The impact of tax on the prospects of achieving target retirement wealth in Australian default superannuation plans

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Abstract

Prior empirical studies on superannuation in Australia have investigated the adequacy of superannuation to fund retirement on a pre–tax basis. Also, government policy in this area is often predicated on simplistic assumptions and methodologies, with little or no empirical evidence of the impacts of superannuation taxation arrangements on retirement wealth and the adequacy of default superannuation plans. This "baseline" study fills this gap in the literature by providing evidence about the

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prospect of a representative member of a complying superannuation fund in Australia, on retirement, having sufficient accumulated superannuation to adequately fund their retirement under current taxation arrangements. We assume the fund utilises a typical default asset allocation, and we use a bootstrap simulation approach to generate relevant asset returns. We compare a representative retiree's terminal wealth at vesting age with a nominal retirement wealth target. Our results suggest that a representative member under current superannuation taxation arrangements has a roughly 50% chance of not accumulating sufficient superannuation to meet a reasonable retirement wealth target by retirement age.

Acknowledgments

1.   Introduction

Given the demographics of an ageing population that is used to an internationally high standard of living,[1] for which governments are increasingly unwilling or unable to pay (for example, by way of a full age pension), superannuation has become a cornerstone of the federal government's three-pillar retirement income policy.[2] A key policy aim is to have self-funded retirees who will take the pressure off government in providing for their retirement.[3] The attractiveness of superannuation is affected not only by the pre-tax returns earned on superannuation (as distinct from other investment vehicles), but also by superannuation regulation and the tax treatment of superannuation contributions, earnings and benefits.[4] Indeed, precisely to encourage retirement savings, the government endows superannuation with a more favourable tax treatment than other types of investment vehicles.[5]

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1   See J Piggott, "Super reform needs some serious action", *Australian Financial Review*, 22 May 2004, 70. Dr Piggott suggests that retirement expectations for the baby boomers [and presumably later generations] relying on the age pension are unlikely to be met given the discrepancy in income between dual income households and the amount of the age pension, which is set at 40% of a single average wage. Note the populations are ageing globally with the old-age dependency ratio (the ratio of the population aged 65 years and older to the population aged 15 to 64 years) being expected to increase from 24% to 48% in advanced economies, and from 13% to 33% in emerging economies over the period 2010–50: International Monetary Fund, "Global financial stability report: the quest for lasting stability" (World Economic and Financial Surveys, International Monetary Fund, 2012) Ch 4, 4.

2   The Australian federal government's "three-pillar" retirement income policy is comprised of the means tested age pension, which is funded from general taxation revenue; the privately funded superannuation guarantee (SG) scheme; and private savings, including additional contributions to superannuation. The three-pillar approach to retirement income was proposed by the World Bank in 1994. See World Bank, *Averting the old age crisis: policies to protect the old and promote growth* (Oxford University Press, 1994). Note that some researchers and bodies refer to a "four-pillar" retirement system where the fourth pillar is income generated from part-time employment. The Geneva Association, in particular, promotes this fourth pillar as being an essential part of sound retirement policy as it enables aged persons with the requisite physical and mental health to continue to "make a valid economic and social contribution" to society: O Giarini, "The four pillars, the financial crisis and demographics – challenges and opportunities" (2009) 34 *The Geneva Papers on Risk and Insurance* 507, 510.

3   The SG scheme was introduced in July 1992 with the aim of providing Australians with an adequate income at retirement so that retirees are less reliant on the age pension: see Australia's Future Tax System, *The retirement income system: report on strategic issues* (Australian Government 2009), 10. The SG scheme requires that employers make compulsory contributions at a prescribed minimum level into the complying superannuation fund or retirement savings account (RSA) of their eligible employees.

4   Note that superannuation of itself is not a type of investment; rather, it is an investment vehicle in which retirement savings can accumulate in a low-tax environment.

5   Note that the concessional tax treatment of superannuation comes at a huge cost in terms of forgone revenue. For further information on this major tax expenditure, see: Australian Government, *Tax expenditures statement 2015* (Treasury, 2016).

Given the cost of providing for an ageing population,[6] there is concern among policymakers on how the retirement needs of Australia's ageing population will be funded. To determine the adequacy of current arrangements, it is useful to examine the effects of the current tax treatment of superannuation on terminal wealth at retirement,[7] and evaluate the extent of any likely shortfalls. While the prior literature touches on the impacts of different tax treatment of superannuation, it is very sparse and mainly does so from different perspectives (for example, from equity or macroeconomic perspectives) from that adopted in this study.

This "baseline" study seeks to evaluate the likelihood that a representative individual superannuant will reach a (specified) retirement wealth target under current superannuation taxation arrangements. If he or she does, the representative superannuant will be a self-funded retiree, with no need (in the absence of unforeseen events) to rely on external sources such as the age pension or other government social welfare schemes. However, if the retiree does not, then to the extent of any significant shortfall, the representative superannuant will need to fund their retirement not only from their accumulated superannuation savings, but also, in the absence of other private sources (for example, other savings), from sources such as the age pension and other government social welfare payments. This study also estimates the size and likelihood of any such shortfall for the representative superannuant. Plainly, the results have significant implications for government taxation and expenditure in the retirement funding area.

This scope of the study is limited in four main respects. First, it focuses on Australian tax concessions applicable to defined contribution (accumulation) complying superannuation funds, from the perspective of superannuants and their retirement outcomes. As such, non-complying superannuation funds, defined benefit schemes, small business retirement concessions, self-managed super funds, hybrid funds, foreign funds, funds with fewer than five members, and small APRA funds are not considered. Second, this article does not quantify the pension amounts or private savings on which a representative superannuant would need to rely in order to make up any income shortfall on retirement. Third, the article does not seek to quantify the tax benefit to superannuants in different tax brackets. The fact that the tax benefit to superannuants on the top marginal tax rate is significantly greater than that for superannuants on the bottom marginal tax rate has already been addressed in other studies.[8] Fourth, the article does not investigate the post-tax wealth effects for the

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6   The costs of an ageing population include a slowing economy and increased expenditure on age-related payments and health. See generally Australian Government, *Intergenerational report 2010, Australia to 2050: future challenges* (Treasury, 2010).

