



## Article

# Retirement Income Sufficiency: A Comparison Study in Australia and New Zealand <sup>†</sup>

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**Abstract:** We use the 2018 survey data from the Household, Income, and Labour Dynamic (HILDA) in Australia and the Household Economic Survey (HES) in New Zealand to investigate the retirement income sufficiency in Australia and New Zealand. Our baseline results indicate that the annuitized net wealth is greater for Australian retirees than for New Zealand retirees. However, New Zealand retirees enjoy a higher level of life satisfaction than Australian retirees. Further analysis reveals a significant greater pre- and postretirement income for the top 10% of wealthy Australian retirees, mainly due to the higher level of homeownership in Australia within this group. Our study fills the gap in the existing literature, which studies the macro- and microlevel influences on Australia and New Zealand retirees, and it also offers important policy implications.

**Keywords:** Australia; New Zealand; retiree; retirement planning; income sufficiency; Blinder–Oaxaca decomposition; demographic traits; individual financial positions; government pension system

**JEL Classification:** D14; D31; G51; I31; J14; J17; J26



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## 1. Introduction

The world continues to experience an unprecedented increasing ageing population, where those aged 65 and above represented 9.3% of the population in 2020, and the percentage is expected to reach 16% by 2050, according to the United Nations. In 2018, for the first time in history, people aged 65 or above globally outnumbered children under 5 years of age.<sup>1</sup> This raises an immediate urgency on issues related to the retirement income sufficiency. A well-established pension system should be designed to protect retirees against poverty during their retirement life. Countries strive to set up better pension systems but can differ in significant ways. Government pension systems usually play vital roles in determining postretirement lifestyles. The universal pension system in New Zealand guarantees retirees' minimum living standard, while the means-tested pension system in Australia provides certain level of security for low-income retirees. Australia and New Zealand have many common characteristics thanks to their geographical location and historical connections as members of the British Commonwealth. However, there exists significant differences between the two pension systems. According to the 2020 Mercer report, Australia and New Zealand ranked 4th and 10th, respectively, among 39 sample countries, both having a B overall Global Index grade. Specifically, the global pension index consists of three subindices, including adequacy (40%), sustainability (35%), and integrity (25%).<sup>2</sup> Although Australia and New Zealand are ranked in the top 10, both pension systems have experienced increasing challenges, such as the prevention of poverty, the ratio of postretirement to preretirement income, and the population's lifespan. Thus,

the pension system needs to be reviewed and reformed over time. Australia employs a means-tested government age pension, expecting to increase the retirement age from 65 years to 67 years by 2023. However, New Zealand maintains the retirement age at 65, and the NZ superannuation is a universal government pension. The differences in the designs of the government pension systems ultimately result in different retirement savings and wealth positions, which may result significant deviations in postretirement income for retirees in Australia and New Zealand and in turn affect their retirement lifestyles. Therefore, it is interesting to undertake a comparison study on retiree income sufficiency in both countries, an area has not been studied in prior literature.

Both Australia and New Zealand have a three-pillar pension system: targeted/universal government pensions as the first pillar, mandatory/voluntary employer contributions as the second pillar, and voluntary retirement savings as the third pillar. New Zealand has a residency test for NZ superannuation, while Australia has income and asset tests as well as a residency test.<sup>3</sup> Both countries have defined contribution plans as the second pillar, which are mandatory employer superannuation in Australia and voluntary KiwiSaver in New Zealand, respectively.<sup>4</sup> Australian superannuation is a compulsory scheme with voluntary components, while New Zealand KiwiSaver is a voluntary pension scheme, with enrolment by default. The third pillar is voluntary savings, undertaken in similar ways among various countries, includes voluntary pension schemes, insurances, financial investments, and other retirement saving instruments. Australians and New Zealanders are confronted with different retirement strategies, so it is interesting to investigate the impact of the pension schemes on retiree's income sufficiency in these two countries, and this paper serves this function and provides important policy implications. Specifically, we attempt to answer the following question: do demographic traits, individual financial positions, and different pension systems result in differences in retirement income sufficiency in Australia and New Zealand?

Using the 2018 Household, Income, and Labour Dynamics Australia (HILDA) survey data in Australia and the Household Economic Survey (HES) New Zealand data, we obtain 3527 Australian retiree observations and 2175 New Zealand retiree observations in our sample. We use four measures to proxy the income sufficiency variable: preretirement annuitized net wealth, postretirement annuitized net wealth, the level of life satisfaction, and the level of financial situation satisfaction. We decompose the mean difference in the annuitized net wealth by following Haveman et al. (2007b) and the life/financial situation satisfactions by following Bond and Lang (2019), using Blinder–Oaxaca linear and nonlinear decompositions to investigate the differences in retirement income sufficiency in Australia and New Zealand. Our control variables consist of demographic traits and individual financial positions.

Our baseline results indicate that annuitized net wealth is greater for Australian retirees than for New Zealand retirees. Further analysis concludes that New Zealand retirees enjoy better demographic traits (i.e., self-rated health status, living in major cities, and higher level of education) and a better pension system, while Australian retirees hold better individual financial positions (i.e., homeownership). Even though Australian retirees have greater annuitized net wealth, certain unobserved factors and the Australian pension system negatively contribute, while the New Zealand pension system contributes positively and raises the New Zealand retirees to a higher level of life satisfaction compared with Australian retirees. We also use two subjective wellbeing measure as alternative ways to measure retiree income sufficiency, retirees' satisfaction with their financial situations, and their life satisfaction values. Using nonlinear Blinder–Oaxaca decomposition method, our results are mainly consistent with the objective decomposition results that better demographic traits (mainly from self-rated health) and a better pension system improve New Zealand retirees' financial situation satisfaction, while individual financial positions (pension funds, other debts, and individual net wealth) benefit Australian retirees. We then use the relative annuitized net wealth ratio as an alternative way to measure retiree

income sufficiency, and our results suggest that the demographic traits, individual financial positions, and pension systems also contribute in the same manner as for the main results.

Next, we divide our sample retirees into the top 10% and the bottom 10% on the basis of wealth level, and an unconditional quantile regression is applied to estimate the impact of the change in the distribution of the independent variables on the marginal quantiles by using a recentered influence function (RIF). For the bottom 10% group, we do not find a significant difference in the postretirement annuitized net wealth; however, Australian retirees have a higher preretirement annuitized net wealth than New Zealand retirees. For the top 10% wealth group, the results suggest that retirees in Australia have significantly more annuitized net wealth than New Zealand retirees. These results indicate that wealthy Australian retirees have higher income sufficiency values than New Zealand wealthy retirees, in both post- and preretirement wealth. Consistent with our main results, demographic traits and pension system benefit New Zealand retirees more, while individual financial positions improve the retirement situation for Australian retirees.

A further robustness test is conducted using homeownership to divide our sample into nonhomeowner and homeowner groups. The results indicate that the nonhomeowner group in Australia have lower average post- and preretirement annuitized net wealth values than the same group in New Zealand. Demographic traits, individual financial positions, and the pension system all benefit retirees in New Zealand. These results confirm that principal residence is the main driver for Australian retirees' higher income sufficiency. Australian nonhomeowner retirees are in a disadvantaged financial situation compared to New Zealand retirees. For the homeowner group, the results suggest that Australian homeowner retirees have relatively higher post- and preretirement annuitized net wealth levels than New Zealand retirees. The unexplained part of the results indicates that the pension system drives New Zealand homeowners towards having higher postretirement wealth and promotes Australian homeowners towards having higher preretirement wealth. The overall homeownership subsample tests emphasize the importance of homeownership in Australia, and homeownership plays a vital role in retirees' wealth accumulation. Pension systems play mixed roles in both annuitized net wealth measures between different groups.

Our paper contributions to the existing literature in several important ways: (1) This paper compares Australian and New Zealand retiree income sufficiency values by using survey data sets (HILDA in Australia and HES in New Zealand). Most research applies a harmonized data set (in Europe and the US) (Christelis et al. 2013) and qualitative analysis for two-country comparisons (Banks et al. 2003). (2) This study focuses on both microlevel (demographic traits and financial positions) and macrolevel (the pension system) comparisons. However, to the best of our knowledge, no prior study to date has focused on both levels. (3) This paper applies a novel method (Blinder–Oaxaca decomposition) to decompose the income sufficiency difference among demographic traits, individual financial positions, and the pension systems. Moreover, objective annuitized net wealth and subjective wellbeing are considered. (4) This research sheds extra light on issues related to pension systems and provides important policy implications.

The remainder of the paper is organized as follows. Section 2 briefly discusses the related literature and institutional backgrounds of the pension system in each country. Section 3 describes the data and the methodology. Section 4 presents our empirical results. Section 5 provides the further analysis and robustness tests. Section 6 concludes.

## 2. Literature Review and Background Information

### 2.1. Literature Review on Cross-Country Comparisons

Cross-country income and wealth comparisons are well studied among the US and European countries. Banks et al. (2003) compared household finance differences in the US and the UK, and they documented that median US households accumulate more financial wealth than similar households in the UK. They concluded that higher longevity risks and large housing price fluctuations in the UK may explain this phenomenon. Homeownership has proven to play an important role in determining individual wealth, and Azpitarte (2011)

also concluded that the housing wealth component boosts the higher poverty level in the UK compared to Spain. [Lu et al. \(2020\)](#) compared the asset allocations among 23 developing and developed countries, including China, the US, 20 EU countries, and Australia. The results show that homeownership occupies a large portion of the assets for these countries, excluding the US. Moreover, [Mathä et al. \(2017\)](#) found that in addition to the common household and demographic factors, homeownership and housing price dynamics were significant factors influencing wealth holdings across all European-area countries and that intergenerational transfers made a smaller contribution. [Cowell et al. \(2012\)](#), however, concluded that average wealth holdings are lower in some countries but higher in those countries with higher levels of savings.

Household characteristics and institutional characteristics (i.e., the macroeconomic factors) play different roles among different age groups. [Christelis et al. \(2013\)](#) examined the household portfolio differences among the population aged 50 years and above in the US and some European countries. They concluded the differences in asset allocations can be explained by institutional characteristics, considered as country-level differences. However, [Sierminska and Doorley \(2018\)](#) used the Blinder–Oaxaca decomposition method and documented that household characteristics determined the younger households' asset participation, by investigating the differences between financial and nonfinancial asset participation in European and North American countries. [Wroński \(2022\)](#) compared the household wealth distribution in Estonia, Hungary, Latvia, Poland, and Slovakia, six Central and Eastern European countries, and the findings showed that households in Poland are almost two times richer than their Hungarian counterparts, even if they have experienced similar economic development. The different household compositions explain approximately a quarter of the gap, but the majority of the gap is unexplained by other, unobserved factors. [Fessler et al. \(2014\)](#) also found that household structure played a major role in the differences of net wealth distributions, by using Household Finance and Consumption Survey with European countries, excluding Estonia and Ireland. By studying the wealth distribution in Spain and the US, [Salas-Rojo and Rodríguez \(2021\)](#) documented that a certain bequest or better-educated parents may significantly widen individual opportunities for wealth accumulation. [Fessler and Schürz \(2018\)](#) showed similar findings: households that received an inheritance have higher net wealth values than those who did not, among the 13 chosen European countries. They also concluded that welfare state expenditures can substitute private wealth accumulation, which means that higher welfare state expenditures result in lower average net wealth holdings.

There are also cross-country comparisons between the OECD countries on ageing populations. [Sierminska et al. \(2007\)](#) compared retirees' financial situations between the US, Canada, UK, Italy, Germany, Finland, and Sweden. They documented that wealth is correlated with education and that homeownership is universal among most ageing households except for Germany. Taking a microeconomic approach, [Bourguignon et al. \(2008\)](#) also documented that the key income difference between Brazil and the US lies in the distribution of education and nonlabour income (mainly pensions). [Smeeding \(2003\)](#) compared the income maintenance among the ageing populations in the US, Australia, Canada, the UK, Spain, France, Luxembourg, Belgium, Denmark, Germany, and the Netherlands. The results confirmed that the means-tested age pension could not benefit older high-income individuals in Australia. By using a qualitative analysis, [Gornick et al. \(2009\)](#) investigated the income and wealth situations of retired women aged 65 years and above in the US, the UK, Germany, Italy, Finland, and Sweden, and they concluded that older women have lower incomes and higher wealth values compared with the national median level. [Fasang \(2012\)](#) examined the influence of social policies on German and British income inequality in retirement. The results revealed that there was no direct link between social policies and income inequality during retirement. Similar results were also concluded in Britain.

## 2.2. Pension Systems in Australia and New Zealand

In 2018, the population aged 65 years and above reached 15.6% and 15.4% in Australia and New Zealand, respectively, and the older-age dependency rate was 23.9% and 23.5%, respectively. The life expectancy at birth was 81.2 and 85.2 years for men and women in Australia, and the numbers are 80.3 and 83.8 years in New Zealand. Increasing life expectancy indicates an extension of each age group, not only the retirement age group. In theory, an ageing population could work longer to postpone their retirement as a necessary response. To maintain the sustainability of its pension system, Australia has announced that it will increase its retirement age to 67 years by July 2023, while the New Zealand retirement age will remain at 65 years. Lyons et al. (2018) compared the ageing populations' financial security among 13 OECD countries and 10 non-OECD countries, and the macroeconomic indicators showed that public pension spending is 3.5% and 4.9% of Australian GDP and New Zealand GDP, respectively. According to the Allianz report in 2020, no country among the 54 studied countries has a sound balance between sustainability and adequacy in their respective pension systems, because it is a trade-off option. New Zealand does better in adequacy, and Australia excels in sustainability.<sup>5</sup>

According to the OECD statistics, the employment rate of older workers, those between 65 and 69 years, is 28.5% in Australia and 44.0% in New Zealand. The effective labour market exit age is 65.3 and 64.3 years for men and women in Australia, respectively, and 69.8 and 66.4 years for men and women in New Zealand, respectively. Working longer proves to be an appropriate solution to increase retirement income (Higo and Klassen 2017). Australians have a longer life expectancy, with a younger retirement age on average. As a result, the expected years in retirement were 19.8 and 23.3 years in Australia and 15.6 and 20.5 years in New Zealand, for men and women, respectively. This globally ranks among the top, according to the Allianz pension report in 2020. This report also reveals that the Australian public pension coverage rate is around 70%, and the New Zealand coverage rate is almost 100%. The results are not surprising, given that the NZ pension system is a universal pension and the Australian government pension is a means-tested one.

