Comments Invited

Retirement Wealth of New Zealand Households: An Initial Analysis based on the Household Savings Survey

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Abstract

Statistics New Zealand has recently released the results of a new survey of the assets and liabilities of New Zealand households. This is the first time in New Zealand that a national survey has provided data on the assets and liabilities of households. The objective of this paper is to use this data on the net worth of individuals and couples to make a preliminary assessment of how adequately they have accumulated wealth that could be the basis for income in retirement. There is no unique measure of adequacy. We take as one measure of adequacy of retirement wealth the ability to maintain the level of pre-retirement consumption. After allowing for the income from NZ Superannuation, we estimate what stock of wealth at retirement would be needed to achieve a given level of consumption smoothing. We then estimate the saving rate that would be needed until retirement to achieve that goal. We find there is a wide variability in this prescribed saving rate across both income and wealth levels. However, some limited evidence suggests that the prescribed saving rates are consistent with the actual pattern of saving we observe among households aged 45-55. If consumption smoothing were accepted as one possible indicator of adequacy of retirement wealth together with the implied saving rates necessary to attain that, then we conclude based on a limited comparison with actual rates, that there is no evidence of widespread under-saving by this cohort. However, this does not preclude the possibility that some individuals might be saving at a rate which subsequently they may come to regard as having been too low. New Zealand Superannuation reduces the inequality of retirement wealth and provides for a substantial level of post-retirement consumption relative to its pre-retirement level (the replacement rate) for those in the lowest income deciles. Our results suggest that on average no further saving by the lowest four income deciles would be needed if their objective is to smooth their consumption.

JEL CLASSIFICATION D31: Personal Income and Wealth Distribution
J26: Retirement

KEYWORDS Household net wealth; retirement; New Zealand

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1 Introduction

Retirement, superannuation, private pensions and saving continue to be topics of intense interest to policy-makers, analysts, the finance industry and the media almost universally. There are few countries, especially among the OECD, where these issues are not at the forefront of public debate. Is the public system for the provision of pensions sustainable? What will happen to health costs as the population ages? Are individuals saving enough for retirement? Will they have choices to remain in the labour market?

There are a range of public policy issues that might be better formulated and evaluated if information were available on the assets and liabilities of households. Issues relating to regional disparities in income and wealth, cost of living, poverty, retirement policy, the adequacy of saving for retirement, the effect of the student loan scheme and possible ethnic differences in net wealth could potentially all be better understood with information about the net worth of individual households. Furthermore, to the extent that there were to be a continuing survey of household net worth, then issues such as an improved measure of actual household saving and changes in the distribution of wealth over time could be analysed.

Up until now, no such information has been available in New Zealand. Estimates of household wealth at the aggregate level have been made (Claus and Scobie 2001, Thorp and Ung 2000, 2001) but no data at the unit record level had ever been assembled in a national survey. In 2001 Statistics New Zealand undertook such a survey for the Office of the Retirement Commissioner, and the results were recently released (Statistics New Zealand 2002a, b). The survey is entitled the *Household Savings Survey* and referred to as the HSS. This paper reports analyses of the survey results that have been generated through a joint project between the Office of the Retirement Commissioner and The Treasury.

[1] We are most grateful to Tanya Randall, Mike Camden, Irene Zeng, John McGuigan, Jean Watt and Sandra McDonald of Statistics NZ for their support in organising access to the data and for guidance and comments. Le Thi Van Trinh checked the derivations in Appendix A. John Creedy provided guidance on the modelling and authored Appendix B. Malcolm McKee of the Treasury answered endless questions about benefits. David Feslier of the Office of the Retirement Commission (ORC) has been instrumental in guiding and supporting this project, which has been a joint undertaking between the ORC and the Treasury.

The HSS has provided the first comprehensive view of the assets and liabilities of New Zealanders based on individual responses. This paper presents an initial analysis of valuable new data from the perspective of retirement wealth. The paper has two goals. The first is to report the patterns of asset accumulation for retirement found in the survey.[2] We have chosen to focus on those aged between 45 and 55 (inclusive) as the group for which retirement savings is a critical issue. The second goal is to analyse the implications for retirement income and savings based on the projected levels of retirement wealth. The paper focuses solely on the retirement accumulation of households and does not consider any possible relationship between the level of private saving and economic growth.

An ancillary question is whether New Zealanders are saving adequately for their retirement. As will be shown, there is no straightforward way to reach a conclusion on this issue.

It will become abundantly clear that it is difficult to define and measure retirement wealth. The difficulty of then determining whether a particular level of wealth is "adequate" is compounded by the problem of assessing the "needs" for retirement income. It is for these reasons that the results in this paper should be regarded as an initial analysis. We have attempted to test the savings rates we find from the modelling against some evidence of actual savings behaviour. We find that we are able to predict the actual behaviour reasonably well. This leads us to conclude that there does not appear to be strong evidence from the HSS of significant under-saving for retirement by New Zealand households aged between 45 and 55. Two caveats are in order. First, this does not preclude the possibility that some individuals may be "under-saving" (although some care is needed to specify what is meant by that term). Second, we regard these results as a "first cut"; the rich data set contained in the HSS will hopefully generate many further studies by other researchers.

The paper proceeds as follows. In the next section we give a very brief synopsis of the HSS that provides the data used in this analysis. In Section 3 we set out the analytical frameworks that have been used. Details of these are contained in Appendices A and B. Section 4 contains the results of the study; these are presented for both unpartnered individuals and for couples. The section concludes with a discussion of the adequacy of retirement savings and draws on limited evidence from the USA and New Zealand. The final section presents the conclusions and outlines unfinished business.

2 The survey

The survey[3] covered those over 18 years old living in private dwellings and usually resident in New Zealand. Those living in non-private dwellings such as institutions, motels, rest homes or hostels were excluded, as were those on offshore islands (except Waiheke Island). The survey population covered about 98% of the resident adult population. The socio demographic characteristics of the respondents are summarised in Appendix Tables 1 and 2.

For the core sample a total of 6,600 households were approached. One person from those qualifying in the household was chosen at random, and information was collected from and about that individual. In the case where they had a partner, information was collected for the couple, ie, where the respondent and his/her partner were living in the

[2] For a detailed analysis of the net worth of the entire population the reader is referred to a companion paper see Gibson and Scobie (2003).

[3] For further details see Statistics New Zealand (2002a).

same household the couple was interviewed as a single unit. In order to improve the accuracy of estimates for Maori, a booster sample was used. In total the response rate was 74% and the final number in the sample was 5,374 households. There were 2,392 individual interviews and 2,982 for couples. It is important to stress that the term household refers to the unit of selection. The results are for individuals (living as individuals or partnered) and not for households or families.

The survey covers a population of 930,900 unpartnered individuals and 1,711,800 individuals in couples, or a total of 2,642,700 people aged 18 and over.

While the survey is entitled a "Household" survey it did not pertain strictly to households per se. Rather it covers non-partnered individuals and couples. Statistics New Zealand uses the term *Economic Units* to refer to the collective of these sampling units. In this paper for convenience we will use the term households with the understanding that it is to be interpreted as a collective term for the units in the sample. Statistics New Zealand uses the term "net worth". In this paper, we include the expected value of New Zealand Superannuation as part of retirement wealth and hence have chosen the term "net wealth" to distinguish it from that used in the survey.

3 Analytical frameworks

We employ three different albeit related, approaches for estimating saving and retirement income. The first involves the joint determination of saving and replacement rates, where the replacement rate is defined as post-retirement income as a share of before tax pre-retirement income. It seeks to find a sustainable level of equal consumption before and after retirement. The second approach asks: if an individual or a couple wish to have a retirement income equal to some arbitrarily chosen fraction of their pre-retirement, what level of savings will they need from now until retirement? In asking this question it is possible to specify a replacement rate which would imply saving at some level which would simply not be feasible. Potentially the implied saving rate could require virtually all pre-retirement income be saved, leaving nothing to current consumption. The first of the three approaches avoids this problem by solving jointly for the saving and replacement rates. The third approach is based on a formal utility or welfare maximising approach.

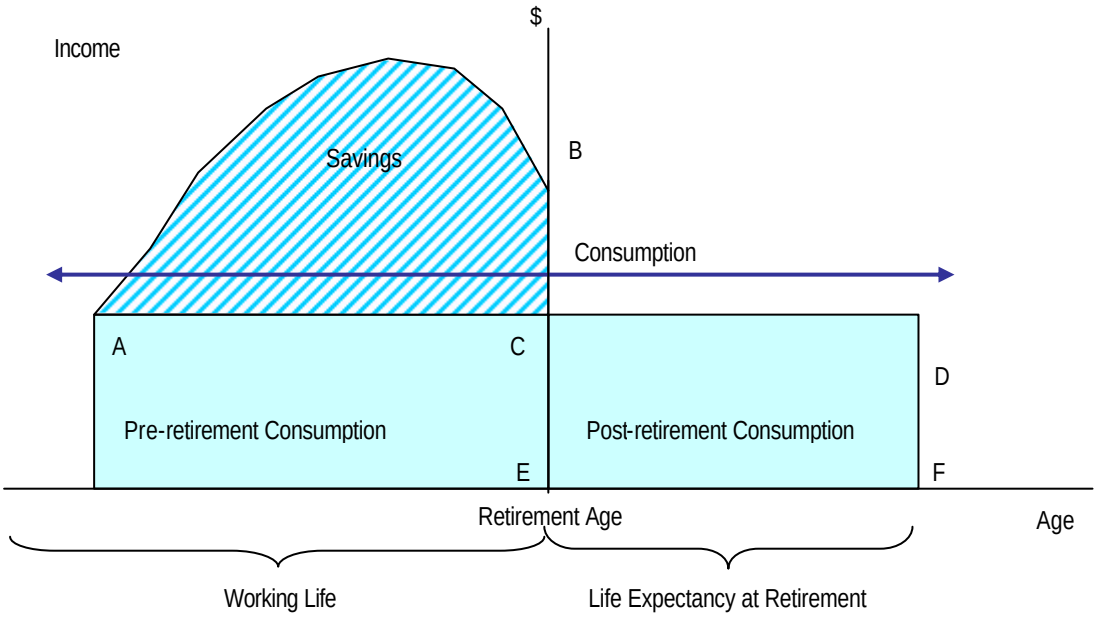
In all three cases we have made some rather strong assumptions. First and foremost is that we assume there are no sources of uncertainty. Specifically this means that an individual of a given age plans to retire at a certain age (and does so); does not engage in the work force after retirement; knows exactly what their income until retirement will be; can accurately project the rate of return on investments; has a known life expectancy at the age of retirement (and lives for exactly that number of years); knows with certainty the amount of NZ Superannuation (NZS) that they will receive; plans and executes whatever bequests they wish to make; has no unexpected changes in health status that would affect income or expenditures and assumes tax rates and other policies remain unchanged. We further assume that the retirement phase for couples begins when the older partner reaches the NZS qualifying age (the younger partner is assumed to continue earning an income, which may affect the value of NZS received by the qualifying spouse).

In the absence of uncertainty, the life cycle saving and consumption patterns can be simply illustrated as in Figure 1. Income rises through working life reaching a peak (typically at around 55 years) and declining somewhat in later life. In this simple model the household chooses a level of consumption that can be financed from income, and from

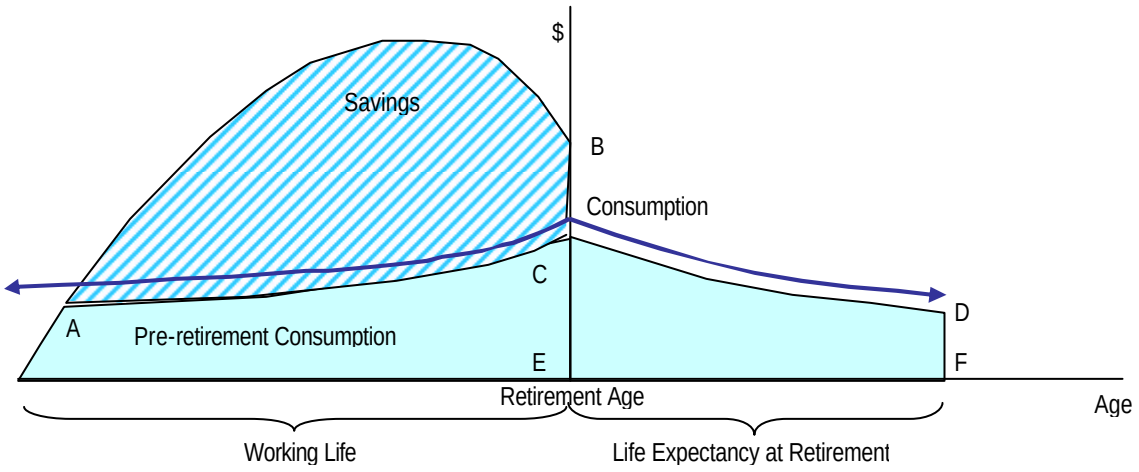
savings during retirement. This implies (in the absence of interest) that savings (the area ABC) is equal to consumption needs in retirement (depicted as the rectangle CDEF). As shown, consumption typically exceeds income during the early years (eg during tertiary education) implying the need to finance consumption by borrowing against future income. This simple life cycle pattern of income consumption and savings is modified when we allow for uncertainty. As shown by Moore and Mitchell (1997) when life expectancy is uncertain consumption will tend to rise until retirement and fall subsequently, rather than remaining uniform throughout (see Figure 1, part (b)). However, the basic pattern of earnings and savings reaching a peak prior to retirement and wealth decumulation throughout retirement to finance consumption is left unaltered.[4]

Figure 1 – A simple life-cycle model of income, savings and consumption

(a) No Uncertainty



(b) With Uncertainty



Source: Adapted from Moore and Mitchell (1997)

[4] For patterns of life-time income, consumption and savings derived from the Household Economic Survey see Gibson and Scobie (2001). Their results show a pattern of lifetime consumption which is captured by the stylised line ACD in Figure 1(b).

In the case of complete certainty a person may or may not plan to leave a bequest. However, in the face of uncertainty, some precautionary savings may be accumulated, which if not needed (because of lower than expected costs or premature death) may, by default, lead to bequests. Conversely, if accumulated savings prove inadequate due to unforeseen events, some other source of income in retirement would be required (typically either from family, the state or charitable agencies).

Abstracting from uncertainty has the advantage of significantly simplifying the analysis. Clearly the results cannot be interpreted as applying to a particular individual whose incomes, expenditures, returns on assets and life expectancy are all subject to shocks. However in the case that these shocks are both unanticipated and distributed equally among both positive and negative changes, then the outcomes illustrated here can be interpreted as expected values for any given population group. For example, in our empirical analysis (Section 4) we use life expectancies at retirement age by ethnic group and gender. Other things equal, our results will show the income, saving, wealth and consumption levels that could be expected for, say, Maori and Pacific Island women aged 45-55 as a group, rather than for a specific individual in that group.