7   Terminal wealth at retirement is the expected future market value (in nominal dollars) of a superannuant's total available superannuation savings at retirement vesting age.

8   See, eg, R Clare, "The equity of government assistance for retirement income in Australia" (Report, ASFA Research and Resource Centre, Association of Superannuation Funds of Australia, 2012); R Clare, "Equity and superannuation – the real issues" (Report, ASFA Research

superannuant during the decumulation phase, during which the benefits from assets accumulated in the fund and any other sources are drawn upon to finance retirement.

This is not to suggest that any of these aspects of the superannuation system is unimportant — far from it — but merely that they must, for the sake of brevity, be the subject of separate investigations.

Section 2 of the article reviews the relevant literature on the adequacy of retirement income in Australia. A key gap in the literature is that almost none of the relevant empirical studies take into account the impact of superannuation tax arrangements on the adequacy of retirement wealth outcomes in Australia. Section 3 of the article sets out the taxation treatment of superannuation in Australia, while section 4 outlines the data and methodology of the study. Section 5 discusses the results of the analysis, while section 6 summarises the main conclusions.

2.   Literature review

While terminal wealth is plainly a function of superannuation contributions, risk-adjusted investment returns and taxation, the impact of taxation on superannuation retirement wealth outcomes has, somewhat surprisingly, largely been ignored in the empirical literature.

In the Australian context, a number of empirical studies exist which have modelled terminal wealth using a similar methodology to that used in this article, but entirely overlooked the effects of tax.[9] For example, Basu and Drew argue that the effects of portfolio size on terminal wealth outcomes over a long time horizon are so large, on a pre-tax basis, that they generally outweigh the volatility reduction benefit of lifecycle investment strategies such as switching to less volatile assets a few years before retirement.[10] In another pre-tax study, Basu and Drew suggest that investment strategies that comprise largely equities could usefully be nominated as default investment options in defined contribution plans, unless plan providers prefer

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and Resource Centre, Association of Superannuation Funds of Australia, 2012); R Clare, "Equity and retirement income provision in Australia" (Report, ASFA Research and Resource Centre, Association of Superannuation Funds of Australia, 2001); D Knox, "Tax, super and the age pension: the issues of cost, equity and incentives" (Research study no. 14, Australian Tax Research Foundation, 1991); G Parle, *The Economic impact of the superannuation tax concessions on statutory participants* (PhD thesis, University of the Sunshine Coast, 2012).

9   See, egs, AK Basu and ME Drew, "The case for gender-sensitive superannuation plan design" (2009a) 42(2) *Australian Economic Review* 177; AK Basu and ME Drew, "The appropriateness of default investment options in defined contributions plans: Australian evidence" (2010) 18(3) *Pacific-Basin Finance Journal* 290.

10   AK Basu and ME Drew, "Portfolio size effect in retirement accounts: what does it imply for lifecycle asset allocation funds?" (2009b) 35(3) *Journal of Portfolio Management* 61.

terminal wealth predictability to terminal wealth adequacy at retirement.[11] It remains unknown, however, whether these results would hold on a post-tax basis, taking into account not just the tax treatment of superannuation but, inter alia, the tax treatment of returns from different asset allocations within the fund.[12] Accordingly, this article evaluates the baseline retirement wealth outcomes of superannuants, taking account of the tax treatment of superannuation using a typical average default asset allocation for a representative fund.

Other practical — as distinct from scholarly — studies have sought to project terminal wealth on a post-tax basis for representative superannuants,[13] but typically do so on an average compound interest basis using highly simplified assumptions. They provide little real guidance for policymakers or government about the adequacy of retirement outcomes for Australian superannuants generally, and certainly none on a post-tax basis given the spread of superannuants (for example, the post-tax impacts on retirement outcomes of the 25th percentile as distinct from the 75th percentile of superannuants).

In contrast, scholarly studies have contributed to our understanding of the complex interrelationships between superannuation outcomes and the state of the economic system as a whole. For example, adopting a more macroeconomic perspective, Kudrna and Woodland (2012a) used general equilibrium overlapping generations (OLG) modelling to evaluate the impacts of hypothetical tax reforms to superannuation in Australia — as well as other more systemic changes — on the vertical (intra- and inter-generational) equity of the superannuation tax system.[14] They found that changing Australian superannuation taxation from a ttE regime to either an EET or TEE regime,[15] as in some other countries, would likely improve vertical equity in the short, medium and long run. That is, they found that lower income households

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11   AK Basu and ME Drew, "The appropriateness of default investment options in defined contributions plans: Australian evidence" (2010) 18(3) *Pacific-Basin Finance Journal* 290.

12   For example, capital gains are often concessionally taxed, as are Australian franked dividends due to the availability of franking credits as part of the Australian imputation system.

13   See, eg, Mercer, "Securing retirement incomes: tax, super and the age pension: assessing the value of total government support" (Report, Mercer, 2012).

14   G Kudrna, and A Woodland, "Progressive tax changes to private pensions in a life-cycle framework" (Working Paper 2012/09, ARC Centre of Excellence in Population Ageing Research, January 2012).

15   Superannuation or private pensions may be taxed at the contributions stage, the investment income stage, and/or at the benefits stage. The tax treatment at each stage is commonly denoted by the following symbols: *E* (exempt from tax), *T* (taxed at full rates), and *t* (taxed at concessional rates): Australia's current superannuation taxation is based on a ttE system — that is, contributions are concessionally taxed, investment income is concessionally taxed, but benefits are broadly tax exempt. Countries such as the United States, Canada and the United Kingdom have adopted an EET approach, as have India, and Hungary and Poland in Eastern Europe. Most Latin American countries, with the exception of Peru, have adopted a TEE approach. See for example, E Whitehouse, "Taxation: the tax treatment of funded pensions" (World Bank Pension Reform

would be economically advantaged relative to higher income households, which currently are the main beneficiaries of superannuation tax concessions. In a later paper, Kudrna and Woodland (2012b) investigated the macroeconomic and welfare effects of gradually increasing employers' mandatory superannuation contributions in Australia from 9% to 12% of gross earnings, and removing the concessional 15% tax on mandatory contributions for workers with an annual taxable income of up to $37,000.[16] Again using general equilibrium OLG modelling, they found that these changes would result in significantly larger superannuation asset accumulations, which were likely, inter alia, to improve self-funding in retirement, with government expenditure on the age pension estimated to fall over the long term by almost 4.6%.