Australia and New Zealand both have a three-pillar pension system. However, the structures of the systems and requirements for pension eligibility are different. They start with the government pension as the first pillar, which is Australia's age pension and New Zealand's superannuation. In New Zealand, residents qualify for NZ superannuation once they reach 65 years, with certain residency requirements. However, Australian retirees are required to pass asset and income tests and must qualify through residency tests. The senior Australians' tax offset may eliminate the tax liability, and Australian age pension receivers may be free from tax.<sup>6</sup> New Zealand remains the 65-year retirement age for the first pillar, while Australia has gradually increased the qualifying age to 66.5 years since 1 July 2021.

Moreover, Australia has a compulsory employer scheme as the second pillar, while New Zealand's KiwiSaver is a voluntary scheme. Australia employer superannuation and New Zealand KiwiSaver can be considered as a hybrid of pillars 2 and 3, as Australian employees can opt to make extra contributions, and New Zealand KiwiSaver is set up for auto-enrolment by default. Australia compulsory employer superannuation requires employers to contribute on behalf of their employees, and the minimum contribution rate has reached 10% since 1 July 2021 and is scheduled to increase to 12% by 2025. When Australian individuals reach 60 years, superannuation can be claimed in either annuity or in a lump sum form. However, New Zealand KiwiSaver is a combined contribution from employees and employers, and the default contribution rate from the employer is 3%. KiwiSaver auto-enrols people; it functions like compulsory employer superannuation. Employees participate in the plan by default, while they have the option to withdraw from the scheme at any time. Australian employee superannuation is taxable at a flat rate of 15%, with an annual cap of AUD 27,500 as of 1 July 2021. New Zealand KiwiSaver is taxable if the contribution is from employers, and the contributions from employees are also made from after-tax income.



The third pillar, voluntary savings (including voluntary contributions from the second pillar), is also an important element influencing postretirement income sufficiency, according to the Australian Treasury Retirement Income Review, published in July 2020. In New Zealand, these contributions are taxable, as the tax preferences were removed in the late 1980s (Guest 2013). A more detailed comparison of each pillar is presented in Table A1 of Appendix A.

Australia's and New Zealand's ageing demographic situations impose tremendous pressure on the pension systems. Dang et al. (2006) documented a relatively higher level of poor elder retirees. On the one hand, individuals under means-tested pensions intend to save less because of the qualification requirements for the government pension in Australia. On the other hand, a universal government pension may lead to insufficient savings, as retirees would rely on the government pension as their sole source of retirement income in New Zealand. Moreover, tax arrangements for retirement savings encourage Australian retirees to save more than New Zealand retirees do. Hence, whether the New Zealand retirement system and the Australian retirement system are beneficial to retirees' income sufficiency is an empirical question.

### 3. Data and Methodology

#### 3.1. Australia HILDA and New Zealand HES Survey Data

We use the 2018 survey data from the Household, Income, and Labour Dynamic (HILDA) in Australia and the Household Economic Survey (HES) in New Zealand. Both surveys include data at the household and individual levels, including information on demographics, income sources, household wealth, and financial and nonfinancial assets. The HILDA survey is a household-based panel study that collects information on household economic and personal wellbeing, labour market dynamics, etc. The survey was funded by the Australian government through the Department of Social Services and was administered by the Melbourne Institute at the University of Melbourne. It collects information on household and family relationships, income, employment, health, and education from more than 17,000 Australians each year. Our study focuses on the 2018<sup>7</sup> wave of the HILDA survey, primarily because it provides sufficient variables and observations to draw meaningful conclusions. We include only those aged 65 and above as of June 2018. Our final sample has 3527 observations from 2565 households, where 1604 households have 1 retiree, 960 households have 2 retirees, and 1 household has 3 retirees.

The New Zealand HES data make up a cross-sectional data set, and households are randomly selected. The full HES runs every 3 years, including income, expenditure, and wealth. We use the HES 2018 data, with 8000 households in the survey. The HES data are part of the Integrated Data Infrastructure (IDI) administered by Statistics NZ, a government department, to collect information through censuses and surveys. The HES survey data are a collection of individual income and household wealth data, which enables the New Zealand government to better understand information on low-income families and thus seeks ways to offer help.

In this paper, we focus mainly on two categories' variables from the survey data: the income category and the wealth category. Table 1 presents a detailed description of these variables for both countries, with Panel A for the income category and Panel B for the wealth category. The income category includes the government pension (first pillar), private pension plans (second pillar), investment income (one source of the third pillar), and gross retirement income. The wealth category consists of information on bank account balances, pension funds, other financial assets, homeownership, other nonfinancial assets, credit card balances, mortgages, and any other debts. The variables' definitions are presented in Table A2 of Appendix A for the HILDA and HES data sets, respectively.

**Table 1.** Australia HILDA and New Zealand HES income and wealth categories from survey data.

Country	Australia	New Zealand
Table A: Income Category		
Government Pensions	Australia Age Pension	New Zealand Superannuation
Private Pensions	Australia compulsory employer superannuation	New Zealand private super schemes (Government Superannuation Fund, National Provident Fund, KiwiSaver, NZ Mutual Fund, other NZ job-related superannuation scheme, other NZ private superannuation scheme that is not job related)
Investment Income	Investment income or dividends from company shares, managed funds, and property trusts	Investment income or dividends from company shares, managed funds, and unit trusts
Gross Retirement Income	All incomes above, plus wages and salaries, business income, and other regular income and transfer before tax	All incomes above plus wages and salaries, and other regular income and transfer before tax
Table B: Wealth Category		
Bank Accounts	Bank accounts	Bank accounts
Pension Funds	Australian employer superannuation	Defined benefit and defined contribution superannuation
Other Financial Assets	Life insurance, cash investment, equity investment, and trust funds	Life insurance, investment, and trusts
Principal Residence	Principal residence	Principal residence
Other Nonfinancial Assets	Vehicles, business assets, and collections	Consumer durables, motor vehicles, cash and noncash assets, farms, and business equity
Credit Card Debt	Credit card debt	Credit card debt
Mortgage	Mortgage for a principal residence	Mortgage for a principal residence
Other Debts	Student loans and other personal debts	Consumer credit loan

Table 2 presents the summary statistics for our sample data, including the income category in Panel A and the wealth category in Panel B, for both the HILDA and the HES data. In Panel A, on average, Australians receive AUD 17,485.49 per annum from their government pensions (the first pillar), representing 75% of regular gross retirement income. New Zealanders receive AUD 18,391.19 per annum from their government pensions, representing 74% of regular gross retirement income. From the second pillar, Australians receive AUD 28,154.67 per annum from private pensions, while New Zealanders receive AUD 23,009.72. For the third pillar, it is AUD 10,527.10 in Australia and AUD 12,286.69 in New Zealand. These indicate that New Zealander retirees receive a relatively higher pension from the government pension (first pillar) and the third pillar, but less from funds in the second pillar. In Panel B, for the wealth category, on average, individual net wealth is AUD 801,376.40 for our sample retirees in Australia and AUD 555,324.07 in New Zealand.

**Table 2.** Individual financial year income and wealth comparisons for ageing populations in 2018, in Australian dollars.

Country	Australia				New Zealand			
Category	Median (Ratio)	Mean (Ratio)	Observations	Received Ratio	Median (Ratio)	Mean (Ratio)	Observations	Received Ratio
Panel A: Income Category								
Government Pensions	AUD 17,774.00 (0.90)	AUD 17,485.49 (0.75)	2400	0.68	AUD 16,938.75 (0.90)	AUD 18,391.19 (0.74)	2076	0.95
Private Pensions	AUD 20,000.00 (0.49)	AUD 28,154.67 (0.53)	1322	0.37	AUD 20,062.06 (0.46)	AUD 23,009.72 (0.44)	162	0.07
Investment Income	AUD 1500.00 (0.06)	AUD 10,527.10 (0.19)	849	0.24	AUD 1721.50 (0.05)	AUD 12,286.69 (0.13)	282	0.13
Gross Retirement Income	AUD 24,670.00	AUD 43,265.83	3527	1.00	AUD 22,743.91	AUD 36,900.10	2175	1.00
Panel B: Wealth Category								
Bank Accounts	AUD 19,289.00 (0.05)	AUD 75,428.05 (0.16)	3318	0.94	AUD 9262.00 (0.04)	AUD 52,443.67 (0.11)	2054	0.94
Pension Schemes	AUD 162,306.50 (0.25)	AUD 305,288.00 (0.29)	1898	0.54	AUD 37,001.29 (0.10)	AUD 109,993.77 (0.20)	410	0.19
Other Financial Assets	AUD 25,000.00 (0.04)	AUD 189,079.60 (0.13)	1424	0.40	AUD 197,371.09 (0.24)	AUD 241,085.96 (0.28)	172	0.08
Principal Residence	AUD 600,000.00 (0.96)	AUD 753,886.40 (1.08)	2757	0.81	AUD 236,178.45 (0.67)	AUD 300,400.74 (0.64)	1306	0.60
Other Nonfinancial Assets	AUD 12,000 (0.02)	AUD 44,846.99 (0.12)	3091	0.88	AUD 47,467.24 (0.18)	AUD 101,217.56 (0.30)	2112	0.97
Credit Card Debt	AUD 1500.00 (0.005)	AUD 3062.15 (0.162)	371	0.11	AUD 740.95 (0.001)	AUD 1447.10 (−0.007)	693	0.32
Mortgage	AUD 124,000 (0.23)	AUD 188,274.80 (0.45)	300	0.08	AUD 32,592.16 (0.13)	AUD 72,990.61 (−0.002)	176	0.08
Other Debts	AUD 9149.50 (0.02)	AUD 42,173.89 (0.20)	422	0.19	AUD 2084 (0.01)	AUD 11,699.85 (−0.10)	264	0.12
Individual Net Wealth	AUD 504,021.00	AUD 801,376.40	3359	0.95	AUD 305,225.91	AUD 555,324.07	2175	1.00

This table presents the median and mean values of different income and wealth sources in 2018, in Australian dollars. The ratios in brackets are compared with regular gross retirement income or individual net wealth.



We use the annuitized net wealth to measure retirees' income sufficiency values while considering the remaining life expectancies and discount rates (Haveman et al. 2007a, 2007b). Specifically, we calculate two annuitized net wealth values: with and without government pensions. The individual overall net wealth is the present value of the remaining government pension added to the individual net wealth at the interview in 2018. As the government pensions are annually adjusted for inflation in both countries, the remaining pensions can be proxied as the current pension multiplied by the remaining life expectancy. The remaining life expectancy is matched to life tables in each country by age and gender, and the discount rate is the inflation-adjusted T-bill rate in 2018. The overall net wealth is annuitized on the basis of the remaining life expectancy and the discount rate in each country in 2018. We also carry out another annuitized net wealth measurement by excluding government pensions, where only the net wealth is considered at the time of interview. This net wealth is annuitized on the basis of the same remaining life expectancy, and the discount rate and is used to measure preretirement wealth. We also calculate the relative annuitized net wealth ratio by using two benchmarks: the national poverty line and the regional median income. Table 3 presents the annuitized net wealth in Australian dollar, with two types of annuitized net wealth measurements in Panel A and the relative annuitized net wealth ratios in Panel B. According to Panel A, Australian retirees have an average annuitized wealth of AUD 73,874.58 and AUD 61,818.51, for the postretirement and the preretirement periods, respectively. New Zealand retirees have an average annuitized wealth of AUD 61,014.33 and AUD 43,780.08, for the postretirement and the preretirement periods, respectively.

**Table 3.** Absolute and relative annuitized net wealth comparisons.

Category	Benchmark	Australia		New Zealand	
		Median	Mean	Median	Mean
Panel A: Annuitized Net Wealth					
Annuitized Net Wealth1		AUD 49,002.04	AUD 73,874.58	AUD 39,411.71	AUD 61,014.33
Annuitized Net Wealth2		AUD 36,002.79	AUD 61,818.51	AUD 21,786.80	AUD 43,780.08
Panel B: Relative Annuitized Net Wealth Ratios					
Annuitized Net Wealth1	National poverty line	2.06	3.11	2.13	3.30
	Regional median income	0.99	1.48	0.93	1.41
Annuitized Net Wealth2	National poverty line	1.52	2.60	1.18	2.37
	Regional median income	0.72	1.23	0.51	1.01

This table presents two annuitized net wealth measurement comparisons in 2018, in Australian dollars, and the relative ratio comparisons. Annuitized Net Wealth1 is the overall net wealth annuitized on the basis of the remaining life expectancy and inflation-adjusted T-bill rate in 2018. The overall net wealth is the present value of remaining government pensions added to the net wealth at the interview time. Annuitized Net Wealth2 is the net wealth at the interview annuitized on the basis of the remaining life expectancy and inflation-adjusted T-bill rate in 2018. The relative ratios are shown in the annuitized net wealth compared with the national poverty lines and regional median incomes.

We follow Sierminska et al. (2007) and use 50% of the median individual income of the total population before housing costs as the poverty line in both countries. In March 2018, the 50% median income poverty line before housing costs for a one-person household was AUD 457 per week, according to Australia Council in 2020 and the annual median income was AUD 23,764 annually as the poverty line in Australia. In New Zealand, the median one-person household income was NZD 39,900 per annum, according to the Ministry of Social Development, and the poverty line was NZD 19,950 annually. Table 3's Panel B shows New Zealand retirees have a higher relative average postretirement annuitized net wealth to poverty line ratio of 3.3 (3.1 in Australia), while Australia has a higher average preretirement annuitized net wealth to poverty line ratio of 2.6 (2.37 in New Zealand). We also use the regional median income as an alternative way to calculate the relative ratio, with Australian state median incomes and New Zealand regional median incomes.<sup>8</sup> Australia exhibits higher relative ratios for both preretirement and postretirements measurements of annuitized net wealth.