Each of the three approaches is described in the remainder of this section. However before proceeding, we digress to address the question: are New Zealand households saving adequately for retirement? This question lies at the heart of the policy debates concerning retirement income. If policies were developed to further stimulate retirement saving, then some notion of what constitutes an adequate level of saving is unavoidable. As we shall see, there is no simple answer to this question.

3.1 What is meant by adequacy?

Any attempt to assess how adequately New Zealanders are preparing for retirement through saving immediately must confront the question: how is "adequate" to be measured? By what criteria would we assess savings and the associated level of wealth accumulation for retirement to be adequate? What is seen as adequate may differ whether we have an individual or a collective perspective. From a public policy perspective we might focus on adequacy as it applies to the average of some group in the population; eg, would, on average, those aged between 55-60 with no dependents and having accumulated retirement wealth of $20,000 and having current income of $25,000 be considered to have saved "adequately"? Or should we recognise that within each group there will be wide variation and conclude that adequacy can only be addressed at the individual level? In that case our measure of adequacy might be say, that at least 90 percent of the group have retirement wealth deemed to be adequate; or perhaps 100%?

There is a range of measures that one might adopt to measure adequacy. They include:

- Post-retirement income as a proportion of pre-retirement income (typically referred to as a replacement rate);
- Some maximum acceptable change in the level of consumption (ie, post-retirement consumption should be at least 80 percent of pre-retirement consumption);
- Income in retirement should be at least at a level deemed necessary to attain an acceptable minimum standard of living (an absolute poverty line approach)
- Income in retirement should be no lower than say 60 percent of the median income of some reference group of retirees (a relative poverty line approach);

- Incomes in retirement should be at least equal to some fraction of the average pre-retirement incomes of the current working population (a variant of a relative measure);
- Incomes in retirement should be at a level that people can sustain their pre-retirement level of consumption thereby avoiding a drop in their living standards (a consumption smoothing approach);
- Income in retirement should be such that it permits an individual to have the same marginal utility of consumption over time (ie, the last unit of consumption has the same value to the individual before and after retirement).

There are undoubtedly other measures that could be proposed. For example once uncertainty is allowed, then we can ask whether an "adequate" retirement income is one which would be capable of covering any possible eventuality, such as unanticipated health expenses, or extended life expectancy. Or should it cover say 80% of the expected costs of such occurrences? In the face of planning under uncertainty, one would want to consider the role of insurance markets to reduce the costs of uncertainty. In the absence of insurance instruments (either a private policy or a social programme that addresses emergency needs or catastrophic events), one might well expect the level of precautionary saving to be higher. In short, the level of uncertainty, an individual's attitude to risk, the cultural patterns of extended family support, the labour force participation patterns of the retirees and the scope of private markets and social insurance would all shape what we might consider as an "adequate" level of retirement wealth. Adequacy cannot be determined without reference to the social and economic context.

The matter is further complicated when we go beyond the level of the retirement savings of individuals. Clearly, preferences differ widely and that factor alone can help explain a considerable amount of the variation in retirement accumulation across individuals. The fact that wealth is typically much more unevenly distributed than income is solid testimony to the fact that individuals, similar in all major observable aspects, will choose to accumulate different amounts, quite apart from the influence of any windfall gains or losses.

Some individuals will have a more risk averse attitude than others, while some will attach different probabilities to possible adverse events. These differences will influence the level of precautionary savings that we observe across individuals. Both the actual level of saving and the "adequate" level of saving will be the resolution of a complex set of factors involving the preferences and perceptions of individuals together with their health and capabilities, the public policies, that are in place, and opportunities in labour markets. Any consideration of adequacy cannot be divorced from these influences.

As a result we have chosen to approach the matter of retirement income and saving by asking what level of post-retirement income could individuals aged between 45 and 55 expect to have based on their current and projected wealth? We estimate the saving rates and the replacement rates that are implied if individuals attempt to sustain an equal level of consumption before and after retirement; ie, we invoke consumption smoothing as the aim of retirement saving. In addition we derive estimates of the income in retirement that is implied by the estimated replacement rates. We then analyse the distribution of the predicted retirement incomes and calculate how many people would have incomes in retirement below 60% of the median income of that cohort (ie, a relative poverty line approach).

Housing wealth represents some particular challenges. In the first place we assume no real capital appreciation in housing values. They are assumed constant in real terms.

This is a conservative assumption that could understate projected retirement wealth. A somewhat typical pattern is for those owning a primary residence to retain this, partly as a precautionary investment and partly as a potential bequest. In such cases it would not be appropriate to include the net value of housing assets as part of retirement wealth and thereby available to be converted into an annuity along with other accumulated assets. In the empirical analysis we present the results for three cases: including housing as part of retirement wealth, including only 50 percent of housing, and excluding entirely the value of net worth in housing.

Housing assets are not necessarily acquired simply to contribute to the lifetime smoothing of consumption. They have a dual role in providing a service (shelter) as well as a form of investment.[5] Given the perceived costs of moving, the costs of renting, the uncertainty of life expectancy and the fact that the annuity value of releasing equity is low at least until later life, housing assets are often bequeathed. For this reason in many of the results we present we have chosen the case that involves no consumption of existing housing assets.

3.2 The basic model: jointly determining replacement and saving rates[6]

This approach computes jointly the saving and income replacement rates for each household in the survey where the respondent was aged between 45-55.

A complete derivation of the model is given in Appendix A, while a graphical illustration is given in Figure 2. At the current time a household has a net worth (depicted as W_a) measured in the HSS. This is projected to grow to an amount denoted W_p by the time they reach a predetermined retirement age (here we assume 62, 65 or 68). In order to have a given level of income in retirement they would need to have accumulated retirement wealth depicted in Figure 2 as the stock, W_r. Part of their retirement income is provided by NZS and the stock or wealth at retirement equivalent to that flow of income, is incorporated in W_r and W_p.

The difference between the required wealth (W_r) and the projected wealth W_p is labelled as the shortfall and is the amount which would need to be accumulated between now and retirement in order to add to the projected stock and hence support an income in retirement of level (denoted Y_r). This additional amount, in the absence of inheritances or unanticipated windfall gains or losses in asset values, would need to be accumulated through savings. These flows are depicted in Figure 2(b).

The approach assumes that some fixed share s of pre-retirement income will be saved ($s=S/Y_p$) and the replacement rate (R) is given by the ratio of gross income in retirement to gross income pre-retirement (ie, $R= Y_r/Y_p$). As explained in Appendix A, under the New Zealand taxation system of TTE,[7] post retirement taxes (denoted as T_r) are assumed to be zero, so real after tax consumption is equal to total pre-retirement income.

[5] For an extended discussion of the consumption of housing equity see Disney (1996).

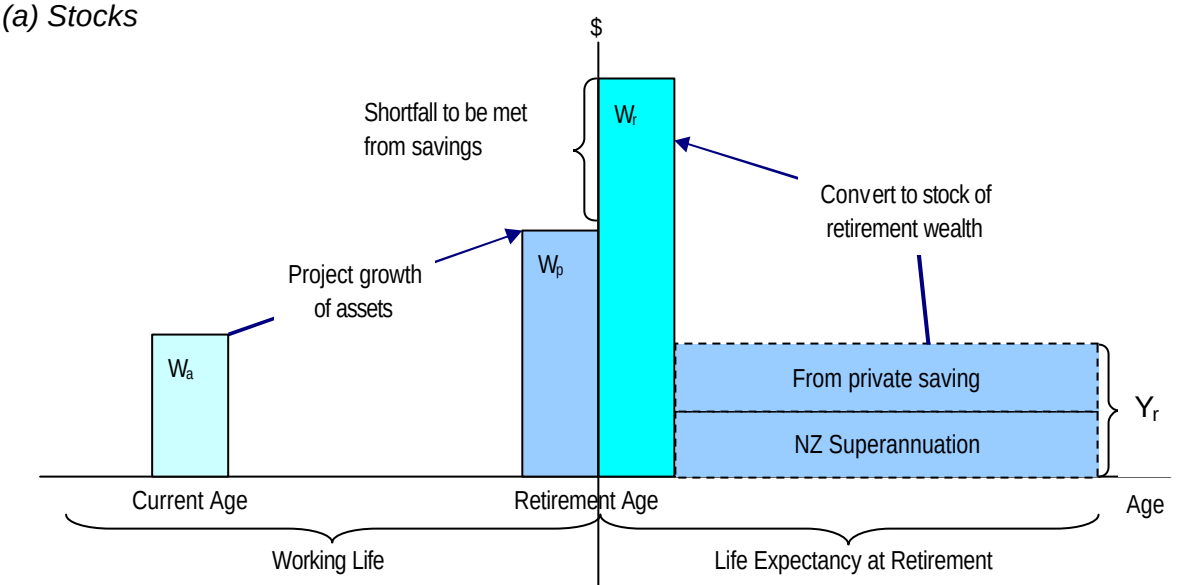
[6] The approach adopted follows that of Moore and Mitchell (1997).

[7] TTE refers to a system where the savings are made from after-tax income, the returns are taxed and the withdrawals are exempt. It differs from those systems which exempt savings or earnings from taxation and tax withdrawals (TET, ETT or EET).

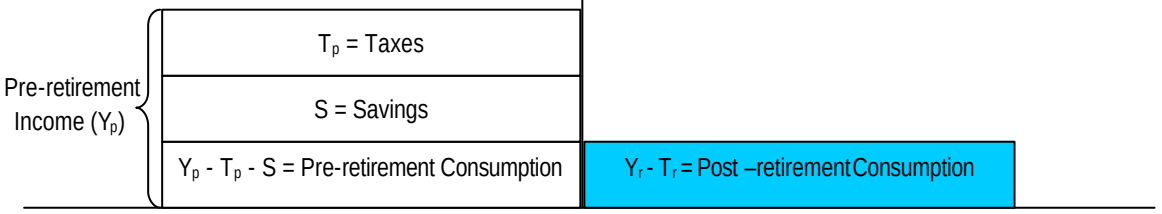
Clearly some values of retirement income could imply a substantial shortfall in retirement wealth, which might in turn require unrealistic or unfeasible levels of saving pre-retirement. It is for this reason that the saving and replacement rates are jointly determined.

Figure 2 – A stylised view of stocks and flows of income, savings and retirement wealth in a model of the joint determination of saving and replacement rates

(a) Stocks



(b) Flows



Legend:

Y_p = Pre-retirement income
T_p = Pre-retirement taxes
Y_r = Post-retirement income
W_a = Wealth at current age
W_p = Projected wealth at retirement
W_r = Wealth at retirement needed to supply a post-retirement income of Y_r

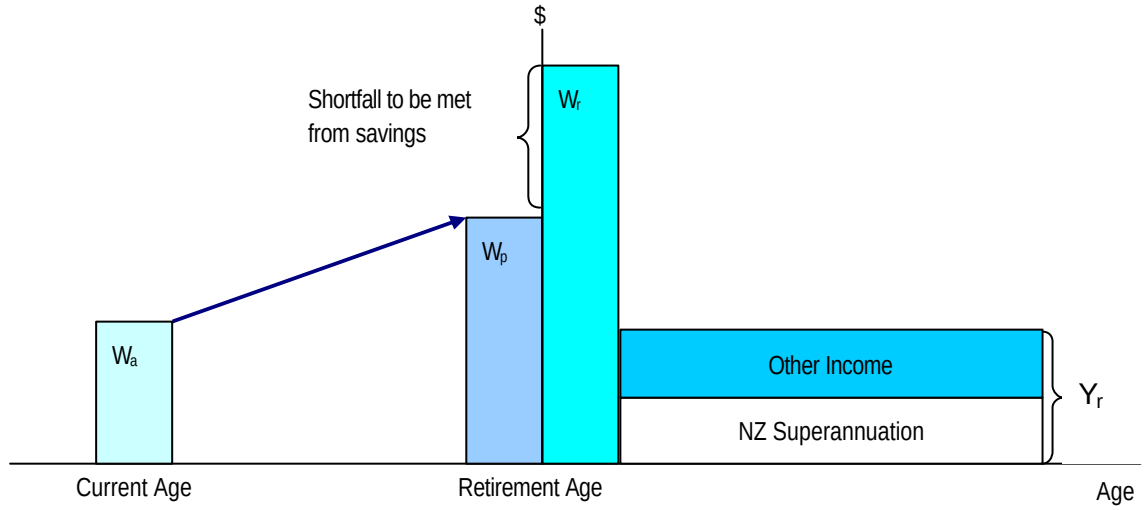
A number of additional factors arise which are not depicted in Figure 2. Instead of a constant pre-retirement income we assume that income grows from its actual level (as observed in the survey) by a fixed annual growth rate of 1% chosen to approximate the average annual rate of labour productivity and real wage growth in the economy. The gross income at retirement (Y_p) is then based on the observed actual earnings plus a compound growth of 1% annually.[8] Pre-retirement tax rates are based on pre-retirement real income (Y_p). NZS payments are assumed to be constant in real terms.

[8] An alternative approach would have been to estimate age earnings profiles for the survey. However, with a single cross section as in the HSS one cannot isolate cohort effects as these would have been compounded into earnings estimates. There are a number of individuals in the sample who report negative or very low incomes. These reported incomes could include a significant transitory component, such as a temporarily low income due to redundancy or losses in an unincorporated business. Some estimate of consumption is often used in such cases as a better proxy for permanent income. In this study we use the unemployment benefit rate as a an estimate of a minimum consumption level for those reporting negative incomes or income below the benefit rate.

3.3 Fixed replacement rates

A second approach is taken which is a variant of the first. Here we start by imposing an arbitrarily chosen replacement rate. This defines the level of post-retirement income. For example if the pre-retirement income was $40,000 and the chosen replacement rate was 50 percent, then post-retirement income would be $20,000. In order to sustain this level in retirement would require a level of wealth at retirement of some level. This amount is compared with the individual's projected accumulation based on their present net wealth. The annual saving rate needed to accumulate the difference between the projected and required levels of retirement wealth is then estimated. The basic structure of this approach is illustrated in Figure 3.

Figure 3 – A simple model based on an arbitrarily chosen replacement rate



Legend:
Wa = Wealth at current age
Wp = Projected wealth at retirement
Wr = Wealth at retirement needed to supply a post-retirement income of Yr

3.4 A utility maximising approach

From a theoretical perspective, the model of joint determination of saving and replacement in section 2 has a potential shortcoming: it specifically is not built on a behavioural model of individual utility maximisation.[9] Models based on utility maximisation while theoretically more appealing can become extremely complex in their implementation. Furthermore they are reliant on estimates of key parameters that describe consumption and saving behaviour, and these are seldom if ever known with certainty.