Although Kudrna and Woodland do take account of superannuation taxation effects, they do not directly address our central research question — namely, whether a representative individual superannuant is likely to reach his (specified) retirement wealth target under current superannuation taxation arrangements, and the size and probability of any shortfall. It remains fair to say that, in Australia at least, we still know precious little about the adequacy with which, on a post-tax basis, Australia's superannuation system can fund a typical retirement; the size and likelihood of any shortfall; and therefore the potential size of any government subsidy from the age pension or other social welfare measures.

It might be argued that focusing on a "representative" superannuant runs the risk of incurring the fallacy of composition,[17] insofar as superannuants' retirement outcomes in the aggregate cannot solely be deduced from studying an individual "representative" superannuant at the micro level alone. While this is true, there is nevertheless value in examining the retirement adequacy of superannuation at the individual level. Because the relevant data do not yet exist, this cannot be done at the level of the "average" superannuant, and so must be done using simulation techniques for a "representative" superannuant. For practical policy design purposes, governments should make informed decisions based on both aggregate studies such as Kudrna and Woodland (2012a, 2012b), and studies based on representative individual superannuants. To rely solely on one or the other methodology runs the risk of failing to achieve the policy objective of increasing the number of retirees who can fund their retirement from their own superannuation and not rely on government assistance. This article seeks to remedy this gap in the literature, and provide policy makers and government with a modest first step to solving what has been described as the government's (and

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Primer Series Brief No. 33389, World Bank, 13 July 2005) 1; Mercer, "Tax & superannuation: benchmarking Australia against the world's best retirement savings systems" (Report, Mercer, 2013) 6.

16 G Kudrna, and A Woodland, "Macroeconomic and welfare effects of the 2010 changes to mandatory superannuation" (Working Paper 2012/10, ARC Centre of Excellence in Population Ageing Research, January 2012).

17 See for example, IM Copi, C Cohen and K McMahon, *Introduction to logic* (Pearson, 14th ed, 2013).
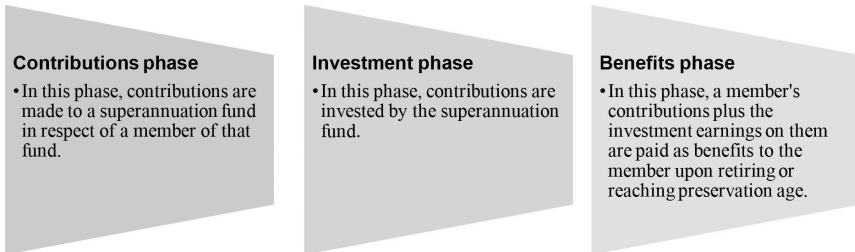
superannuants') "longevity risk" problem — that is, the risk that retirees could well outlive their retirement savings.[18]

3.   Relevant superannuation taxation treatment

In Australia, tax may be imposed on *contributions* into a superannuation fund, income generated by *investing* those contributions, and *benefits* paid out of the superannuation fund, although the latter are generally tax-free for persons who are at least 60 years old following the simplified superannuation reforms.[19]

The three phases in the tax treatment of superannuation are depicted in Figure 1.[20]

Figure 1: Overview of superannuation taxation in Australia

Contributions phase
•In this phase, contributions are made to a superannuation fund in respect of a member of that fund.

Investment phase
•In this phase, contributions are invested by the superannuation fund.

Benefits phase
•In this phase, a member's contributions plus the investment earnings on them are paid as benefits to the member upon retiring or reaching preservation age.

In the contributions phase, contributions to superannuation funds may be made on behalf of members by employers, voluntarily by the members themselves including in the capacity of a self-employed person,[21] by third parties such as spouses, by the

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18   See generally, International Monetary Fund, "Global financial stability report: the quest for lasting stability" (World Economic and Financial Surveys, International Monetary Fund, 2012) Ch 4; Deloitte, "Dynamics of the Australian superannuation system, the next 20 years: 2013 – 2033" (Report, Deloitte Actuaries & Consultants, 2013).

19   The taxation of superannuation in Australia was significantly reformed in 2007. One of the purposes of the rewrite was to simplify the tax treatment of eligible termination payments (ETPs) by taxing all superannuation benefits (regardless of whether they are paid as a lump sum or as an income stream) under a separate regime to employment termination payments. Part 3-30 of the *Income Tax Assessment Act 1997* (Cth) (ITAA97) now contains the tax rules that apply to superannuation, whereas the taxation of ETPs is dealt with under Div 82 ITAA97. The tax treatment of ETPs is outside of the scope of this article.

20   The three phases in the tax treatment of superannuation are outlined in s 280-5 ITAA97.

21   Contributions made by self-employed persons can only be deducted for income tax purposes if the conditions specified in ss 290-155 to 290-180 ITAA97 are satisfied. That is, such a contribution must be made to a complying superannuation fund by a person who can attribute less than 10% of the sum of their assessable income, reportable fringe benefits and reportable employer superannuation contributions (RESC) for the income year to employment and who

government on behalf of low income earners,[22] and by other means such as a transfer from a first home saver account (FHSA).[23]

Contributions included in the assessable income of a superannuation fund are termed "concessional contributions".[24] Most commonly, these are deductible contributions made by an employer under the superannuation guarantee (SG) scheme. In addition, these deductible employer contributions could include those made under salary sacrifice arrangements.[25] Concessional contributions are included in the fund's assessable income and taxed at 15% within the superannuation fund.[26] There is also an additional 15% tax known as "Div 293 tax" that may be imposed on the concessional contributions of high income earners, but this tax is outside of the scope of this article given that we assume our representative superannuant earns an average income.[27]

has provided a valid notice to the trustee of the superannuation fund of their intention to claim an income tax deduction. Where deductible, these contributions are treated as concessional contributions. Given that we assume that our representative superannuant is in full-time employment and that all of his contributions are made by his employer at the current mandatory standard SG rate, these deductible personal contributions are outside of the scope of this article (despite the 10% income test rule for such contributions being abolished with effect from 1 July 2017).