In addition, we use the self-rated life satisfaction and financial situation satisfaction from the survey questions to compare the retirees' subjective wellbeings in Australia and New Zealand. We use a dummy variable as the subjective wellbeing, including overall life satisfaction and financial situation satisfaction. Overall life satisfaction is assigned as 1 if, when all parts of retirees's lives are considered, their lives are better than average. Otherwise, the life satisfaction is 0 if retirees' lives are lower than the average level. Those retirees who have more than enough income to cover their daily costs are assigned as 1, and those with less than enough or just enough income for their daily needs are 0. The summary statistics and the comparison results are presented and discussed in detail in Section 5.

### 3.2. Methodology

We use postretirement and preretirement annuitized net wealth values to measure retiree objective income sufficiency. We also use relative annuitized net wealth ratios to proxy the retirement living standard that annuitized net wealth can maintain. In Table 3, we observe some substantial differences in post- and preretirement annuitized net wealth values between Australia and New Zealand. The difference is widened when excluding the government pensions in the preretirement annuitized net wealth. We therefore use the Oaxaca's approach to decompose the influences from demographic traits, individual financial positions, and pension systems (Oaxaca 1973; Sierminska and Doorley 2018). Oaxaca (1973) and Blinder (1973) first utilized this decomposition method to male and female wage differences to determine the impact from personal characteristics (explained reasons) and discrimination factors (unexplained reasons). The Blinder–Oaxaca approach is a statistical method explaining the difference in the means of a dependent variable between two groups. The difference between the two groups can be decomposed into the differences in the mean values of the independent variable within the group. In our context, the differences in retiree income sufficiency values may be caused by demographic traits, individual financial positions, or other unobserved variables (mainly pension systems). Therefore, we decompose the difference in income sufficiency measurements, i.e., the post- and preretirement annuitized net wealth values, to capture the influences from demographic traits, individual financial positions, and pension systems, by following Sierminska and Doorley (2018). We also decompose subjective financial and life satisfaction to explain retiree income sufficiency from a subjective wellbeing perspective. Both linear and nonlinear Oaxaca decompositions are applied, and in the following section, we discuss more details on the decomposition methods.

#### 3.2.1. Standard Blinder–Oaxaca Approach for Linear Regression Models

The fundamental question that Blinder–Oaxaca is dealing with is how much the mean outcome difference is:

$$R = E(Y_A) - E(Y_B) \quad (1)$$

In our equation, the  $A$  and  $B$  groups are Australian retirees and New Zealand retirees, respectively, and  $E(Y)$  is the expected value of the post- and preretirement annuitized net wealth values. Therefore,  $R$  shows the group differences between the predictors.

On the basis of the linear model, we can use the following equation:

$$Y_l = X_l' \beta_l + \varepsilon_l, \quad E(\varepsilon_l) = 0, \quad l \in \{A, B\} \quad (2)$$

$X$  is a vector containing the control variables (demographic traits and individual financial positions) and a constant;  $\beta$  contains the slope parameters and the intercept; and  $\varepsilon$  is the error term. The mean outcome difference can be expressed as the difference in the linear prediction at the group-specific means of the regressors.

$$R = E(Y_A) - E(Y_B) = E(X_A)' \beta_A - E(X_B)' \beta_B \quad (3)$$

Since  $E(Y_I) = E(X_I'\beta_I + \varepsilon_I) = E(X_I'\beta_I) + E(\varepsilon_I) = E(X_I)'\beta_I$ , under the assumption that  $E(\beta_I) = \beta_I$ , and  $E(\varepsilon_I) = 0$ . Oaxaca (1973) aimed to investigate the wage difference between two genders caused by personal characteristics (different education levels) or discrimination between two genders (unobserved factors). In the research, he assumed that  $\beta^*$  is the nondiscriminatory coefficient vectors. The outcome can be changed into the following:

$$R = [E(X_A) - E(X_B)]'\beta^* + [E(X_A)'(\beta_A - \beta^*) + E(X_B)'(\beta^* - \beta_B)] \quad (4)$$

Similarly, in our context,  $\beta^*$  is the undifferentiated retiree wealth structure between Australia and New Zealand. Now, we have the two-fold decomposition:  $R = Q + U$ , where  $Q = [E(X_A) - E(X_B)]'\beta^*$  is the explained part in the group difference in the control variables (“quality effect”), meaning that this part can be explained by these variable differences (the mean values in demographic traits and individual financial positions) controlled in the regression.  $U = [E(X_A)'(\beta_A - \beta^*) + E(X_B)'(\beta^* - \beta_B)]$  is the “unexplained” part, showing all potential effects of differences in unobserved variables. For  $\beta^*$ , there are different specifications in the literature.<sup>9</sup> In our research, we aim to find the difference between wealth accumulation caused by individual characteristics and pension systems. We simplify  $\hat{\beta}^* = \hat{\beta}_{AUS}$  as the benchmark, and the gap can be calculated as

$$\hat{R} = [E(X_{AUS}) - E(X_{NZ})]'\hat{\beta}_{AUS} + E(X_{NZ})'(\hat{\beta}_{AUS} - \hat{\beta}_{NZ}) \quad (5)$$

In this equation,  $Q = [E(X_{AUS}) - E(X_{NZ})]'\hat{\beta}_{AUS}$  is considered as the part explained by personal characteristics, if New Zealand retirees were faced with Australia situations. The  $Q$  part can be further decomposed into each control variable.  $U = E(X_{NZ})'(\hat{\beta}_{AUS} - \hat{\beta}_{NZ})$  is the unexplained differences (pension system influence), which are due to the different processes in wealth accumulation for retirement (Jann 2008). This unexplained difference can be largely attributed to institution differences and to unmeasurable factors, such as risk preference differences and cultures (Sierminska and Doorley 2018). However, our research focuses on retirees, and the pension system is the main factor influencing the differences between the sample retirees from the two countries. Therefore, in the following part of the paper, we utilize pension system differences to refer to this unexplained part in the decomposition.

### 3.2.2. Standard Blinder–Oaxaca Approach for Nonlinear Regression Models

We use an extension of Blinder–Oaxaca decomposition for a nonlinear regression with binary results for our subjective retiree income sufficiency measurement (Fairlie 1999; Sinning et al. 2008). We estimate a probit model for income sufficiency satisfaction:

$$p_j(m) = F(X\beta) \quad (6)$$

On the basis of the linear regression, the final linear decomposition in (5) can be decomposed on conditional expectations in nonlinear regression (Sinning et al. 2008) into the following:

$$\bar{Y}_{AUS} - \bar{Y}_{NZ} = \left[ \left( E_{\hat{\beta}_{AUS}}(Y_{AUS}|X_{AUS}) - E_{\hat{\beta}_{AUS}}(Y_{NZ}|X_{NZ}) \right) \right] + \left[ \left( E_{\hat{\beta}_{AUS}}(Y_{NZ}|X_{NZ}) - E_{\hat{\beta}_{NZ}}(Y_{NZ}|X_{NZ}) \right) \right] \quad (7)$$

Equation (7) can be rewritten as follows:

$$\hat{p}^{AUS}(m) - \hat{p}^{NZ}(m) = \left( \hat{p}^{AUS}(m) - \hat{p}_{NZ}^{AUS}(m) \right) + \left( \hat{p}_{NZ}^{AUS}(m) - \hat{p}^{NZ}(m) \right) \quad (8)$$

This is our method for determining subjective wellbeing measurements.

### 3.2.3. Oaxaca Recentred Influence Function Decomposition

The recentred influence function (RIF) of the unconditional quantile is used to estimate the effect of the change in independent variables on the marginal quantiles of the dependent variable, as proposed by [Firpo et al. \(2009\)](#). It is a suitable method to check the impact of the small change in the distribution of independent variable  $X$  on the  $\beta$ th quantile of the unconditional distribution of the dependent variable  $Y$ . It is assumed that  $Y$  and  $X$  have a joint distribution on  $F_{Y,X}(\cdot, \cdot) : R \times \chi \rightarrow [0, 1]$  and  $\chi \in R^k$ . The unconditional distribution function of  $Y$  can be written as follows:

$$F_Y(y) = \int F_{Y|X}(y|X=x) \cdot dF_X(x). \quad (9)$$

$G_Y$  represents the counterfactual distribution of  $Y$ , under the assumption that the conditional distribution  $F_{Y|X}(\cdot)$  is unaffected by the small change in the distribution of  $X$ . The directional derivative of  $v$  in the direction of the distribution  $G_Y$  is as follows:

$$\lim_{t \rightarrow 0} \frac{v(F_{Y,t,G_Y}) - v(F_Y)}{t} = \frac{\partial v(F_{y,t,G_Y})}{\partial t} \Big|_{t=0} = \int IF(y; v, F_Y) \cdot d(G_Y - F_Y)(y). \quad (10)$$

$F_{Y,t,G_Y}$  is the mixing distribution showing that  $t$  is away from  $F_Y$  in the direction of the distribution  $G_Y$ .  $F_{Y,t,G_Y} = (1-t)F_Y + t \cdot G_Y = t \cdot (G_Y - F_Y) + F_Y$ , where  $0 \leq t \leq 1$ . Moreover,  $IF(y; v, F_Y) = \frac{\partial v(F_{y,t,\Delta y})}{\partial t} \Big|_{t=0}$ , and  $\Delta y$  is the probability measure that puts mass 1 at the value of  $y$ . Additionally,  $(F_{Y,t,G_Y}) = v(F_Y) + t \cdot \int IF(y; v, F_Y) \cdot d(G_Y - F_Y)(y) + r(t; v; G_Y, F_Y)$ , and  $r(t; v; G_Y, F_Y)$  is the remainder term. [Firpo et al. \(2009\)](#) defined RIF such that  $G_Y = \Delta y$  and  $t = 1$ , and  $\int IF(y; v, F_Y) \cdot dF_Y(y) = 0$ . Finally,

$$RIF(y; v, F_Y) = v(F_Y) + \int IF(s; v, F_Y) \cdot d\Delta y(s) = v(F_Y) + IF(y; v, F_Y). \quad (11)$$

This method can be used to analyse the change in the distribution of  $X$  and how it affects the unconditional distribution of  $Y$ , applying to some other distributions, such as different quantiles and the Gini inequality index. Using the standard Blinder–Oaxaca decomposition manages to decompose the mean value difference, and we apply the RIF Blinder–Oaxaca method to decompose the 10th and 90th quantiles for different wealth levels among retirees.

Moreover, [Firpo et al. \(2018\)](#) also proposed a two-stage method for wage difference decomposition, using both the reweighting and RIF regressions. We also use this method for our further analysis. In the first stage, a reweighting method decomposes the overall gap into a regression structure effect (retiree wealth accumulation) and a composition effect. Next, the second stage further decomposes each explanatory variable by using RIF regressions, as shown above. We will explain more details on the first stage for the reweighting process. Our interest is to decompose the retiree income sufficiency gap between Australia and New Zealand.

$$\Delta v = v_{AUS} - v_{NZ} = v(F_Y^{AUS}) - v(F_Y^{NZ}). \quad (12)$$

$$\Delta v = v\left(\int F_{Y|X}^{AUS}(Y|X) dF_X^{AUS}(X)\right) - v\left(\int F_{Y|X}^{NZ}(Y|X) dF_X^{NZ}(X)\right). \quad (13)$$

To further decompose both the composition (explained) and coefficient (unexplained) effects, a counterfactual statistic  $v_c$  is defined:

$$v_c = v\left(\int F_{Y|X}^{NZ}(Y|X) dF_X^{AUS}(X)\right)$$

$$v_1 = E(RIF(y_i; v(F_Y^{AUS}))) = \overline{X^{AUS}}' \beta^{AUS}$$

$$v_0 = E(RIF(y_i; v(F_Y^{NZ}))) = \overline{X^{NZ}}' \beta^{NZ}$$

$$v_c = \overline{X^{AUS}}' \beta^{NZ}$$

To identify the counterfactual distribution for  $v_c = v\left(\int F_{Y|X}^{NZ}(Y|X)dF_X^{AUS}(X)\right)$  on the basis of observed data, this reweighting method was proposed (DiNardo et al. 1996) to deal with the possible incorrect identification issues (Barsky et al. 2002). As the distribution of the outcomes and characteristics of the counterfactual distribution  $F_{Y|X}^C$  can not be directly observed, factor  $\omega(X)$  was multiplied by  $dF_X^{NZ}(X)$  to represent  $dF_X^{AUS}(X)$ :

$$F_{Y|X}^C = \int F_{Y|X}^{NZ}(Y|X)dF_X^{AUS}(X) \cong \int F_{Y|X}^{NZ}(Y|X)dF_X^{NZ}(X)\omega(X). \quad (14)$$

According to Bayes's rule, the reweighting factor is as follows:

$$\omega(X) = \frac{dF_X^{AUS}(X)}{dF_X^{NZ}(X)} = \frac{dF_{X|T}(X|T = AUS)}{dF_{X|T}(X|T = NZ)} = \frac{dF_{T|X}(T = AUS|X)}{dF_T(T = AUS)} \frac{dF_T(T = NZ)}{dF_{T|X}(T = NZ|X)} = \frac{1 - P}{P} \frac{P(T = AUS|X)}{1 - P(T = NZ|X)}. \quad (15)$$

Here,  $P$  is the portion of people in Australia, and  $P(T = AUS|X)$  is the conditional probability of someone with the characteristic  $X$  of being part of Australia. In this way,  $\omega(X)$  is estimated by using probit or logit model to estimate the conditional mean (Rios-Avila 2020). After the weight is determined, RIF Blinder–Oaxaca can be used in the second stage for further decomposition. This method is applied as a robustness check for our main results.

#### 4. Empirical Results

The Blinder–Oaxaca approach is applied to decompose the mean outcome differences between the groups (Oaxaca and Ransom 1994, 1999), and our research utilizes the same method to decompose retiree income sufficiency values between Australia and New Zealand, by following Siernimska and Doorley (2018). We attempt to examine the effect of demographic traits (age, gender, living area, employment status, self-rated health, highest education, and partnership status), individual financial positions (bank savings, homeownership, pension funds, mortgages, other debts, home content insurance, financial market participation, income, and wealth), and unobserved factors (mainly pension systems) on the differences in mean annuitized net wealth and subjective wellbeing between Australia and New Zealand.

