore, provides a more accurate wealth measure as it includes the benefits of the pension system.

Even though my methodology is closely related to the ones by (Bönke et al., 2019; Kuhn, 2020), the peculiarities of the Australian pension system compared to Germany, Switzerland, and US cause some deviation. The social security schemes in these three countries are pay-as-you-go schemes relying on individual labor income histories and associated pension contributions. Hence, they can calculate the present value of their pension contributions at any point in their life cycle. In these countries, tax-funded social security pensions exist as a basic income support for those who received a lower lifetime income. As these payments are not per se a pension scheme, they are not included in the present value calculation by (Bönke et al., 2019; Kuhn, 2020). However, in my analysis, I include them in the present value calculation, because Age Pension is the major social security scheme in Australia. As I cannot observe whether cohorts below the retirement age will qualify for Age Pension, I only include their savings in Superannuation accounts.

Calculating dissaving rates and aggregate w11d Another central aspect is the interaction between Age Pension eligibility and Superannuation wealth. Once individuals reach the preservation age, the government lets individuals choose how much they retrieve per year. As Superannuation is included in the Age Pension income and asset test, there can be an incentive for those who are slightly above the income and wealth thresholds, to dissave Superannuation wealth at a higher rate. Contrary to other financial assets, this would not affect the individual tax rate[24] and one could potentially fulfill the income and asset test requirements. For this reason, I run an artificial income and asset test for those who reached the retirement age and meet the residency rules. I calculate the average Superannuation dissaving rate $\overline{\nu_{c,y}}$ for each cohort c in year y:

$$\overline{\nu_{c,y}} = \frac{1}{N_{c,y}} \sum_{i=1}^{N} \frac{y^s_{i,c,y}}{w^s_{i,c,y}} \tag{2}$$

[24] E.g. returns from selling shares falls under the capital gain tax.

with $y^s_{i,c,y}$ describing the annual annuity retrieved from Superannuation wealth by individual i, and $w^s_{i,c,y}$ representing the individuals total Superannuation wealth. $N_{c,y}$ is the total size of cohort c in year y. I assign the average dissaving rate to those individuals who would pass the artificial income and asset test by reducing their Superannuation in each period of the present value calculation in Equation 1. Aggregate w11d is then calculated as the present value similar to the other pensions in Equation 1. As soon as individuals are eligible, the dummy variable $d^P_{t,i,y}$ switches from 0 to 1 and the individuals receive $pension^{p,imputed}_{t,i,y}$ from this period onward.[25]

Analysis of Dissaving Rates I shed more light on the interaction between the two main pension schemes by scrutinizing dissaving rates. I estimate a pooled fractional probit model. The advantage of this, is that compared to a binary probit model, I can take the intensive margin of the continuous dissaving rate into account. The fractional probit model was introduced by Papke and Wooldridge (1996), who analyze aggregated employee participation rates in 401(k) pension plans in the US. The model has the following form:

$$E(\nu_i|X_i) = \Phi(X_i\beta_j) \tag{3}$$

where ν_i represents the dissaving rate, and X_h represents a set of the covariates of individual i and the intercept. $\Phi()$ represents the standard normal cumulative distribution function.

4 Data

The main source of my analysis is the Household and Income Dynamics in Australia (HILDA) Survey (Watson and Wooden, 2002). Additional data on the income and asset testing, as well as payments of the Age Pension scheme is taken from the Australian Government (2018). This section describes the HILDA dataset, especially in regards to the wealth modules. Furthermore, I define the working sample for the analysis of Superannuation dissaving rates.

Wealth data in HILDA The HILDA survey is representative for the Australian population and it has been conducted annually by the Melbourne Institute since 2001. I use the HILDA survey, as it includes, first, broad information on socio-economic characteristics and a detailed wealth module on the household level for the years 2002, 2006, 2010, 2014, and 2018. Second, it includes information on surrender pension values $pension^p_{t,i,y}$ from all Australian pension schemes

[25] This affects 7.91 percent of households with a retired household head in my working sample.

on the individual level. Third, the panel survey allows me to track wealth pensions over time. Fourth, neither the wealth module, nor the methods of data collection have been changed over time, so I can rely on consistent information over a 16-year time period.

Table 4. Means of Selected Characteristics: HILDA

	2002	2006	2010	2014	2018
Obs	7,063	7,003	7,193	9,363	9,486
Age HH Head	48.08	48.70	49.07	50.00	50.54
	(0.13)	(0.14)	(0.14)	(0.14)	(0.13)
Numb HH	2.60	2.60	2.59	2.58	2.56
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female HH Head (%)	45.92	46.31	48.39	47.64	47.57
	(0.39)	(0.41)	(0.42)	(0.40)	(0.42)
Yearly Eq. Inc HH	52,449	58,617	63,502	65,684	67,247
	(340)	(375)	(415)	(434)	(478)
Net Worth (Survey)	598,160	810,683	801,490	792,315	933,664
	(7,016)	(10,715)	(10,599)	(9,062)	(10,342)

Notes: Own calculation based on the full sample. Weighted monetary mean values are in AUD and set to 2018 prices on the basis of the Consumer Price Index (The World Bank, 2021). Income is equalized by using the modified OECD scale (Hagenaars et al., 1994). Net worth provided here follows the definition of the HILDA Survey which includes Superannuation wealth (Wilkins et al., 2020). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights (Efron, 1979).
Source: HILDA Survey wave 18.

Table 4 depicts the numbers of observation and mean values for selected variables in the HILDA survey over time. In 2002, 7,063 households are surveyed. With a top up in 2011, more than 9,000 households are included since then. The household member answering the household questions is defined as household head. The average age of the household head is close to 50, and the average number of individuals in a household is constant and around 2.6 in all waves, and 46 to 48 percent of the household heads are female. All monetary values in my analysis are provided in 2018 prices. The mean of the households' equivalent income increases in the 2000s from \$52,449 to \$63,502, and ends up at \$67,247 in 2018. The mean net worth follows the definition of the HILDA Survey which includes Superannuation wealth (Wilkins et al., 2020) increases between 2002 and 2006 from \$598,160 to \$810,683, then decreases to \$792,315 in 2014, and rises to \$933,664 in 2018.

Wealth data based on survey information comes with the caveat, that the top one percent are difficult to capture adequately (Eckerstorfer et al., 2016; Kennickell and McManus, 1993). Oversampling of the rich potentially addresses this problem (Kennickell, 2008), but this is not

provided by the HILDA survey. Moreover, wealth and income variables are top-coded, which affects 30 to 40 observations in each survey year.[26] Therefore, the results of my analysis do not incorporate changes for the top of the wealth distribution. Nevertheless, the HILDA survey provides reliable wealth data for large parts of the population, which is surveyed consistently over time.

Working sample for the analysis of dissaving rates Data requirements potentially put limits on an analysis of dissaving rates. Long-term panel data with wealth modules are scarce. Even if panel wealth data is available, dissaving patterns are difficult to obtain, as the extraction values from private pension accounts are commonly not provided. The HILDA dataset allows me to observe both: I can observe the total Superannuation in five waves between 2002 and 2018 and, for every year, observe the annuity retrieved from this account.

For the estimation of Equation 3, I pool all waves with the wealth module from between 2002 and 2018. I rely on individual information, as data on Superannuation accounts is one of the few wealth items which is provided on the personal level in the HILDA dataset. I restrict my dataset to retired individuals over 55 years of age, who hold at least some wealth in their Superannuation accounts. This leaves 5,679 observation in total.[27]

5 Empirical Findings

I show the empirical findings in three major subsections: the first part provides descriptive statistics of the wealth aggregates in Australia over time including the analysis on augmented wealth inequality. The second part sets the results within the context of augmented wealth in Germany, the US (Bönke et al., 2019), and Switzerland (Kuhn, 2020). The third part exhibits distributional implications of the Age Pension and Superannuation scheme, which incorporates the analysis of the individual Superannuation dissaving rate.

5.1 The Distribution of Augmented Wealth in Australia

This subsection describes augmented wealth inequality from several angles. Aside from mean values of the wealth aggregates, I illustrate the change wealth levels along age cohorts. Moreover, I analyze the evolution of augmented wealth inequality.

[26] The observations hold an imputed, mean preserving value. This affects the top 0.5 percent.
[27] Further details on the sample is provided in Appendix D.

Table 5. Selected weighted mean values based on HILDA

	2002	2006	2010	2014	2018
w1: HMR Value	307,381	407,842	443,434	420,146	508,951
	(2,834)	(3,884)	(4,224)	(3,674)	(5,145)
w5. Financial Wealth	101,038	125,351	121,199	134,375	147,243
	(2,142)	(3,252)	(3,093)	(2,850)	(3,225)
w6: Gross Wealth	575,738	805,250	809,938	775,967	896,743
	(6,692)	(10,869)	(10,249)	(8,296)	(10,053)
w10: Net Worth	474,784	650,131	624,835	589,465	692,618
	(6,002)	(9,672)	(8,933)	(7,073)	(8,668)
w11s: PW from survivor benefits	22	225	629	676	0
	(7)	(7)	(19)	(25)	(0)
w11d: PW after dissaving Super	1,102	769	1,315	2,056	3,403
	(132)	(105)	(139)	(194)	(257)
w12 Social Security PW	70,242	73,415	71,800	81395	75,805
	(1,219)	(1,457)	(1,375)	(1,563)	(1,478)
w13: Superannuation	123,280	160,876	177,978	203,086	240,726
	(1,979)	(2,911)	(3,245)	(2,761)	(3,135)
w15: Aug. Wealth	668,306	884,422	874,613	873,946	1,009,149
	(6,865)	(10,999)	(10,979)	(8,778)	(10,296)

Notes: Own calculation based on the full sample. Weighted mean values are in AUD and set to 2018 prices on the basis of the Consumer Price Index (The World Bank, 2021). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18.

Descriptive Statistics Table 5 provides the mean values of the wealth aggregates w1, w5, w6, w10, w12, w13, and w15. All values are provided in Australian dollars and in 2018 prices. I observe a substantial increase in all wealth aggregates between 2002 and 2006, except for social security pension wealth. Mean gross wealth increases between 2002 and 2010, slightly decreases in 2014 and increases significantly to $896,743 in 2018. Net worth provides similar patterns. The estimates suggest that the home owner residence value (w1) drives much of that development, as a comparably high ownership rate, i.e around 65 percent in the total population (Wilkins, 2016) coincides with a steep increase in housing prices in Australia (Knoll et al., 2017; Wilkins et al., 2020). The mean of the financial wealth (w5) aggregate rises by around 40 percent during the 16 years, only stagnating between 2006 and 2010 – the time of the general financial crisis (henceforth GFC). Social security pension wealth remained relatively constant over time, with an increase in 2014 followed by a decrease close to the 2010 level at $75,805. I also include wealth from survivor benefits (w11s), which depend on widow allowance payments. Only very few households receive

pensions from this scheme and it stopped in 2018. The mean pension wealth from Age Pension after dissaving their Superannuation account (w11d) is higher than those from aggregate w11s, but not also not relevant for the overall wealth distribution.[28] The mean of Superannuation (w13) doubled between 2002 and 2018, which can be explained by the advanced maturity of the scheme in combination with a high take-up rate. The family home represents, on average, the most valuable asset in 2018, followed by Superannuation wealth, financial assets, and eventually social security pension wealth.

Australian households, on average, yield high augmented wealth positions (w15). The aggregate increases greatly between 2002 and 2006, plateaus between 2006 and 2014, and increases again in 2018. During the considered 16 years, augmented wealth has increased by 51 percent. Increasing housing (households main residence, HMR) wealth and Superannuation drive these results. Table 5 also shows the relevance of pension wealth, as the mean of augmented wealth is 45 percent higher than net wealth in 2018.

The pension schemes were affected by several policy adjustments and they may help to explain the changes over time. The rise of the retirement age for women and the bi-annual adjustments of the thresholds and pension payments contribute in keeping the social security pension wealth values stable, even though the numbers of retirees has increased. The relatively steep upturn between 2010 and 2014 is likely due to a composition effect, as the retirement age for women was successively increased from 60 to 65 until 2014. Therefore, several women had to postpone their retirement and become eligible in that year. The decrease of the mean from 2014 to 2018 might be a consequence of the rather large threshold adjustment in the income and asset test by the government and the first step of increasing the retirement age to 67 for men and women.

Major changes of the Superannuation scheme, like the reduction of the concession cap in the early 2010s, reduced the Superannuation wealth growth. However, the results do not provide a counterfactual scenario, which would also be difficult to disentangle from the aftermath of the GFC at that time. The increase of the preservation age between 2014 and 2018 possibly increases wealth in Superannuation accounts, as the accumulation phase is prolonged. Again, which is difficult to disconnect from the developments of international stock markets, that significantly rose in that period.

Looking beyond the mean, Table 6 provides the mean, median, 25th-, 75th-, and 90th percentiles of selected wealth aggregates in 2018. Typical for net worth is having a much lower

[28] Henceforth, w11s and w11d are not presented separately.