22 As we assume that our representative superannuant's starting salary is equal to the annualised full-time adult average weekly ordinary time earnings (OTE) as at May 2014, that is $75,603, both the superannuation government co-contribution for low income earners (SGCLIE) and the low income superannuation contribution (LISC) are outside of the scope of this article. Furthermore, the LISC has been repealed with effect from 1 July 2017: *Minerals Resource Rent Tax Repeal and Other Measures Act 2014* (Cth).

23 Transfers from a FHSA are included in a member's non-concessional contributions cap. Given that the Abbott Government abolished FHSAs with effect from 1 July 2015, the treatment of FHSAs is outside of the scope of this article. Furthermore, we assume that all of our representative superannuant contributions are made by his employer at the current mandatory standard SG rate.

24 "Concessional contributions" are defined in ss 291-25 and 291-165 ITAA97.

25 In accordance with TR 2001/10 *Income Tax: fringe benefits tax and superannuation guarantee: salary sacrifice arrangements*, para 19, a "salary sacrifice arrangement" means "an arrangement under which an employee agrees to forego part of his or her total remuneration, that he or she would otherwise expect to receive as salary or wages, in return for the employer or someone associated with the employer providing benefits of a similar value". As we assume that all of our representative superannuant contributions are made by his employer at the current mandatory standard SG rate, salary sacrifice arrangements are outside of the scope of this article.

26 Under s 295-160 ITAA97, deductible employer contributions are included in the assessable income of a complying superannuation fund, and these contributions form part of the "low tax component" of a complying superannuation fund, which is taxed at 15% in accordance with s 26(1)(a) of the *Income Tax Rates Act 1986* (Cth) (ITRA86).

27 Div 293 tax was introduced on 1 July 2012 with the object of reducing the concessional tax treatment of superannuation contributions for very high income earners who traditionally derived a greater benefit from the concessional treatment of superannuation than did other income earners who were on less than the top marginal rate of tax: s 293-5 ITAA97. Note that persons who do not make any concessional contributions in a year will not be liable for the Div 293 tax irrespective of their income level.

"Non-concessional contributions" are those not included in the assessable income of a superannuation fund[28] — these are generally non-deductible contributions from post-tax income and thus could include contributions made by spouses.[29]

In order to prevent taxpayers from over-exploiting the superannuation tax concessions, there are caps on the amount of concessional and non-concessional contributions that can be made each income year.[30] In this baseline study, all contributions are assumed to be employer contributions in line with the SG scheme at the current SG rate of 9.5% on full-time adult average weekly ordinary time earnings — hence these caps will not be exceeded despite annual wage growth (as the contribution caps are indexed in line with average weekly ordinary time earnings (AWOTE)).

In the investment phase, contributions are invested in accordance with a member's chosen investment profile (for example, default, conservative, growth or high-growth) and earn investment returns that form part of the fund's taxable income. A complying superannuation fund's taxable income is divided into a "low tax component", which is taxed at 15%, and a "non-arm's length component", which is taxed at 47%.[31] The "low tax component" includes concessional contributions as well as the investment income.[32] From 1 July 2014, additional tax is imposed on the no-TFN contributions income of a complying superannuation fund at 34%.[33] For the purposes of this baseline study, it is assumed that there is no "non-arm's-length component" or no-TFN contributions income to the fund's taxable income.

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28 The definition of "non-concessional contributions" is contained in s 292-90 ITAA97.

29 Contributions on behalf of a spouse may be made by an individual directly, in which case a tax offset may be available to the contributor, or by an individual splitting a contribution to their own superannuation fund and arranging for part of that contribution to be transferred into their spouse's superannuation account. Note that these contributions are outside of the scope of this article as we assume that all of our representative superannuant contributions are made by his employer at the current mandatory standard SG rate.

30 As at 1 July 2014, the concessional contributions cap was $35,000 for those aged 49 years or over on 30 June 2014, and $30,000 for all other persons, and the non-concessional contributions cap was $180,000.

31 Ss 26(1), 27(1), 27A and 35 ITRA86. The "non-arm's length component" is the fund's non-arm's length income less any attributable deductions: s 295-545 ITAA97. Note that the 47% rate includes the 2% temporary budget repair levy (TBRL), which only applies for the 2014-15 to 2016-17 income years.

32 The low tax component is defined as the part of the fund's taxable income that is not the non-arm's length component: s 295-545(3) ITAA97. Note that contributions would not normally be regarded as "ordinary income" of the fund under the income tax law, as they are essentially receipts of capital, which is why concessional contributions are assessed as statutory income under Subdiv 295-C ITAA97.

33 S 29 ITRA86. No-TFN contribution income is from contributions for which the member has not provided their tax file number (TFN) to the fund. The 34% tax rate on no-TFN contribution income that applied from 1 July 2014 includes the recent 0.5% increase in the Medicare levy rate to 2%, plus the 2% TBRL.

Although the "low tax component", which includes the investment income, is taxed at 15% for complying funds, the effective tax payable on investment income can be more nuanced. For example, the availability of franking credits on Australian franked dividend income can result in a refund of tax rather than an income tax liability. That is, Australian resident shareholders who receive franked dividends from Australian resident companies are assessed on the cash amount of the dividend received plus an amount equivalent to the attached franking credit, which is referred to as the "gross-up".[34] The "gross up" amount represents the amount of tax paid at the company level on the profits out of which the dividend has been paid,[35] and is calculated as:

$$\text{Franked amount of the dividend} \times \frac{\text{company tax rate}}{(1 - \text{company tax rate})}$$

By including the gross-up in the resident individual shareholder's assessable income, the shareholder is assessed on the pre-company tax amount of the dividend and pays income tax on it at their appropriate tax rate — but they are then entitled to a tax offset, which is equal to the gross-up and referred to as a "franking credit".[36] Where complying funds receive fully franked dividends from Australian companies, the effective tax rate on the income will be –15%. That is, the fund includes the dividend and gross-up in the "low tax component" of its taxable income and pays 15% tax on it, but is then entitled to claim a franking credit worth up to 30%.