##### 4.1. Summary Statistics

Table 4 provides the summary statistics for our sample: Australia in Panel A and New Zealand in Panel B. The sample average postretirement annuitized net wealth and preretirement annuitized net wealth is AUD 52,052 and AUD 29,733 in Australia, respectively, and AUD 44,356 and AUD 16,984 in New Zealand, respectively.<sup>10</sup> There are 83% of retirees with above-average life satisfaction and 74% with better than average financial situation satisfaction in Australia, and these two ratios are 88% and 71% in New Zealand, respectively.

In Australia, retiree average age is 74.34, and 46% are men. Moreover, 57% of retirees are living in major cities, the average employment status is 1.18 out of 3 (from retired to working full time), and the self-rated health value is 2.94 out of 5 (from poor to excellent). The highest education is 1.68 out of 3 (from secondary school or below to university degree), and 62% of retirees have a partner. Almost all retirees have bank account savings, which is consistent with older people's high degree of risk aversion. The homeownership is 81%, and 9% have not paid off their mortgages. More than half of the retirees have pension funds (57%), and 20% of retirees have debts other than mortgages and credit card debt. Moreover, 88% of sample retirees have home contents insurance, and the direct financial



market participation rate is 29%. The average regular gross retirement income is AUD 43,270 annually, and the average net wealth is AUD 850,000.

**Table 4.** Summary statistics in Australia and New Zealand.

	N	Mean	Std. Dev.	P1	P99
Panel A: Australia					
Annuitized_Net_Wealth1	3521	10.86	1.00	7.26	13.11
Annuitized_Net_Wealth2	3491	10.30	1.73	3.95	13.12
Overall_Life_Satisfaction	3351	0.83	0.38	0	1
Financial_Situation_Satisfaction	3100	0.74	0.44	0	1
Demographic Traits					
Age	3527	74.34	7.22	65	93
Gender	3527	0.46	0.50	0	1
Living_Area	3527	0.57	0.50	0	1
Employment_Status	3524	1.18	0.51	1	3
Self_Rated_Health	3084	2.94	0.94	1	5
Highest_Education	3360	1.68	0.77	1	3
With_Partner	3359	0.62	0.49	0	1
Individual Financial Positions					
Bank_Accounts	3359	0.99	0.11	0	1
Princial_Residence	3385	0.81	0.39	0	1
Pension_Funds	3359	0.57	0.50	0	1
Mortgage	3484	0.09	0.28	0	1
Other_Debts	3355	0.20	0.40	0	1
Home_Content_Insurance	3511	0.88	0.32	0	1
Financial_Market_Participation	3333	0.29	0.45	0	1
Gross_Retirement_Income (in 1000)	3527	43.27	71.66	0	288
Individual_Net_Wealth (1,000,000)	3527	0.85	1.08	0.002	4.72
Panel B: New Zealand					
Annuitized_Net_Wealth1	2164	10.70	0.93	7.51	12.95
Annuitized_Net_Wealth2	2134	9.74	1.82	3.49	12.90
Overall_Life_Satisfaction	1849	0.88	0.33	0	1
Financial_Situation_Satisfaction	1849	0.71	0.45	0	1
Demographic Traits					
Age	2175	74.00	6.84	65	91
Gender	2175	0.49	0.50	0	1
Living_Area	2175	0.67	0.47	0	1
Employment_Status	2167	1.34	0.69	1	3
Self-Rated_Health	2147	3.42	1.08	1	5
Highest_Education	2132	1.75	0.76	1	3
With_Partner	2175	0.62	0.49	0	1
Individual Financial Positions					
Bank_Accounts	2106	0.98	0.16	0	1
Principal_Residence	2175	0.60	0.49	0	1
Pension_Funds	2175	0.19	0.39	0	1
Mortgage	2175	0.08	0.27	0	1
Other_Debts	2175	0.39	0.49	0	1
Home_Content_Insurance	1849	0.85	0.35	0	1
Financial_Market_Participation	2175	0.13	0.34	0	1
Gross_Retirement_Income (in 1000)	2175	38.06	35.92	0	227.41
Individual_Net_Wealth (in 1,000,000)	2175	0.56	0.80	−0.002	5.48

This table presents summary statistics of the overall 3527 Australian and 2175 New Zealand age observations, whose ages are 65 years and above. Annuitized\_Net\_Wealth1, measured by postretirement wealth, and Annuitized\_Net\_Wealth2, measured by preretirement wealth, are in the natural logarithm. P1 and P99 show the values at 1 and 99 percentiles.

In New Zealand, retiree average age is 74, and 49% are men. Moreover, 67% of the retirees are living in major cities, with an average score of 1.34 out of 3 for employment status. The average self-rated health is 3.42 out of 5; the average highest education is 1.75 out of 3, and 62% have a partner. Most demographic characteristics are similar to Australia,

but New Zealand has a higher male rate, a higher portion of retirees living in major cities, and a better self-rated health status. Financially, 98% of retirees have bank account savings, but the homeownership is 60%, far behind Australia. Among homeowners, 8% have not yet paid off their mortgages. Only 19% of the sample retirees have pension funds, and 39% have debts other than mortgages and credit card debt. New Zealand retirees have a low risk tolerance, showing that 85% of the sample retirees have home contents insurance, and 13% of the retirees directly participate in the financial market. The regular annual gross retirement income is AUD 38,060, and the average individual net wealth is AUD 560,000.

#### 4.2. Baseline Result: Objective Income Sufficiency Result

Table 5 presents the decomposition results on the differences in postretirement annuitized net wealth between Australian and New Zealand retirees, using three model specifications.<sup>11,12</sup> Column 1 presents the results that include the demographic traits, Column 2 includes the individual financial positions, and Column 3 includes both personal characteristics and individual financial positions. In Column 1, the coefficient of the differences in postretirement annuitized net wealth is 0.133, and the difference is statistically significant at the 1% level, highlighting the fact that Australian retirees have a 14% higher postretirement annuitized net wealth on average<sup>13</sup> than New Zealand retirees. This result is consistent with the literature (Dang et al. 2006): countries that provide less support for their ageing populations may have a higher poverty rate, as New Zealand has a more generous government pension. The −11.8% counterfactual gap in postretirement annuitized net wealth is due to the explained reasons illustrated by the personal characteristic control variables, and it reveals that these explained factors contribute a −89%<sup>14</sup> to the overall postretirement annuitized net wealth gap. The mean Australian postretirement annuitized net wealth is higher than New Zealand's, as the difference between the Australian and New Zealand averages is a positive value of 0.133. However, the value of demographic characteristics is better in New Zealand, as the explained difference is −0.118. In other words, while holding everything else consistent, Australian retirees are expected to gain a higher annuitized net wealth if they carry the same demographic traits as the New Zealand retirees. A further analysis in the “explained” factors reveal that “self-rated health” and “the living area” are the two major factors that contribute most to New Zealand retirees' postretirement annuitized net wealth, and the reasons can be explained from the mean value differences of each variable. This is supported by the summary statistics in Table 4 that New Zealand retirees enjoy a better health status score of 3.42, compared with 2.94 for Australian retirees. The living area can be explained in the same way, in that a higher proportion, specifically 67%, of New Zealand retirees live in major cities, while this ratio in Australia is 57%. New Zealand retirees enjoy better average demographic traits, even if they have lower postretirement annuitized net wealth. New Zealand retirees also have better education qualification than Australian retirees. Overall, New Zealand retirees enjoy better demographic traits in general, such as a better health status, being able to afford living in major cities, and a higher level of education.

Column 2 examines the influence of individual financial positions and decomposes the gaps among these individual financial characteristics, including bank accounts, principal residence, pension funds, mortgage, other debts, home contents insurance, income, wealth, and financial market participation. The results show that the overall annuitized net wealth difference is 7.8%, and the 25.8% counterfactual gap is due to individual financial positions. This indicates that the postretirement annuitized net wealth for Australian retirees is 8%<sup>15</sup> higher than that for New Zealand retirees, and the individual financial factors contribute 3.31<sup>16</sup> times of the postretirement annuitized net wealth difference between the two countries. It also reveals that Australian retirees have 29%<sup>17</sup> higher postretirement annuitized net wealth than New Zealand retirees, thanks to individual financial positions. Furthermore, the detailed decomposition in the explained part in Column 2 shows that principal residence and individual net wealth play a dominant role in Australian retirees' retirement savings, and each factor stands for almost half of the overall postretirement

annuitized net wealth gap. Australia has a higher rate of homeownership, at 81%, in our sample, while New Zealand's ratio is 60%, as shown in Table 4.<sup>18</sup> The pension systems between the two countries affect the incentives in this homeownership gap as Australia's means-tested age pension allows for a generous exemption for the asset test for homeowner retirees, encouraging Australians to buy a principal residence. Moreover, part 5 of the retirement income review's final report in 2021<sup>19</sup> shows that financial incentives, such as the capital gains tax concession, applying to the home purchase decisions and other nonfinancial factors (such as a sense of security, stability, and belonging), are also influential drivers of investing in a principal residence.<sup>20</sup> This higher homeownership improves retirees' overall individual assets, and in turn, Australian retirees have a higher level of individual net wealth. Australian retirees also possess a better average situation of other debts and financial market participation, while New Zealand retirees are better off in pension funds.

**Table 5.** Postretirement annuitized net wealth decomposition in Australia and New Zealand.

Dependent Variable		Annuitized Net Wealth1	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Difference	0.133 *** (4.98)	0.078 ** (2.86)	0.080 ** (2.89)
Explained	−0.118 *** (−7.53)	0.258 *** (10.98)	0.305 *** (11.23)
Unexplained	0.250 *** (9.27)	−0.180 *** (−6.42)	−0.225 *** (−7.91)
Explained			
Age	−0.0001 (−0.02)		−0.024 * (−2.39)
Gender	−0.002 (−1.56)		−0.001 (−0.63)
Living_Area	−0.025 *** (−5.37)		−0.010 *** (−3.93)
Employment_Status	−0.006 (−1.00)		0.007 * (2.29)
Self_Rated_Health	−0.072 *** (−7.15)		−0.020 ** (−3.16)
Highest_Education	−0.012 * (−2.29)		−0.002 (−1.72)
With_Partner	−0.0002 (−0.31)		−0.005 (−1.78)
Bank_Accounts		−0.001 (−1.18)	−0.001 (−1.60)
Principal_Residence		0.127 *** (9.56)	0.143 *** (10.40)
Pension_Funds		−0.037 *** (−3.60)	0.068 *** (6.62)
Mortgage		−0.003 (−1.76)	−0.002 (−1.66)
Other_Debts		0.025 *** (3.92)	0.009 (1.60)
Home_Content_Insurance		0.003 (1.60)	0.008 * (2.31)
Gross_Retirement_Income		−0.002 * (−2.10)	−0.001 (−0.76)
Individual_Net_Wealth		0.125 *** (8.25)	0.120 *** (8.30)
Financial_Market_Participation		0.022 *** (5.32)	0.016 *** (4.51)

Table 5. Cont.

Dependent Variable		Annuitized Net Wealth1	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Unexplained			
Age	0.138 (0.42)		0.938 *** (3.25)
Gender	−0.001 (−0.04)		0.018 (1.03)
Living_Area	0.159 *** (4.87)		0.074 *** (3.47)
Employment_Status	−0.046 (−0.70)		−0.03 (−0.66)
Self_Rated_Health	0.163 (1.74)		0.167 * (2.31)
Highest_Education	0.001 (0.01)		0.023 (0.56)
With_Partner	−0.025 (−0.72)		−0.051 * (−2.05)
Bank_Accounts		−0.352 * (−2.22)	−0.348 * (−2.34)
Principal_Residence		0.252 *** (6.57)	0.298 *** (8.27)
Pension_Funds		−0.004 (−0.62)	0.019 ** (3.03)
Mortgage		0.003 (0.85)	0.005 (1.45)
Other_Debts		−0.013 (−0.72)	−0.015 (−0.82)
Home_Content_Insurance		−0.253 *** (−3.09)	−0.16 (−1.91)
Gross_Retirement_Income		−0.048 ** (−2.75)	−0.085 *** (−4.15)
Individual_Net_Wealth		−0.063 *** (−3.08)	−0.090 *** (−4.55)
Financial_Market_Participation		0.001 (0.10)	0.001 (0.12)
Constant	−0.139 (−0.37)	0.297 (1.61)	−0.988 *** (−2.78)
Obs of Australia	3078	3191	2958
Obs of NZ	2115	1788	1768

This table presents the decomposition result over the mean value of annuitized net wealth measured by postretirement wealth, and there are three groups of variables with three regressions. The first result decomposes only the overall annuitized net wealth shown in logarithm values over demographic traits, including Age, which is the age of retirees; Gender, which equals to one if the retiree is a male and zero otherwise; Living\_Area, which equals to one if the retiree lives in a major city and zero otherwise. Employment\_Status, which equals to one if the retirees do not work, two if the retirees work part time, and three if they work full time; Self\_Rated\_Health, which is the retirees' self-perception of their health conditions, ranging from one to five, from poor to excellent; Highest\_Education, which is the highest education level achieved by the retiree that equals one if it is 12 years or less, two if the retiree has a certificate or diploma, and three if the retiree has a university degree; With\_Partner, which is a dummy variable that equals one if the retiree is living with a partner and zero otherwise. The second result decomposes the overall annuitized net wealth difference over individual financial positions, including Bank\_Accounts, which is a dummy variable that equals to one if the retirees have savings in their bank accounts and zero otherwise; Principal\_Residence, which equals to one if the retirees have a principal residence and zero otherwise; Pension\_Funds, which is a dummy variable if the retirees have pension funds and zero otherwise; Mortgages, which is a dummy variable if the retirees have mortgages left and zero otherwise; Home\_Content\_Insurance, which is a dummy variable if the retirees have insurance and zero otherwise; Financial\_Market\_Participation, which is a dummy variable if the retirees have income or dividends from stocks, funds, and trusts; Gross\_Retirement\_Income, which is the retiree's annual before-tax retirement income, in thousands AUD; and Individual\_Net\_Wealth, which is the individual retiree's net wealth, in millions AUD, which is overall assets minus debts. The third set of results includes all the variables in the first and second sets of results. The *t*-statistics are in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Column 3 focuses on the unexplained differences, and the decomposition includes all the demographic and individual financial factors. In Column 3, the overall difference is 8%, indicating that Australian retirees possess a higher postretirement annuitized net wealth than the New Zealand retirees. The unexplained reason accounts for  $-22.5\%$ , showing that unobserved influences both within and between each country contribute to  $-2.81^{21}$  times the overall postretirement annuitized net wealth difference. This implies that New Zealand retirees benefit from those unexplained factors given that the value is negative. Following [Sierminska and Doorley \(2018\)](#), this unexplained part of the gap varies across countries and may be caused by institutional differences and other unmeasurable factors, such as culture. As our research targets retirees, the design of the pension systems is the major difference, and the institutional difference can largely be explained by the differences in pension systems between Australia and New Zealand.