Table 6. Descriptive Statistics Wealth Aggregates: 2018

Aggregates	Mean	p10	p25	p50	p75	p90	Frac >0
w10: Net Worth	692,618	200	35,000	357,797	858,900	1,718,000	90.51
	(10,053)						(0.33)
w12 Social Security PW	75,805	0	0	0	0	357,809	21.07
	(1,478)						(0.44)
w13 Superannuation	240,726	0	16,628	95,000	275,000	600,000	84.88
	(3,135)						(0.12)
w15 Augmented Wealth	1,009,149	28,000	165,830	601,000	1,307,299	2,325,522	96.20
	(10,296)						(0.14)

Notes: Own calculation based on the full sample. Monetary values are in AUD. All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18.

median than the mean, indicating a highly rightly-skewed distribution, with $35,000 at the 25th –, $858,900 at the 75th –, and $1,718,000 at the 90th percentile, respectively. It also provides the ratio of households which hold a positive amount in the wealth aggregate. For net worth in 2018, these were 90.51 percent of all households. Social security pension wealth applies for 21.07 percent of Australian households. Superannuation is much more dominant in comparison to the social security pensions, but it's distribution is rightly-skewed as well. 84.88 percent of Australian households hold at least some wealth in Superannuation accounts. Augmented wealth is considerably higher than net worth for all statistics shown in Table 6 , and only 3.8 percent of all households do not possess positive augmented wealth.

Wealth and Age Cohorts The longitudinal data allows me to compare wealth endowments of different age cohorts in the observed period. These results are helpful to understand which age groups benefited and which aggregate contributed to the increase in wealth.[29]

Figure 1 shows the results with with age referring to the household head. I calculate the mean wealth of 21 age cohorts. Each age cohort includes three years of age, for instance, household heads at the age 22 to 24 in the second age cohort.[30] The last age cohort comprises of all households with a household head at the age 80 or older. I plot the results for each wave using

[29]The individual age determines the stage of wealth accumulation over the life cycle. Following the neoclassical theory, individuals choose their saving rate to smooth their consumption over time. Previous research shows an inverted u-shaped pattern of wealth accumulation throughout an individual's life, with an increase throughout the working life and a decline, once an individual retires (Atkinson, 1971; Davies and Shorrocks, 2000). There are many factors that shape the wealth accumulation patterns, e.g. saving rates, especially precautionary saving (Cagetti, 2003; De Nardi and Fella, 2017), investment behavior (Calvet et al., 2007; Benhabib et al., 2011; Lusardi et al., 2017; Wenzel and Koenig, 2019), and bequest motives, either accidental (De Nardi, 2004) or due to the "warm glow" (Andreoni, 1989; De Nardi and Fella, 2017).

[30]The first cohort includes 4 years, aged 18-21.

LOWESS regressions.[31] In the four panels, I depict augmented –, social security pension –, Superannuation –, and housing wealth.

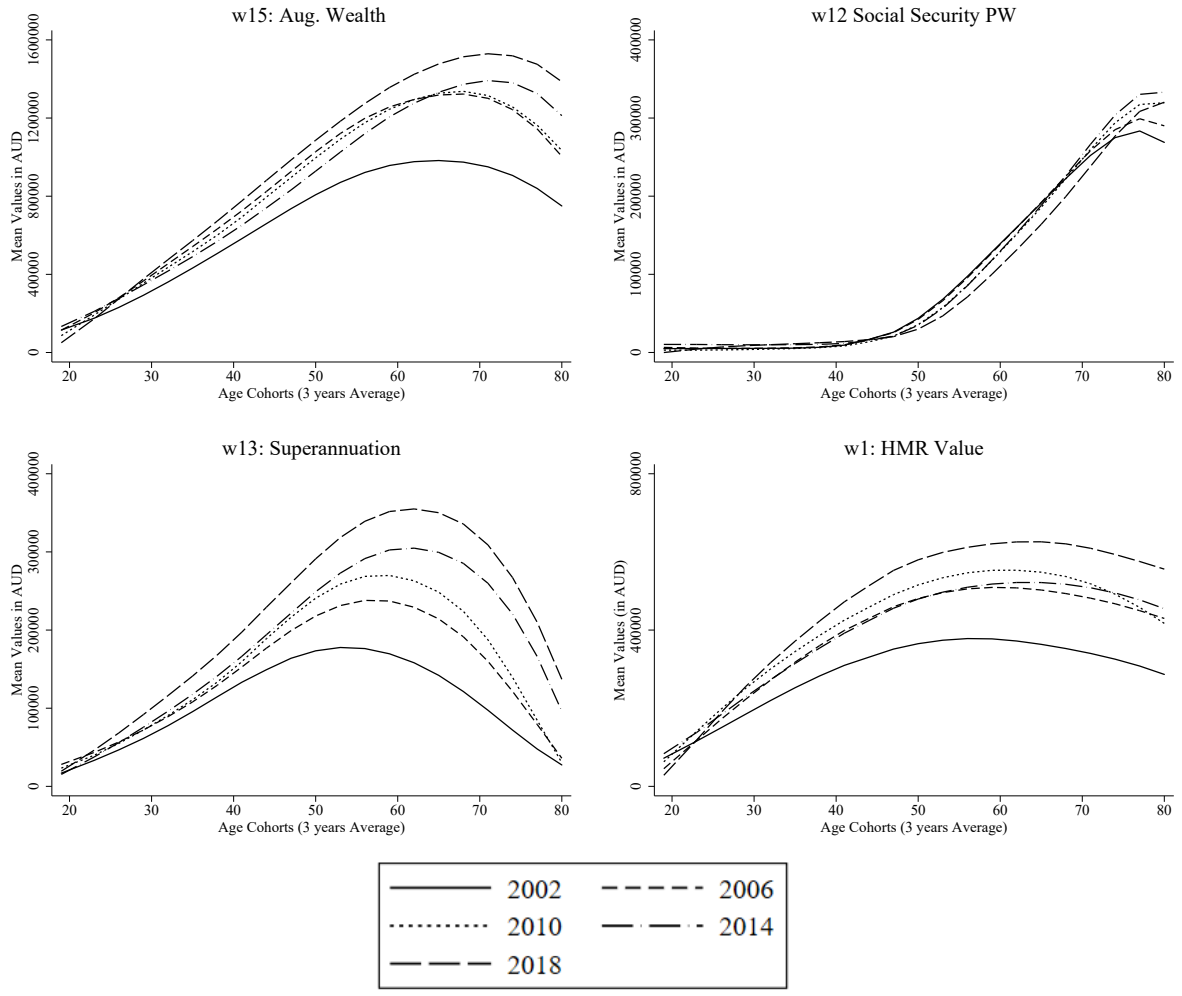


Figure 1. Life Cycle Wealth Profiles

Notes: Own calculation based on the full sample. 3 year average values by age cohort, smoothed with LOWESS. Age refers to HH Head. All values are in AUD and set to 2018 prices on the basis of the Consumer Price Index (The World Bank, 2021).
Source: HILDA Survey wave 18.

Augmented wealth follows the same pattern in all considered waves, starting at a level close to 0 at the beginning of the life cycle and then a steady increase until the 60s, after which mean wealth values start to decline again. The estimates show, that the large increase of wealth between 2002 and 2006 seems to evaluate the wealth of those in their 50s and above. In the years 2010 and 2014, augmented wealth stagnated at the 2006 levels for all age cohorts. In 2018 augmented wealth increases again for older age cohorts, while the difference for those below their 50s is small.

[31] Scatter plots with bootstrapped standard error for the years 2002 and 2018 are provided in Figure A3 in Appendix F.

While the patterns of social security pension wealth are very persistent over time, the plots confirm the previous finding that Superannuation wealth and housing wealth drive the increase of augmented wealth in these periods. Pension wealth from social security schemes starts to grow at the age of 50 in all years and then continuously increases almost linearly until the late 70s cohorts. There are other social security pension schemes included, e.g. the Service Pension or Disability Pension, which explains the take off before the 60s. Social security wealth in 2018 appears to be slightly lower then in the cohorts before, but the difference is not significant. Superannuation wealth follows an inverted u-shaped pattern across the age cohorts and grows in every wave, but less during the time of the GFC.

The increase of Superannuation wealth between 2014 and 2018 is interesting, as several changes and economic factors interact in this period. The rise of the preservation age potentially increased wealth levels, as the accumulation phase was prolonged. The reduced concessional rate, established in the 2010s, however, could have reduced accumulation patterns. Well performing financial markets in that period potentially offset effects on the accumulation rates and raised wealth for all cohorts. In the cross-section, mean wealth reduces for households with a household head above the retirement age. Mean values for household heads 80 or older get closer to zero for the waves 2002, 2006, and 2010, but remain at above $100,000 in the last two waves.

Housing wealth increases throughout the life cycle as home-ownership becomes more and more relevant. Home-ownership did not change significantly across age cohorts[32]. The increase is, therefore, fully attributable to increasing housing values.[33]

Wealth Modules and Inequality The results so far show substantial changes in the wealth endowment, which raises the question about the distributional consequences. The distribution of wealth in Australia has been studied before. Using data of the Australian Bureau of Statistics (ABS), Harding (2002) finds a net wealth Gini coefficient at 0.64 in 1986 and in 1998, which remained constant due to the equalizing effect of the Superannuation accounts. Later studies reveal estimates between 0.6 and 0.65 using ABS data (Kaplan et al., 2018) or HILDA data (Headey et al., 2005; Frick and Headey, 2009; Sila and Dugain, 2019; Wilkins, 2016). The trends over time are, however, controversial as Kaplan et al. (2018) describe increasing inequality, while Sila and Dugain (2019) and Wilkins (2016) find stable inequality patterns. Australian Bureau of Statistics (2021c) finds an increase of the Gini index from 0,565 in 2003 to 0,619 in 2018. This

[32]For a graphical representation see Appendix F.
[33]I further discuss pension wealth along several household characteristics in Appendix G.

paper contributes to the discussion by providing a long-run analysis and by adding the, thus far, not included social security pension wealth aggregate.

Table 7. Gini Coefficients of Wealth Aggregates

Aggregates	2002	2006	2010	2014	2018
w10: Net Worth	0.644	0.661	0.649	0.661	0.664
	(0.0035)	(0.0040)	(0.0040)	(0.0032)	(0.0033)
w10 + w11: Personal Ent.	0.602	0.624	0.615	0.622	0.628
	(0.0035)	(0.0040)	(0.0040)	(0.0033)	(0.0034)
w10 + w12: Social Sec PW	0.602	0.624	0.615	0.622	0.628
	(0.0035)	(0.0040)	(0.0040)	(0.0044)	(0.0034)
w10 + w13: Superannuation	0.619	0.632	0.625	0.628	0.624
	(0.0035)	(0.0037)	(0.0039)	(0.0031)	(0.0030)
w15: Augmented Wealth	0.577	0.597	0.593	0.592	0.592
	(0.0033)	(0.0037)	(0.0039)	(0.0032)	(0.0030)
Net worth <= 0 (%)	7.66	9.41	9.75	10.93	11.10

Notes: Own calculation based on the full sample. All estimates are based on imputed values and weighted with household population weights. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18.

Table 7 presents the Gini coefficients of net worth, adding up social security pension wealth and Superannuation to augmented wealth in the considered waves. Based on my estimates, the Gini index of net worth inequality increased slightly over time. Bottom coding or censoring does not alter the estimates veritably, as only a relatively small proportion of the distribution holds negative net worth.[34] My estimates of the Gini coefficient correspond to previous estimations with HILDA data in Headey et al. (2005), Frick and Headey (2009), and Wilkins (2016). Aggregate "w10 + w13" comes closest to the net wealth definition in the survey, as it includes wealth from Superannuation accounts.

Adding pension wealth to the net worth distribution decreases the measured inequality, as augmented wealth exhibits lower Gini estimates than net worth in all waves. The Gini coefficient of augmented wealth increases slightly over time, i.e. from 0.577 in 2002 to 0.592 in 2018. The aggregates w11s and w11d have no distributional relevance, which is shown by the same estimates of "w10+w11" and "w10+w12". In 2002, net worth and social security pension wealth are slightly more equally distributed than net worth combined with wealth in Superannuation accounts. However, this changes by 2018, when both pension aggregates exhibit about the same level of inequality.

Relatively constant Gini coefficients are not what one would necessarily expect in the Australian case. Economic growth can be observed constantly between 2002 and 2018, and it is, in

[34] Corresponding estimates are provided in Appendix H

advanced economies, associated with growing wealth inequality during the last decades (Islam and McGillivray, 2019; Stiglitz, 2012), as economic growth is more beneficial to high-income-earners, and they choose higher saving rates (Saez and Zucman, 2016). This does not seem to hold for Australian households. The share of households in the sample which possess zero net worth or less has, however, increased from 7.66 to 11.10 percent. Hence, the economic growth does not seem to coincide with a broader accumulation of wealth.