Another example pertains to capital gains. If there is a net capital gain, it will be included in the fund's assessable income for the income year.[37] However, in order to calculate that net capital gain, a complying fund may have had access to the one-third discount that is found in Div 115 of the *Income Tax Assessment Act 1997* (Cth) (ITAA97).[38] If that is the case, the "effective" tax rate on the discount capital gains is only 10% (that is, two-thirds of 15%). However, it should be noted that there are two modifications to the CGT provisions that apply to complying superannuation funds and thus alter the tax treatment of certain CGT assets for these entities. These modification rules are contained in ss 295-85 and 295-90 ITAA97.

The first modification rule pertains to CGT assets acquired by a complying superannuation fund before 20 September 1985, that is, "pre-CGT assets".

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34   Section 44(1) of the *Income Tax Assessment Act 1936* (Cth) includes dividend income in the assessable income of a taxpayer, whereas the gross-up is included under s 207-20(1) ITAA97.

35   In accordance with s 23(2) ITRA86, the company tax rate (for non-small business entities) is currently 30%.

36   S 207-20(2) ITAA97.

37   S 102-5 ITAA97.

38   Complying superannuation funds are entitled to the one-third discount on capital gains where the capital gain results from a CGT event that happened after 11.45 am AEST 21 September 1999; the cost base was not indexed (to take into account the effect of inflation); and the CGT asset was held for at least 12 months: ss 115-15, 115-20 and 115-25 ITAA97.

Section 295-90 deems all pre-CGT assets held by complying superannuation funds to have been acquired post-CGT on 30 June 1988 for either their market value or cost base on that date, whichever yields the smaller capital gain or loss. This means that unlike other entities, complying superannuation funds cannot rely on the exemption for the disposal of pre-CGT assets and can thus *potentially* have a CGT liability on the disposal of such assets.[39]

The second modification rule in s 295-85 renders the CGT provisions as the primary code for assessing gains or losses on the disposal of certain CGT assets, such as shares, held by complying superannuation funds, even if these assets were held for a profit-making purpose and would be treated on revenue account by other entities in similar circumstances. This means that complying superannuation funds cannot claim a tax deduction for losses realised on the disposal of such assets, but rather will have a capital loss available to offset capital gains or carry forward.[40] Furthermore, complying superannuation funds cannot rely on the CGT exemption for trading stock in s 118-25 as s 70-10(2)(b)(i) excludes certain assets covered in s 275-105, such as shares, land and units in a managed fund, from being trading stock if they are owned by a complying superannuation fund.

However, even though a capital gains tax (CGT) liability may arise on disposal of securities such as bonds, debentures, bills of exchange and promissory notes where these financial assets are held as a long-term investment,[41] complying superannuation funds must treat the disposal of securities on revenue account. That is, in accordance with s 295-85(3), gains or losses on the disposal of securities held by complying superannuation funds will be subjected to the ordinary income and general deduction provisions, rather than the CGT provisions.

The favourable tax treatment of franked dividends along with the CGT discount suggests, at least in part (from a tax perspective), why Australian equities figure so significantly in Australian funds' default investment strategies — something which is to be further explored in our ongoing research.

Finally, superannuation benefits are preserved in the fund and are generally not accessible until a "condition of release" has been met. This is consistent with the policy objective of encouraging taxpayers to save for their own retirement and alleviate the need for government to provide for them. Conditions of release include

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39   The exemption for disposal of pre-CGT assets is contained in s 104-10(5) ITAA97.

40   Where shares are held on revenue account by entities other than complying superannuation funds, gains made on the disposal of shares would be assessed as ordinary income under s 6-5 ITAA97 and losses incurred on disposal would be allowed as a general deduction under s 8-1. Whereas capital losses cannot be deducted from assessable income by virtue of s 102-10(2) ITAA97.

41   Shares do not fall within the definition of securities in s 295-85(3)(b) ITAA97, which is confirmed by ATO ID 2009/92 Superannuation income tax: tax treatment of losses realised by a complying SMSF on disposal of shares.

retirement, attaining preservation age, attaining 65 years of age, severe financial hardship, compassionate grounds, permanent incapacity or death.[42] As noted earlier, benefits paid out of a complying fund are generally tax-free for superannuants who are at least 60 years old. Since this baseline study focuses on the effects of taxation on terminal wealth at retirement, as distinct from during the decumulation phase, it is not necessary to examine the tax treatment of the benefits phase in detail.

4.   Data and methodology

We use historical monthly returns data on Australian equities, bonds and bills from October 1882 to February 2013. The data are derived from the Global Financial Database.[43] The three asset classes comprise of the ASX200 Accumulation Index (as a proxy for growth assets), Australian 10-year Commonwealth Government bonds (as a proxy for fixed interest), and Australian bills (as a proxy for cash). The data span a period of 131 years, covering both positive and negative returns on the component asset classes between 1882 and 2013.

Table 1 presents the summary descriptive statistics of the data used in the study. All statistics are based on the nominal historical monthly returns. The numbers below in parenthesis are annual statistics.

Table 1: Descriptive statistics of nominal monthly return data

	Mean	Standard deviation	Median	Minimum	Maximum	Skewness	Kurtosis
ASX200 Accumulation Index	1.01% (12.17%)	3.76% (13.03%)	1.11%	–42.13%	23.16%	–0.84	13.94
Australian 10-year government bonds	0.49% (5.85%)	2.02% (6.99%)	0.41%	–16.58%	23.90%	1.01	23.72
Australian bills total return index	0.35% (4.22%)	0.29% (1.02%)	0.28%	0.06%	1.62%	1.78	3.19

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42   These conditions of release are specified in Sch 1 to the *Superannuation Industry (Supervision) Regulations 1994* (Cth). Some conditions of release such as reaching preservation age, experiencing severe financial hardship or having compassionate grounds are subject to cashing restrictions, which limit the amount of the benefit that can be withdrawn.

43   Global Financial Database is a reputable provider of historical financial data with their data being cited in over 900 publications. See, eg, www.globalfinancialdata.com/WhoUsesGFD/who.html. Note that returns on Commonwealth Government bonds prior to Federation are actually returns on bonds issued by the colonial government of New South Wales.