The unobserved factors of age and homeownership are two major influences that result in high wealth accumulation for Australian retirees. As shown in Table A3 of Appendix A, with the separate regressions in each country, the coefficients in age and principal residence are significantly positive, and the influences are stronger in Australia. The different structures of the pension systems between the two countries can largely explain this phenomenon. The factor that influences postretirement annuitized net wealth mainly lies in the remaining life expectancy in New Zealand in that the older retirees are more likely to have higher postretirement annuitized net wealth for a short life expectancy compared with younger retirees. However, this scenario becomes more complicated in Australia because of the means-tested age pension. The older retirees with more wealth accumulation have a higher potential to fail in the means-tested age pension. On the other hand, “age” in New Zealand only works through the remaining life expectancy, while “age” also potentially influences the qualification for the government pension in Australia. The architecture of the government pensions can further explain the influence on homeownership following the same rationale. Homeowners have a higher level of assets according to the asset test for the government pension in Australia, while there is no such test in New Zealand.<sup>22</sup> Principal residence not only increases an individual’s net wealth but also loosens the rules for government pension eligibility in Australia. Therefore, certain unobserved factors that may have impact on living area, self-rated health, and pension funds could significantly benefit Australian retirees.

Moreover, other unobserved factors may have certain impacts on the partnership status, bank account savings, gross retirement income, and individual net wealth, which may improve New Zealand retirees’ savings. New Zealand retirees qualify for the government pension regardless of how much they are currently earning and are only subject to the residency test with certain requirements. The extra pension received can help retirees achieve better retirement income sufficiency. In contrast, the higher income reduces Australian retirees’ chances to receive the government pension. As a result, partnership status, gross retirement income, and individual net wealth are hurdles for government pension qualification in Australia.

Table 6 shows the decomposition results of preretirement annuitized net wealth: Column 1 contains demographic traits, Column 2 contains individual financial positions, and Column 3 contains all the control variables. The results are mainly consistent with those from postretirement annuitized net wealth. Demographic traits and unobserved factors help New Zealand retirees to accumulate more wealth, while individual financial positions benefit Australians more.

In conclusion, the post- and preretirement annuitized net wealth decomposition results reveal that the retiree income sufficiency gap would be wider if Australian retirees applied similar demographic traits and had the same pension system as that in New Zealand. New Zealand possesses better average demographic traits and a better pension system for retirees. In contrast, Australians have better average individual financial positions, and Australian retirees contribute more to their post- and preretirement wealth accumulations.



**Table 6.** Preretirement annuitized net wealth decomposition in Australia and New Zealand.

Dependent Variable		Annuitized Net Wealth2	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Difference	0.509 *** (10.08)	0.349 *** (6.87)	0.364 ** (7.10)
Explained	−0.242 *** (−9.29)	0.772 *** (16.76)	0.790 *** (15.48)
Unexplained	0.751 *** (15.63)	−0.423 *** (−8.73)	−0.427 *** (−8.91)
Explained			
Age	−0.003 (−0.25)		−0.037 * (−2.57)
Gender	−0.001 (−0.39)		−0.001 (−0.54)
Living_Area	−0.039 *** (−4.84)		−0.017 *** (−4.11)
Emploment_Status	−0.043 *** (−4.82)		−0.015 *** (−3.37)
Self_Rated_Health	−0.145 *** (−7.80)		−0.045 *** (−4.47)
Highest_Education	−0.021 * (−2.14)		−0.005 (−1.89)
With_Partner	0.008 (1.23)		−0.004 (−1.65)
Bank_Accounts		0.001 (0.20)	0.001 (0.32)
Principal_Residence		0.402 *** (11.83)	0.435 *** (12.40)
Pension_Funds		0.111 *** (7.03)	0.247 *** (13.82)
Mortgage		−0.004 (−1.94)	−0.003 (−1.83)
Other_Debts		0.046 *** (4.89)	0.028 *** (3.32)
Home_Content_Insurance		0.017 * (2.48)	0.029 *** (3.45)
Gross_Retirement_Income		−0.001 (−1.05)	−0.001 (−0.80)
Individual_Net_Wealth		0.156 *** (8.03)	0.144 *** (8.05)
Financial_Market_Participation		0.045 *** (6.70)	0.035 *** (5.80)
Unexplained			
Age	−1.552 ** (−2.68)		0.485 (1.16)
Gender	0.009 (0.18)		0.039 (1.33)
Living_Area	0.332 *** (5.30)		0.117 *** (2.94)
Employment_Status	0.046 (0.49)		0.126 (1.78)
Self_Rated_Health	0.089 (0.52)		0.037 (0.34)
Highest_Education	−0.234 * (−2.23)		−0.07 (−1.05)
With_Partner	−0.089 (−1.30)		−0.185 *** (−4.58)

Table 6. Cont.

Dependent Variable		Annuitized Net Wealth2	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Bank_Accounts		−0.869 * (−2.18)	−0.883 * (−2.31)
Principal_Residence		0.744 *** (10.09)	0.814 *** (11.34)
Pension_Funds		0.036 ** (3.06)	0.066 *** (5.75)
Mortgage		0.015 * (2.29)	0.01 (1.59)
Other_Debts		−0.077 ** (−2.90)	−0.073 *** (−2.90)
Home_Content_Insurance		−0.774 *** (−5.55)	−0.465 *** (−3.43)
Gross_Retirement_Income		−0.018 (−0.58)	−0.052 (−1.39)
Individual_Net_Wealth		−0.230 *** (−5.92)	−0.266 *** (−6.88)
Financial_Market_Participation		−0.002 (−0.17)	0.003 (0.38)
Constant	2.151 *** (3.13)	0.753 (1.69)	−0.129 (−0.21)
Obs of Australia	3052	3161	2932
Obs of NZ	2091	1771	1752

This table presents the decomposition result over the mean value of preretirement annuitized net wealth, and there are three groups of variables with three regressions. The first result decomposes only the annuitized net wealth shown in logarithm values over demographic traits, including Age, which is the age of retirees; Gender, which equals to one if the retiree is a male and zero otherwise; Living\_Area, which equals to one if the retiree lives in a major city, and zero otherwise. Employment\_Status, which equals to one if the retirees do not work, two if the retirees work part time and three if they work full time; Self\_Rated\_Health, which is the retirees' self-perception of their health conditions, ranging from one to five, from poor to excellent; Highest\_Education, which is the highest education level achieved by the retiree that equals one if it is 12 years or less, two if the retiree has a certificate or diploma, and three if the retiree has a university degree; and With\_Partner, which is a dummy variable that equals one if the retiree is living with a partner and zero otherwise. The second result decomposes the annuitized net wealth difference over individual financial positions, including Bank\_Accounts, which is a dummy variable that equals to one if the retirees have savings in their bank accounts and zero otherwise; Principal\_Residence, which equals to one if the retirees have a principal residence and zero otherwise; Pension\_Funds, which is a dummy variable if the retirees have pension funds and zero otherwise; Mortgages, which is a dummy variable if the retirees have mortgages left and zero otherwise; Home\_Content\_Insurance, which is a dummy variable if the retirees have insurance and zero otherwise; Financial\_Market\_Participation, which is a dummy variable if the retirees have income or dividends from stocks, funds, and trusts; Gross\_Retirement\_Income, which is the retiree's annual before-tax retirement income, in thousands AUD; and Individual\_Net\_Wealth, which is the individual retiree's net wealth, in millions AUD, which is overall assets minus debts. The third set of results includes all the variables in the first and second sets of results. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

#### 4.3. Baseline Result: Subjective Wellbeing Result

Subjective wellbeing is an alternative way to measure retiree income sufficiency, which focuses on retirees' self-rated happiness (Bonsang and Klein 2012; Tibesigwa et al. 2016). In this paper, we use two subjective wellbeing values, including financial situation satisfaction and life satisfaction. A dummy variable is used for financial situation satisfaction, where retirees who have more than enough income for their daily expenses are considered as 1 and retirees with just enough or not enough income for daily costs are considered as 0. We also use overall life satisfaction as another subjective measurement: if retirees factor in everything in their lives, those who can just get by or are in a worse situation are assigned as 0 and those can do better than average are assigned as 1. The nonlinear Blinder–Oaxaca decomposition method is used to deal with binary-dependent variables.

We carry out the same procedure as in Section 4.2, using nonlinear regressions, and the results are presented in Table 7 for financial situation satisfaction decomposition and

in Table 8 for life satisfaction. The financial situation satisfaction results in the first row of Table 7 reveal that Australia and New Zealand do not significantly differ in satisfaction on how their income can meet their daily costs, even if the gap in objective annuitized net wealth measures are statistically significant. However, demographic traits in Column 1, personal financial positions in Column 2, and pension system differences in Column 3 are all statistically significant. The results are mainly consistent with the objective decomposition results: better demographic traits (mainly from self-rated health) and the better pension system improves New Zealand retirees' financial situation satisfaction, while individual financial positions (pension funds, other debts, and individual net wealth) benefit Australian retirees.

**Table 7.** Retiree financial situation satisfaction decomposition in Australia and New Zealand.

Dependent Variable		Financial Situation Satisfaction	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Difference	0.024 (1.81)	0.022 (1.54)	0.018 (1.26)
Explained	−0.046 *** (−8.74)	0.109 *** (9.82)	0.066 *** (5.12)
Unexplained	0.070 *** (5.56)	−0.087 *** (−5.66)	−0.048 ** (−3.03)
Explained			
Age	−0.003 (−1.83)		−0.027 * (−2.28)
Gender	0.0002 (0.72)		0.0002 (0.67)
Living_Area	0.0002 (0.19)		0.003 ** (2.67)
Emploment_Status	−0.001 (−10.26)		0.003 (1.90)
Self_Rated_Health	−0.043 *** (−10.26)		−0.024 *** (−7.76)
Highest_Education	−0.003 * (−2.16)		−0.0004 (−0.95)
With_Partner	0.003 (1.71)		0.002 (1.67)
Bank_Accounts		0.001 (1.31)	0.0004 (0.98)
Principal_Residence		0.008 * (2.05)	0.001 (0.16)
Pension_Funds		0.020 ** (3.13)	0.017 ** (2.71)
Mortgage		−0.001 (−1.43)	−0.001 (−1.46)
Other_Debts		0.025 *** (6.79)	0.019 *** (5.68)
Home_Content_Insurance		0.004 ** (2.90)	0.002 * (2.08)
Gross_Retirement_Income		0.009 ** (3.01)	0.009 ** (2.92)
Individual_Net_Wealth		0.036 *** (2.90)	0.033 *** (5.06)
Financial_Market_Participation		0.009 ** (2.94)	0.005 (1.89)

Table 7. Cont.

Dependent Variable		Financial Situation Satisfaction	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Unexplained			
Age	−0.135 (−1.02)		0.041 (0.19)
Gender	−0.004 (−0.41)		−0.002 (−0.13)
Living_Area	−0.0112 (−0.75)		−0.043 (−1.50)
Employment_Status	−0.088 ** (−3.01)		−0.157 (−1.95)
Self_Rated_Health	0.118 *** (3.30)		0.175 (1.95)
Highest_Education	−0.002 (−0.08)		−0.042 (−0.91)
With_Partner	0.02 (1.43)		0.037 (−1.27)
Bank_Accounts		−0.015 (−0.16)	−0.022 (−0.18)
Principal_Residence		0.01 (0.46)	−0.016 (−0.53)
Pension_Funds		0.011 (1.72)	0.012 (1.38)
Mortgage		0.002 (0.54)	0.004 (0.86)
Other_Debts		−0.045 *** (−3.35)	−0.050 * (−2.13)
Home_Content_Insurance		−0.024 (−0.70)	−0.022 (−0.47)
Gross_Retirement_Income		−0.014 (−0.45)	0.034 (0.57)
Individual_Net_Wealth		−0.005 (−0.19)	0.015 (0.39)
Financial_Market_Participation		−0.001 (−0.07)	−0.001 (−0.16)
Constant	0.173 (1.11)	−0.007 (−0.07)	−0.011 (−0.04)
Obs of Australia	3048	2982	2933
Obs of NZ	1827	1789	1769

This table presents the decomposition result over the mean value of financial situation satisfaction, and there are three groups of variables with three regressions. The first result decomposes only the financial situation satisfaction over demographic traits, including Age, which is the age of retirees; Gender, which equals to one if the retiree is a male and zero otherwise; Living\_Area, which equals to one if the retiree lives in a major city and zero otherwise. Employment\_Status, which equals to one if the retirees do not work, two if the retirees work part time, and three if they work full time; Self\_Rated\_Health, which is the retirees' self-perception of health conditions, ranging from one to five, from poor to excellent; Highest\_Education, which is the highest education level achieved by the retiree that equals one if it is 12 years or less, two if the retiree has a certificate or diploma, and three if the retiree has a university degree; and With\_Partner, which is a dummy variable that equals one if the retiree is living with a partner and zero otherwise. The second result decomposes the overall annuitized net wealth difference over personal financial positions, including Bank\_Accounts, which is a dummy variable that equals to one if the retirees have savings in their bank accounts and zero otherwise; Principal\_Residence, which equals to one if the retirees have a principal residence and zero otherwise; Pension\_Funds, which is a dummy variable if the retirees have pension funds and zero otherwise; Mortgages, which is a dummy variable if the retirees have mortgages left and zero otherwise; Home\_Content\_Insurance, which is a dummy variable if the retirees have insurance and zero otherwise; Financial\_Market\_Participation, which is a dummy variable if the retirees have income or dividends from stocks, funds, and trusts; Gross\_Retirement\_Income, which is the retiree's regular weekly average before-tax retirement income, in thousands AUD; and Individual\_Net\_Wealth, which is the individual retiree's net wealth, in millions AUD, which is overall assets minus debts. The third set of results includes all the variables in the first and second sets of results. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 8.** Retiree life satisfaction decomposition in Australia and New Zealand.