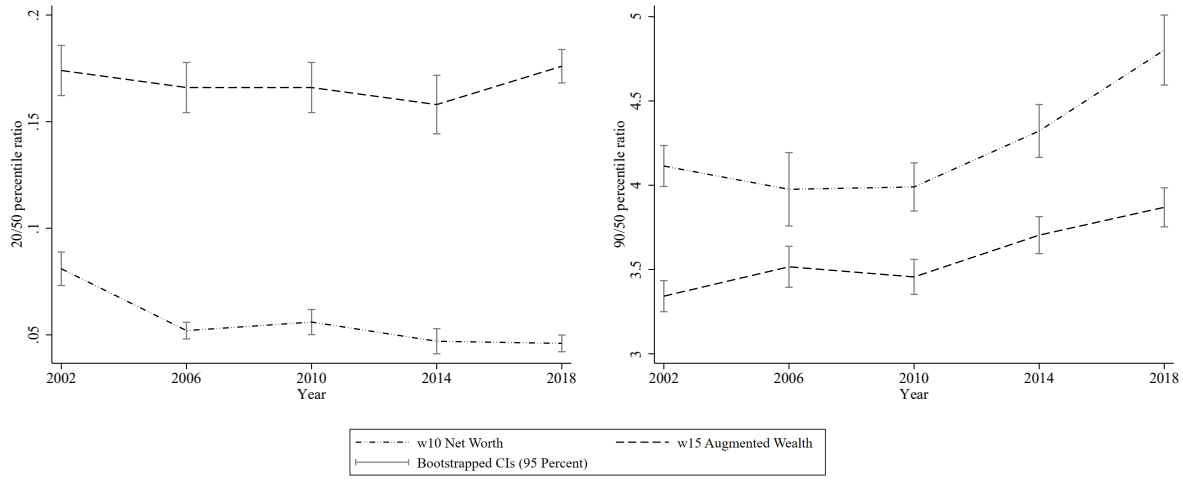


Figure 2. Percentile Ratios: 20/50 and 90/50

Notes: Own calculations based on the full sample. The left (right) panel provides the 20/50 (90/50) percentile ratio over time. All estimates are based on multiple imputations. Bootstrapped standard errors are based on 1000 replica weights. *Source:* HILDA Survey wave 18.

Going beyond the Gini coefficient, I provide percentile ratios to investigate the tails of the net worth and augmented wealth distribution. This incurs another angle if inequality, as the Gini coefficient is more sensitive to changes in the middle of the distribution (Cowell, 2011). Figure 2 depicts the 20/50 and 90/50 percentile of the two aggregates between 2002 and 2018.[35]

The ratios reveal an increase of inequality on both wealth aggregates in the 2010s, which is not captured by the Gini coefficient. The first panel in Figure 2 shows that households held less than 10 percent of the median net worth at the 20th percentile in 2002, and around 5 percent in 2018, while they hold around 18 percent of the median augmented wealth. The second panel shows that households held 4.1 times the median net worth at the 90th percentile in 2002, increasing to 4.8 in 2018, at the same time holding 3.3 (3.8) time the median augmented wealth in 2002 (2018). As shown with the Gini coefficient above, percentile ratios of augmented wealth exhibit

[35] I choose those percentiles as they guarantee that individuals hold some positive wealth at the lower end. Table A6 in Appendix I shows the corresponding numbers for all pension wealth aggregates.

less inequality than those of net worth. However, the differences are more distinct at the top tail of the distribution, i.e. the 90/50 percentile ratio.[36]

It is important to keep in mind that the applied wealth data is top coded and survey data potentially does not capture the top adequately. This may explain why other datasets show a more significant increase of inequality in the same period (Australian Bureau of Statistics, 2021c). The 90/50 percentile ratio also hints towards a larger variation at the top. Further, it shows that including social security pension wealth affects the level, but not trend of inequality, as its contribution is relatively constant over time and plays no role at the top of the wealth distribution.

5.2 The Distribution of Augmented Wealth in an International Comparison

Augmented wealth is a helpful tool to enhance the comparability of wealth data between countries, as it reduces the bias from different social security pension schemes. This allows me to compare Australian wealth inequality with Germany, the US (Bönke et al., 2019), and Switzerland (Kuhn, 2020). The pension system in Germany, Switzerland, and the US are all based on public, private and occupational pension schemes. The public pension in these countries are pay-as-you-go schemes, hence, the present value of the future benefits can be assigned to an individual at any age in their life cycle. As shown above, Australia's pension scheme differs, as it is not conditional on income during the worker's life, but on income and wealth endowment starting at the retirement age, and is, therefore, a special case in this group of countries. Furthermore, only the Australian Superannuation scheme and the occupational pension scheme[37] in Switzerland have a compulsory component. The Riester-Scheme in Germany, and the 401k-plan in the US are voluntary schemes.

In the following analysis, all values are in US Dollars and purchasing-power-parity-adjusted (ppp). For Australia, one Australian Dollar is equal to 0.90 US Dollars, i.e. the average exchange rate in 2014, and adjusted with the 1.452 ppp-conversion-rate provided by the OECD (2021). For Switzerland, I transform the estimates from Kuhn (2020), where one Swiss Franc is equal to 1.041 US Dollars and the ppp-conversion-rate is 1.235 in 2015. For a better comparison to

[36] Table A6 in Appendix I shows that this is fully attributable to social security pension wealth.
[37] In German: "Berufliche Vorsorge"

Bönke et al. (2019), I exclude vehicles from the Australian wealth aggregates, as it is not asked in Germany and excluded from the US.[38]

Comparison of Descriptive Statistics I start with the comparison of mean values and several quintiles of the wealth aggregates w10, w12, w13, and w15 in Table 8. Regarding the mean net worth in Australia, at 324,664 USD, it is considerably higher than in Germany (182,329 USD) and Switzerland (223,525 USD) and slightly below the US (337,570 USD). However, mean social security pension wealth is 4.2 times higher in Germany, 2.6 in Switzerland, and 3.4 times higher in the US. The mean value in Superannuation accounts is higher than those of the occupational and private pension schemes in Germany or Switzerland but lower than the one in the US. Consequently augmented wealth in Australia sits at a mean value of 487,822 USD, which is above the one of Germany (472,401 USD) and Switzerland (451,294 USD) and below the US (652,504 USD). Augmented wealth in Australia is lower at the lower end of the wealth distribution, i.e. at the 25th percentile, than in the other countries.

The statistics reveal the differences between the social security pension schemes. As it is only accessible for the retired population in Australia, it accounts for only 21.29 percent of the overall population in 2014. As described above, this is mainly due to the different pension concepts. Two-thirds of the Australian Pension wealth comes, on average, from Superannuation accounts, with 84.33 percent of the households holding some wealth here. The coverage is considerably higher than in the other countries and can be explained by the compulsory nature of the Superannuation scheme.[39] Comparing the values of pension wealth, it shows that pension wealth of Australian households is proportionally, and in absolute terms, lower than in the other three countries depicted.

Comparison of the Gini Indices The Gini indices of the different wealth aggregates in Table 9 provide further insights into the distributional differences of the wealth aggregates. The net worth Gini coefficient in Australia lies at 0.661, which is lower than the Gini coefficient of 0.755 in Germany, 0.750 in Switzerland, and 0.889 in the US. Adding personal entitlements of social security pension wealth to net worth, the Gini coefficient reduces in Australia with 5.90 percent less than in the other two countries, i.e. 32.84 percent in Germany, 24 percent in Switzerland,

[38] Kuhn (2020) does not provide information on this, but the SILC survey asks generally for overall wealth, which potentially includes vehicles. Hence, the estimates from Switzerland potentially include slightly more wealth types than the other countries.

[39] Coverage is not provided by Kuhn (2020) for the other compulsory scheme, i.e. Switzerland.

Table 8. Descriptive Statistics Wealth Aggregates

Aggregates	Mean	p25	p50	p75	frac >0
Australia					
w10: Net Worth	324,664	8,368	171,257	406,970	84.53
	(3,850)				(0.29)
w12 Social Security	45,552	0	0	0	24.28
	(921)				(0.33)
w13 Superannuation	117,606	6,198	40,289	123,967	84.33
	(1,686)				(0.27)
w15 Augmented Wealth	487,822	66,474	296,876	636,399	93.84
	(4,953)				(0.19)
Germany					
w10: Net Worth	182,329	0	49,623	228,528	71.64
	(2,287)				(0.23)
w12 Social Security	200,424	68,620	162,780	296,048	93.17
	(923)				(0.21)
w13 Occupational and Private Pensions	89,648	0	13,059	78,352	64.24
	(1,116)				(0.15)
w15 Augmented Wealth	472,401	149,128	326,990	630,784	98.38
	(2,761)				(0.07)
Switzerland					
w10: Net Worth	223,525	12,074	66,870	513,221	n/a
	(7,414)				
w12 Social Security	123,868	52,298	88,915	262,859	n/a
	(688)				
w13 Occupational and Private Pensions	103,901	16,801	51,223	268,932	n/a
	(1,116)				
w15 Augmented Wealth	451,294	116,364	259,388	967,464	n/a
	(7,889)				
United States					
w10: Net Worth	337,570	0	40,001	198,800	73.14
	(5,351)				(0.28)
w12 Social Security	161,481	64,486	124,938	227,458	96.49
	(806)				(0.13)
w13 Occupational and Private Pensions	153,453	0	13,000	140,000	61.68
	(2,227)				(0.4)
w15 Augmented Wealth	652,504	86,311	246,663	608,473	95.83
	(6,710)				(0.14)

Notes: Results from Australia are based on own calculations in 2014. Australian estimates are transformed into USD (1 AUD= 0.90 USD, average exchange rate in 2014) and ppp-adjusted, with the factor 1.452 provided by the OECD (2021) Estimates from Germany and the US are taken from Bönke et al. (2019). Estimates from Switzerland are taken from Kuhn (2020) and transformed ppp-adjusted USD by using the 1 CHF= 1.041 USD and the 1.235 ppp-conversion-rate (OECD, 2021). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18, German and US estimates by Bönke et al. (2019) based on SOEP v30/v31 and SCF 2013, respectively, Switzerland results are based on EU-Silc.

and 20.13 percent in the US. Net worth, plus occupational and private pension wealth, reduces the Gini index slightly in all countries. Eventually, augmented wealth in Australia provides at 0.592 a higher Gini coefficient than Germany at 0.508, Switzerland at 0.55, but remains below the one in the US at 0.700. Including augmented wealth, therefore, leads to a different ranking of Australia in terms of inequality.

Table 9. Wealth Aggregates: Gini Coefficients

	Australia	Germany	Switzerland	United States
w10: Net Worth	0.661	0.755	0.750	0.889
	(0.0032)	(0.036)	(0.007)	(0.029)
w10 + w12: Social Sec PW	0.622	0.507	0.570	0.585
	(0.0033)	(0.037)	(0.004)	(0.035)
w10 + w13: Occ. / Private PW	0.628	0.705	0.650	0.826
	(0.0031)	(0.034)	(0.005)	(0.031)
w15: Augmented Wealth	0.592	0.508	0.550	0.700
	(0.0032)	(0.034)	(0.008)	(0.033)

Notes: Results from Australia are based on own calculations in 2014. German and US estimates are taken from Bönke et al. (2019). Estimates from Switzerland are taken from Kuhn (2020). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18. German and US estimates by Bönke et al. (2019) based on SOEP v30/v31 and SCF 2013, respectively, Switzerland results are based on EU-Silc.

5.3 Superannuation and Age Pension: What can be Learned from the Australian Case?

This section analysis in detail at the main pension schemes, i.e., Age Pension and Superannuation. The findings cover several dimensions which are potentially important from a public policy perspective. I argue that policy makers who aim to reform or extend the occupational pension can learn from the Australian case. This section includes three diffres: first, it describes the relevance of the schemes, which includes especially the take-up rate of the Superannuation scheme. Second, it inquires a behavioral response from the interaction of the two schemes. Third, the section discusses distributional implications of the Superannuation scheme.

Relevance of the Pension Schemes I find that the relative importance of the Superannuation scheme rises significantly while the Age Pension remains relatively constant between 2002 to 2018. Figure 3 provides the proportion of retired households with a household head at 55 years of age or higher, who receive at least some Age Pension or withdraw some positive annuity from their Superannuation account. The proportion of recipients of Age Pension is relatively constant

at around 50 percent throughout the considered years. The proportion of those withdrawing Superannuation annuities, however, increases from around 26 percent to 40 percent. One factor for this increase in the take up rate is the establishment of the scheme: retired individuals in 2018 were enrolled for a longer time span throughout their life-cycle in comparison to those in earlier years. Although the establishment of the scheme was affected by the GFC at the end of the 2000s, it did not stop its growing relevance. The compulsory nature of the scheme potentially contributes substantially to the high take-up rate.

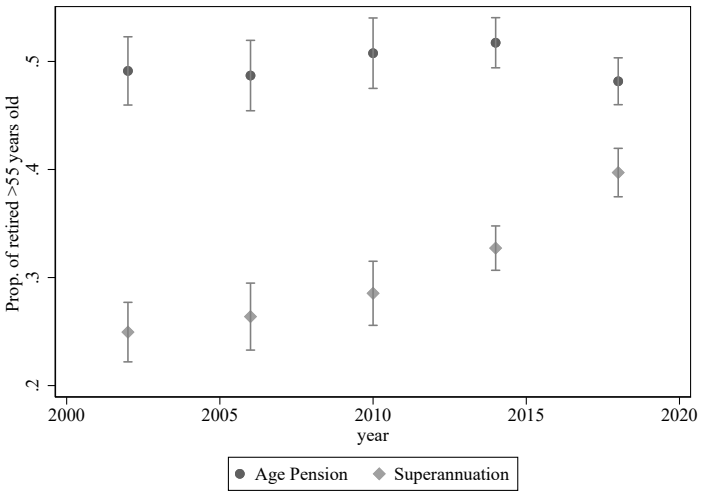


Figure 3. Age Pension and Superannuation Accounts in Australia by Wave

Notes: Own calculation. Numbers represent the proportion of households with a retired household head over the age of 55 receiving some positive Age Pension and/or some positive annuity from their Superannuation accounts. Brackets represent bootstrapped 95 percent confidence intervals. All estimates are weighted with cross-sectional household weights and based on imputed data.
Source: HILDA Survey wave 18.