In this study we have relied on the admittedly more pragmatic approach of a model that is more akin to a financial planning approach, rather than one having a theoretical utility maximising foundation. However in order to provide a comparison and in part to test the difference with our basic model, we have estimated a simple version of a utility maximising model, albeit without uncertainty.

Figure 4 provides an illustration of the essential concepts behind the utility maximising model. An individual of a given current age is viewing the time to retirement and life

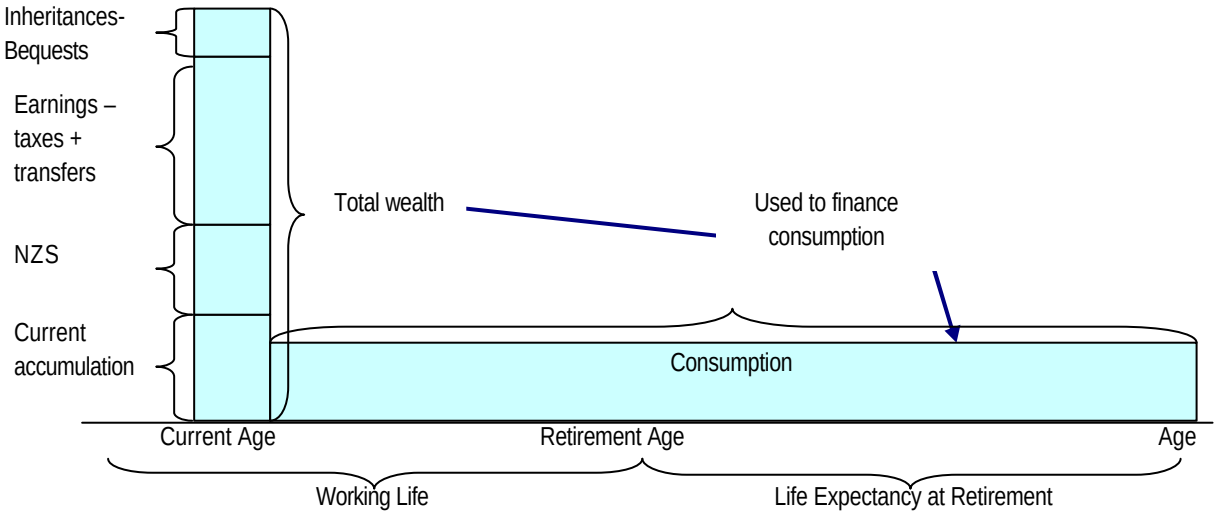
[9] For an example of a study based on stochastic life-cycle simulation model with an underlying utility function and allowing for uncertainty, see Engen, Gale and Uccello (1999).

expectancy at their current age. For example a 55 year old might plan to retire at the age of 65 at which point s/he has a life expectancy of, say, 16 years. Ignoring interest and time preference rates for the moment, then the total amount this individual can consume and bequeath is constrained to be equal to the total value of wealth. Wealth is made up of four components each expressed as a present value:

- current net worth (accumulation of past savings plus changes in asset valuation);
- the value of NZS expressed as lump sum at current age;
- future earnings net of taxes and transfers;
- inheritances, net of bequests.

To illustrate: in the case of a current 55 year old with an expected 26 years of life remaining, then were the present value of their total life time wealth, say, 260 units, this would support an annual consumption of 260/26 = 10 units (in the absence of bequests and interest earnings).

Figure 4 – An illustration of lifetime wealth and consumption based on a simple model of utility maximisation



In practice we need to allow for the fact that wealth will earn a return (in the form of profit, dividends or interest) and individuals typically value more highly a unit of consumption now than in the future. However, these factors do not alter the basic premise that lifetime consumption in constrained by total wealth.[10]

A formal statement of the model and the solution for that level of consumption that maximises the discounted present value of life time utility subject to the wealth constraint in given in Appendix B, authored by John Creedy. For any given income level, saving is then determined as the difference between after tax income, and the estimated level of consumption that can be sustained.

A fundamental strength of this approach is that given the behavioural parameters of the utility function,[11] a trade off is made between more saving today for subsequent consumption versus the lower consumption today that this would imply. An individual is assumed to continue adjusting today's consumption and saving until the last unit of

[10] This is formally referred to as the intertemporal budget constraint.

[11] These are the rate of time preference, the intertemporal elasticity of substitution and the discount rate.

consumption today provides the same satisfaction as an additional unit of deferred consumption. Once this point has been reached, further saving would reduce lifetime welfare, as it would imply foregoing consumption now, which was more highly valued than the gain from additional consumption in the future.

4 Results

4.1 Level and composition of current retirement wealth

In this first section of the results we present the level and composition of retirement wealth. All the results are population estimates for those aged between 45 and 55 or in the case of couples where at least one partner fell in this age range and the other partner had yet to reach the lowest retirement age we consider, of 62. The results are broken down by decile of current wealth, by two major ethnic groups (European/Pakeha and Maori/Pacific Island), and by gender.

We define four categories of wealth: Housing, Financial, Pension and NZ Superannuation. Housing wealth is the current net worth of the primary residence. Financial wealth includes farms. Businesses, other property (holiday homes, rental property, commercial and overseas property) together with life insurance, bank deposits, positive credit card balances, shares and managed funds, money owed, motor vehicles, cash, collectibles and other assets. Pension wealth is based on the holdings in personal superannuation schemes, defined contribution schemes and defined benefit schemes. In the first two cases the value was the that which the respondent would receive if the scheme were cashed up on the day of the interview. In the third case, the estimate of value was provided by the Government Actuary. Maori assets are excluded from the analysis as it is not clear that any one individual reporting net Maori assets could annuitise those for retirement income.

We have chosen to present separate sets of results for unpartnered individuals and couples. An alternative approach would have been to have combined both data sets and based the analysis on households, or economic units as defined by Statistics NZ. This approach would have been valid (setting aside some practical difficulties with defining variables for couples) were couples to be in effect the sum of any two individuals. It seemed unlikely such would be the case; the phenomenon of assortive mating would suggest otherwise. To test for this we estimated a model across all individuals Partnered and unpartnered) for net worth, including a wide range of conditioning variables. In addition we added a dichotomous variable for being partnered. Given that this had a highly significant effect (implying that all else equal people who were partnered had $44,400 more net worth than those not partnered), we maintained the subsequent analyses separate, rather than pooling the observations.

The total wealth is disaggregated into four major categories: net housing wealth; net financial wealth, pension wealth and NZS wealth. The first three categories are derived from the HSS, where housing wealth refers to the primary residence rather than holiday homes or investment properties.[12] The final category is computed by converting the expected flow of NZS payments (after tax and abatement due to a non-qualifying spouse)

[12] Assets listed as Maori trusts are excluded as it is not clear that these could be converted to a flow of retirement income.

into a lump sum at retirement age. This amount is simply that, which if converted to a series of annual payments, would, for the number of years of life expectancy at retirement age, be equivalent to the payments under NZS, assuming a continuation of current superannuation policy. This lump sum is then discounted back to the individual's current age (or the age of the older partner in the case of couples) and added to their existing wealth. Results are presented for three retirement ages (62, 65 and 68); both means and medians are reported. It should be noted that there are a number of cells for which the median is reported as zero; this is correct and simply implies that 50% of the observations fell at (or below) zero (eg, the case of pension wealth).

Throughout we have used an after tax, real rate of return of 2% pa. For all compounding and discounting.

A particular difficulty was encountered with the computation of pre-retirement income (Y_p) based on actual reported incomes at the time of the survey (Y_a). In some cases, observed incomes were zero or negative. This is to be expected as some people might be reporting losses from unincorporated businesses, while others might have transitory shocks to their normal incomes. The implication of this is that to apply a consumption smoothing model in these cases would require borrowing against future income in order to provide for some consumption today, as a no reported income implies, for a modelling perspective, that there is no consumption spending. In the case where the only future income is expected to be from NZS, then clearly borrowing against this is not a feasible option.

Ideally, we would prefer an estimate of permanent income, free of transitory components. Consumption spending is sometimes used as an indicator. We assigned the unemployment benefit as a minimum estimate of consumption for those who reported income below this level. We recognise that while this overcomes the difficulty of zero or low reported incomes for the purposes of applying a consumption smoothing model, it does not address the possibility that such transitory elements are equally prevalent at higher reported income levels. Our defence would have to rest on the expectation that positive and negative transitory components are both present and would tend to cancel out if symmetrically distributed.

4.1.1 Unpartnered individuals

The composition of wealth for unpartnered individuals is shown in Appendix Tables 1 and 2 for the means and medians. For the lowest four deciles, NZS represents almost the entire amount of retirement wealth, dropping to 15% for the wealthiest decile. For the median 10% of individuals it represents about one half of retirement wealth. NZS wealth increases with total wealth; ie, the absolute value of NZS is greatest for the wealthier individuals, as their life expectancies are typically greater. Similarly, the current value of NZS is greater for women than men. For Maori and Pacific Islanders, NZS comprises 58% of retirement wealth, compared to 40% for all Pakeha respondents. Figure 5 summarises the level and composition of wealth by deciles.

Figure 5 – Level and composition of mean current wealth by wealth decile: Unpartnered respondents aged 45-55

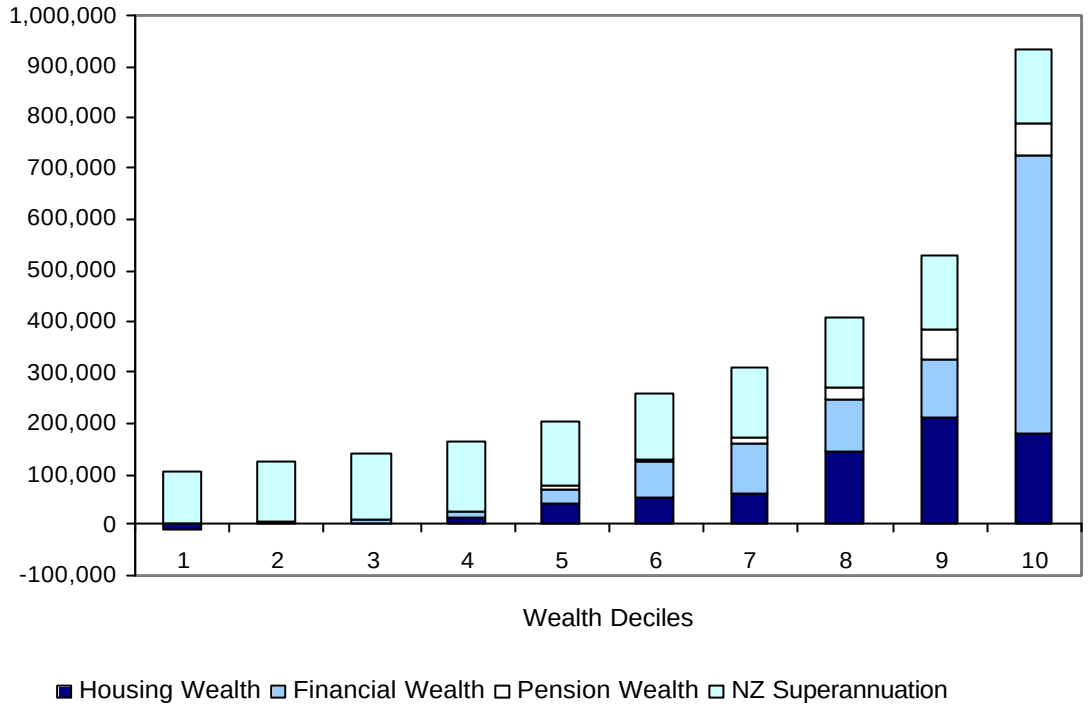
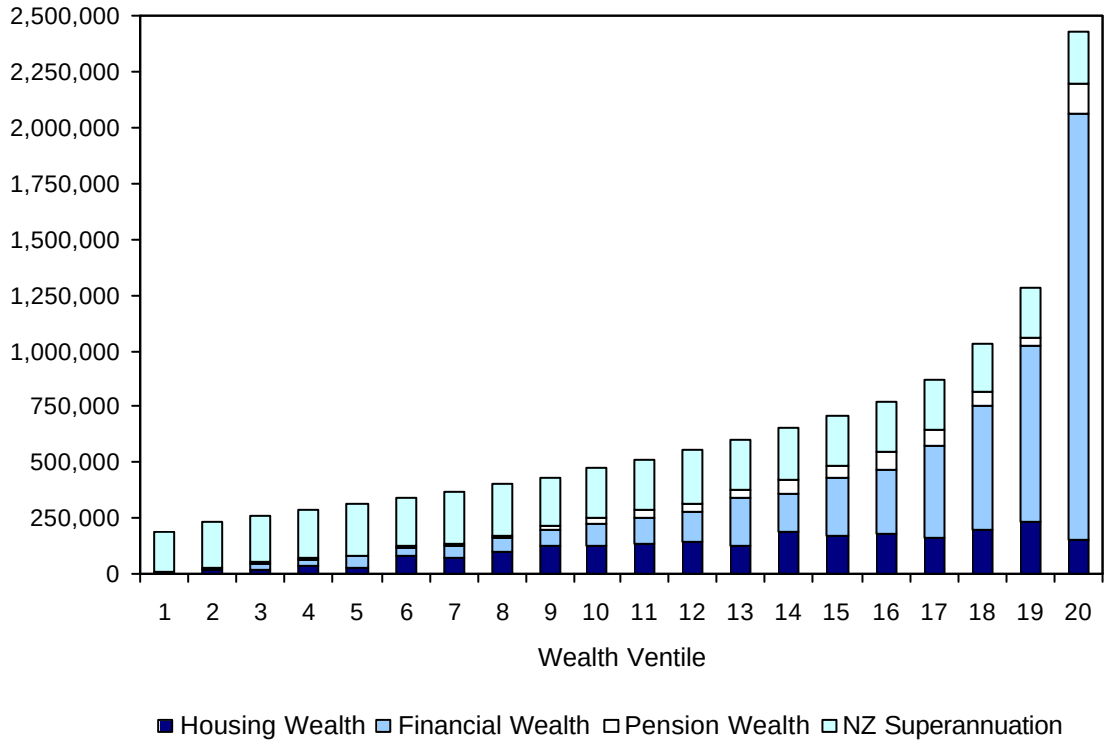


Figure 6 – Level and composition of mean current wealth by wealth ventile: Couples aged 45-55



4.1.2 Couples

The means and median levels and composition of retirement wealth for couples aged 45-55 are given in Appendix Tables 14 and 15. In the lowest wealth decile, NZS represents

over 90% of total retirement wealth. This falls to under 15% for those in the highest wealth decile. For the whole cohort, the median share of NZS is 45%. The level and composition of retirement wealth is illustrated in Figure 6.