Dependent Variable		Life Satisfaction	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Difference	−0.046 *** (−4.50)	−0.058 *** (−5.65)	−0.052 *** (−5.00)
Explained	−0.028 *** (−7.07)	0.070 *** (8.35)	0.046 *** (4.59)
Unexplained	−0.018 (−1.83)	−0.128 *** (−9.45)	−0.097 *** (−6.90)
Explained			
Age	−0.002 (−1.73)		−0.002 * (−2.18)
Gender	0.0001 (0.60)		0.0001 (0.53)
Living_Area	0.001 (1.26)		0.003 * (2.10)
Employment_Status	−0.0003 (−0.19)		0.002 (1.24)
Self_Rated_Health	−0.028 *** (−8.48)		−0.020 *** (−6.11)
Highest_Education	−0.001 (−1.44)		0.0003 (0.77)
With_Partner	0.002 (1.75)		0.001 (1.63)
Bank_Accounts		0.001 (1.62)	0.001 (1.36)
Principal_Residence		0.007 * (2.06)	0.002 (0.63)
Pension_Funds		0.019 ** (2.98)	0.020 ** (2.87)
Mortgage		−0.001 (−1.59)	−0.001 (−1.52)
Other_Debts		0.021 *** (6.23)	0.018 *** (5.46)
Home_Content_Insurance		0.002 * (2.30)	0.003 * (2.53)
Gross_Retirement_Income		0.004 * (2.46)	0.005 * (2.51)
Individual_Net_Wealth		0.012 ** (2.60)	0.011 * (2.30)
Financial_Market_Participation		0.004 (1.57)	0.002 (0.91)
Unexplained			
Age	0.029 (0.33)		0.12 (0.81)
Gender	0.002 (0.23)		0.0003 (0.03)
Living_Area	0.005 (0.47)		0.005 (0.26)
Employment_Status	−0.072 *** (−3.38)		−0.181 *** (−5.16)
Self_Rated_Health	0.005 (0.17)		−0.03 (−0.70)
Highest_Education	0.03 (1.62)		0.004 (0.12)
With_Partner	−0.002 (−0.26)		−0.011 (−0.72)



Table 8. Cont.

Dependent Variable		Life Satisfaction	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Bank_Accounts		0.096 (1.06)	0.126 (1.43)
Principal_Residence		0.007 (0.35)	−0.003 (−0.17)
Pension_Funds		0.014 * (2.19)	0.016 ** (2.64)
Mortgage		−0.0004 (−0.12)	0.002 (0.64)
Other_Debts		−0.045 *** (−3.84)	−0.034 ** (−3.07)
Home_Content_Insurance		0.004 (0.11)	0.04 (1.31)
Gross_Retirement_Income		0.023 (1.10)	0.067 ** (3.15)
Individual_Net_Wealth		0.029 (1.65)	0.019 (1.09)
Financial_Market_Participation		0.004 (0.65)	0.001 (0.28)
Constant	−0.133 (−0.13)	−0.257 ** (−2.67)	−0.238 (−1.25)
Obs of Australia	3081	3192	2961
Obs of NZ	1827	1789	1769

This table presents the decomposition result over the mean value of the life satisfaction, and there are three groups of variables with four regressions. The first result decomposes only the life satisfaction over demographic traits, including Age, which is the age of retirees; Gender, which equals to one if the retiree is a male and zero otherwise; Living\_Area, which equals to one if the retiree lives in a major city and zero otherwise. Employment\_Status, which equals to one if the retirees do not work, two if the retirees work part time, and three if they work full time; Self\_Rated\_Health, which is the retirees' self-perception of health conditions, ranging from one to five, from poor to excellent; Highest\_Education, which is the highest education level achieved by the retiree at the time of the interview that equals one if it is 12 years or less, two if the retiree has a certificate or diploma, and three if the retiree has a university degree; and With\_Partner, which is a dummy variable that equals one if the retiree is living with a partner and zero otherwise. The second result decomposes the life satisfaction difference over personal financial positions, including Bank\_Accounts, which is a dummy variable that equals to one if the retirees have savings in their bank accounts and zero otherwise; Principal\_Residence, which equals to one if the retirees have a principal residence and zero otherwise; Pension\_Funds, which is a dummy variable if the retirees have pension funds and zero otherwise; Mortgages, which is a dummy variable if the retirees have mortgages left and zero otherwise; Home\_Content\_Insurance, which is a dummy variable if the retirees have insurance and zero otherwise; Financial\_Market\_Participation, which is a dummy variable if the retirees have income or dividends from stocks, funds, and trusts; Gross\_Retirement\_Income, which is the retiree's regular weekly average before-tax retirement income, in thousands AUD; and Individual\_Net\_Wealth, which is the individual retiree's net wealth, in millions AUD, which is overall assets minus debts. The third set of results includes all the variables in the first and second sets of results, and the last result uses an instrumental variable for Financial\_Market\_Participation. The *t*-statistics are in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8 presents the decomposition results of life satisfaction. Interestingly, New Zealand retirees have a significantly higher mean value of the life satisfaction, which confirms what we have found in the literature (Alan et al. 2008): life satisfaction and financial wellbeing show different results. The first row shows that the Australian retiree's average life satisfaction minus the New Zealand retiree's average is negative, and the difference is statistically significant at the 1% level, which highlights New Zealand retirees' better life satisfaction on average. Demographic traits explain 61%<sup>23</sup> of the overall life satisfaction difference between Australian retirees and New Zealand retirees in Column 1, and individual financial positions contribute to 1.21<sup>24</sup> times the overall difference for Australia in Column 2. In Column 3, the pension system improves New Zealand retirees' life satisfaction.

Our results in this section suggest that retirees do not exhibit a significant difference in financial satisfaction in the two countries, and New Zealand retirees have relatively higher life satisfaction on average. Australian retirees gain more subjective wellbeing satisfaction from individual financial positions, and the demographic traits and pension system benefit New Zealand retirees more. Furthermore, the universal pension system raises New Zealand retirees' life satisfaction to a higher level than that of Australian retirees.

## 5. Further Analysis

### 5.1. Alternative Annuitized Net Wealth Measurement

In this section, we use the relative annuitized net wealth ratios as alternative ways to measure retiree income sufficiency. The results in Table 9 use the national poverty line as the benchmark, as in Butrica et al. (2007), and the results in Table 10 use the regional median income as the benchmark.

Table 9's Panel A is the decomposition result of the ratio of postretirement annuitized net wealth to the national poverty line, and Panel B is the result of the ratio of preretirement annuitized net wealth to the national poverty line. The results reveal that there is no statistically significant difference in both annuitized net wealth ratios between New Zealand and Australia. The demographic traits, individual financial positions, and pension systems also contribute in the same manner as for the main results. New Zealand retirees enjoy better demographic traits and a better pension system, while Australian retirees possess better individual financial positions on average. These results imply that Australian and New Zealand retirees have similar income sufficiency when using the national poverty line as the benchmark.

**Table 9.** Retiree relative income sufficiency decomposition in Australia and New Zealand (compared with the national poverty line).

Dependent Variable	Relative Retiree Income Sufficiency (Benchmark: the National Poverty Line)		
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
	Panel A: Annuitized Net Wealth1		
Difference	−0.086 (−0.61)	−0.193 (−1.28)	−0.208 (−1.36)
Explained	−0.371 *** (−6.45)	0.303 *** (3.30)	0.653 *** (6.56)
Unexplained	0.285 (1.92)	−0.496 *** (−4.30)	−0.861 *** (−7.85)
Obs of Australia	3083	3196	2963
Obs of NZ	2124	1792	1772
	Panel B: Annuitized Net Wealth2		
Difference	0.353 * (2.50)	0.254 (1.67)	0.249 (1.61)
Explained	−0.429 *** (−7.33)	0.463 *** (4.87)	0.748 *** (7.33)
Unexplained	0.782 *** (5.23)	−0.209 (−1.83)	−0.499 *** (−4.59)
Obs of Australia	3083	3196	2963
Obs of NZ	2124	1792	1772

This table presents the relative retiree income sufficiency decomposition results, and the annuitized net wealth is compared with national poverty lines. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth compared with the national poverty lines, and Panel B reports the results of preretirement annuitized net wealth compared with the national poverty lines. The *t*-statistics are in parentheses. \*\*\* and \* indicate statistical significance at the 1% and 10% levels, respectively.

We also apply the regional median income with more variations as the benchmark, to carry out the same decomposition. Table 10 shows the decomposition results of the ratios of annuitized net wealth to the regional median incomes, in Panels A and B for the post- and preretirement annuitized net wealth values, respectively. Panel A indicates that Australian and New Zealand retirees do not have a statistically significant difference in their postretirement annuitized net wealth ratio. Panel B shows a higher average preretirement annuitized net wealth ratio in Australia than in New Zealand, and the difference is statistically significant at the 1% level. The explained and unexplained parts are consistent with the main results: New Zealand retirees enjoy better demographic traits and a better pension system, while Australian retirees have better individual financial positions. Our results suggest that Australian and New Zealand retirees can maintain similar levels of postretirement lifestyles. Furthermore, Australian retirees maintain a better level of retirement life compared with the New Zealand retirees when measured by the preretirement annuitized net wealth, implying a higher level of preretirement wealth among Australian retirees.

**Table 10.** Retiree relative income sufficiency decomposition in Australia and New Zealand (compared with the regional median incomes).

Dependent Variable	Relative Retiree Income Sufficiency (Benchmark: the Regional Median Income)		
	Controlled Variables	Demographic Traits	Individual Financial Positions
			Overall Factors
		Panel A: Annuitized net wealth1	
Difference		0.119 (1.86)	0.064 (0.91)
Explained		−0.171 *** (−6.30)	0.148 *** (3.39)
Unexplained		0.290 *** (4.25)	−0.084 (−1.52)
Obs of Australia		3083	3192
Obs of NZ		2124	1792
		Panel B: Annuitized net wealth2	
Difference		0.283 *** (4.38)	0.233 *** (3.31)
Explained		−0.199 *** (−7.22)	0.224 *** (4.97)
Unexplained		0.482 *** (6.98)	0.009 (0.17)
Obs of Australia		3083	3196
Obs of NZ		2124	1792

This table presents the relative retiree income sufficiency decomposition results, and annuitized net wealth is compared with the regional median incomes. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement overall annuitized net wealth compared with the regional median incomes, and Panel B reports the results of preretirement annuitized net wealth compared with the regional median incomes. The *t*-statistics are in parentheses. \*\*\* and \*\* indicate statistical significance at the 1%, and 5% levels, respectively.

## 5.2. Alternative Distributional Decomposition Method

In Australia, retirees located in the lower financial conditions qualify for the means-tested government pension; therefore, retirees in different quantiles of the wealth level may reveal certain differences. Table 11 presents the results of retirees in the bottom 10% of the wealth level, and the results of the top 10% are presented in Table 12. Following Firpo et al. (2009), the unconditional quantile regression is applied to estimate the effect of the change in the distribution of the independent variables on the marginal quantiles by using the recentred influence function (RIF). The influence function illustrates the effect of an individual observation on distributional statistics. Table 11's Panel A indicates that the bottom 10% wealth group in both countries do not have any significant difference

in their postretirement annuitized net wealth values. However, the results in Panel B reveal that Australian retirees enjoy a higher preretirement annuitized net wealth than New Zealand retirees, and the difference is statistically significant at the 1% level. For the top 10% wealth retirees' group, the results in Table 12 suggest that retirees in Australia have significantly higher annuitized net wealth than New Zealand retirees. These results indicate that wealthy Australian retirees have higher income sufficiency than New Zealand wealthy retirees according to both post- and preretirement wealth values. Demographic traits, individual financial positions, and pension systems maintain the same as in the main results. Consistent with our main results, demographic traits and the pension system benefit New Zealand retirees more, while individual financial positions improve the retirement situation for Australian retirees, in both the bottom 10% and top 10% wealth levels.

We also employ a two-stage method to decompose the differences between the retirees in both countries (Firpo et al. 2018) to conduct a further robustness test on our main findings. In the first stage, distributional changes are divided into a wealth structure effect and a composition effect by using a reweighting method. In the second stage, these components are decomposed into each respective covariate by using RIF regression. This method is a much more flexible wealth-setting model and extends the decomposition to any distributional measure beyond the mean value. We apply this method to reweight the factors, and the results are presented in Table 13. All the results are consistent with our main results. Australian retirees have a better post- and preretirement annuitized net wealth value in Panel A and Panel B, and they benefit more from the individual financial positions. In contrast, New Zealand retirees have positive impacts from the demographic characteristics and pension system. These results confirm that our main results are robust.

**Table 11.** Other distributional decomposition methods (bottom 10%).

Dependent Variable		Annuitized Net Wealth	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
	Panel A: Annuitized Net Wealth1		
Difference	0.018 (0.68)	−0.052 (−1.93)	−0.052 (−1.92)
Explained	−0.043 ** (−2.72)	0.253 *** (10.54)	0.307 *** (10.18)
Unexplained	0.061 * (2.12)	−0.304 *** (−8.32)	−0.360 *** (−8.83)
Obs of Australia	3078	3191	2958
Obs of NZ	2116	1788	1768
	Panel B: Annuitized Net Wealth2		
Difference	1.037 *** (5.31)	0.545 ** (2.66)	0.611 ** (2.87)
Explained	−0.647 *** (−5.63)	3.467 *** (14.33)	3.712 *** (13.49)
Unexplained	1.684 *** (8.84)	−2.922 *** (−10.67)	−3.101 *** (−10.48)
Obs of Australia	3052	3161	2932
Obs of NZ	2091	1771	1752

This table presents the retiree income sufficiency decomposition results using RIF (recentred influence function) decomposition. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth, and Panel B reports the results of preretirement annuitized net wealth. The *t*-statistics are in parentheses. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 12.** Other distributional decomposition methods (top 10%).