Interaction between the Schemes A new pension scheme introduced, it can potentially create incentives and behavioral responses with the established pension schemes, which policy planers may do not intend. An interesting feature of the Superannuation scheme is that it leaves choices on the income stream during retirement almost completely to the individual who reaches the preservation age. While many rules apply during the accumulation phase, no dissaving rules apply from this point. Aside for consumption purposes, however, the tax advantages from the scheme leave little incentives to transfer wealth away to other financial investments. Eventually, this could be another driver of inequality, as those with lower levels of wealth need to dissave their Superannuation wealth proportionally more to secure their level of consumption or to pay off debts.

To investigate this relationships, I provide the results of the pooled fractional probit model with the dissaving rate as independent variable, to understand how they vary across several socio-economic characteristics, e.g. age, household types, education, and wealth endowments. The working sample is based on 5,679 retired individuals in five waves, who hold at least some wealth in their Superannuation account. I present the marginal effects at the mean (MEM) of the covariates on the Superannuation dissaving rate with the 95 percent confidence interval in Figure 4.

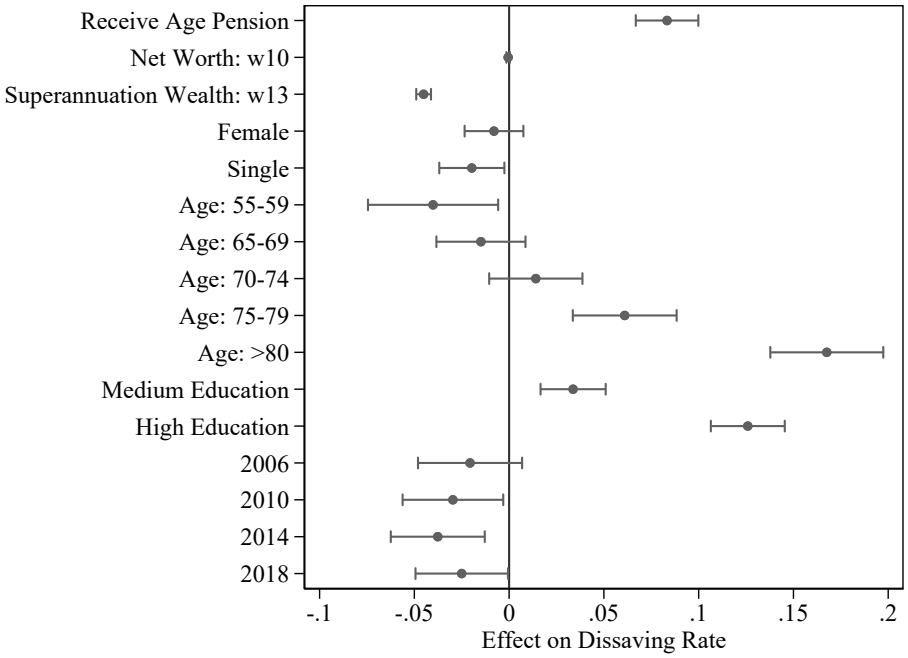
The MEM describes the partial effect of the independent variable, when all other covariates are set at their means.[40] The upper panel of Figure 4 provides the MEMs for all covariates used in the regression, the lower panel demonstrates results for several model specifications for the binary variable, which is equal to 1 if individuals receive Age Pension.

The regression results provide several insights into dissaving at retirement. Individuals receiving Age Pension choose higher dissaving rates. The effect size is not trivial: for the average individual, the dissaving rate is 8.33 percentage points higher per year. A back-of-the-envelope calculation would suggest that, all else equal, a fund of $100,000 would reduce to $24,106 in 5 years, instead of the $35,891 at the mean dissaving rate (21.6, see table above) of the working sample. Australian retirees, hence, seem to react to the interplay between Superannuation and Age Pension and dissave their accounts faster, potentially to qualify for (higher) Age Pensions. The methodology applied in this analysis does not verify a causal relationship, but given the benefits for being only partially eligible, it is likely to be one central driver of this behavior. Aside from this objective, those individuals may also have to use comparably more wealth from Superannuation accounts to guarantee their consumption levels.

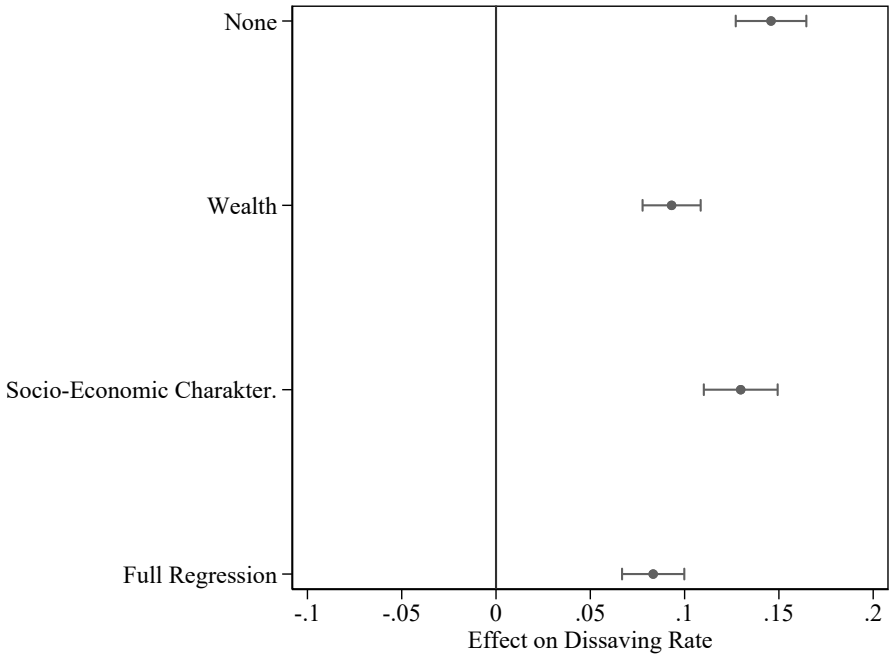
The estimate is robust to several specifications of the fractional probit model. The lower panel provides the results of those receiving Age Pension with different model specifications. The estimate of the full regression is the lower bound:[41] adding only wealth or socio-economic characteristics as covariates to the Receive Age Pension dummy variable does not change the significance of the result.

Net worth and Superannuation wealth are divided by $100,000. The MEM of net worth is statistically and economically zero. Wealth levels of financial assets and housing investments are included in net worth and they do not seem to drive the individual dissaving rate decision in

[40] The full model, as well as OLS estimates, are provided in Appendix J.
[41] The OLS regression provides a similar effect size, which is provided in Appendix J



(a) Marginal Effects at the Mean from Covariates on the Dissaving Rate



(b) Effects of Age Pension on Dissaving Rates for Different Model Specifications

Notes: Own calculation based on retired individuals over 55 years of age. Panels provide the marginal effects at the mean for several covariates. The confidence intervals are specified at the 95% level. The upper panel provides the full set of the main regression. The lower panel shows the marginal effect at the mean from those receiving Age Pension for several different model specifications. The y-axis describes the set of covariates included in the regression. All statistics are based on imputed values.
Source: HILDA Survey wave 18.

Figure 4. Regression results of the Fractional Probit: Marginal Effects at the Mean

this specification.[42] Superannuation wealth, however, is negatively associated with the saving rate. An increase of $100,000 decreases the dissaving rate at the means by 4.51 percentage points. One reason is, as I state above, that individuals dissave more at the lower end of the distribution dissave more to sustain a certain level of consumption or pay off debts. Moreover, the tax advantage for holding wealth in Superannuation accounts is much stronger for individuals in higher marginal tax brackets. Thus, this can be reflected in the lower dissaving rate of Superannuation accounts, as the it is more efficient to dissave other means of investments first.

The socio-economic characteristics show that women do not dissave significantly differently from men. Single households extract slightly less then those living in coupled households, but the estimate is only significant at the five percent level. A negative coefficient could indicate higher exposure to income risk, as household pooling is not possible, therefore choosing more prudent rates. The age dummies reveal a clear increase in age, significant from the 75-79 bracket. A credible factor would be the decreasing insecurity over an individual's life expectancy. A bequest motive could limit, however, the excess of the dissaving rate, as Superannuation wealth is not subject to inheritance or other additional tax that affects the transition to the closer kin. Individuals with a medium level of education, here classified as at least 12 years of schooling and less than a bachelor degree, as well as those with a higher level of education, dissave relatively more. It is not straightforward to qualify the result, as a higher dissaving rate is per se not more or less efficient.

I also include year dummies in the regression, showing that the year-specific conditional mean of the dissaving rate reduces over time. This is may be explained, again, by the growing maturity of the Superannuation scheme associated with increasing life expectancy. Naturally these are long-term trends and, therefore, probably do not dominate the choice of the dissaving rate.

I conclude that I find suggestive evidence for individuals reactions due to the provision of Superannuation wealth and income in the Age Pension eligibility test. The income and asset tests can be considered as an indirect tax on Superannuation wealth, as it reduces or hinders social security payments, but only for some, i.e. for those who would receive the full or partial pension without Superannuation wealth in the picture. This bears three major concerns: first, minimizing the tax burden, the policy may force individuals to choose inefficient dissaving rates, in regards to

[42]This result comes with the caveat, that net worth is measured on the household level. By sharing resources, many components could affect the individuals dissaving decision, e.g. joint consumption decisions or tax-considerations. Moreover, those who receive Age Pension passed the income and asset test, which therefore captures the net worth effect.Therefore, the true net worth effect is difficult to classify from this model specification. If only financial wealth or additional housing wealth is included, instead of net wealth as a covariate, the coefficient remains around zero. Regression result are available upon request.

consumption smoothing or insurance decisions, especially at the wake of increasing health risks with age. This could induce welfare losses. Second, the policy may encourage individuals who are potentially eligible for Age Pension to reduce contribution to their Superannuation scheme before they reach the retirement age. As the contribution is linked to the employment status, this could lead to distortions, i.e. lower supply at the labor market. Third, in combination with the nearly unlimited access after the preservation age, this could contribute to tax evasion strategies, transferring wealth into less traceable means, i.e. cash or wealth in accounts overseas.

Superannuation and Inequality: An Inter-generational Problem? The evolution of Superannuation wealth shows an increase of the wealth endowment for many Australians during the 2002 to 2018 period. Especially its compulsory component seems to support a broad range of households to accumulate wealth for retirement. As this compulsory component of the scheme was 26 years old in 2018, nearly a whole generation has participated in the scheme so far. In what follows, I discuss the distributional implications of the scheme from an inter-generational perspective.

Wealth in Superannuation accounts increases along the augmented wealth distribution. Figure 5 provides generalized concentration curves of Superannuation wealth along the population ordered by augmented wealth. The cumulative mean of Superannuation increased more at the upper end of the augmented wealth distribution, while over 15 percent did not accumulate any Superannuation wealth at all. This pattern is not surprising, as the Superannuation Guarantee depends on monthly labor income, which is highly correlated with wealth. Moreover, the tax incentives are higher for those at the upper end. Even though the maximum contribution cap was reduced in the 2010s, this did not stop these dynamics, as there is a significant increase between 2014 and 2018.[43]

While the observed *intra*-generational period of the scheme seems to affect overall wealth inequality only to a small extent, my results incorporate concerns about the distributional consequences of *inter*-generational transfers in the future. Connecting this finding to my analysis above, where I observe higher wealth levels at the end of the life cycle in 2014 and 2018, inheritances from Superannuation accounts will play a vital role for younger age cohorts in the decades to come. My analysis also shows that higher amounts of Superannuation wealth are associated

[43]Despite these absolute differences, households at the top did not increase their overall share of Superannuation wealth. In Appendix K, I provide the normalized concentration curves for 2002 and 2018. It shows that the concentration curves are not significantly different in 2018 compared to 2002. Nevertheless, the top 20 percent hold nearly 60 percent of the overall Superannuation wealth.

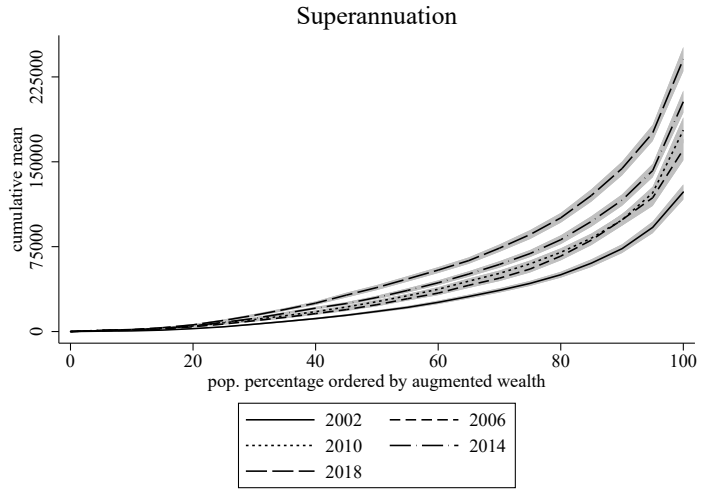


Figure 5. Generalized Concentration Curves of Superannuation and Augmented Wealth: 2002 to 2018

Notes: Own calculations based on the full sample. Generalized concentration curves of Superannuation from 2002 to 2018. Values are in AUD and set to 2018 prices on the basis of the Consumer Price Index (The World Bank, 2021). Grey area represents 95 % confidence intervals.
Source: HILDA Survey wave 18.

with lower dissaving rates. This can indicate higher remainder values for larger Superannuation accounts. Then, the effect on inequality depends on the dispersion of Superannuation wealth across the augmented wealth distribution. As the concentration curve in Figure 5 shows that Superannuation wealth is higher at the upper end of the augmented wealth distribution. Even though this does not increase the share of Superannuation wealth between 2002 and 2018, inter-generational transmissions could potentially lead to an increasing concentration of Superannuation wealth in the long run.