4.2 Levels of projected wealth at retirement

Projections of retirement wealth were made on the basis of assumed growth rates defined as after tax real rates of return for different classes of assets. Net housing wealth was assumed to remain constant in real terms (ie, no capital gains). Business and financial assets were assumed to grow at 2% pa, while other classes such as farms, property and vehicles were assumed to maintain constant real value. The projected levels of wealth make no allowance for any additional saving that might occur between now and retirement age. As the HSS does not provide any indication of saving rates, it was impossible to predict how much individuals might save. The results of the basic model in Section 4.3 estimate the saving rates that would be consistent with a consumption-smoothing requirement. Note that NZS wealth declines with increasing retirement age, as the number of years of expected benefits is the difference between retirement age and life expectancy. Life expectancies derived from Statistics NZ are given in Table 1.[13]

Table 1 – Life expectancies by age of retirement, ethnicity and gender

	Retirement Age					
	62		65		68	
	Pakeha	Maori/Pac.Is	Pakeha	Maori/Pac.Is	Pakeha	Maori/Pac.Is
Male	18.05	13.83	15.79	12.23	13.69	10.76
Female	21.80	16.34	19.33	14.54	16.95	12.87

Note:
Pacific Islanders were assumed to have the same life expectancies as Maori. In the modelling we used the actual life expectancies at age 65 and adjusted these by -3 and +3 for ages 62 and 68.

4.2.1 Unpartnered individuals

The means and medians of projected retirement wealth at the three retirement ages are given in Appendix Tables 3 and 4. At age 65, the mean projected wealth for all respondents is $388,000. The fact that the distribution is skewed to the upper levels is evidenced by the fact that the median is $290,000. The median level of wealth at 65 for Maori and Pacific Islanders is 50 % of the median for Pakeha. Females have higher wealth overall than males, due to higher housing wealth and a greater value for NZS due to their longer life expectancies.

4.2.2 Couples

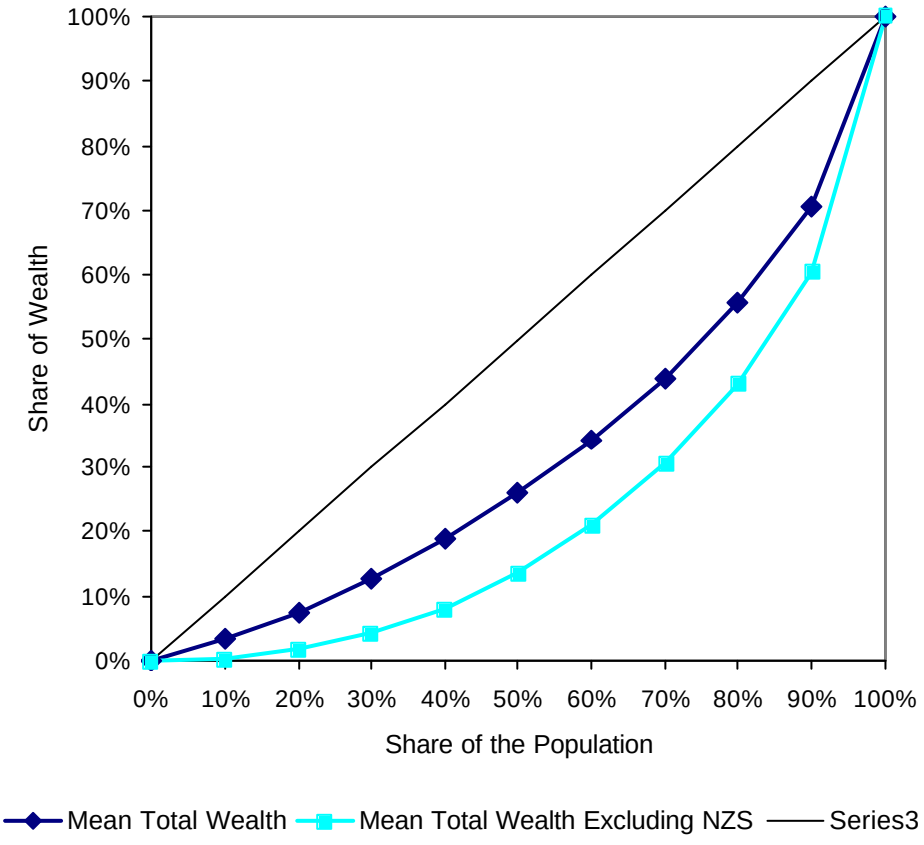
The projected wealth at retirement for all couples currently aged 45-55 is $590,000 (see Appendix Table 16). Of this, 50% is accounted for by NZS, while financial wealth is 23% of the total. Only 6% of retirement wealth is accounted for by pension plans. Maori and Pacific Islanders are projected to have just over on half of the median retirement wealth of Pakeha respondents.

[13] All individuals are assumed to survive from their current age until the retirement age.

Differences in wealth accumulations between ethnic groups could arise if the asset allocations were different (Straight 2002). If one group were to hold a disproportionately higher share of their wealth in low growth assets, then there projected wealth may be commensurately lower. In fact, Maori/Pacfic Island couples hold a lower share of their wealth in housing, which we have assumed to show no real growth. The projected wealth of the Pakeha couples would be if hence grow more slowly other things being equal. In short it does not appear that asset allocation contributes significantly to the differences in projected retirement wealth.

The contribution of NZS to reducing the inequality of retirement wealth amongst couples is illustrated in Figure 7. The lowest 30% of couples have 4% of the total wealth excluding NZS, but their share rises to 13% when NZS is included. The lowest 70% have 30% of the total retirement wealth, rising to 44% when NZS is included. The top 10% have 40% of the total wealth excluding NZS, but their share falls to 29% when NZS is included.

Figure 7 – Distribution of retirement wealth for couples with and without NZ Superannuation



4.3 The basic model

This section presents the results of applying the model of joint determination of replacement rates and saving rates described in Section 3.2 and Appendix A. The results for unpartnered individuals are summarised in Appendix Tables 5 through 10. For each of three assumptions about housing wealth there is a table for means and a separate table for medians. To estimate earnings at retirement we assume that current earnings grow at one percent in real terms. Pre-retirement tax is applied to the resulting income. The results are presented by decile of current wealth, and by ethnic group and gender. Results

ordered by income decile for each of three assumptions about housing wealth, are given in Appendix Tables 11 through 13.

4.3.1 Unpartnered individuals

The first feature of the results is that the replacement rates are broadly similar for all wealth deciles, although they rise sharply at the highest levels. They are typically of the order of 70%, ie, retirement income is approximately 70% of pre-retirement income (before tax). The mean saving rate for the entire sample is negative; ie, with the average level of projected retirement wealth, an "average" individual could expect a replacement rate of just 70% with no further savings.[14] Naturally this disguises wide variation across the wealth distribution. The prescribed mean saving rates for the upper four wealth deciles are negative. This implies that those who have already accumulated significant wealth can sustain a high replacement rate with no further savings (or even with some consumption of their present accumulation). This result parallels that of Moore and Mitchell (1997) for the USA (Table 3).

However, it is argued that the mean results are not particularly insightful. A few high wealth individuals, whose prescribed saving rates are highly negative, can affect substantially the average for the group as a whole. For this reason we prefer to examine the medians. We have presented both means and medians however, for completeness.

The median prescribed saving rate for retirement at 65 is 6.3% with a corresponding replacement rate of 69.2%. Females have a significantly lower prescribed saving rate and attain a higher replacement rate than males, which may account for the finding that NZ women are less likely to make provision for their own retirement than are men (Gee, et al, 2002). The prescribed saving rate for Maori-Pacific Island is somewhat higher than for Pakeha, although the replacement rates are similar.

The median replacement rates for earlier and later retirement are 67.2% for age 62, and 71.0% at age 68). In other words, there is no dramatic change in the replacement rate for shifts in the retirement age.

What is the effect of different degrees of annuitisation of housing wealth? We compute the prescribed saving rates assuming that there is no annuitisation, 50% and 100%. In the case of the lowest three wealth deciles there is virtually no effect (using either the means or the medians).[15] This reflects the fact that projected housing wealth, based on constant real values of current wealth, is low, so regardless of the proportion that is converted to retirement income there is little effect. For the remainder of the wealth deciles (4 through 10) the prescribed saving rate falls and the corresponding replacement rate increases. For example, consider the case of individuals retiring at age 65 and in current wealth decile 6. With no use of housing wealth the median values of the saving and replacement rates are 8.6% and 64.7%; while with all the housing wealth converted to income the corresponding values are 3.7% and 71.8%.

[14] Throughout the results we encounter some prescribed saving rates as negative. We would caution against interpreting these negative rates too literally; ie, they should not be taken as a recommendation that those groups should 'dissave' and consume their current stock of wealth before retirement. Rather, we are inclined to interpret the negative rates as an indication that no further saving would be needed to sustain consumption levels in retirement, given the household's current wealth.

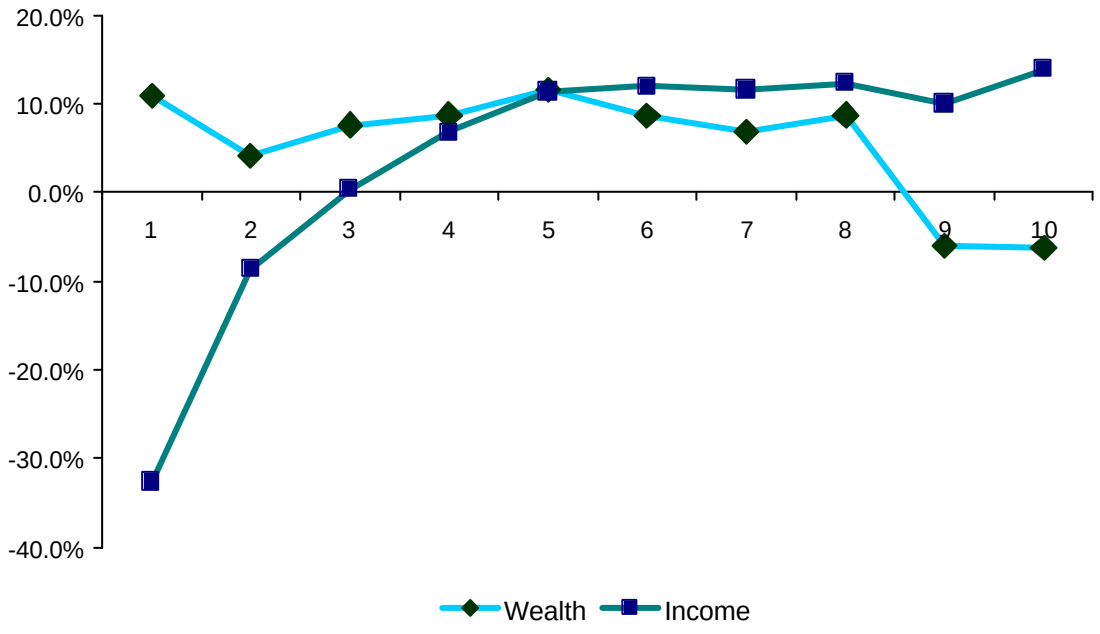
[15] Refer to Appendix Tables 5 through 10.

Had more of the savings been allocated to housing wealth, then these changes would have been more substantial. This serves to underscore the fact that the survey provides no information on which to predict the portfolio allocation of savings that might be made from now (the individual's current age) until retirement. Some people would undoubtedly choose to lock more of their savings into property and not convert that to retirement income. The property then represents precautionary saving (a reserve against emergencies) and may form part of their estate. The consequence is that they would need to have higher savings to achieve any given replacement rate. Unquestionably, housing plays a key role in determining retirement income replacement rates.

To this point the results have been presented for wealth deciles. What happens if we regroup the saving and replacement rates by income decile? These results are given in Appendix Tables 11 through 13. Consider the case of no consumption of housing wealth. Now we find that the mean prescribed saving rates for those in the lowest income deciles are negative; ie, all those individuals in the lower 40% of the income distribution can achieve a relatively high replacement rate (typically over 80%) with no savings for retirement over and above their current accumulation of retirement wealth. When current incomes are low, there is no incentive to reduce current consumption further in order to provide savings for future consumption, given the expectation that NZS will provide for a consumption level in retirement that may even, in some cases, exceed that prior to retirement.

These results are summarised in Figure 8, which illustrates that the pattern of saving is reversed at the lower and upper ends depending on whether we are considering income or wealth. These patterns serve to underscore the fact that there is a rather low correlation between wealth and income.

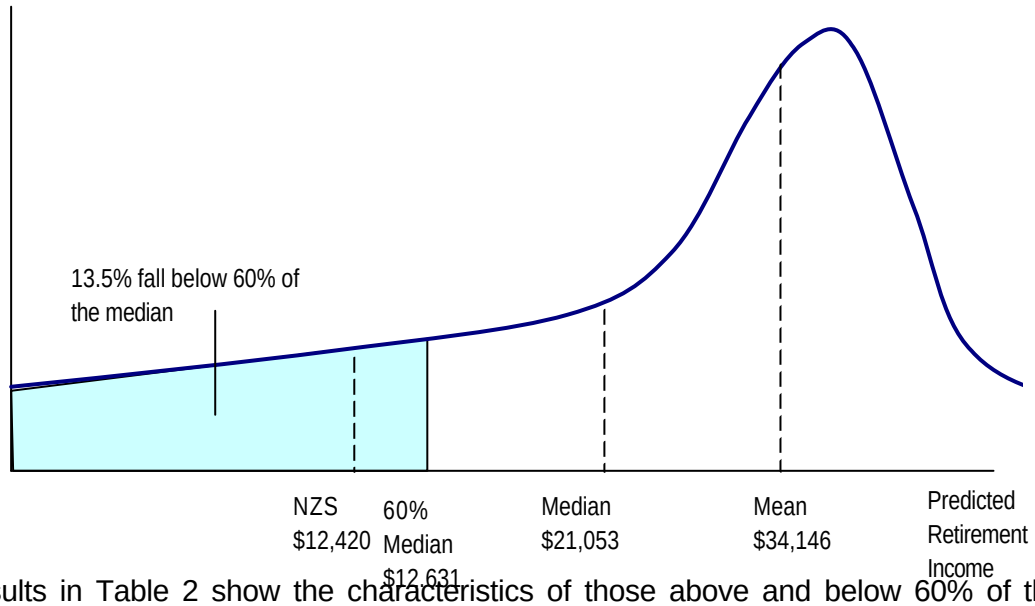
Figure 8 – Prescribed median saving rates for unpartnered individuals retiring at age 65 with no consumption of housing: by wealth and income deciles.