Dependent Variable		Annuitized Net Wealth	
Controlled Variables	Demographic Traits	Individual Financial Positions	Overall Factors
Panel A: Annuitized Net Wealth1			
Difference	0.201 *** (4.62)	0.176 *** (3.98)	0.167 *** (3.70)
Explained	−0.138 *** (−6.00)	0.073 * (2.00)	0.161 *** (3.74)
Unexplained	0.339 *** (6.94)	0.104 ** (2.83)	0.007 (0.17)
Obs of Australia	3078	3191	2958
Obs of NZ	2116	1788	1768
Panel B: Annuitized Net Wealth2			
Difference	0.340 *** (6.78)	0.314 *** (6.07)	0.309 *** (5.89)
Explained	−0.155 *** (−6.24)	0.084 * (2.09)	0.174 *** (3.73)
Unexplained	0.495 *** (8.88)	0.230 * (5.47)	0.134 ** (2.98)
Obs of Australia	3052	3161	2932
Obs of NZ	2091	1771	1752

This table presents the retiree income sufficiency decomposition results using RIF (recentred influence function) decomposition. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth, and Panel B reports the results of preretirement annuitized net wealth. The *t*-statistics are in parentheses. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 13.** Recentred influence function decomposition.

Dependent Variable		Annuitized Net Wealth	
Controlled Variables	Demographic Traits	Financial Positions	Overall Factors
Panel A: Annuitized Net Wealth1			
Difference	0.133 *** (4.99)	0.078 ** (2.85)	0.080 ** (2.89)
Explained	−0.099 *** (−8.95)	0.349 *** (17.31)	0.360 *** (10.69)
Unexplained	0.232 *** (7.67)	−0.271 *** (−7.00)	−0.280 *** (−5.95)
Obs of Australia	3078	3191	2958
Obs of NZ	2116	1788	1768
Panel B: Annuitized Net Wealth2			
Difference	0.509 *** (10.09)	0.349 *** (6.88)	0.364 *** (7.11)
Explained	−0.198 *** (−10.19)	0.994 *** (21.77)	0.966 *** (12.52)
Unexplained	0.707 *** (12.71)	−0.645 *** (−8.28)	−0.602 *** (−6.05)
Obs of Australia	3052	3161	2932
Obs of NZ	2091	1771	1752

This table presents the retiree income sufficiency decomposition results using reweighting RIF (recentred influence function) decomposition. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth, and Panel B reports the results of preretirement annuitized net wealth. The *t*-statistics are in parentheses. \*\*\* and \*\* indicate statistical significance at the 1% and 5% levels, respectively.

### 5.3. Homeownership

Principal residence plays an important role in retirees' wealth accumulation, and the Australian pension system has an incentive to encourage individuals to purchase their



principal residence (property) in that the principal residence is excluded from the asset test for the government age pension. We therefore divide our sample into nonhomeowners and homeowners and carry out the same regressions; the results are presented in Table 14 for the nonhomeowner group and in Table 15 for the homeowner group. In Table 14, the results indicate that the nonhomeowner group in Australia has a lower average post- and preretirement annuitized net wealth than the New Zealand group. Demographic traits, individual financial positions, and the pension system all benefit retirees in New Zealand. These results confirm that principal residence is the main driver of Australian retirees' higher income sufficiency: Lu et al. (2020) show that housing is the largest part of the asset portfolio. Australian nonhomeowner retirees are also in a disadvantaged financial situation compared with New Zealand retirees.

**Table 14.** Retiree income sufficiency decomposition among nonhomeowners in Australia and New Zealand.

Dependent Variable	Annuitized Net Wealth among Nonhomeowners		
Controlled Variables	Demographic Traits	Financial Positions	Overall Factors
	Panel A: Annuitized Net Wealth1		
Difference	−0.578 *** (−8.12)	−0.613 *** (−8.65)	−0.643 *** (−8.63)
Explained	−0.093 (−1.81)	−0.458 *** (−5.01)	−0.368 *** (−3.56)
Unexplained	−0.486 *** (−6.09)	−0.155 (−1.58)	−0.275 * (−2.50)
Obs of Australia	522	596	516
Obs of NZ	828	657	646
	Panel B: Annuitized Net Wealth2		
Difference	−1.147 *** (−8.38)	−1.321 *** (−9.77)	−1.382 *** (−9.77)
Explained	−0.646 *** (−6.66)	−0.739 ** (−3.12)	−0.718 ** (−3.01)
Unexplained	−0.501 *** (−3.62)	−0.583 * (2.38)	−0.664 * (−2.86)
Obs of Australia	496	566	490
Obs of NZ	806	642	632

This table presents the retiree income sufficiency decomposition results among those nonhomeowners. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth, and Panel B reports the results of preretirement annuitized net wealth. The *t*-statistics are in parentheses. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In Table 15, the results suggest that Australian homeownership retirees have relatively higher post- and preretirement annuitized net wealth values than New Zealand retirees, and the difference is statistically significant at the 1% level. New Zealand retirees enjoy better average demographic traits, and Australian retirees benefit more from individual financial positions. Pension systems play certain roles in annuitized net wealth. The negative influence on Australian homeowners for postretirement annuitized net wealth is switched to a positive influence on preretirement annuitized net wealth. The unexplained part of the results indicates that the pension system drives New Zealand homeowners towards having higher postretirement wealth and promotes Australian homeowners towards having higher preretirement wealth. The overall homeownership subsample tests emphasize the importance of homeownership in Australia, and it plays a vital role in retirees' wealth accumulation. Pension systems play mixed roles in both annuitized net wealth measures between different groups. The different pension systems play a fundamental role in retirees' wealth accumulation processes.

**Table 15.** Retiree income sufficiency decomposition among homeowners in Australia and New Zealand.

Dependent Variable	Annuitized Net Wealth among Homeowners		
Controlled Variables	Demographic Traits	Financial Positions	Overall Factors
Panel A: Annuitized Net Wealth1 among Homeowners			
Difference	0.167 *** (7.18)	0.149 *** (6.26)	0.144 *** (5.97)
Explained	−0.116 *** (−7.22)	0.173 *** (8.95)	0.184 *** (8.19)
Unexplained	0.283 *** (13.01)	−0.243 (−1.22)	−0.041 ** (−2.65)
Obs of Australia	2465	2595	2442
Obs of Australia	1288	1131	1122
Panel B: Annuitized Net Wealth2 among Homeowners			
Difference	0.431 *** (13.69)	0.417 *** (12.80)	0.408 *** (12.40)
Explained	−0.167 *** (−8.51)	0.316 *** (12.82)	0.293 *** (10.32)
Unexplained	0.598 *** (20.84)	0.101 *** (3.61)	0.115 *** (5.28)
Obs of Australia	2465	2595	2442
Obs of NZ	1285	1129	1120

This table presents the retiree income sufficiency decomposition results among those homeowners. We present only the overall decomposition results, and we control all the variables as those in the main result. Panel A reports the results of postretirement annuitized net wealth, and Panel B reports the results of preretirement annuitized net wealth. The *t*-statistics are in parentheses and \*\*\* and \*\* indicate statistical significance at the 1% and 5% levels.

## 6. Conclusions

We used the 2018 survey data from the Household, Income, and Labour Dynamic (HILDA) in Australia and the Household Economic Survey (HES) in New Zealand to investigate the retirement income sufficiency in Australia and New Zealand. Our baseline results indicated that the annuitized net wealth was greater for Australian retirees than for New Zealand retirees. Further analysis concluded that New Zealand retirees enjoyed better demographic traits (i.e., self-rated health status, living in major cities, and higher level of education) and a better pension system, while Australian retirees hold better individual financial positions (i.e., homeownership). Even though Australian retirees have greater annuitized net wealth, the Australian pension system negatively contributes to Australia, while the New Zealand pension system positively contributes and raises the New Zealand retirees to a higher level of life satisfaction than that of Australian retirees. We also used two subjective wellbeing values as alternative ways to measure retiree income sufficiency, financial situation satisfaction, and life satisfaction. Using the nonlinear Blinder–Oaxaca decomposition method, our results were mainly consistent with the objective decomposition results: better demographic traits (mainly from self-rated health) and a better pension system improve New Zealand retirees' financial situation satisfaction, while individual financial positions (pension funds, other debts, and individual net wealth) benefit Australian retirees. We then used the relative annuitized net wealth ratio as an alternative way to measure retiree income sufficiency, and our results suggested that the demographic traits, individual financial positions, and pension systems also contributed in the same manner as for the main results.

Next, we divided our sample retirees into the top 10% and the bottom 10% on the basis of wealth levels, and an unconditional quantile regression was applied to estimate the impact of the change in the distribution of the independent variables on the marginal quantiles by using a recentred influence function (RIF). For the bottom 10% group, we did not find a significant difference in postretirement annuitized net wealth; however, Australian retirees had a higher preretirement annuitized net wealth than New Zealand retirees. For the top 10% wealth group, the results suggested that retirees in Australia

had significantly higher annuitized net wealth than New Zealand retirees. These results indicated that wealthy Australian retirees had higher income sufficiency than New Zealand wealthy retirees in both post- and preretirement wealth. Demographic traits and the pension system benefited New Zealand retirees more, while individual financial positions improve the retirement situation for Australian retirees.

A further robustness test was conducted by using homeownership to divide our sample into nonhomeowner and homeowner groups. The results indicated that the non-homeowner group in Australia had a lower average post- and preretirement annuitized net wealth than the same group in New Zealand. Demographic traits, individual financial positions, and the pension system all benefited retirees in New Zealand. These results confirmed that principal residence was the main driver for Australian retirees' higher income sufficiency. Australian nonhomeowner retirees are in a disadvantaged financial situation compared with New Zealand retirees. For the homeowner group, the results suggested that Australian homeowner retirees had relatively higher post- and preretirement annuitized net wealth values than New Zealand retirees. The unexplained part of the results indicated that the pension system drove New Zealand homeowners towards having higher postretirement wealth and promoted Australian homeowners towards having higher preretirement wealth. The overall homeownership subsample tests emphasized the importance of homeownership in Australia, and homeownership played a vital role in retirees' wealth accumulation. Pension systems played mixed roles in both annuitized net wealth measures between different groups.

Our research provides important implications for governments and individuals in Australia and New Zealand. The Australia government should apply a more generous pension system, such as by loosening the qualification rules for income and asset tests to improve retirees' life satisfaction levels. In addition, Australian retirees should also be educated to understand the special setting of the government pension to support disadvantaged retirees. However, homeownership should be encouraged in New Zealand to improve retirees' wealth accumulation. The government should promote the knowledge of KiwiSaver for the benefits of first-home purchasing,<sup>25</sup> and individuals should be educated to understand the significance of housing for their wealth accumulation during retirement life.

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## Appendix A

**Table A1.** Australia and New Zealand Pension System.

Pension System	Australia	New Zealand
Pillar 1	<p>Australia Age Pension Eligibility:</p> <ul style="list-style-type: none"> <li>a. Age: 66.5 years as of 1 July 2021, which will increase to 67 by 2023.</li> <li>b. Residency rules: generally, on the day that you claim age pension, you must be an Australian resident and in Australia (be a resident for at least 10 years without a break in the residence for at least 5 years).</li> <li>c. Asset test (asset threshold): (1) To obtain a full pension: For a single retiree, homeowners AUD 268,000 and nonhomeowners AUD 482,500; for a couple combined, for a couple separated owing to illness combined, and for a couple where one partner is eligible combined, AUD 401,500 for homeowners and AUD 616,000 for nonhomeowners. (2) To obtain a part pension: For a couple, one partner eligible combined and a couple combined, AUD 880,500 for homeowners and AUD 1,095,000 for nonhomeowners; for a couple, separated owing to illness combined AUD 1,037,000 for homeowners and AUD 1,251,500 for nonhomeowners; and for a single retiree, AUD 585,750 for homeowners and AUD 800,250 for nonhomeowners. (3) To obtain a transitional pension: For a single retiree, homeowners AUD 533,500 and nonhomeowners AUD 748,000; for a couple combined and a couple where one partner is eligible combined, AUD 830,000 for homeowners and AUD 1,044,500 for nonhomeowners; and for a couple, separated owing to illness combined, AUD 932,500 for homeowners and AUD 1,147,000 for nonhomeowners.</li> <li>d. Income test: (1) For a single person, up to AUD 178 per fortnight, and age pension will reduce by 50 cents for each dollar over AUD 178. (2) For a couple living together or separate owing to illness combined, up to AUD 316 per fortnight, and age pension will reduce by 50 cents for each dollar over AUD 316.</li> </ul>	<p>New Zealand Superannuation Eligibility:</p> <ul style="list-style-type: none"> <li>a. Age: 65 years or over (no increase planned).</li> <li>b. Residency rules: you must be a New Zealand citizen, a permanent resident, or hold a residence class visa; you are an ordinary resident in New Zealand, the Cook Island, Niue or Tokelau when you apply; you have lived in New Zealand for at least 10 years since your turned 20; you have lived in New Zealand the Cook Island, Niue, or Tokelau (or a combination of these) for at least 5 years since you turned 50.</li> <li>c. No asset or income tests.</li> </ul>
	<p>Payment:</p> <ul style="list-style-type: none"> <li>(1) Maximum normal basic rates: for a single, AUD 868.30 per fortnight; a couple combined, AUD 1309.00 per fortnight; and a couple apart owing to ill health, AUD 868.30 per fortnight.</li> <li>(2) Maximum transitional rates: for a single, AUD 782.20 per fortnight; couple combined, AUD 1263.60 per fortnight; and couple apart owing to ill health, AUD 782.20 per fortnight.</li> </ul>	<p>Payment:</p> <ul style="list-style-type: none"> <li>(1) Living alone or with a dependent child, NZD 1013.28; living with some else either 18 years or older or visiting and staying for more than 13 weeks, NZD 932.06 for a fortnight before tax.</li> <li>(2) Either both people of the couple or only one meets the criteria for NZ super, NZD 768.92 for each person for a fortnight before tax.</li> </ul>
	Tax: taxable but liability may be eliminated by tax offset for seniors.	Tax: taxable at a marginal rate.