The average annual return of the ASX200 Accumulation Index is approximately twice that of the bond returns and thrice that of the bill returns. The standard deviation for the ASX200 Accumulation Index is also higher than it is for the bonds and bills returns, which is expected, given a higher standard deviation is a reflection of the expectation of higher risk for higher returns.[44] The returns for the government bonds exhibit the highest kurtosis, which is also expected given the small difference between the mean and median. The returns for the ASX200 Accumulation Index are negatively skewed, with a median return 10% greater than the mean return. The descriptive statistics of this data are consistent with financial data analysed in financial literature.

For the purposes of this baseline analysis, we evaluate the retirement adequacy of the projected terminal wealth of a representative individual superannuant using the key assumptions outlined in Table 2.

Table 2: Key assumptions

Variable	Assumption
Fund investment horizon	1 July 2014 – 30 June 2054
Starting balance	$5,000[45]
Starting salary	$75,603[46]
Salary growth rate	3% pa[47]
Contribution rate	9.5%[48]

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44   See H Markowitz, "Portfolio selection" (1952) 7(1) *Journal of Finance* 77.

45   We assume that our representative superannuant has a starting superannuation balance of $5,000 as recent research has shown that the average superannuation balance for 19 to 24 year olds is $4,981. See R Clare, "An update on the level and distribution of retirement savings" (Report, ASFA Research and Resource Centre, Association of Superannuation Funds of Australia, 2014) 7.

46   We assume that our representative superannuant's starting salary is equal to the annualised full-time adult average weekly ordinary time earnings (OTE) as at May 2014. See Australian Bureau of Statistics, Average weekly earnings, Australia, May 2014 (ABS 6302.0, 2014). We chose to use OTE as employers are required to contribute an amount of superannuation equivalent to the SGC percentage multiplied by an employee's OTE for the particular quarter for each eligible employee in an accumulation plan in order to avoid the SGC: s 23 of the Superann*uation Guarantee (Administration) Act 1992* (Cth).

47   We assume a salary growth rate of 3% (comprising growth of 0.5% productivity and 2.5% inflation) over the superannuant's investment horizon. In regard to inflation, we chose 2.5% as this is the mid-point of the Reserve Bank of Australia's long-range inflation target of 2–3%: www.rba.gov.au/inflation/inflation-target.html; and because average inflation rates in Australia are generally predicted to remain very low over the next 40 years. Even the historical long-term average inflation rate for the period 1882 – 2013 was only about 3% pa, some times of very high inflation notwithstanding. Productivity is usually in the order of 0.5% pa.

48   We assume that employer contributions are made at the current mandatory standard SG rate of 9.5% throughout the representative superannuant's investment horizon given that the Abbott Government froze the SG rate increase until 1 July 2021, and that the government of the day may choose to continue to freeze this rate for a longer period if economic conditions do not improve.

Variable	Assumption
Starting age	25 years[49]
Retirement age	65 years
Asset allocation[50]	70% equities,[51] 20% bonds,[52] 10% bills
Franking proxy	79%[53]

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All modelling is based on the tax law in force as at 1 July 2014. We further assume that the representative superannuant does not make any contributions of his own with all contributions made by his employer at the current mandatory standard SG rate. For expository purposes, contributions are assumed to be credited to the superannuant's account on a monthly-in-arrears basis. Finally, we assume that our representative superannuant experiences no gaps in his employment during this time, and ceases his

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49 When modelling retirement wealth outcomes, an assumption of a starting age of 25 years and a retirement age of 65 years appears to be the norm in the pension finance literature.

50 We assume that our representative superannuant is the beneficiary of a complying superannuation fund with a default allocation comprising 70% growth and 30% defensive assets (comprised of 20% bonds and 10% bills). Our asset allocation is consistent with the average default plan asset allocation findings of APRA. See Australian Prudential Regulation Authority, Annual superannuation bulletin, June 2013 (Report, APRA, 2014) 8. Note that we allotted foreign equities, property, other assets, and international fixed interest to our three investment assets in the following manner: foreign equities and international fixed interest were allocated directly to the Australian equities and bonds respectively, property was allocated on a pro-rata basis to equities and bonds only given the similar risk-return profiles, and other assets were allocated on a pro-rata basis to all three of our asset classes. This gave us an asset allocation of 70.3% for equities, 19.7% for bonds and 10% for bills, which we then rounded to the nearest whole numbers. Note that our asset reallocation approach is consistent with Basu and Drew's approach: AK Basu, and ME Drew, "The appropriateness of default investment options in defined contributions plans: Australian evidence" (2010) 18(3) Pacific-Basin *Finance Journal* 290, 298.

51 It is assumed that any equities disposed of in the monthly rebalancing of the portfolio had been held for at least 12 months and are therefore eligible for the CGT discount. The rate of asset turnover is that which was actually needed to rebalance the fund at the end of every month, hence no single rate of asset turnover has been assumed. The dividend yield on equities is the actual dividend yield from the historical data for the particular month, which has been randomly selected using the bootstrapping procedure. Hence no single dividend yield has been assumed.

52 Earnings on bond instruments are income in nature and are not subjected to CGT. Furthermore, as previously noted, although a CGT liability can arise on the disposal of bonds (such as when the portfolio is rebalanced monthly to maintain the target asset allocation), for complying superannuation funds, these gains or losses are instead assessed as ordinary income or allowed as general deductions. This was explicitly taken into account in the modelling. The same applies to the bills.

53 A franking proxy of 79% (interpreted as the average level of franking) was calculated using historical data from the companies comprising the ASX200 as at June 2015, together with ASX200 dividend data for the 2014-15 income year.

superannuation contributions at a notional retirement age of 65 years; is not in any of the exempt categories for the SG; and is charged no fees or insurance premiums.[54]

All baseline calculations are done on both a pre-tax and post-tax basis, in order to assess the effects of the current tax treatment of superannuation on terminal wealth at retirement. Using simulated asset class return vectors, we evaluate the retirement adequacy of the superannuant's retirement wealth using a common measure of retirement wealth adequacy known as the retirement wealth ratio (RWR), which is defined as:

$$RWR = \frac{TW}{FS}$$

where:

TW is the terminal wealth; and
FS is the final annual salary at retirement.