Why is it that the wealthiest households have negative prescribed saving rates?[16] The implication is that they have projected levels of retirement wealth that are more than adequate to smooth consumption. The issue is important if we wish to understand household wealth accumulation in aggregate as the rich individuals account for a disproportionate amount of both savings and of accumulated household wealth. Carroll (2000) argues that for the USA, the standard life cycle model does not explain well the behaviour of high wealth individuals. An obvious contender is the so-called dynastic model, one in which individuals place importance on the welfare of their descendants and accumulate wealth to bequeath. Carroll points out that this however is at variance with the responses of many wealthy households who respond that providing an inheritance is not a primary motivation for wealth accumulation. If it were we would expect that wealth decumulation would be greater for childless couples and this is not the pattern observed in the USA evidence. Carroll, echoing Veblen[17], concludes that the accumulation of wealth itself or the psychic services it provides may offer a better explanation.

While the means and medians give an overall picture they do not reveal the full extent of the underlying heterogeneity across individuals. We therefore now consider the distribution of predicted retirement income.[18] In doing this we use one possible indicator of the adequacy of predicted retirement incomes. We have chosen the cut-off as below 60% of the median predicted retirement income. This proportion of the median is sometimes used as an indicator of a poverty level. In all, some 13.5% of unpartnered individuals have predicted retirement incomes based on their projected retirement wealth that fall below 60% of the median for all those aged 45-55. This is illustrated in Figure 9.

Figure 9 – Distribution of predicted retirement incomes for unpartnered individuals aged 45-55, retiring at age 65 with no consumption of housing wealth



The results in Table 2 show the characteristics of those above and below 60% of the median predicted retirement income. Given that this group is from a narrow age band, then perhaps unsurprisingly, there is no difference in age between those below and those at or above 60% of median predicted income. Likewise there is only a modest difference in years of education.

[16] F. Scott Fitzgerald to Ernest Hemingway: " The very rich are different from you and me", to which Hemingway replied: "Yes. They have more money". Cited in Bartlett (1980)

[17] "Wealth is now itself intrinsically honorable and confers honor on its possessor." *The Theory of the Leisure Class*

[18] Retirement income Y_r is predicted from the estimated replacement rate and pre-retirement income ($Y_r = Y_p * R$)

Table 2 – Characteristics of unpartnered respondents by predicted retirement income: Retirement at age 65 with no consumption of housing

	Predicted Retirement Incomes		All Respondents Aged 45-55
	< 60% of median	=60% of median	
Age	49.5	49.7	49.7
Years of education	4.8	5.7	5.5
Income	10,412	37,500	33,840
Net Worth	7,365	210,710	183,235
Total Wealth	129,712	342,722	313,941
Proportion who are:			
Male	0.41	0.41	0.41
Pakeha	0.54	0.77	0.74
Maori or Pacific Islanders	0.46	0.18	0.22
Those inheriting >$10,000	0.10	0.22	0.20
Homeowners	0.17	0.57	0.52

Note: Proportion of population with predicted retirement incomes (Y_r)<60% of median is 13.5%.

What is striking is that the current reported incomes of those below the cut-off are about one quarter of the average reported incomes of those in the upper tail, while their total wealth is about one third of the upper group. It is worth noting while the low-income group have net worth of less than 5% of those above the cut-off, their total wealth is around one third of the higher group. In other words, the inclusion of NZS reduces substantially the disparity in accumulated retirement wealth of the two groups (refer to Figure 7).

There is no apparent gender bias, as females comprise 59% of those above the cut-off and the same proportion of those below. The same however is not true for the two major ethnic groups. Pakeha appear to be under-represented and Maori and Pacific Islanders over-represented in the group with low predicted retirement incomes. While 20% of all respondents reported inheriting more than $10,000, only 11% of those in the low retirement income group had received an inheritance of this magnitude. In those at or above 60% of the median income, over half are home owners, while homeowners comprise only 17% of those below 60% of the median.

While illuminating, the results in Table 2 do not allow for measuring the effect of any one variable while holding the others constant. To do this we have estimated a probit model, in which the dependent variable is the probability of falling below 60% of the median retirement income. The aim is to determine what characteristics are associated with a greater likelihood that an individual's predicted retirement income will fall below the so-called "poverty line" defined for this purpose as being 60% of the median retirement income.

The probit model has as its dependent variable the probability of low predicted retirement income. The explanatory variables are income, years of education, gender, ethnicity, inheritances, and home ownership. The results are summarised in Table 3.

Table 3 – Results of a probit regression for the probability of having a predicted retirement income below 60% of the median for unpartnered individuals retiring at age 65 and with no consumption of housing

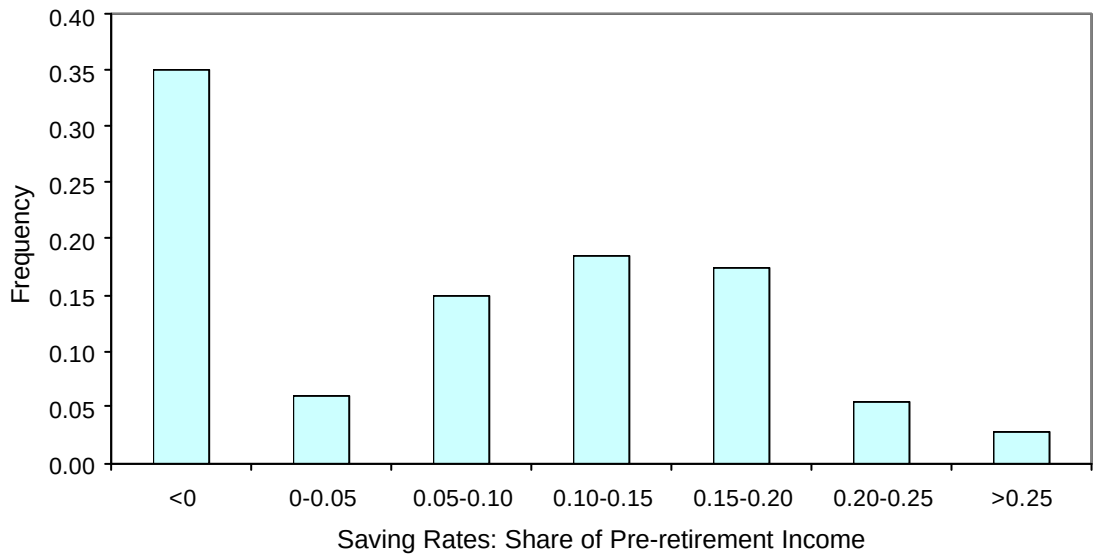
Dependent Variable: Probability of low retirement income	Coefficients	t-statistic	p-value
Income ($'000)	-0.003	5.68	0.00
Years of Education	-0.001	1.14	0.25
Male	0.027	1.54	0.12
Pakeha	-2.150	1.77	0.08
Ever inherited	-0.003	0.64	0.52
Owns Home	-0.017	1.67	0.10

Notes: n=361; pseudo R^2 =0.60. The coefficients show the change in the probability of having predicted retirement income below 60% of the medium for a one-unit change in the independent variable.
All coefficients are multiplied by 10^{12}.

The probit analysis suggests that the main characteristics of individuals with low predicted retirement income is that they have low current incomes, that they are non-Pakeha, and that they do not own their own home. These results reinforce the cross-tabulations reported in Table 2.

To further explore the variability across individuals Figure 6 plots the frequency distribution of the prescribed saving rates. Over one-third of respondents aged 45-55 have negative savings rates (implying no further saving would be required to meet their replacement rate, given their current levels of retirement wealth). In total, 57% have a rate below 10% of their pre-retirement (before tax) income. A further 35% would require between 10 and 20%, and 8% require a saving rate of over 20%. Recall that the prescribed saving rate is predicated on the assumption that individuals seek to smooth their consumption over the life cycle.

Figure 10 – Frequency distribution of prescribed saving rates for unpartnered individuals aged 45-55: retirement at age 65 and consumption of 50% of housing wealth



In Table 4 we present the results of descriptive regressions that test for the importance of some key selected explanatory variables for the prescribed saving rate and for the level of projected retirement wealth.

Table 4 – Testing for key variables that are associated with the prescribed saving rate and projected retirement wealth for individuals aged 45-55 retiring at age 65 with no consumption of housing wealth

Explanatory Variables	Dependent Variable	
	Prescribed Saving Rate	Projected Retirement Wealth
Income	++	++
Net Worth	--	na
Years of Education	*	*
Male	*	*
Pakeha	*	--
Maori-Pacific Islander	++	--
Ever Inherited	*	++
Own Home	++	--

Notes: ++ and - - indicate the variable is significant at the 1% level; * = not significant; na = not applicable

What is associated with a higher prescribed saving rate? Higher incomes are positively related as a consequence of the fact we have found that the prescribed saving rates are low (or even negative) for the lowest income groups. Those with higher net worth predictably have a lower prescribed saving rate, holding income and other factors constant. Education and gender are not however significant in explaining the prescribed saving rate. Inheriting is negatively associated with the saving rate but not significantly so, and owning a house is associated with a higher prescribed saving rate, in the case where none of the wealth in housing is to be made available for retirement income.

Projected retirement wealth is (unsurprisingly) higher for those with greater incomes, and both Pakeha and Maori-Pacific Islander are lower than for Asians and Other (the reference group in this case). Again, gender and education have no effect. Inheritances boost projected wealth, but home ownership reduces it. This result for home ownership reflects the assumption that housing wealth cannot be consumed, and so does not get counted in the projected retirement wealth. If full consumption of housing wealth is allowed, there is no significant effect of home ownership in the regression for projected retirement wealth.

It has been noted that the correlation between income and wealth is not especially high. The correlation coefficient income and wealth for unpartnered individuals is 0.35, and 0.34 for couples. To further explore the relation between income and wealth and its effect on the prescribed saving rates from the basic model we have arrayed the means and medians of the saving rates by quintiles of income and wealth in Table 5.

All those individuals in the lowest 20% of the income distribution have negative saving rates regardless of their level of wealth. The saving rates in fact become progressively more negative with rising wealth for this income group. This reinforces the finding that if the motivation for saving to build retirement wealth is in order to smooth consumption across the life cycle, then it appears that the presence of NZS provides for a sufficient level of post retirement consumption such that no further saving from current income can be justified.

We would expect to observe little if any retirement saving among low-income earners if this basic model has captured the essence of the life cycle consumption smoothing plans.

Table 5 – Means and medians of prescribed saving rates by wealth and income quintiles for unpartnered individuals retiring at age 65 with no consumption of housing wealth

Total Current Wealth by quintiles		Income by quintiles				
		1	2	3	4	5
1	Mean	-0.05	0.07	0.17	0.21	0.13
	Median	-0.04	0.06	0.15	0.23	0.11
2	Mean	-0.21	0.03	0.14	0.15	0.19
	Median	-0.21	0.03	0.13	0.15	0.19
3	Mean	-0.29	-0.05	0.10	0.11	0.16
	Median	-0.27	-0.02	0.11	0.12	0.15
4	Mean	-0.90	-0.14	0.02	0.07	0.14
	Median	-0.89	-0.07	0.07	0.08	0.15
5	Mean	-0.58	-0.59	-0.39	-0.04	-0.09
	Median	-0.53	-0.39	-0.03	-0.04	-0.05

Note:
Negative saving rates are shaded.

High net wealth individuals (the top 20%) also have prescribed saving rates that are negative. Their present wealth accumulations would allow them to smooth consumption with no further accumulation through savings. It those individuals with middle to upper incomes and medium levels of wealth that display the highest prescribed saving rates.

4.3.2 Couples

The extent of conversion of housing equity to retirement income clearly has a marked effect on the prescribed saving rates for couples as well as unpartnered individuals. The median saving and replacement rates for couples are shown in Table 6 for three assumed levels of conversion of housing. In the case with no conversion (ie, the entire value of housing wealth is retained and bequeathed), the prescribed median saving rate of 12.8% of pre-retirement (before tax) income. This falls to under half (5.5%) if the entire value of housing wealth is converted. Obviously, in this case, housing rental would become an expense to be met from the higher retirement income.

Table 6 – Median prescribed saving and replacement rates for couples aged 45-55 retiring at age 65 by level of conversion of housing wealth

Conversion of Housing Wealth to Retirement Income	Prescribed Saving Rate	Replacement Rate
None	12.8%	58.7%
50%	9.1%	62.4%
100%	5.5%	66.1%

Note:
The values in the table are the averages for respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

The means and medians for prescribed saving and replacement rates for couples are shown in Appendix Table 17 by wealth decile. For the lower half of the wealth distribution of couples, the typical prescribed saving rate is about 20% of pre-retirement income, giving an average replacement rate of about 50%. The replacement rate rises and the prescribed saving rates fall with increasing wealth. Saving rates are negative for the top 10% of the wealth distribution.

The mean prescribed saving rate for Pakeha respondents is only 5%, compared to 11% for Maori and Pacific Island respondents. However, once again the means are strongly influenced by skewed distributions, so that the median saving rates are almost identical for both these ethnic groups.

The story again parallels that for individuals when we look at the saving and replacement rates by income decile (see Appendix Table 18). Among the lowest 10% of income earners the prescribed saving rates are negative and the replacement rates extremely high. This reflects the fact that NZS provides a substantial floor under the retirement income of the lowest income earners. Given our assumption that couples attempt to smooth their lifetime consumption, there is no rationale for the low-income groups to reduce further their pre-retirement consumption in order to set aside savings.[19]

We conclude the results for couples by considering the predicted levels of retirement income. These are summarised in Appendix Table 19. Overall, the median couple is predicted to have an income of $71,000 and total accumulated wealth (including NZS) of $437,000 at retirement. Given the assumption of consumption smoothing, this implies a median retirement income of $39,000. This ranges from $28,000 for the lowest wealth decile to $86,000 in the highest wealth decile.

In Figure 10 and 11 we illustrate the distribution of mean and median predicted retirement incomes by both wealth and income deciles. The cut-off line of 60% of the overall median retirement income is shown in both figures. The median net income of the lowest income decile falls below this line. Given that there is a distribution within each decile some of the couples in the next decile would fall below the line. However, the proportion of the entire cohort that would fall below the cut-off is broadly similar to that estimated for individuals. In the case of couples, we estimate that 11.8% of the present 45-55 year old cohort have predicted retirement incomes below 60% of the median for the group as a whole.

It should be stressed that these calculations are based on the predicted retirement incomes that would result for the replacement rates and the implied savings rates derived from our basic model.. If people did not save at those rates then clearly they would have lower replacement rates, and by definition lower predicted retirement incomes. However, in fact this issue does not arise for the two lowest income deciles where the mean prescribed saving rates are in any event, negative (see Appendix Table 18). Even the median saving rate for the lowest income decile is negative, and there would be some within the second decile who would also have negative prescribed rates. In short, most of those falling in lower part of the distribution of retirement income (ie below 60% of the median) are from the lowest income deciles where the prescribed saving rates are negative.