Another concern emerges from the divergence in tax advantages along the distribution. As discussed above, the tax advantage is at 4 percent for the lowest tax rate, and 30 percent at the highest margin. As retirees at the lower end of the wealth distribution dissave Superannuation faster, they drop out of the scheme completely. This will ultimately increase the dispersion between retirees receiving Age Pension and those using Superannuation accounts entailing the risk of a two-tiered retirement system.

6 Conclusion

This paper shows that the levels of net worth and augmented wealth inequality in Australia are persistent over time. This coincides with large wealth gains during the 2000s, which were

driven by increases in housing values, accompanied by a relatively high home-ownership, and large gains in Superannuation accounts. Wealth gains are the most profound for households with a household head over 50 years of age.

In an international comparison, Australia exhibits relatively high values of net worth, but relatively low values of pension wealth. Net worth is more equally distributed than in Germany, Switzerland or the US. However, adding pension wealth reduces the Gini coefficient less than in the other countries, so that augmented wealth in Australia is less equally distributed than in Germany and Switzerland.

My analysis includes a policy analysis of the Australian pension schemes and the lesson that can be learned from the Australian case. The Superannuation scheme helps to generally increase wealth endowment for the retired population and, thus, there is a high take-up rate, also due to its compulsory nature. Age pension payments remained stable over the considered period, but it is not certain if this trend will prevail. As wealth in Superannuation accounts is considered in the income and asset test, the growth of the Superannuation scheme hampers Age Pension eligibility. My analysis finds suggestive evidence for a behavioral response for individuals dissaving their Superannuation accounts faster during retirement, if they are eligible to Age Pension. I conclude that there is a risk of a two-tiered retirement system: those depending on Superannuation and those depending on Age Pension, which may be enhanced by *inter*-generational transmissions and dispersed tax incentives along the wealth distribution in the future.

Policy planners also need to be aware that Superannuation imposes further risk on the population, i.e. financial market – and institutional risk. As Superannuation accounts invest in the stock market, individuals in the maturing Superannuation scheme face more financial market risk in their household portfolios. For retirement wealth, this can have severe consequences when individuals, that are close to retirement, face a downward trend on the financial markets, e.g. as seen lately in the COVID-19 crisis. The government could provide aid in these situations to prepare individuals to re-balance their portfolios before retirement. Over the years, the Superannuation scheme has been transformed and adjusted regularly. Naturally, the scheme is shaped by partisan policies, e.g. the initial plans of one administration for significant increases of the Superannuation Guarantee were reduced and postponed by the successor. While fundamental parameters, like the compulsory nature of the contributions, are not affected, the scheme bears institutional risk.

I conclude that policy planners need to set a solid saving and extraction framework, so that the tax schedule and the scheme itself does not set adverse incentives when introducing an additional pension scheme. Simultaneously, the planners need to minimize potential deadweight loss effects, i.e. lessen the amount of individuals attending the scheme for tax advantages without adjusting their actual ceteris paribus saving behavior. The set of rules for a new scheme also needs to consider carefully its distributional consequences, as long-term imbalances are difficult to address with ex post policies.

References

James Andreoni. Giving with impure altruism: Applications to charity and ricardian equivalence. *Journal of political Economy*, 97(6):1447–1458, 1989.

ASFA. Superannuation statistic. https://www.superannuation.asn.au/resources/superannuation-statistics, 2021. Accessed: 2021-01-27.

Anthony B Atkinson. The distribution of wealth and the individual life-cycle. *Oxford Economic Papers*, 23(2):239–254, 1971.

Orazio P Attanasio and Agar Brugiavini. Social security and households' saving. *the Quarterly Journal of economics*, 118(3):1075–1119, 2003.

Australian Bureau of Statistics. Life Tables 2002-2018. https://www.abs.gov.au/statistics/people/population/life-tables/latest-release, 2021a. Accessed: 2021-01-27.

Australian Bureau of Statistics. Retirement and retirement intentions, australia, 2018-19. https://www.abs.gov.au/ausstats/abs@.nsf/mf/6238.0, 2021b. Accessed: 2021-01-27.

Australian Bureau of Statistics. Household income and wealth, australia. https://www.abs.gov.au/statistics/economy/finance/household-income-and-wealth-australia, 2021c. Accessed: 2021-01-27.

Australian Government. Superannuation Guarantee (Administration) Act 1992. https://www.legislation.gov.au/Details/C2017C00230, 1992. Accessed: 2021-01-27.

Australian Government. Social security and other legislation amendment (pension reform and other 2009 budget measures) bill 2009. https://www.legislation.gov.au/Details/C2009A00060, 2009. Accessed: 2021-01-27.

Australian Government. A guide to austrlian government payments 2002-2018. https://www.servicesaustralia.gov.au/, 2018. Accessed: 2021-01-27.

Australian Government. Social security guide. https://guides.dss.gov.au/guide-social-security-law/4/4/1/10/, 2021a. Accessed: 2021-01-27.

Australian Government. Deeming. https://www.servicesaustralia.gov.au/individuals/topics/deeming/29656, 2021b. Accessed: 2021-01-27.

Australian Prudential Regulation Authority (APRA). Annual Superannuation Bulletin 2019. https://www.apra.gov.au/annual-superannuation-bulletin, 2021. Accessed: 2021-01-27.

Australian Tax Office. Individual income tax rates for prior years. https://www.ato.gov.au/Rates, 2021. Accessed: 2021-01-27.

Sutirtha Bagchi and Jan Svejnar. Does wealth inequality matter for growth? the effect of billionaire wealth, income distribution, and poverty. *Journal of Comparative Economics*, 43 (3):505–530, 2015.

Jess Benhabib, Alberto Bisin, and Shenghao Zhu. The distribution of wealth and fiscal policy in economies with finitely lived agents. *Econometrica*, 79(1):123–157, 2011.

Andrew Berg, Jonathan D Ostry, Charalambos G Tsangarides, and Yorbol Yakhshilikov. Redistribution, inequality, and growth: new evidence. *Journal of Economic Growth*, 23(3):259–305, 2018.

Timm Bönke, Markus M. Grabka, Carsten Schröder, and Edward N. Wolff. A head-to-head comparison of augmented wealth in germany and the united states*. *The Scandinavian Journal of Economics*, 122(3):1140–1180, 2019. doi: 10.1111/sjoe.12364. URL https://onlinelibrary.wiley.com/doi/abs/10.1111/sjoe.12364.

Marco Cagetti. Wealth accumulation over the life cycle and precautionary savings. *Journal of Business & Economic Statistics*, 21(3):339–353, 2003.

Laurent E Calvet, John Y Campbell, and Paolo Sodini. Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy*, 115(5):707–747, 2007.

Frank Cowell. *Measuring inequality*. Oxford University Press, 2011.

James B Davies and Anthony F Shorrocks. The distribution of wealth. *Handbook of income distribution*, 1:605–675, 2000.

Mariacristina De Nardi. Wealth inequality and intergenerational links. *The Review of Economic Studies*, 71(3):743–768, 2004.

Mariacristina De Nardi and Giulio Fella. Saving and wealth inequality. *Review of Economic Dynamics*, 26:280–300, 2017.

Paul Eckerstorfer, Johannes Halak, Jakob Kapeller, Bernhard Schütz, Florian Springholz, and Rafael Wildauer. Correcting for the missing rich: An application to wealth survey data. *Review of Income and Wealth*, 62(4):605–627, 2016.

Bradley Efron. Bootstrap methods: another look at the jackknife. *Annals of Statistics*, 7(1): 1–26, 1979.

Joachim R Frick and Bruce W Headey. Living standards in retirement: Accepted international comparisons are misleading. *Journal of Contextual Economics*, 129(2):309, 2009.

Aldi JM Hagenaars, Klaas De Vos, and M Asghar Zaidi. Poverty statistics in the late 1980s: Research based on micro-data. 1994.

Ann Harding. Trends in income and wealth inequality in australia. In *Presentation to the Economic and Social Outlook Conference: Towards Opportunity and Prosperity*, pages 4–5, 2002.

Jeff Harmer. *Pension review background paper*. Department of Families, Housing, Community Services and Indigenous Affairs, 2008.

Bruce Headey, Gary Marks, and Mark Wooden. The structure and distribution of household wealth in australia. *Australian Economic Review*, 38(2):159–175, 2005.

Md Rabiul Islam and Mark McGillivray. Wealth inequality, governance and economic growth. *Economic Modelling*, 2019.

Greg Kaplan, Gianni La Cava, and Tahlee Stone. Household economic inequality in australia. *Economic Record*, 94(305):117–134, 2018.

Arthur B Kennickell. The role of over-sampling of the wealthy in the survey of consumer finances. *Irving Fisher Committee Bulletin*, 28:403–408, 2008.

Arthur B Kennickell and Douglas A McManus. Sampling for household financial characteristics using frame information on past income. In *Proceedings of the Section on Survey Research Methods*, 1993.

Katharina Knoll, Moritz Schularick, and Thomas Steger. No price like home: Global house prices, 1870-2012. *American Economic Review*, 107(2):331–53, 2017.

Moritz Kuhn, Moritz Schularick, and Ulrike I Steins. Income and wealth inequality in america. *Journal of Political Economy*, 2017.

Ursina Kuhn. Augmented wealth in switzerland: the influence of pension wealth on wealth inequality. *Swiss Journal of Economics and Statistics*, 156(1):1–16, 2020.

Robert I Lerman and Shlomo Yitzhaki. Income inequality effects by income source: A new approach and applications to the united states. *The review of economics and statistics*, pages 151–156, 1985.

Annamaria Lusardi, Pierre-Carl Michaud, and Olivia S Mitchell. Optimal financial knowledge and wealth inequality. *Journal of Political Economy*, 125(2):431–477, 2017.

OECD. Purchasing power parities (ppp) (indicator). doi: 10.1787/1290ee5a-en, 2021. Accessed: 2021-01-27.

Leslie E Papke and Jeffrey M Wooldridge. Econometric methods for fractional response variables with an application to 401 (k) plan participation rates. *Journal of applied econometrics*, 11 (6):619–632, 1996.

Emmanuel Saez and Gabriel Zucman. Wealth inequality in the united states since 1913: Evidence from capitalized income tax data. *The Quarterly Journal of Economics*, 131(2):519–578, 2016.

Urban Sila and Valéry Dugain. Income, wealth and earnings inequality in australia: Evidence from the hilda survey. 2019.

Joseph E Stiglitz. *The Price of Inequality: How Today's Divided Society Endangers our Future*. WW Norton & Company, 2012.

Superannuation (Objective) Bill. https://www.legislation.gov.au/Details/C2016B00182, 2016. Accessed: 2021-01-27.

The World Bank. Consumer prices. https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=AU, 2021. Accessed: 2021-01-27.

Nicole Watson and Mark Wooden. The household, income, labour dynamics in australia (hilda) survey: Wave 1 survey methodology, 2002.

Maximilian Wenzel and Johannes Koenig. Investment losses and inequality. *Available at SSRN 3446783*, 2019.

Roger Wilkins. The 11th annual statistical report of the hilda survey, 2016.

Roger Wilkins, Ferdi Botha, Esperanza Vera-Toscano, and Mark Wooden. The household, income and labour dynamics in australia survey: Selected findings from waves 1 to 18, 2020.

Edward N Wolff. International comparisons of wealth inequality. *Review of Income and Wealth*, 42(4):433–451, 1996.

Edward N Wolff. *Inheriting wealth in America: Future boom or bust?* OUP Us, 2015a.

Edward N Wolff. Us pensions in the 2000s: The lost decade? *Review of Income and Wealth*, 61 (4):599–629, 2015b.

A Additional Payments and Eligibility

Table A1 provides the payments per fortnight in AUD for each wave. The maximum Age pension payment has nearly doubled during the observed period for both, singles and couples. The government also provides further support, i.e. Rent Assistance, Energy and Pension Supplements. Rent Assistance is payed for singles (couples) who pay at least 121.2 (196.20) AUD per fortnight in 2018. The payment is linear to the payed rent. Individuals receive the maximum payment of 135.8 (128 per person) AUD if they pay more or equal to 302.27 (366.87). Energy Supplement was introduced in 2013 to protect retired individuals from increasing energy costs. The payment is 14.10 (10.60) per fortnight, but only if income is below 1,197 (2,201.68) AUD. The Pension Supplement is an extra payment to ensure that individuals can cover their utility, phone, internet and medicine costs. The payments of 67.80 (51.10) AUD are paid to every eligible recipient.