To achieve this, this baseline study employs a bootstrap simulation technique to generate returns for the 40-year investment horizon.[55] The simulation methodology randomly selects a vector of monthly returns of the three asset classes within the dataset and then replaces this vector to repeat the process again $N \times 12$ times, where N is the number of years in our horizon. A total of 10,000 iterations are completed. For all of these, the cross-correlation between asset classes is maintained since we select data from all three asset classes for the particular simulated month. At the end of each month, the portfolio is rebalanced in order to maintain the target (default) asset allocation. This simulation approach is common in the pension finance literature.[56]

Following the shortfall measures used by Basu and Drew,[57] we compute the probability of shortfall (P_S), the Value-at-Risk (VaR), and the expected tail loss (ETL) of terminal wealth. The probability of shortfall represents the likelihood that the representative superannuant will have less terminal wealth at retirement than his baseline target. Value-at-Risk here is a measure of the worst-case outcome at a specified confidence level. For example, at the 95% confidence level, only the worst 5% of retirement wealth outcomes are likely to fall below the VaR estimate. While measuring the VaR is useful, it does not indicate the severity of the superannuant's situation if he ends up with a "below VaR" retirement wealth outcome. In order to assess this, the ETL estimates the probability-weighted average of terminal wealth outcomes which fall below VaR

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54   Fees and insurance premiums will reduce terminal wealth on both a pre-tax and after-tax basis. We are instead interested in how tax impacts on terminal wealth outcomes.

55   B Efron, "Bootstrap methods: another look at the jackknife" (1979) 7(1) *Annals of Statistics* 1.

56   See, for example, AK Basu and ME Drew, "The case for gender-sensitive superannuation plan design" (2009a) 42(2) *Australian Economic Review* 177, 178–179.

57   AK Basu and ME Drew, "The case for gender-sensitive superannuation plan design" (2009a) 42(2) *Australian Economic Review* 177, 178–179.

at a specified confidence level. Put another way, the ETL at the 95% confidence level represents the probability-weighted average of terminal wealth outcomes below the estimated 5th percentile of the terminal wealth distribution.

5.   Results and discussion

Based on the foregoing assumptions, the representative superannuant's final annual salary (FS) is $246,620. We believe that a target RWR of 16 is adequate given that interest rates are expected to be low for the foreseeable future. Hence, based on our projections, an appropriate terminal wealth target for the representative superannuant would be $3,945,920 at retirement age.[58]

Table 3 shows the representative superannuant's estimated average terminal wealth at retirement on a pre-tax and post-tax basis ($5,564,712 and $4,283,443, respectively). The equivalent median figures, which remove the influence of the outliers in the distribution of outcomes, are significantly lower at $5,007,096 and $3,868,466, respectively. Table 3 also shows the representative superannuant's RWR on a pre-tax and post-tax basis — on average, 22.56 and 17.37, respectively.

**Table 3: Terminal wealth and retirement wealth ratio estimates**

	Terminal wealth		RWR		
	No tax	Tax	No tax	Tax	Change in RWR
Mean	$5,564,712	$4,283,443	22.56	17.37	–23%
Median	$5,007,096	$3,868,466	20.30	15.69	–23%
25th percentile	$3,734,723	$2,906,180	15.14	11.78	–22%
75th percentile	$6,825,007	$5,248,385	27.67	21.28	–23%

Similar figures are also presented in Table 3 for the estimated 25th and 75th percentiles of the distribution of terminal wealth outcomes. The 25th percentile is the midpoint of below-average outcomes, while the 75th percentile is the midpoint of above-average outcomes. The RWR estimates in Table 3 show that, at the 25th percentile of outcomes, the representative superannuant falls short of his target RWR of 16 on both a pre-tax and (more particularly) a post-tax basis. In contrast, at the 75th percentile of outcomes, the representative superannuant exceeds his target RWR considerably, both on a pre-tax and a post-tax basis. We find that the average RWR decreases by approximately 23% once we factor tax into our model, or conversely, that we overstate the average terminal wealth outcome by approximately 30% if we ignore the effects of tax.

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58   This target is equal to 16 times the final salary of $246,620.

Figure 2 illustrates the cumulative distributions of terminal wealth outcomes achieved for our representative superannuant on a pre-tax and post-tax basis. The dotted line represents pre-tax terminal wealth outcomes, while the continuous line represents post-tax terminal wealth outcomes.

Figure 2: Similar distribution functions for pre-tax and post-tax terminal wealth
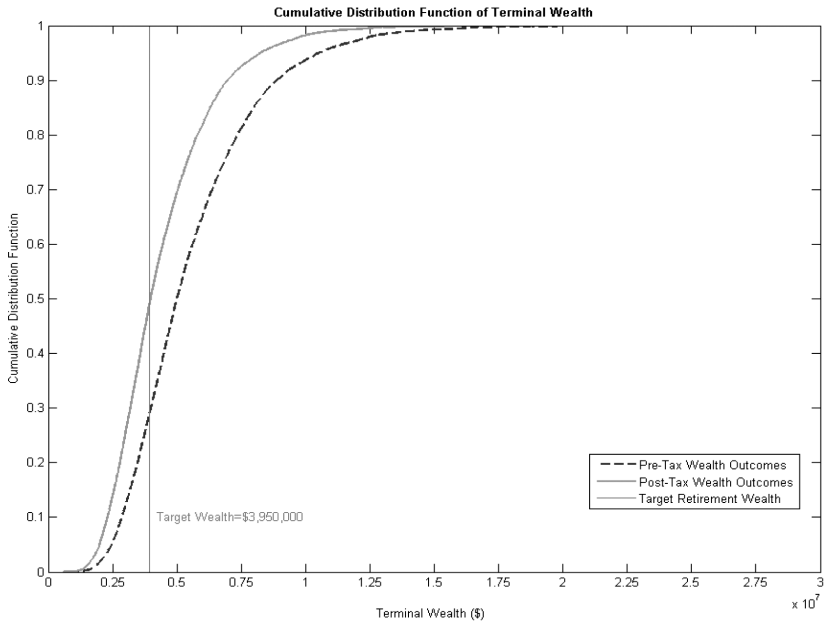
The horizontal axis in Figure 2 represents the nominal dollar value of the portfolio at retirement age. The fact that the pre-tax cumulative distribution function lies to the right of the post-tax cumulative distribution function simply reflects the fact that the superannuant's pre-tax terminal wealth at retirement age exceeds his post-tax terminal wealth. On a post-tax basis, there is around a 50% probability of the representative superannuant not reaching his terminal wealth target at retirement, and about a 30% probability of not reaching that target on a pre-tax basis. The gap between the two cumulative distribution functions widens as we move up toward higher terminal wealth figures, although after a point (roughly at $8m in 40 years' time) it starts to gradually diminish. The gap is at its widest at $7.4m.