[19] Government benefits accounted for about one half of the average disposable income of Australian couple aged between 65 and 74 in 1997 (Harding, King and Kelly 2002)

Figure 11 – Mean predicted retirement income by income and wealth deciles: Couples aged 45-55 retiring at 65

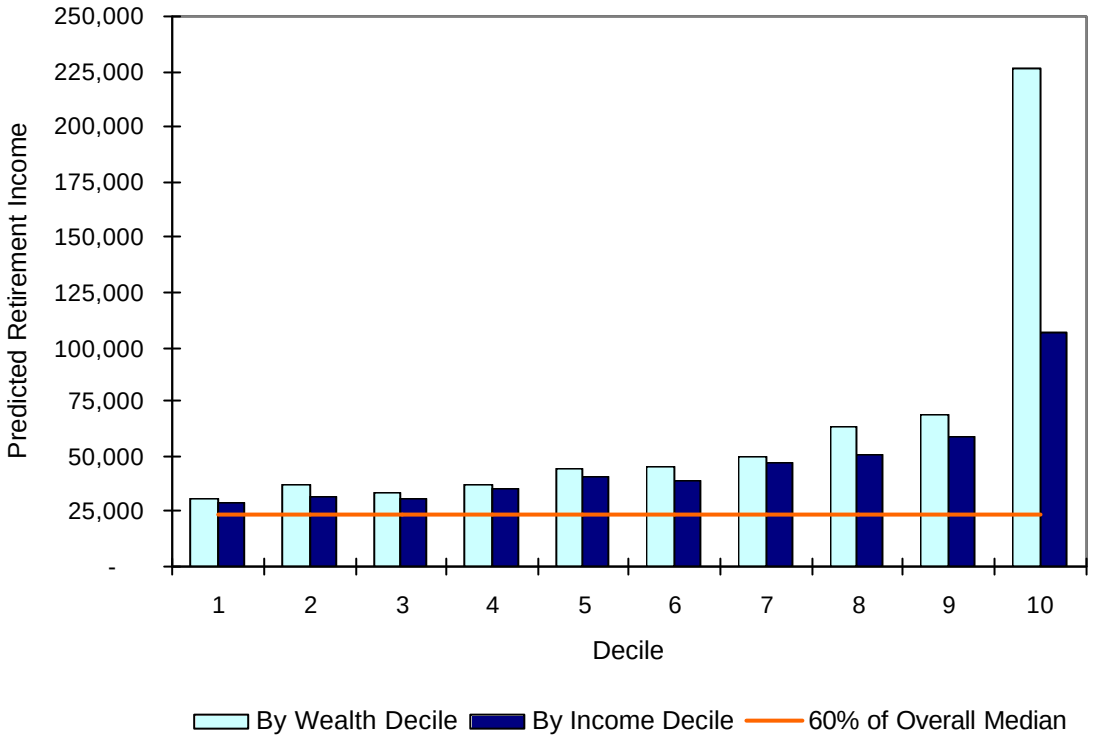
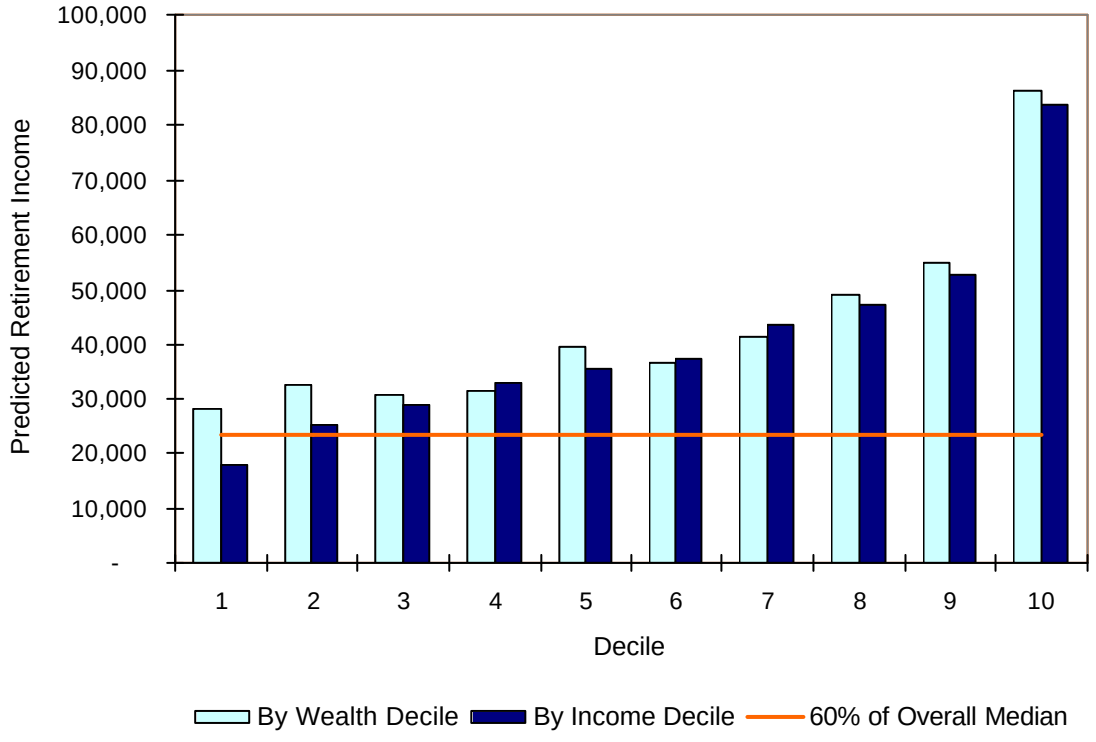


Figure 12 – Median predicted retirement income by income and wealth deciles: Couples aged 45-55 retiring at 65



4.4 Fixed replacement rates

In this section we report on the results of setting a fixed replacement rate, as outlined in Section 3.3.

4.4.1 Unpartnered individuals

Virtually no further saving would be required for individuals regardless of their level of wealth, if their target replacement rates are 60% or below (Table 7)

Table 7 – Prescribed saving rates needed to achieve a specified replacement rate for unpartnered individuals retiring at age 65 with no consumption of housing wealth: by deciles of current wealth

Deciles of Current Wealth	Prescribed saving rates needed to achieve a specified replacement rate of			
	40%	60%	80%	100%
(a) Means				
1	-0.09	0.05	0.19	0.33
2	-0.26	-0.11	0.04	0.19
3	-0.26	-0.10	0.06	0.21
4	-0.31	-0.15	0.01	0.16
5	-0.12	-0.03	0.18	0.33
6	-0.19	-0.03	0.13	0.29
7	-0.66	-0.50	-0.34	-0.19
8	-0.35	-0.18	-0.12	0.16
9	-0.65	-0.46	-0.27	-0.9
10	-0.75	-0.58	-0.40	-0.23
Total	-0.36	-0.20	-0.04	0.12
(b) Medians				
1	-0.08	0.05	0.21	0.34
2	-0.19	-0.05	0.07	0.22
3	-0.13	-0.01	0.13	0.24
4	-0.17	-0.1	0.16	0.29
5	0.02	0.13	0.26	0.39
6	-0.11	0.02	0.19	0.35
7	-0.06	0.06	0.19	0.31
8	-0.15	-0.01	0.20	0.40
9	-0.46	-0.26	-0.07	0.14
10	-0.29	-0.11	0.04	0.19
Total	-0.16	-0.01	0.16	0.29

Note:
Negative saving rates are shaded.

To achieve replacement rates above that level would require median saving rates that become progressively higher, the greater the target, and the 100% replacement level is clearly infeasible for all but the very wealthy. We repeat the analysis by ranking individuals by income deciles. Here we find again that those in lowest income decile have negative

median prescribed saving rates for all levels of income replacement in retirement that were considered.

Table 8 – Prescribed saving rates needed to achieve a specified replacement rate for unpartnered individuals retiring at age 65 with no consumption of housing wealth: by deciles of income

Deciles of Income	Prescribed saving rates needed to achieve a specified replacement rate of:			
	40%	60%	80%	100%
(a) Means				
1	-1.17	-1.01	-0.86	-0.71
2	-0.60	-0.43	-0.26	-0.08
3	-0.58	-0.41	-0.24	-0.07
4	-0.35	-0.20	-0.04	0.12
5	-0.24	-0.09	0.06	0.22
6	-0.29	-0.12	0.04	0.20
7	-0.04	0.12	0.28	0.44
8	-0.04	0.12	0.27	0.42
9	-0.19	-0.02	0.14	0.30
10	-0.06	0.01	0.25	0.41
Total	-0.36	-0.20	-0.04	0.12
(b) Medians				
1	-0.91	-0.74	-0.56	-0.36
2	-0.47	-0.30	-0.15	0.03
3	-0.33	-0.16	0.01	0.17
4	-0.16	-0.04	0.13	0.25
5	-0.10	0.04	0.20	0.34
6	-0.40	0.09	0.25	0.38
7	0.00	0.14	0.28	0.41
8	0.03	0.15	0.28	0.39
9	0.00	0.15	0.26	0.39
10	0.09	0.22	0.35	0.47
Total	-0.16	-0.01	0.16	0.29

Note:
Negative saving rates are shaded

Overall an 80 % replacement rate would call for a median saving rate of 16% from before tax, pre-retirement income.[20] However, even at this level the median rates are negative or low for the bottom three income deciles (the lowest 40%).

[20] Kelly (2003) adopts a 70% replacement rate as a rule for assessing adequacy of those in New South Wales born between 1946 and 1964 (the so-called baby boom). He finds that based on their projected retirement wealth it is unlikely that on average those in Sydney would have enough income to meet this level.

4.4.2 Couples

We conducted a similar analysis of the prescribed saving rates needed to achieve specific replacement targets. The results, arrayed by wealth deciles are shown in Table 9, and the corresponding results by income deciles in Table 10.. In contrast to the results for unpartnered individuals, rather higher prescribed saving rates are needed by couples to reach the specified replacement rates. In fact, even at just a 60% replacement rate, the median prescribed saving rate is likely to be infeasible for all except either the wealthiest two deciles or the two lowest income deciles..

Table 9– Prescribed saving rates needed to achieve a specified replacement rate for couples retiring at age 65 with no consumption of housing wealth: by deciles of current wealth

Deciles of Current Wealth	Prescribed saving rates needed to achieve a specified replacement rate of			
	40%	60%	80%	100%
(a) Means				
1	0.00	0.21	0.41	0.61
2	0.05	0.31	0.58	0.84
3	-0.11	0.21	0.52	0.84
4	-0.13	0.18	0.50	0.81
5	0.01	0.29	0.57	0.85
6	-0.35	-0.03	0.29	0.61
7	-0.05	0.24	0.53	0.82
8	-0.21	0.03	0.28	0.52
9	-0.46	-0.13	0.20	0.53
10	-2.11	-1.83	-1.54	-1.25
Total	-0.33	-0.05	0.24	0.52
(b) Medians				
1	0.07	0.24	0.40	0.58
2	0.13	0.30	0.49	0.69
3	0.07	0.27	0.47	0.72
4	0.07	0.28	0.51	0.73
5	0.13	0.34	0.55	0.75
6	-0.02	0.23	0.44	0.65
7	0.02	0.23	0.45	0.69
8	-0.05	0.16	0.41	0.61
9	-0.28	0.06	0.35	0.65
10	-0.65	-0.40	-0.16	0.07
Total	0.03	0.24	0.44	0.65

In part this reflects the fact that the payment structure for NZS implies relatively large scale economies, so the per capita payments to couples are rather less than the payments to individuals. Specifically, if a couple was formed from two NZS recipients who had previously lived alone, the *per capita* payments would be just over three-quarters as high as what they were previously (alternatively, the equivalence scale for the second person is only 55% of that for the first). Consequently, NZS is a more important source of retirement

wealth for individuals than for couples; accounting for 46% of projected wealth at retirement for individuals and only 38% of projected wealth at retirement for couples.

The second reason why the prescribed rates for couples is higher stems from the fact that we assume retirement starts when the first member of the couple reaches age 65.

Table 10 – Prescribed saving rates needed to achieve a specified replacement rate for couples retiring at age 65 with no consumption of housing wealth: by deciles of current income

Deciles of Current Income	Prescribed saving rates needed to achieve a specified replacement rate of			
	40%	60%	80%	100%
(a) Means				
1	-2.36	-1.97	-1.59	-1.21
2	-0.79	-0.47	-0.15	0.17
3	-0.23	0.07	0.38	0.68
4	-0.11	0.16	0.43	0.70
5	-0.11	0.18	0.47	0.77
6	0.09	0.36	0.63	0.89
7	-0.03	0.21	0.45	0.70
8	0.01	0.28	0.55	0.82
9	0.06	0.32	0.59	0.86
10	0.14	0.38	0.63	0.87
Total	-0.33	-0.05	0.24	0.52
(b) Medians				
1	-1.06	-0.62	-0.27	0.01
2	-0.25	0.00	0.22	0.42
3	-0.03	0.17	0.40	0.61
4	0.06	0.25	0.44	0.66
5	0.08	0.31	0.54	0.83
6	0.11	0.34	0.54	0.73
7	0.07	0.27	0.48	0.69
8	0.09	0.31	0.54	0.81
9	0.14	0.31	0.49	0.68
10	0.18	0.36	0.55	0.74
Total	0.03	0.24	0.44	0.65

Note:
Negative saving rates are shaded.

At this point the amount received in superannuation for the non qualifying spouse (who by definition is under 65) is adjusted according to the household's income according to the benefit schedule currently in force. The total period for the analysis is then taken until the partner dies. In the case of an individual this is simply 65 plus the years of life expectancy at 65; for example 16 years. In this case the annuities were computed for a 16 year period. Now consider the case of a couple in which the respondent was aged 55 and the partner 45. Suppose the life expectancy of the partner is 19 years. The respondent would be expected to die at age 81, 16 years after retirement. The partner at this stage would be 71, and have an expected 13 years remaining.[21] Hence, in total we have a retirement period of 29 years, and the wealth accumulated at retirement would be annuitised over 29 years. Clearly, this couple, even if identical in other respects (such as current wealth and income)

[21] For the purposes of this simple illustration we have not made any adjustement for the fact that life expectancy at 71 will not necessarily be 6 years less than at 65.

to an individual, will require a higher rate of saving in order to sustain their level of consumption for a much longer period. Note that this assumes that the same consumption level is sustained throughout the entire period of retirement; ie there is no adjustment in the above results made for a lower consumption when there is a sole survivor. Incorporating such an adjustment would lower substantially the prescribed saving levels.

To explore this further we used the basic model to estimate the prescribed saving rates and associated replacement rates for the case where no provision is made for the provision of income to the surviving partner; ie the annuity period is only for the life expectancy of the partner expected to die first. The assumption is that the surviving partner would be eligible for the single rate on NZS, and from a sampling point of view would have been picked up in the unpatterned section of the survey. The impact of the two assumptions about survivors is summarised in Table 11.