Table A1. Eligibility and Payments

Type	2002	2006	2010	2014	2018
			Payments per fortnight		
Age Pension					
pension single	352.10	402.40	496.30	585.50	629.00
pension couple	421.80	478.50	658.40	776.70	834.40
Rent Assistance					
payment single	90.60	100.6	115.20	127.60	135.80
payment couple	85.40	95	108.60	120	128.00
red. rate	0.25	0.25	0.25	0.25	0.25
min. rent single	80.40	89.6	102.40	113.2	121.20
max. rent single	201.20	223.73	256	283.3	302.27
max. rent couple	131.00	145.8	166.80	184.20,	196.20
max. rent couple	244.87	272.47	311.60	344.20	366.87
Energy Sup.					
payment single	0	0	0	14.10	14.10
payment couple	0	0	0	10.60	10.60
single max.	0	0	0	1197	1197
couple max.	0	0	0	2201.68	2201.68
Pension Sup.					
payment single	0	17.80	57.70	63.50	67.80
payment couple	0	14.80	87.00/2	95.80/2	51.10

Note. Information is taken from Australian Government (2018, 2021a). Table provides thresholds for the income and asset test, deeming, and payments for Age Pension. Further payments, i.e. Rent Assistance, CDEP Participant Supplement (CPS), Energy and Pension Supplements are potentially paid es well. All values are provided in AUD, as they are directly taken from the public authority. Following the official approach, most values, apart from the Asset Test and Deeming, are calculated per fortnight.

B Further Pension Schemes

Besides Age Pension, the Australian government provides several other pension schemes.[44] The Disability Pension is available to compensate veterans and their partners and/or descendants for injuries or diseases caused or aggravated by war service or certain defense service. Disability Support Pension is for people aged over 16 and below retirement age with a physical, intellectual or psychiatric impairment that prevents them from working, or being re-skilled to work. Mature Age Allowance is a bridging income support payment for individuals of at least 60 years of age until they reach the retirement age. A Service Pension is paid to veterans at the same level, but five years earlier than, the Age Pension. The War Widow's/Widower's pension is paid to widowed partners and dependents of veterans. Widow Allowance is a means-tested benefit for women (born on or before 1 July 1955) widowed, divorced or separated after turning 40, working less than 20 hours per week. Wife pension used to apply to female partners of recipients of Age Pension where those partners were not eligible in their own right for another pension. Given a relatively high immigration rate, Australians potentially receive pensions from other governments.[45]

Table A2. Pensions in Australia: Annuities

Pension Type	2002 N (in '000)	2002 Mean (in $)	2002 Median (in $)	2018 N (in '000)	2018 Mean (in $)	2018 Median (in $)
Age Pension	1,472	12,664	13,380	2,048	16,608	17,542
Superannuation	579	22,783	17,644	1,367	28,561	20,000
Disability Pension	96	14,134	11,469	56	21,619	20,000
Disability Sup Pension	219	12,811	13,233	222	19,175	20,000
Mature Age Allowance	53	12,163	12,807	0	0	0
Service Pension	176	12,773	13,380	88	19,498	17,784
War Widow Pension	83	19,279	21,026	40	27,866	29,000
Wife Pension	27	11,433	12,577	0	0	0
Widow Allowance	16	13,607	14,704	15	11,290	14,000
Foreign Pension	246	7,567	5,293	282	5,744	4,000
Other Pension	10	3,816	662	2	4,655	2,000
Total N	2,894		3,961			

Notes: Own calculation. The total number reflects the total sum of the cross-sectional population weight for individuals, who are retired and at least 55 years of age. Means and medians are in AUD and set to 2018 prices on the basis of the Consumer Price Index (The World Bank, 2021) and refer to the recipients of the respective pension type.
Source: HILDA Survey wave 18.

[44] Additional information on pensions are taken from Australian Government (2018). A detailed overview is provided by Harmer (2008).

[45] Not included here is the Widow B Pension, which used to be paid to widowed, divorced or separated women aged 50 years and over, as it is not observed in HILDA, probably because it stopped for new entrances in 1997. It potentially is still included under the "Other Pension" category in Table A2. Further, the Mature Age Partner Allowance is not included, as it existed only from 1994 to 1996.

Table A2 depicts conditional means, medians and number of observations of each pension scheme taken from the HILDA dataset in 2002 and 2018 respectively. The statistics are based on individuals, who are at least 55 years old, and retired. The total number is calculated by multiplying the number of observations in the dataset with their personal population weight. The total number represented in both years increased from around 2.9 million to 4.0 million. This is in line with the figures provided by the Australian Bureau of Statistics (2021b).

Age Pension is the most important pension in both years with 1.5 (2.1) million individuals receiving Age Pension in 2002 (2018). Australian retirees who where eligible for Age Pension, received on average $12,664 per year in 2002 and $16,608 in 2018 with a slightly higher median in both years. The number of individuals withdrawing annuities from Superannuation accounts increased from around 0.6 million to 1.4 million in the same time span. The amount is considerably higher on average in both years, with $22,783 and $28,561 respectively. The median is lower than the mean in both years, indicating a slightly left-skewed distribution. Further important pension schemes in 2002 are the Disability Support Pension, the Service Pension, and foreign pensions. The payments of the first two are around the same level as the Age Pension, whereas those of foreign pensions are on average lower. Pensions related to individuals serving for the Australian military, i.e. Disability Pension, Service Pension, and War Widow Pension, decreased over the years, which is potentially connected with the decrease of the WWII generation in this period. The Mature Age Allowance, the Widow Allowance, and the Wife Pension were stopped for new entrances in 2003 (phased out 2008), 2018, and 1995, respectively. Those eligible before these years still received their payments until the schemes were phased out.

C Superannuation and Taxation

The tax rate depends on the type of contribution. Most commonly, contributions are taxed lump-sum at 15 percent. These are "concessional" contributions including the compulsory payments by the employer[46] and additional private investments up to $25,000 per year from the gross income. The "Division 293 tax" raises the tax rate to 30 percent for individuals earning more than $250,000. Additional "Non-concessional" contributions are not taxed, as they stem from net-income. However, they are capped at $100,000 per year in 2018 and only allowed for those with less than $ 1.6 million wealth in Superannuation accounts. Any contribution above is taxed at the marginal income tax rate.[47] Except in rare circumstances, e.g. due to medical conditions, individuals cannot access their Superannuation accounts before they reach the preservation age, without paying marginal income tax rates. Self-managed funds can also borrow a loan against its Superannuation, before preservation age is reached. Generally, returns on Superannuation investments are taxed at a 15 % tax rate[48], while returns on the first $1.6 million are not taxed if they are realized in the retirement phase.

Table A3. Marginal Income Tax Rates

2002		2018	
Tax bracket	Tax	Tax bracket	Tax
$1 – $6,000	Nil	$1 – $18,200	Nil
$6,001 – $20,000	17 %	$18,201 – $37,000	19 %
$20,001 – $50,000	30 %	$37,001 – $87,000	32,5 %
$50,001 – $60,000	42 %	$87,001 – $180,000	37 %
$60,001 and over	47 %	$180,001 and over	45 %

Notes: Table provides the marginal income tax rates for 2002 and 2012. For foreign residents, different tax rates apply and they are not depicted here. Thresholds are in AUD and not adjusted for inflation.
Source: Information is taken from Australian Tax Office (2021).

The reduced taxation rate is the main vehicle to incentivize savings throughout the accumulation period. The taxation of Superannuation investments and returns is, at 15 percent, considerably lower than the marginal income tax rates, which includes income from capital gains. In Australia, there is no separate tax rate on capital gains, as it is added to labor income and other income sources. The total sum defines the individual tax rate. Table A3 provides the tax brackets and the corresponding tax rates for the years 2002 and 2018. The brackets

[46] The contribution is deductible for employers at the end of financial year.

[47] These tax rates are calculated at the end of the financial year. As income taxes are normally paid directly, this can delay tax payments. Therefore, the Australian government introduced the Excess concessional contribution charge rates, which adds an extra rate on the marginal income tax (4.96% in 2018).

[48] Australian Tax Office applies a dividend imputation system, meaning that tax payments, e.g. by the share emitting company, can be used by the shareholder to offset their own tax liabilities. It potentially decreases the tax rate for the Superannuation owner.

increased significantly in the considered period and the tax rates were raised at the lower end and decreased at the top. As the Division 293 Tax does not apply for individuals with an income below $250,000, the tax advantage from Superannuation savings is substantially higher at the upper end of the income distribution.

D Sample Retired Population

Table A4 compares the mean values of the full retired population in all considered waves and the mean of the working sample. There are significant differences in means, which does not come by surprise, as the working sample is selected on the Superannuation wealth variable.

Table A4. Selected Means: Retired Population

Variable	Full Sample	WS Regression
Annual Dissaving Rate ν	0.182	0.207
	(0.001)	(0.003)
Receive Age Pension in %	32.3	52.9
	(0.274)	(0.458)
Annuity Superannuation	6,280	15,442
	(30)	(223)
w13 Superannuation	99,892	226,405
	(944)	(3,868)
w10 Net Worth	402,752	674,070
	(3,449)	(8,094)
Female in %	56.6	46.8
	(0.340)	(0.453)
Single Households in %	29.1	25.3
	(0.299)	(0.396)
Age	71.5	69.6
	(0.066)	(0.075)
Medium Education in %	31.4	41.2
	(0.321)	(0.443)
High education in %	11.1	20.8
	(0.147)	(0.200)
Obs	15,019	5,679

Notes: Own calculation based on the retired population. Pooled dataset include the waves 2002, 2006, 2010, 2014, and 2018. Full sample describes all retired individuals who are at least 55 years. The working sample includes all retired individuals who are at least 55 years old, and who hold at least some Superannuation wealth. All statistics are based on imputed values. Monetary values are in AUD. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18.

The mean annual dissaving rate in the working sample is slightly higher than the one in the full sample. This is due to the fact that the observations outside of the working sample have primarily missing values, and some zeros. The latter is the case, if individuals claim zero values for both income from Superannuation and wealth in Superannuation accounts. More than thirty percent of the full retired population receive income from Superannuation and Age Pension during their retirement. This increases to 55 percent in the working sample, as those who only

receive Age Pension and do not hold any Superannuation wealth, drop out. The remaining covariates show that individuals owning Superannuation wealth hold generally more net wealth, are proportionally more male, and more educated. I control for all of these dimensions in the regression analysis.

E Wealth Portfolios

The analysis of wealth portfolios shows the relative importance of different wealth components along the gross wealth distribution over time. Figure A1 depicts four graphs plotting the mean wealth portfolio shares for households below the 25th percentile of the gross wealth distribution ("the poor"), for those between the 25th and the 75th percentiles ("the middle"), for those between the 75th and the 90th percentile ("the upper middle") and those above the 90th percentile ("the rich"), respectively. For the sake of clarity, all components are divided by the year and group mean of augmented wealth.[49] As debts are included, the shares can be larger than 1. Moreover, the mean age of the household head for each group at each wave is provided at the right y-scale.

The figure reveals that the portfolio composition and the relative importance of pension wealth vary along the distribution. The first panel shows that pension wealth is the most important wealth component for "the poor" and this finding is consistent over time. The Superannuation wealth share increases from 35 percent to 46 percent for "the poor". Social security is the most important asset at the lower end of the wealth distribution share, i.e. 56 percent of augmented wealth in 2002, decreasing slightly to 53 percent in 2018. This changes for "the middle class" group in the second panel, where housing becomes the most important wealth component and the relative importance of pension wealth decreases relatively to "the poor". Financial assets play a bigger role from here, but are still less important than pension wealth for "the middle class". Housing wealth remains by far the most significant wealth aggregate for "the upper middle" and "the rich", the relevance of social security pension diminishes. Furthermore, the proportion of financial assets increase in the portfolio. The relative importance of Superannuation reduces for "the rich" category, where its share decreases while business investments and financial assets increase their share, respectively.[50]

The portfolios provide consumption -, business/HECS[51] -, and housing debts. Consumption debts are the main source of debts for the lower end of the wealth distribution, which is replaced

[49] Tables and graphs with monetary values are provided in Appendix **??**.
[50] Similar patterns were found in the US by Kuhn et al. (2017).
[51] Stands for "Higher Education Contribution Scheme" and includes tertiary education fees