Table A1. Cont.

Pension System	Australia	New Zealand
Pillar 2	<p>Australia employee superannuation</p> <p>Contribution: The current contribution rate is 10% as of 1 July 2021, and the rate will incrementally increase each year until 12% by 2025.</p> <p>Tax: Super contributions are taxed at 15% under the threshold of AUD 25,000, and the excess contributions are taxed at a marginal rate. Super earnings are taxed at a notional rate of 15%, but the actual rate is around 8% owing to imputation credits and capital gains. Super withdrawals: At the age of 60, tax free. Decumulation: Lump sums and account-based pensions (allocated pensions or phased withdrawals).</p>	<p>New Zealand KiwiSaver</p> <p>Contribution: The employer contribution rate is 3% minimum, and the employee contribution rate is 3% by default. But the employees can choose 4%, 6%, 8%, or 10%, and they can even choose to opt out.</p> <p>Tax: KiwiSaver contributions are after-tax payments, and the employees pay the tax by the income marginal rate. Super fund earnings are generally taxed at 28%. Super withdrawals: At the age of 65, tax free. Decumulation: Lump sums or regular amounts with no minimum withdrawals.</p>
Pillar 3	<p>Private superannuation funds: Individuals can contribute to their employee superannuation to make an extra contribution for their voluntary savings.</p>	<p>Private superannuation funds: KiwiSaver (Pillar 2) is a hybrid of Pillars 2 and 3 in that employees can choose the contribution rate.</p>

**Table A2.** Variable definitions.

Variables	Description
Annuitized Net Wealth1	The present value of the remaining years of government pensions is added to individual net wealth in 2018. The final value is the individual's overall net wealth, and this value is annuitized on the basis of the remaining life expectancy (according to gender and region in each country) and the discount rate (inflation-adjusted T-bill rate in 2018 in the respective country). The natural logarithm of overall annuitized net wealth is the final value for this variable.
Annuitized Net Wealth2	This value is the logarithm of annuitized net wealth without government pensions. The annuitized net wealth is the net wealth (at the time of interview) annuitized on the basis of the remaining life expectancy and the discount rate, as in the overall annuitized net wealth.
Financial Situation Satisfaction	For the income and daily cost, this is the sufficiency of income. Less than or just enough = 0, and more than enough = 1. For this question in New Zealand, only one person from each household answered the question, and we duplicated the answers for other members in the same household. In Australia, it is a direct answer from everyone in each household.
Overall life Satisfaction	Factoring in all parts of life (not limited to the questions asked in the survey), worse than or just average = 0 and better than average = 1.
Demographic traits	
Age	Individuals were 65 years or above in the 2017–2018 survey period in New Zealand, and those were aged 65 years or above as of 30 June 2018 in Australia.
Gender	Dummy variable, male = 1, female = 0.
Living Area	Living in major urban areas = 1, living elsewhere = 0 depending on the accessibility to services, according to the relative classifications in each country.
Employment Status	Not working = 1, working part time = 2, working full time = 3. In Australia, retiree works less than 35 h is considered part time, while in New Zealand, that time is 30 h.
Self-Rated Health	Self-assessed health status: poor = 1, fair = 2, good = 3, very good = 4, or excellent = 5.
Highest Education	The highest education level has been achieved by 2017–2018 interview: secondary school or below = 1, certificate or diploma = 2, university degree = 3
With Partner	Dummy variable, have a partner = 1, otherwise = 0.
Individual Financial Positions	
Bank Accounts	Dummy variable, with bank account savings = 1, otherwise = 0.
Principal Residence	Dummy variable, with principal residence = 1, otherwise = 0.
Pension Funds	Dummy variable, with pension funds = 1, otherwise = 0.
Mortgage	Dummy variable, with mortgage left = 1, otherwise = 0.
Other Debts	Dummy variable, with other debts except for mortgage = 1, otherwise = 0.
Home Content Insurance	Dummy variable, with home content insurance = 1, otherwise = 0.
Financial Market Participation	Dummy variable, with direct financial market participation = 1, otherwise = 0. Income from company shares, trust, and managed funds.
Gross Retirement Income	Total annual personal income from regular and recurring sources, including income from current and previous employment, investment income (rental properties, interests, and dividends), all types of government transfer and other regular and recurring income (private superannuation payment, spousal and child support payments, etc.) before taxes in the 2017/2018 survey in New Zealand and in the 2018 period in Australia.
Individual Net Wealth	Individual net wealth = individual assets—individual liabilities at interview time in 2018.

This table presents the descriptions of each variable and related questions in the 2018 Australia HILDA and New Zealand HES surveys. The sample comprises retirees aged 65 years and above.

**Table A3.** OLS results of single country regression for objective income sufficiency with all the factors.

Dependent Variable	Annuitized Net Wealth1	Annuitized Net Wealth1	Annuitized Net Wealth2	Annuitized Net Wealth2
Country	Australia	New Zealand	Australia	New Zealand
Age	0.048 *** (24.98)	0.036 *** (10.51)	0.069 *** (21.91)	0.063 *** (13.56)
Gender	0.109 *** (4.85)	0.071 * (2.40)	0.121 *** (3.36)	0.039 (0.78)
Living_Area	0.108 *** (4.98)	−0.004 (−0.18)	0.179 *** (5.27)	0.002 (0.05)
Employment_Status	−0.066 * (−2.46)	−0.042 (−1.83)	0.133 *** (4.00)	0.036 (0.84)
Self-Rated_Health	0.041 *** (3.22)	−0.007 (−0.44)	0.090 *** (4.66)	0.080 *** (3.27)
Highest_Education	0.039 ** (3.15)	0.026 (1.33)	0.114 *** (5.61)	0.154 *** (4.86)
With_Partner	−0.185 *** (−6.90)	−0.101 ** (−3.27)	−0.132 *** (−3.32)	0.169 *** (3.25)
Bank_Accounts	−0.152 * (−2.39)	0.203 (1.47)	0.098 (0.32)	0.998 *** (4.04)
Principal_Residence	0.747 *** (15.24)	0.277 *** (10.02)	2.246 *** (24.12)	0.973 *** (16.68)
Pension_Funds	0.163 *** (6.76)	0.056 * (2.27)	0.592 ** (15.28)	0.221 *** (4.62)
Mortgage	−0.125 *** (−4.25)	−0.193 *** (−5.37)	−0.183 *** (−4.26)	−0.321 *** (−4.26)
Other_Debts	−0.053 (−1.61)	−0.015 (−0.44)	−0.154 *** (−3.44)	0.038 (0.79)
Home_Content_Insurance	0.194 ** (2.86)	0.381 *** (5.35)	0.740 *** (6.92)	1.281 *** (11.06)
Financial_Market_Participation	0.096 *** (4.76)	0.092 *** (3.81)	0.209 *** (6.36)	0.184 *** (3.25)
Gross_RetirementIncome	−0.0001 (−0.78)	0.002 *** (4.09)	−0.0002 (−0.82)	0.001 (1.26)
Individual_Net_Wealth	0.506 *** (21.32)	0.661 *** (27.63)	0.601 *** (17.75)	1.056 *** (19.26)
Constant	6.029 *** (30.53)	7.016 *** (23.80)	0.956 * (2.30)	1.085 * (2.39)
R-squared	0.66	0.57	0.73	0.66
Observations	2958	1768	2932	1752

This table presents the OLS regression results in each country over the annuitized net wealth1 and annuitized net wealth2. The dependent variables are overall annuitized net wealth and annuitized net wealth, both of which are shown in logarithms. The control variables include Age, which is the age of retirees; Gender, which equals to one if the retiree is a male and zero otherwise; Living\_Area, which equals to one if the retiree lives in a major city and zero otherwise. Employment\_Status, which equals to one if the retirees do not work, two if the retirees work part time, and three if they work full time; Self\_Rated\_Health, which is the retirees' self-perception of health conditions, ranging from one to five, from poor to excellent; Highest\_Education, which is the highest education level achieved by the retiree that equals one if it is 12 years or less, two if the retiree has a certificate or diploma, and three if the retiree has a university degree; With\_Partner, which is a dummy variable that equals one if the retiree has a partner and zero otherwise; Bank\_Accounts, which is a dummy variable that equals to one if the retirees have savings in their bank accounts and zero otherwise; Principal\_Residence, which equals to one if the retirees have a principal residence and zero otherwise; Pension\_Funds, which is a dummy variable if the retirees have pension funds and zero otherwise; Mortgage, which is a dummy variable if the retirees have mortgages left and zero otherwise; Other\_Debts, which is a dummy variable if retirees have debts other than mortgages and zero otherwise; Home\_Content\_Insurance, which is a dummy variable if the retirees have insurance and zero otherwise; Financial\_Market\_Participation, which is a dummy variable if the retirees have income or dividends from stocks, funds, and trusts; Gross\_Retirement\_Income, which is the retiree's regular annual before-tax retirement income, in thousands AUD; and Individual\_Net\_Wealth, which is the individual retiree's net wealth, in millions AUD, which is overall assets minus debts. The *t*-statistics are in parentheses. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## Notes

<sup>1</sup> <https://www.un.org/en/global-issues/ageing> (accessed on 10 December 2021).

<sup>2</sup> Adequacy focuses on benefits, system design, savings, government support, homeownership, and growth assets; sustainability includes pension coverage, total assets, demographics, public expenditure, government debt, and economic growth; and integrity is measured mainly by regulation, governance, protection, communication, and operating costs.



- See Section 2.2 and Table A1 of Appendix A for more details on a comparison between the Australia and New Zealand pension systems.
- KiwiSave is a voluntary scheme, and it belongs to the third pillar according to the World Bank. However, because of its enrolment by default, it can be considered as a combination of the second and third pillars. In order to make Australian and New Zealand pension systems consistent, we consider KiwiSaver as the second pillar, but it is strictly the third pillar.
- Sustainability shows the ability for the pension system to cushion the impact of demographic changes, 60% of which consists of predictions and 40% of finances. Adequacy includes the adequate level that an individual can gain from the first pillar (50%) and other pension incomes (50%).
- <https://www.ato.gov.au/Individuals/Income-and-deductions/Offsets-and-rebates/Seniors-and-pensioners-tax-offset/> (accessed on 8 January 2022).
- In 2018, the survey covered income and wealth questions, providing all the necessary information for this research.
- In the Australian states of New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, Northern Territory, and the Australian Capital Territory, the total median incomes were AUD 50,153, AUD 49,266, AUD 48,826, AUD 48,354, AUD 52,671, AUD 45,546, AUD 60,636, and AUD 64,332, respectively. In New Zealand, the regional median incomes in the Northland, Auckland, Waikato, Bay of Plenty, Gisborne/Hawkes Bay, Taranaki, Manawatu, Wellington, Tasman/Nelson/Marlborough/West Coast, Canterbury, Otago, and Southland regions were NZD 40,560, NZD 54,080, NZD 46,748, NZD 39,884, NZD 48,880, NZD 42,744, NZD 39,780, NZD 58,240, NZD 38,688, NZD 44,876, NZD 44,356, and NZD 42,224, respectively.
- Reimers (1983) used the average coefficients of both groups as estimators of the nondiscriminatory parameter:  $\hat{\beta}^* = 0.5\hat{\beta}_A + 0.5\hat{\beta}_B$ . In contrast, Cotton (1988) suggested weighting the coefficients by the group size  $n_A$  and  $n_B$ :  $\hat{\beta}^* = \frac{n_A}{n_A+n_B}\hat{\beta}_A + \frac{n_B}{n_A+n_B}\hat{\beta}_B$ . Neumark (1988) used the pooled model for both groups to obtain  $\hat{\beta}^*$ , and Elder et al. (2010) argued that the pooled OLS regression overstated the role of observables. There is no specific reason to assume that the coefficients of one or the other group are nondiscrimination.
- These numbers are in the natural logarithm forms.
- We are aware of the limitation of not using survey weights, and we appreciate the reviewer's comments on this. We therefore apply the cross-sectional weights on our data and rerun our summary statistics and our main regression; our results suggest that there are no significant differences between using the weighted and unweighted variables. In addition, in our original analysis, we controlled enough independent variables, which were benchmarks used in weighting to keep our unweighted regressions unbiased and consistent to a large extent (Winship and Radbill 1994). Moreover, according to the literature (Sierminska and Doorley 2018), survey weights are not commonly used for cross-country comparisons.
- For New Zealand data, unfortunately, we are unable to access to the Statistics NZ data lab, owing to the expiration of our subscription. We believe that this may not make our results significant, according to the results from using the weighted and unweighted variables for the Australian data. We therefore also placed Footnote 11 to address this limitation of the NZ data.
- Overall annuitized net wealth is in the log format; therefore, the gap in overall annuitized net wealth equals  $\exp(0.133) - 1 = 0.14$ .  $-0.118/0.133 = -0.89$ , which is the explained part of  $-0.118$  divided by the overall difference of 0.133.
- $\exp(0.078) - 1 = 0.08$ .
- $0.258/0.078 = 3.31$ .
- $\exp(0.258) - 1 = 0.29$ .
- According to the 2018 census, the homeownership percentages for NZ retirees aged 65 years or above exceed 70%, which is higher than the data that we use for this research. HES data show lower homeownership among retirees. Even if we follow the census data, this retiree homeownership ratio is still lower than that for Australian retirees, according to the HILDA survey.
- [https://treasury.gov.au/sites/default/files/2021-02/p2020-100554-ud-05\\_cohesion.pdf](https://treasury.gov.au/sites/default/files/2021-02/p2020-100554-ud-05_cohesion.pdf) (accessed on 1 May 2022).
- The financial incentives could be applied to retirees in both countries, and the pension system differences play key roles in the retiree homeownership differences, as a result.
- $-0.225/0.080 = -2.81$ .
- More details are shown in Table A1 of Appendix A.
- $-0.028/(-0.046) = 0.61$ .
- $0.070/(-0.058) = -1.21$ . The negative sign means that New Zealand possess higher overall average life satisfaction. However, the positive value is utilized when the contribution from Australia is explained.
- <https://www.amp.co.nz/media-hub/first-home.html> (accessed on 3 February 2023).

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