Table 11 – The effect of different survivor payments on the mean and median prescribed saving rate and the associated replacement rate for couples aged 45-55 retiring at 65 with no consumption of housing wealth

Couples	Prescribed Saving Rate	Replacement Rate
With no benefits to survivor	-1.2%	73.7%
	(13.4%)	(60.0%0
With full retirement income to survivor	6.3%	66.1%
	(18.1%)	(54.7%)

Note: Means with medians below in parentheses.

The results for couples with no survivor benefit are remarkably similar to the results for unpartnered individuals. For that the individuals, the mean prescribed saving rate was also negative (-5.0%) and the median rate 6.3%. The mean and median replacement rates for individuals were 77.7% and 69.2% respectively. We conclude that the higher savings rates for couples then depend partially on the fact that NZS is lower than for the sum of two individuals; and importantly on the assumption made about survivor benefits. If the surviving partner is assumed to only receive NZS at the individual rate, then the prescribed saving rates for couples are much closer to those for unpartnered individuals.

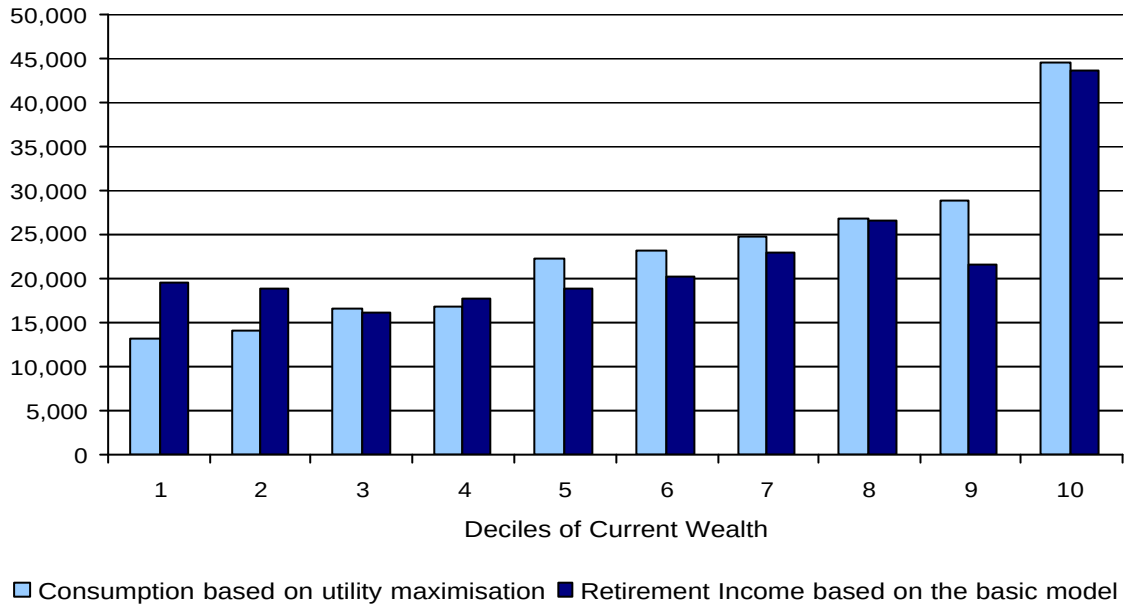
4.5 Utility maximisation

The basic model from which the results for the prescribed saving and replacement rates are derived is based on the condition that pre– and post-retirement consumption should be equal. This is an arbitrary rule, and one that is not derived directly from any explicit theoretical underpinning. In other words, it does not start from a proposition about how individuals behave. An alternative approach is to place the retirement saving problem in the context of lifetime utility maximisation. This behavioural approach postulates an individual will make choices about how much to consume now and how much to save for retirement in a way that provides the maximum benefit to him/her subject to a total lifetime wealth constraint.

As a check on the extent to which the basic model was generating results consistent with at least one postulated version of individual maximising behaviour, we estimated consumption from the utility model set out in Appendix B. Total lifetime wealth was computed as the sum of discounted value of future earnings, plus current wealth and the

value of NZS.[22] The possibility of any inheritances is ignored and the only bequests are the remaining value of housing.[23] The results of this comparison are plotted in Figure 8. It is evident that the results of the two models do not differ significantly. In some ways this is not altogether surprising as in both cases we have assumed known life expectancies and no other forms of uncertainty. However we draw some comfort that the basic model is capable of approximating the results from a model derived from theoretical principles.

Figure 13 – Comparison of predicted retirement income from the basic model with consumption derived from a lifetime utility maximising framework for unpartnered individuals aged 45-55 retiring at age 65 with no consumption of housing wealth



4.6 Sensitivity

4.6.1 Annuity factor

We have taken an actuarially fair factor that converts wealth at retirement into an annuity for a fixed number of years.[24] However, in reality, the price of an annuity is likely to be higher. There are a number of reasons for this. In the first place there is uncertainty about the years remaining for a whole life annuity. Second, there are costs associated with providing an annuity, plus normal profit margins for the provider. Third a provider faces the problem of asymmetric information about the life expectancy of the purchaser of the annuity leading to the possibility of adverse selection. The use of less favourable factors would reduce the estimates of retirement income generated by the basic model.

[22] Taken from Gibson and Scobie (2003).

[23] The values of the parameters were taken as: ? = the intertemporal elasticity of substitution= 1.25; ? = 1+ the rate of time preference = 1.02; and d = 1 + the discount rate = 1.02. Provided we maintain the assumption that ? = d, then the actual values assumed for these parameters has no effect on the outcome. Furthermore under this maintained hypothesis, tests showed that the results are highly insensitive to values of ? between o and 1,000,000.

[24] The annuity factor is given by $[r (1 + r)^n]/[(1 + r)^n – 1]$ where r = the rate of interest and n the number of tears for which the annuity is to be paid. Multiplying this factor by the stock of retirement wealth converts it to an annual flow of income.

We applied two levels on the annuity factor; 10% and 25% below the base case. The results are summarised in Table 12. To sustain consumption smoothing would require an increase in saving, and at the same time a lower replacement rate. With a 10% less favourable rate, predicted retirement income at the median would fall by 4.4%; this increases to a drop of 10.6% when the annuity factor is 25% less favourable. The Table also provides estimates of the share of the 45-55 aged cohort whose retirement incomes might fall below 60% of the median. The rise is modest for a 10% fall in the annuity factor and rises to 1.6% above the base for the least favourable case.

Table 12 – The impact of less favourable annuity rates for unpartnered individuals aged 45-55 retiring at 65 with no consumption of housing

	Base Case	Annuity factor reduced 10%	Annuity factor reduced 25%
Median prescribed saving rate	6.3%	8.9%	12.7%
Median replacement rate	69.2%	66.3%	61.7%
Median predicted retirement income	$20,759	$19,848	$18,562
Proportion of cohort whose predicted retirement income falls below 60% of the median for the group	13.5%	13.7%	15.1%

4.6.2 Pre-retirement tax rates

In this section we explore the possible responses to different pre-retirement rates of personal income taxes. All the results to date have been based on the three-tiered structure of marginal rates that currently applies. The issue now raised is whether changes in tax rates would induce different patterns of saving and consumption? Specifically, would lower rates lead to higher retirement incomes through greater saving, and if so by how much? We use the basic model to simulate the effect of lower tax rates. We make no allowance for the fiscal costs of these changes nor do we assume any concomitant change in the eligibility or payments for NZS.

We examine two cases. In the first, the tax rate in the lowest bracket is cut by 50% while all other rates are left at their original levels. In the second case, all rates are reduced 20% from their current levels. These changes are summarised in Table 13.

Table 13 – Summary of the rates of personal income taxation for three scenarios

Income Level	< $38,000	$38,000 - $60,000	> $60,000
Base Case	0.207	0.342	0.402
Reduce lowest rate by 50%	0.104	0.342	0.402
Reduce all rates by 20%	0.166	0.274	0.322

These rates were applied to the basic model for those retiring at 65 and converting 50% of their housing equity to retirement income. The resulting predicted post-retirement incomes were estimated, together with the saving rates. The findings are summarised in Table 14.

A reduction of 50% in the tax rate for the lowest income group would result in a rise in both their saving rates and their replacement rates. Hence the predicted retirement income of the lowest decile would rise by 6%.

The proportion of the cohort falling below 60% of the median predicted retirement income would fall from 13.5% in the base case, to 12.2% in the case where the lowest tax rate was halved. Given that there are approximately 120,000 individuals in this category, it would mean that about 1.3% or 1,600 people would be "shifted" from below the "poverty line" to above it. It must be recalled that these results are predicated on the assumption that individuals wish to smooth their level of consumption. Other behavioural assumptions about the effect of tax changes may well generate different outcomes.

Table 14 – Effect of changes in the pre-retirement rates of personal income taxation on median levels post-retirement incomes and saving rates for the lowest four wealth deciles of unpartnered individuals aged 45-55 retiring at 65 and no consumption of housing wealth

	Base case	Reduce lowest rate by 50%	Reduce all rates by 20%
(a) Predicted income in retirement	median	median	median
By Decile of Current Retirement Income			
Decile 1	10,709	11,397	11,074
Decile 2	12,527	13,310	12,853
Decile 3	15,643	16,586	15,799
Decile 4	17,082	18,110	17,408
Total	20,759	21,677	21,767
Share of cohort below 60% of the median retirement income	13.5%	12.2%	13.0%
(b) Prescribed saving rate			
By Decile of Current Wealth			
Decile 1	0.11	0.14	0.13
Decile 2	0.04	0.08	0.06
Decile 3	0.08	0.10	0.09
Decile 4	0.09	0.12	0.11
Total	0.063	0.086	0.078

(a): Percentages in parentheses refer to the increase in predicted retirement income over the base case

Overall the median saving rate would rise from 6.3% to 8.6% of pre-retirement (pre-tax) income. While this seems like a substantial proportionate rise, the absolute effect is modest. On the median income of $30,400 for this group, current predicted savings are $2,142 (= $30,400*0.063). At the higher rate of 8.6%, savings would be $2,614 an increase in savings of about $9 per week, out of an increase in disposable income of $30,400*(0.207-0.1035)/52 = $60 per week. In short, while reductions in the tax rates would be expected to increase savings and lead to higher retirement incomes for the lowest deciles of the wealth distribution, the absolute effects are modest even for a substantial reduction. Further more there is only a very minor effect on the distribution of post-retirement incomes. It must be stressed that this changes are based on the model of consumption smoothing. They do not pretend to estimate the effect on savings of a change in the tax system relative to current savings patterns.

4.7 Is there under-saving?

It is widely believed that people typically do not save adequately for retirement. From one perspective this seems improbable. After all, saving decisions are made by individuals who arguably are the best judge of their own welfare. If they could increase their own well-being by foregoing some consumption today, and use those savings to enjoy a higher level of consumption tomorrow, then surely that is exactly what they would do. Viewed in this way the level of saving that we observe people undertaking must be that level which they feel is the most appropriate for them. They could not be made better off by increasing their saving rate now – if that were the case they would have done exactly that. Were this the end of the matter, the issue of adequacy of saving simply could not arise. By definition an adequate level of saving is the level that individuals have chosen.

However there may be other elements to the optimal saving story not captured by this view of the rational consumer. Three possible candidates for the under-saving hypothesis are externalities, transaction costs and procrastination. The first requires that there is some distortion that precludes people from making the "right" choices. For instance if the rate of return they can get on their savings does not represent the real cost of foregone consumption, one might suspect under-saving. However in the presence of well functioning capital markets it seems unlikely that this could be a serious candidate. The second argument is that because of the complexity of the problem and the uncertainties that are inherent, people simply find the task too difficult and are discouraged from investing time and effort in retirement planning. Public awareness campaigns, financial education, the private provision of financial planning advice and easy access to tools for calculating the effect of different saving plans can all help to lower the transactions costs and allow people to make decisions about the "correct" level of saving.

Finally there is an emerging literature offering richer insights into how people make decisions. The standard model used widely in economics and finance assumes that the rate at which individuals discount the value of funds in the future is constant, regardless of the length of the planning horizon. However, as Akerlof (2002) argues,

> "… individuals use high discount rates to evaluate options that require an immediate sacrifice for a future reward and lower discount rates when the same sacrifice is deferred"

People then procrastinate about saving (and taking more exercise, dieting, quitting smoking, etc.). They are much more willing to undertake the investment in the future than they are to start immediately.[25]

A widely held view is that savings are low because people have "insufficient" income; after meeting their immediate consumption needs they have no surplus from which to make savings. This argument, while superficially appealing, does not adequately recognise the life cycle view of saving and consumption decisions. In this paper we have in effect posed the question: given that I expect to receive a basic income in retirement from NZS, is it worth my while to reduce my current consumption and save more in order to have a higher income in retirement? We would argue that the results from our modelling are consistent with evidence. Very few people in the lowest income groups have any significant accumulation of retirement wealth (beyond the expected payment from NZS). One might

[25] Akerlof (2002) provides a concise synthesis of the theory and cites a growing body of empirical evidence that suggest that insights from behavioural economics can help explain the observed pattern of saving.

argue that this is because they are too poor to save – but equally, it can argued that they are making a rational choice about not reducing consumption now when they expect to have at least their current level of consumption in retirement, or in some cases even more.

One indication of inadequate saving may be a sharp observed drop in consumption. (Banks, Blundell and Tanner 1998) argues that not all of the change in observed consumption can be accounted for within the life cycle model. They conclude that the arrival of adverse information (such as health status) which had not been fully anticipated could lead to adjustments in the amount people consume relative to that which they had planned in the absence of the adverse information.

4.7.1 International Evidence

Our results suggest that the presence of a publicly provided superannuation scheme has a significant impact on the saving decisions of low income earners. There is corroborating evidence from the USA that suggests that it is to be expected that low-income households would have very low saving rates. This is quite apart from the argument that low-income earners cannot afford to save. Using a utility maximising model similar to that outlined in Appendix B. Bernheim, Forni, Gokhale and Kotlikoff (2000) calculate the rate of saving that the model would recommend. They use data from the Health and Retirement Survey in the USA, and compute the saving rates for different income levels and age groups. Their results are summarised in Table 15.

Table 15 – Median recommended saving rates: USA

Income Category	Ages 50-55	Ages 56-61
Low	0.01	0.00
Lower Middle	0.13	0.17
Upper Middle	0.14	0.20
High	0.17	0.23

Source: Bernheim, Forni, Gokhale and Kotlikoff (2000) Table 1, p.290).