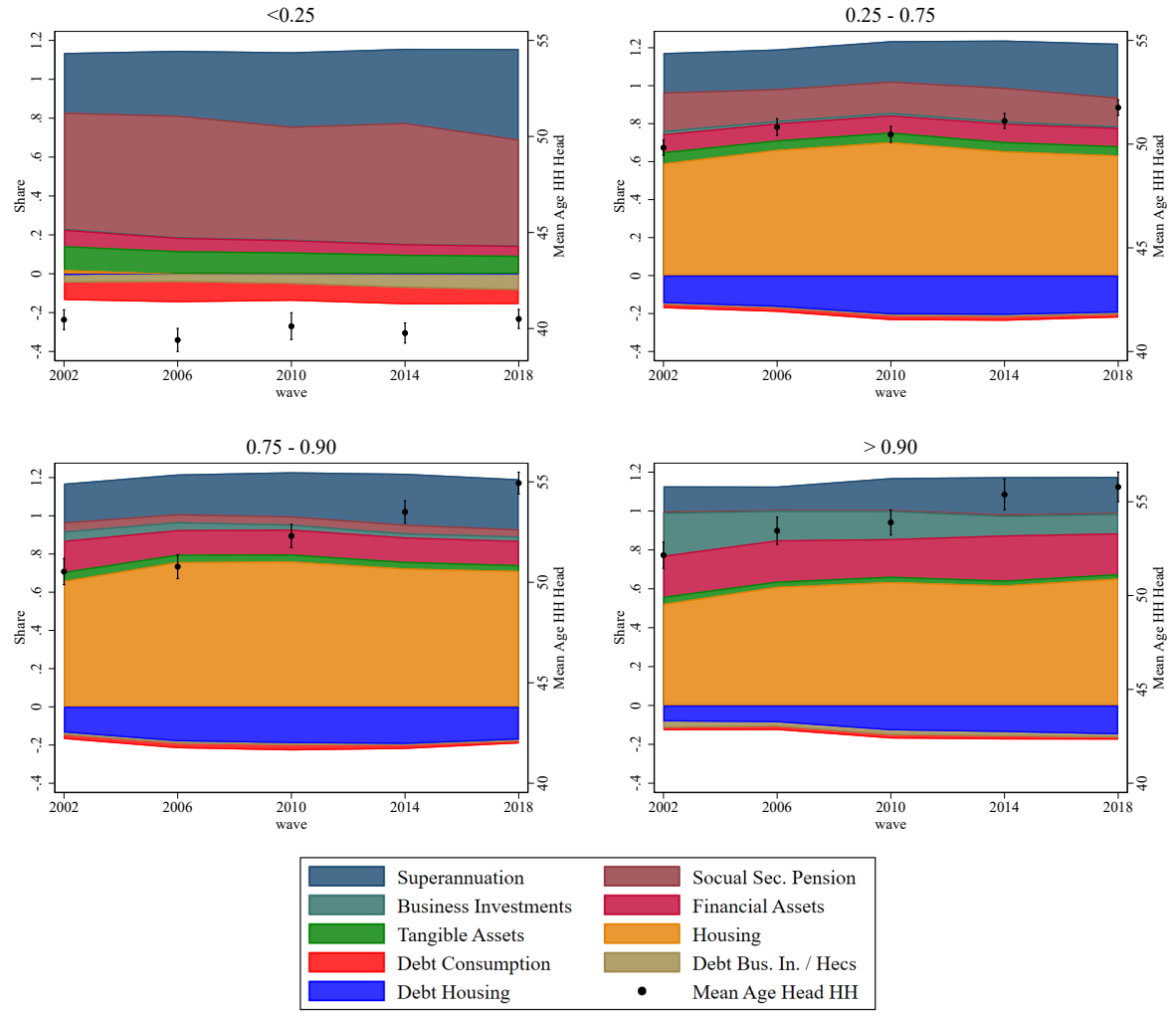


Figure A1. Portfolio shares along the gross-wealth distribution

Notes: Own calculation based on the full sample. The four groups are defined by percentiles in the gross wealth distribution. The share is calculated as the ratio between the weighted average of the wealth aggregate and the weighted average of augmented wealth in the respective subgroup. All estimates are based on multiple imputations.
Source: HILDA Survey wave 18.

by housing debts for the wealthier groups. Business/HECS debts are of minor relevance for all groups, compared to the other debts and wealth sources.

The four panels also show the age gradient for each group in each wave. "The poor" household heads are on average around 40 years, hence, considerably younger than those in the upper parts of the gross-wealth distribution. As wealth accumulation continues throughout the working life, some households in "the poor" group potentially end up in one of the groups above in the following years. However, as social security pension wealth is only provided for retirees, there is also a considerable fraction of older household heads in "the poor" group. Furthermore, the age difference is relatively small between "the middle", "the upper middle", and "the rich". Life cycle

accumulation patterns do not seem to be a main determinant as to whether a household belongs in one of these three groups.

These portfolio patterns contribute to the understanding how relevant social security pension wealth is for the lower end of the distribution, especially compared to Superannuation wealth for "the poor". Nonetheless, this could change in the years to come, as Superannuation wealth is constantly increasing its share. This offsets some of the distributional consequences of the housing boom, as they are not captured by this group. Even in "the middle", social security pension wealth plays a vital role. Financial assets and business investments seem to be an aggregate rather for "the upper middle" and "the rich". The Superannuation scheme has increased wealth for all four groups, which points to the success of the scheme during the considered periods. However, it is still open to debate whether these gains would have occurred in other financial assets, if the scheme had not been introduced.

F Life Cycle Patterns

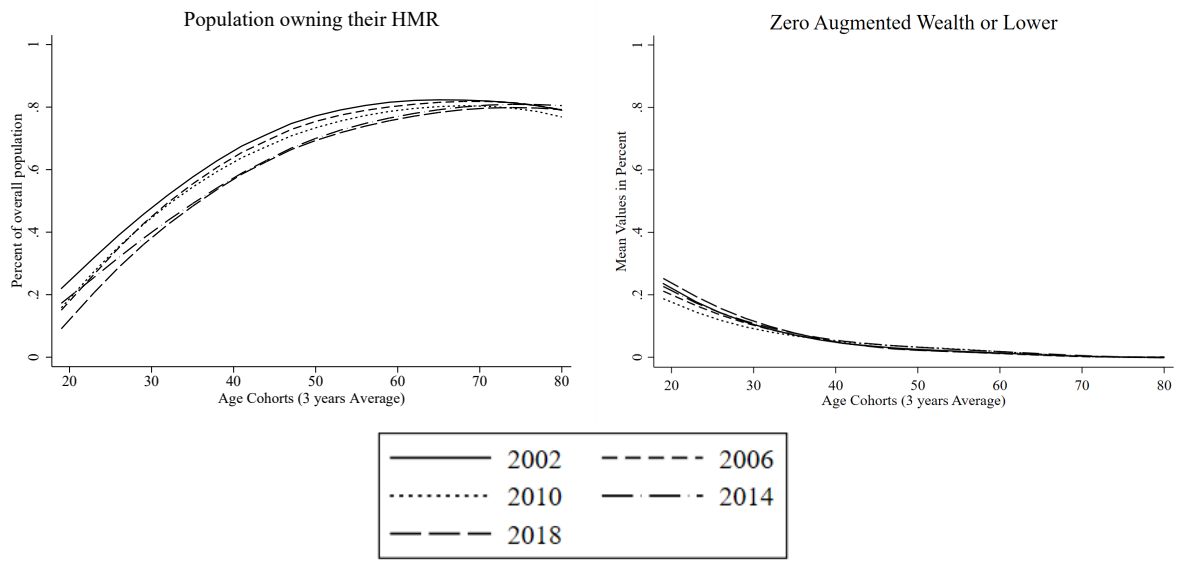


Figure A2. House-ownership and Non-Positive Augmented Wealth

Notes: Own calculation. 3 year average values by age cohort, smoothed with LOWESS. Age refers to HH Head. All values are in 2018 prices and in USD.
Source: HILDA Survey wave 18.

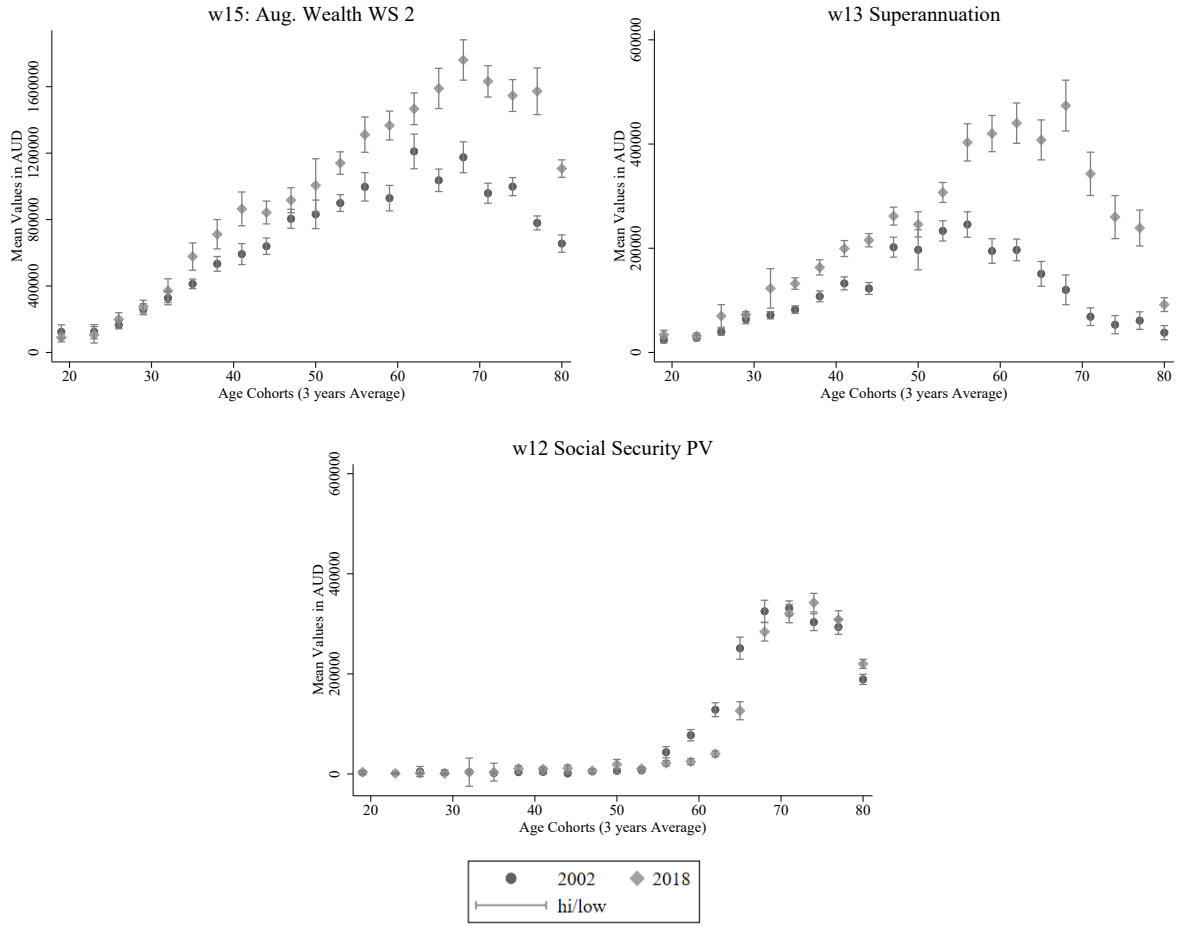


Figure A3. Life Cycle Means with Bootstrapped Standard Errors

Notes: Own calculation. 3 year average values by age cohort. Age refers to HH Head. All values are in 2018 prices. 95 percent confidence intervals are based on bootstrapped standard errors in brackets using 100replica weights
Source: HILDA Survey wave 18.

G Pension Wealth by Characteristics

Focusing on 2018, I provide pension wealth by household characteristics along age cohorts. This adds to the general understanding of pension wealth dynamics and its distribution across age groups. The results are shown in Figure A4. The left panels depict social security pension wealth, the right panels represent Superannuation wealth. I start with differentiating between single and couple households. To make wealth levels more comparable, I divide the couples' wealth by two. The panels show that social security pension wealth is relatively similar for coupled households, which means in regard to the per head perspective, couples hold considerably less social security pension wealth. It reflects the proportionally lower payments and stricter thresholds of the Age Pension scheme for couples compared to two single households. In terms of wealth in Superannuation accounts, couples hold more Superannuation wealth per head than single couples. I am not able to disentangle the dynamics behind it, whether they receive less pension due to higher amounts of Superannuation, or save more, as they expect a lower pension. Nevertheless, it indicates another interaction between the two schemes.

I also show differences between genders. Social security pension wealth is held at equal levels by female and male household heads. Superannuation accounts show no difference during the accumulation period, but start do diverge in the 60s. Both are interesting findings. This panel cannot detect child birth "penalties" for women, even though contributions are conditioned on labor market participation. This does not mean that the penalties do not exist. As this is a household perspective, these effects are potentially mitigated by partners in the household. The divergence during retirement age cannot be explained by higher dissaving rates, as I could not find a significant difference between men and women in my analysis above. Men seem to accumulate Superannuation wealth several years longer than women and, therefore, hold more wealth in their accounts.

Finally I compare pension wealth between households who own their main household residence (HMR) with those who do not. Those who do not own their HMR hold more social security pension wealth, but the difference is small. In terms of wealth in Superannuation accounts, HMR owners hold much more wealth than their counterparts. The result is striking: those households who do not own their primary home are also considerably worse off in terms of pension wealth.[52] This raises concerns about how housing wealth is treated in the Age Pension asset test. Those who

[52]It directly relates to the generalized concentration curves in Figure 5 above, as housing wealth is the main component of augmented wealth.