Based on this analysis, the representative superannuant would have an average terminal wealth shortfall at retirement age (relative to his nominal RWR target) of $3,063,804 before tax, and $2,877,377 on a post-tax basis (Table 4).

Table 4: Terminal wealth shortfall based on target RWR of 16

	No tax	Tax
Average shortfall	$3,063,804	$2,877,377
Shortfall probability	29%	52%

The probability of shortfall would be 29% on average on a pre-tax basis, but increases substantially to 52% on a post-tax basis. This plainly has implications for both superannuation and taxation policy in Australia, since the probability of the representative superannuant falling short of his target terminal wealth at retirement appears to increase significantly when taking tax into account in calculating terminal wealth.

The VaR and ETL estimates at the 95% confidence level are shown in Table 5. Figures are expressed both in dollar terms and in terms of RWR.

Table 5: Value-at-Risk and expected tail loss

	Terminal wealth		RWR	
	No tax	Tax	No tax	Tax
Value-at-Risk @ 95% confidence level	$2,459,291	$1,930,559	9.97	7.83
Expected tail loss @ 95% confidence level	$2,058,330	$1,619,683	8.35	6.57

Since the estimated VaR for the representative superannuant's fund is $1.93m (post-tax), then at the 95% confidence level, there is a less than 5% chance that the superannuant's terminal wealth at retirement would be $1.93m or less. Plainly the VaR declines when tax is taken into account because the superannuant's terminal wealth itself is lower post-tax, implying that there is less portfolio value to be at risk. To assess the severity of the superannuant's situation if he ends up with such a "below VaR" retirement wealth outcome, the ETL of $1,619,683 (post-tax) at the 95% confidence level represents the probability-weighted average of the terminal wealth outcomes which fall below the 5th percentile of the post-tax terminal wealth distribution.

The difference between the representative superannuant's pre-tax and post-tax terminal wealth outcomes are presented in Table 6, both in dollar terms and in terms of the RWR equivalent.

Table 6: Difference between pre-tax and post-tax terminal wealth outcomes

	Amount	RWR equivalent*
Average	$1,281,270	5.2
Median	$1,134,110	4.6
Maximum	$7,417,320	30.1
Minimum	$148,934	0.6

* The RWR equivalent is calculated as the terminal wealth difference divided by annual final salary. For example, the average RWR equivalent of 5.2 = $1,281,270/$246,620.

On average, based on our assumptions, the difference which superannuation taxation makes to the superannuant's terminal wealth on retirement is almost $1.3m. Based on our simulated outcomes, the largest difference between terminal wealth ignoring tax and terminal wealth not ignoring tax is $7.4m; and the smallest difference between terminal wealth ignoring tax and terminal wealth not ignoring tax is $148,934. This shows the extent to which the results of prior studies, almost all of which evaluate superannuation on a pre-tax basis, are incomplete and may misinform the public policy debate. At worst, the RWR for the representative superannuant on a default superannuation plan in Australia may be overstated by a factor of 30 (cf at best, by a factor of 0.6), but on average, a multiple of 5.2 of final salary. That difference is significant — almost $1.3m — in terms of terminal wealth at retirement age.

6.   Conclusion

Our results highlight the extent to which prior studies, almost all of which evaluate superannuation on a pre-tax basis, are incomplete and may misinform the public policy debate surrounding superannuation. Based on our results, the difference to a representative superannuant's terminal wealth (assuming a typical default investment plan) between ignoring tax and not ignoring tax may be as little at retirement age as approximately $150,000, or as much as $7.4m. While the minimum figure may make little substantive difference to the representative superannuated in the overall scheme of things at retirement age, the representative superannuant could — if the difference in his case were to reach $7.4m — be forgiven for experiencing a sense of panic as to whether he could adequately fund his retirement. Even the average difference of almost $1.3m to terminal wealth between ignoring tax and not ignoring tax, based on our assumptions, would be sufficient to cause the representative superannuant more

than a little consternation, particularly given that it represents a multiple of more than five times the representative superannuant's final salary.

Perhaps our most interesting result is that the probability of the representative superannuant falling short of his target terminal wealth at retirement appears to double, at least for our set of assumptions, when tax is taken into account in calculating terminal wealth. This implies that, under current superannuation taxation arrangements, a representative member has roughly a 50% chance of not accumulating sufficient superannuation to meet a reasonable retirement wealth target.

Plainly, tax matters, and our results have significant implications for both superannuation and taxation policy in Australia, since a key aim of superannuation policy is to ease the burden on government of providing for an ageing population in retirement. This has implications for both theoretical and empirical studies which seek to inform the public policy debate surrounding superannuation. For example, finance and economic studies on superannuation must clearly take tax into account if their results are to be meaningful.

A key objective of this study was to provide a baseline or benchmark against which to compare the results of future research in this area. There is a myriad of fruitful areas for further research. These include whether the effects of portfolio size on terminal wealth outcomes over (say) 40 years is so large, given tax effects, that it generally outweighs the volatility reduction benefit of lifecycle investment strategies such as switching to less volatile assets a few years before retirement; the impacts of tax on the alternative asset allocations with a view to determining the extent to which an alternative allocation might be more appropriate as a default investment option for representative superannuants in Australia; and the sensitivity of post-tax terminal wealth to increasing the SG rate. This baseline study is but a modest first step toward our improved understanding of the impacts of Australia's taxation system on superannuation and retirement wealth outcomes.