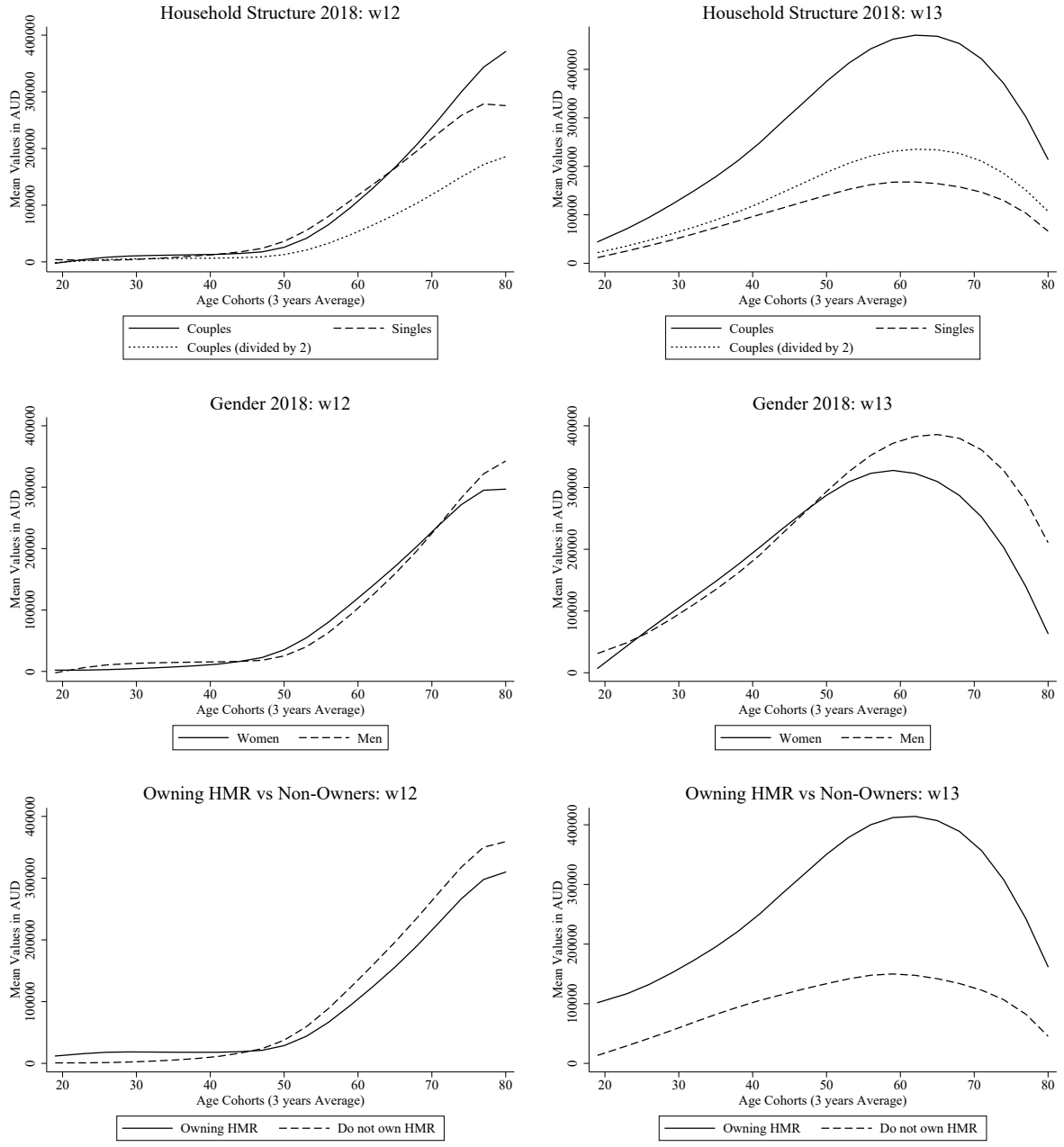


Figure A4. Pension Wealth by Characteristics

Notes: Own calculation based on the respective subgroup. 3 year average values by age cohort, smoothed with LOWESS. Left panels present social security pension wealth, right panels depict wealth in Superannuation accounts. Age refers to HH Head. All values are in 2018 prices.
Source: HILDA Survey wave 18.

do not own their home potentially do not benefit from comparably higher thresholds. Reforming Age Pension in that matter could offset some of the differences in retirement.

H Ginis

Table A5. Gini Coefficients of Wealth Aggregates

Aggregates	2002	2006	2010	2014	2018
Bottom coded at 0					
w10: Net Worth	0.638	0.653	0.636	0.646	0.654
	(0.0039)	(0.0044)	(0.0031)	(0.0035)	(0.0018)
w10 + w12: Social Sec PW	0.597	0.617	0.604	0.609	0.619
	(0.0042)	(0.0044)	(0.0035)	(0.0043)	(0.0021)
w10 + w13: Superannuation	0.615	0.626	0.616	0.618	0.617
	(0.0036)	(0.0041)	(0.0023)	(0.0036)	(0.0018)
w15: Augmented Wealth	0.577	0.597	0.593	0.592	0.592
	(0.0038)	(0.0042)	(0.0029)	(0.0046)	(0.0019)
Bottom censored at 0					
w10: Net Worth	0.609	0.619	0.601	0.608	0.618
	(0.0044)	(0.0044)	(0.0045)	(0.0052)	(0.0028)
w10 + w12: Social Sec PW	0.567	0.582	0.568	0.570	0.582
	(0.0037)	(0.0050)	(0.0045)	(0.0064)	(0.0028)
w10 + w13: Superannuation	0.589	0.597	0.586	0.587	0.587
	(0.0039)	(0.0040)	(0.0023)	(0.0038)	(0.0012)
w15: Augmented Wealth	0.556	0.577	0.570	0.568	0.572
	(0.0036)	(0.0042)	(0.0022)	(0.0051)	(0.0012)

Notes: Own calculation. All estimates are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18.

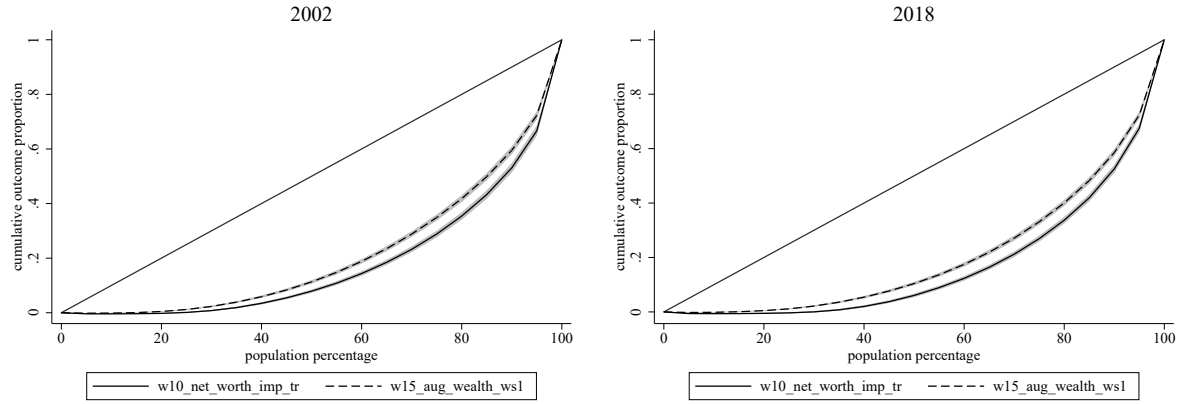


Figure A5. Lorenz Curves: Net Worth and Augmented Wealth

Notes: Own calculation. All values are in 2018 prices.
Source: HILDA Survey wave 18.

I Percentile Ratios

Table A6. Percentile Ratios

	2002	2006	2010	2014	2018
20/50 ratio					
w10: Net Worth	0.081	0.052	0.056	0.047	0.046
	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)
w10 + w11: Personal Ent.	0.105	0.0790	0.0750	0.0650	0.0630
	(0.004)	(0.005)	(0.004)	(0.004)	(0.003)
w10 + w12: Social Sec PW	0.105	0.0790	0.0750	0.0650	0.0630
	(0.004)	(0.005)	(0.004)	(0.004)	(0.003)
w10 + w13: Superannuation	0.147	0.130	0.140	0.138	0.144
	(0.006)	(0.005)	(0.004)	(0.004)	(0.005)
w15: Augmented Wealth	0.174	0.166	0.166	0.158	0.176
	(0.006)	(0.006)	(0.005)	(0.007)	(0.005)
90/50 ratio					
w10: Net Worth	4.114	3.976	3.990	4.322	4.802
	(0.067)	(0.113)	(0.073)	(0.084)	(0.105)
w10 + w11: Personal Ent.	3.445	3.582	3.555	3.819	4.029
	(0.055)	(0.062)	(0.057)	(0.061)	(0.067)
w10 + w12: Social Sec PW	3.463	3.586	3.580	3.856	4.085
	(0.054)	(0.060)	(0.058)	(0.060)	(0.068)
w10 + w13: Superannuation	4.137	4.133	4.036	4.411	4.488
	(0.068)	(0.091)	(0.075)	(0.071)	(0.065)
w15: Augmented Wealth	3.342	3.516	3.456	3.704	3.869
	(0.050)	(0.061)	(0.049)	(0.048)	(0.059)

Notes: Own calculation. All estimates are based on imputed values. Bootstrapped standard errors in brackets using 100replica weights.
Source: HILDA Survey wave 18.

J Dissaving Regression Results

Table A7. Regression Results

	(1)	(2)	(3)
Receive Age Pension	0.0936***	0.3575***	0.0833***
	(0.0096)	(0.0364)	(0.0084)
Net Worth: w10	-0.0005	-0.0022	-0.0005
	(0.0004)	(0.0021)	(0.0005)
Superannuation Wealth: w13	-0.0151***	-0.1935***	-0.0451***
	(0.0010)	(0.0091)	(0.0020)
Female	-0.0031	-0.0343	-0.0080
	(0.0091)	(0.0339)	(0.0079)
Single	-0.0183	-0.0844*	-0.0197*
	(0.0104)	(0.0376)	(0.0088)
Age: 55–59	-0.0288	-0.1721*	-0.0401*
	(0.0157)	(0.0753)	(0.0175)
Age: 65–69	-0.0124	-0.0638	-0.0149
	(0.0121)	(0.0515)	(0.0120)
Age: 70–74	0.0222	0.0604	0.0141
	(0.0136)	(0.0538)	(0.0126)
Age: 75–79	0.0945***	0.2616***	0.0610***
	(0.0166)	(0.0597)	(0.0140)
Age: >80	0.2786***	0.7190***	0.1676***
	(0.0203)	(0.0634)	(0.0152)
Medium Education	0.0294**	0.1448***	0.0338***
	(0.0101)	(0.0377)	(0.0088)
High Education	0.1150***	0.5402***	0.1259***
	(0.0122)	(0.0434)	(0.0100)
2006	-0.0360*	-0.0884	-0.0206
	(0.0182)	(0.0601)	(0.0140)
2010	-0.0441*	-0.1272*	-0.0297*
	(0.0175)	(0.0581)	(0.0135)
2014	-0.0643***	-0.1614**	-0.0376**
	(0.0160)	(0.0541)	(0.0127)
2018	-0.0554***	-0.1072*	-0.0250*
	(0.0159)	(0.0533)	(0.0125)
R^2	0.1557	0.1593	
N	5,679	5,679	5,679

Notes: Table provides the regression results of the OLS regression (1), the estimates of the Fractional Probit Model (2), and the marginal effect at means (3). Wealth variables are divided by 100,000. Robust standard errors are provided in brackets. The R^2 in (2) represents the pseudo-R^2 of the fractional probit model. The significance levels are reported with * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.
Source: Regression are based on the HILDA dataset.

K Concentration Curves

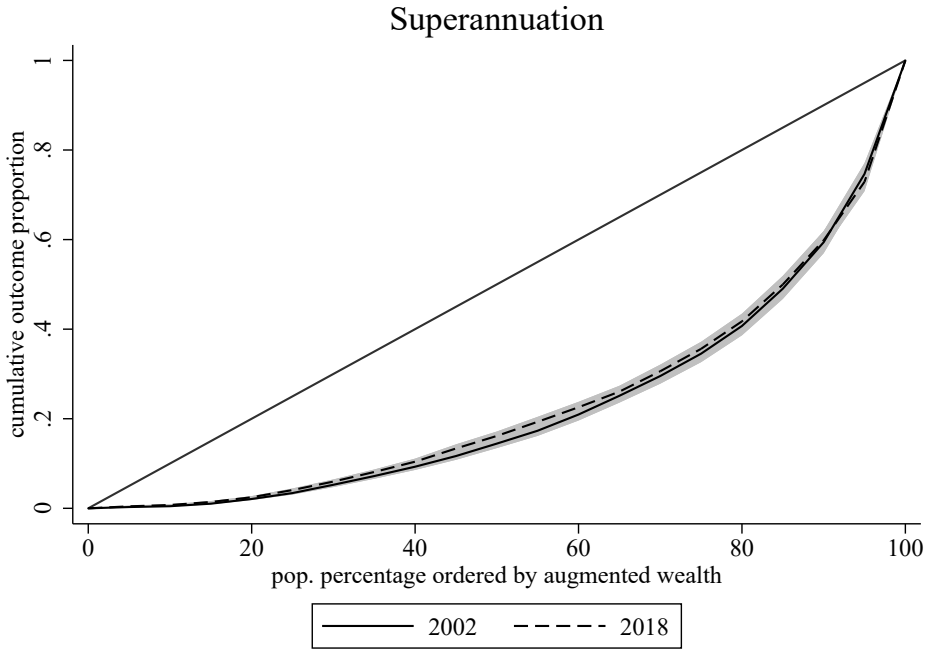


Figure A6. Concentration Curves of Superannuation and Augmented Wealth

Notes: Own calculations. Generalized concentration curves of Superannuation for 2002 and 2018. Grey area represents 95 % confidence intervals.
Source: HILDA Survey wave 18.