They observe:

> "The fact that the recommended saving rate is close to zero for the low income group and that the rate rises with income is not surprising. Most of the low-income households will receive the majority of their post-retirement incomes from Social Security. And the higher the level of income, the smaller the fraction of pre-retirement income being replaced by Social Security".
>
> Bernheim, Forni, Gokhale and Kotlikoff (2000)

The authors re-estimate the saving rates under the assumption that in future Social Security payments would be reduced by 30 percent. Unsurprisingly, this implies the optimal rate of saving would rise by some 5 to 6 percentage points at all levels of income in order to compensate. However they stress that within each group there is considerable variation in the recommended saving rate. Knowing the general demographic characteristics of a household is a guide to understanding optimal saving rates, but knowledge of the particular circumstances of an individual household is needed to formulate specific recommendations.

4.7.2 Comparing actual with prescribed rates of saving

In this paper we have estimated the rates of saving that we have defined as prescribed rates for the cohort of 45-55 year olds. These rates are those which, if people's saving behaviour was governed by a desire to smooth consumption over their lifetimes would be consistent with that objective. Of course, modelling behaviour requires us to formulate a theory of how we think people behave with respect to savings and consumption now versus later. It is impossible to know for certain if the proposed theory is really how people behave. Often, evidence of a counter example will be used to imply that the theory cannot be valid. Some individuals might appear to behave in a way quite counter to that which the theory of savings would predict.

Such theoretical models do not, however, ever pretend to predict the behaviour of every individual. They are by their very nature abstractions from the complexity of real world observations; were they not they would cease to be useful constructs. The most powerful test of the underlying theory we have proposed about savings behaviour is whether or not it is capable of predicting how people actually behave.

In order to conduct this test we need data on actual savings behaviour. The Household Economic Survey (HES) is the best source of this information at the individual household level. We have used that as our source.[26] From that survey we were able to derive estimates of the ratio of household saving to disposable income by decile of disposable income. We then adjusted these to ratios of savings to pre-tax (gross) income, using the relevant tax rates[27].

The results are shown in Figure 14. The striking feature is how well the prescribed rates match those of the actual savings behaviour from the HES. In the lowest income decile, the actual and prescribed rates are negative. Recall that a negative value of the prescribed rate is an indication that no further saving is required if it is the intention to smooth consumption through time. We find that indeed the lowest income decile has negative saving rates as we would have predicted. The pattern for the remaining deciles is similar – generally the prescribed rates are reasonable predictors of the actual savings behaviour. The actual rate is well below the prescribed rate for decile 3; as this only applies to the one decile it may be more due to sampling variation than any underlying systematic under-saving.

The actual saving rates in deciles 9 and 10, the upper quintile of the income distribution are considerably higher than the prescribed rates. What might explain this? Our model assumes that the only bequest would be the residual value of housing equity. Recall that this is computed by simply setting the projected level of net housing wealth at its current level. Households in these deciles may well be accumulating more retirement wealth than is necessary to achieve consumption smoothing because of a desire to leave larger bequests (or simply because of the utility they derive from the ownership of substantial stocks of wealth).

The prescribed rate for the total cohort differs from the actual rate by only 6.4%. We would argue that this is a remarkably good prediction and gives us some cause to think that our

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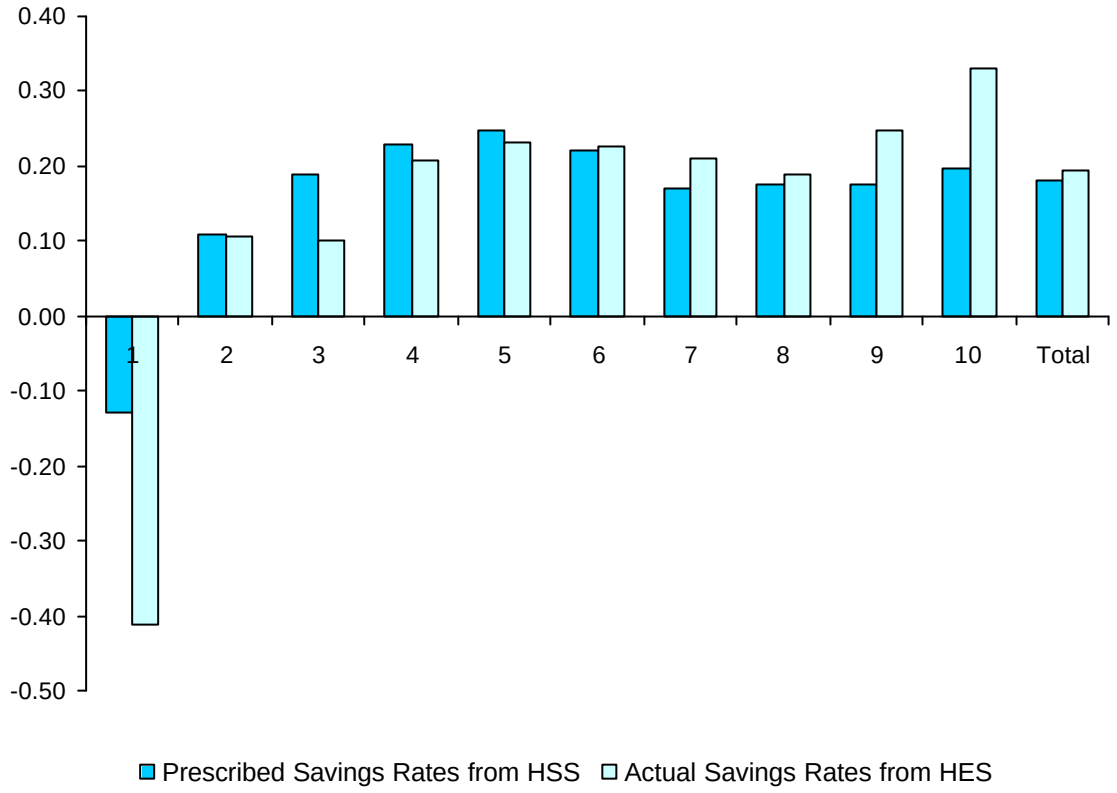
[26] See Gibson {, 2001 #1587}

[27] From the HES we obtained S/Y_d where Y_d is disposable income. Now $S/Y_p = (S/Y_d)*(Y_d/Y_p)$. However, as $(Y_d/Y_p) = (Y_p - T_p)/Y_p = 1-t_p$ where T_p is total pre-retirement taxes and t_p the rate of personal income tax applicable to the particular income level, then $S/Y_p = (S/Y_d)*(1-tp)$.

underlying model of consumption smoothing behaviour is at least consistent with the way people are observed to behave with respect to saving.

Figure 14 – Median actual saving rates from the HES compared with median prescribed saving for couples from HSS rates for 45-55 year olds retiring at 65 with no consumption of housing wealth

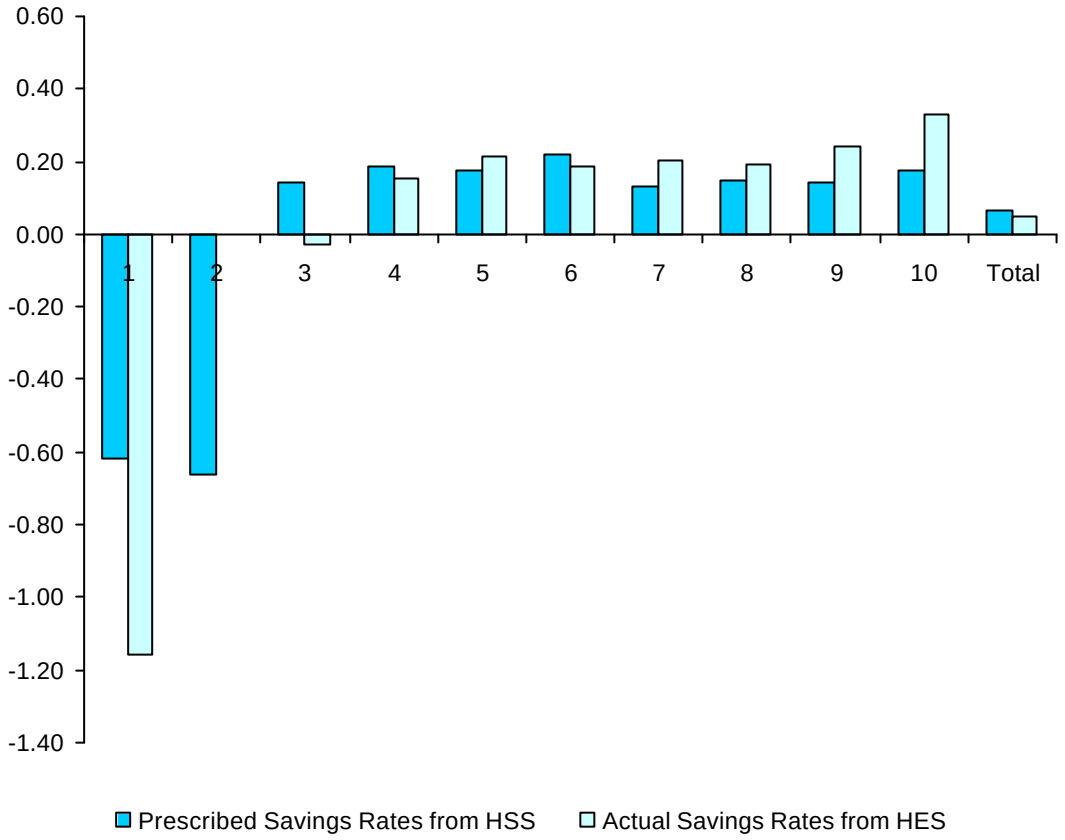


We have chosen to focus on the medians for this comparison. In large part this is because a few extreme outliers tend to distort the means. However for completeness we show a similar comparison between the mean prescribed and actual saving rates by income deciles in Figure 15.

The pattern is again similar, with negative rates in the lowest deciles and the prescribed rate well below what people actually save in the upper deciles. The mean actual rate falls well below the prescribed in decile 3 mirroring the outcomes for the medians. The overall mean actual rate for this cohort was 5.1%, while the prescribed saving rate from the consumption smoothing model was 6.3%. This is in contrast to the results for the medians where the actual saving rate was 19.3%, slightly above the prescribed rate of 18.1%.

There are a number of caveats. In the first place the data from the HES is based on households rather than on couples as in the HSS. If it is the case that 45-55 year old couples have other household members who contribute to the income and saving of the household in a manner which is not proportional to that of the respondent and partner, then the HES and HSS results could differ due to household composition. We have no way to verify this as the HSS data are only collected for the respondent and partner.

Figure 15 – Mean actual saving rates from the HES compared with mean prescribed saving for couples from HSS rates for 45-55 year olds retiring at 65 with no consumption of housing wealth



A second limitation is that the HES sample was selected on the basis of those households where the respondent was aged between 45 and 55, regardless of the age of the partner. In contrast, the HSS sample was based on both the respondent and the partner being between 45 and 55.

Third, we have made the comparison based on HES results for one year only, namely 1998. As we are dealing with rates, the changes in the real absolute levels due to inflation are not a consideration. However, the actual observations in the HES could include transitory components of income, both positive and negative deviations from the underlying trend of permanent income. While more years of the HES are available, we would have confounded the comparison with age cohort effects had we used the 45-55 year old group from successive years. .In any event the drawback of a single year comparison is minimised by the fact that transitory components doubtless reside in the HSS data.

Overall we regard the limitations as relatively minor, and not such as to detract from the main thrust of the conclusion: namely, the evidence we have is that prescribed savings rates from the HSS, based on a model of consumption smoothing, are consistent in broad measure with the observed saving behaviour among 45-55 year old households. This would suggest that there is no wholesale under-saving for retirement amongst this cohort, if the concept of adequacy is derived from a model in which people act to smooth consumption over the life cycle.

5 Conclusions and unfinished business

5.1 Conclusions

In this study we have based estimates of retirement income on the projected stock of retirement wealth that a person might be expected to have. This stock of wealth is based on the accumulation of net worth observed in the HSS, and includes the expected value of NZS. The stock of retirement wealth is converted to an annuity. We have considered the effect of both including and excluding the primary residence as part of the stock of retirement wealth. We have been able to develop a profile of retirement income for various classes of individuals.

We are able to explain some, but by no means all of the variation in net worth across individuals in the pre-retirement age group, 45-55. What really explains retirement wealth – ie, the amount an individual say 50 years old has accumulated and could be used as a source of retirement income? The answer is a complex set of economic and social conditions combined with individual preferences and circumstances. Only with much more detailed information about personal life histories could we expect to improve our ability to explain variations in retirement wealth accumulation. Furthermore, cohort effects are likely to be a significant factor in themselves.

The assumptions underlying the modelling must be stressed. The fundamental behavioural assumption is that people would select a rate of saving that would allow them to smooth their consumption over the life cycle. In other words, we determine the level of saving and the implied income replacement rates *assuming* that this is how people behave. In no way do these results represent what people actually choose. Nor in any sense do they imply what they "should " do.

There is no unique answer to the question: are New Zealanders saving adequately for retirement? There would be a different answer to that question for each definition of what is viewed as "adequate". Our approach has been to make an estimate of the potential retirement income based on the observed levels of retirement accumulation of 45-55 year olds at the time of the survey. From that we have derived the saving rate that would be implied in order to attain the objective of consumption smoothing.

As a test of whether the underlying model is capable of predicting actual saving behaviour, we compared the prescribed saving rates with the actual rates of 45-55 year old households from the Household Economic Survey. We find that in broad measure we are in fact able to predict actual saving behaviour remarkably closely. What does this allow us to conclude?

The evidence on actual saving rates from the HES is consistent with people behaving as if they were attempting to smooth consumption over their life cycle. If among the many possible definitions of adequacy, one were to agree that saving at a rate which would attain consumption smoothing represents a plausible definition, then based on the limited information we have available, we found no significant evidence of gross under-saving for retirement by New Zealand household in this age cohort. This of course does not mean that some individuals might be saving at a rate which later, they may come to view as "too low". But for the cohort as a whole the evidence would not appear to support a claim that New Zealanders aged 45-55 as a group, are under-saving..

Of course it is entirely possible that if one were to start with a different model of savings behaviour and a different concept of adequacy, one might well find evidence of under-saving. Our results depend on the underlying behaviour we have posited. They are open to challenge by those who believe an alternative theory of savings behaviour would better explain the observed patterns of household saving. An alternative way to address this is to ask: what alternative model of savings behaviour do those who argue that there is under-saving for retirement have in mind? And is that model a better predictor of what we actually observe?

Even if the means and medians of the prescribed and actual distributions of saving rates are reasonably close, it should not be taken as evidence that all individuals within an income decile have an actual saving rate that is close to the prescribed rate. The only way to make this comparison, individual by individual, is to have panel data at repeated intervals.

However, even if we were to have such a data set, there would be a further obstacle to concluding that there was evidence of under-saving. Under-saving is detected in this context, by comparing the actual saving rates that people choose to adopt with a rate that would have been chosen had they been following some norm proposed by some-one else. The statement: "we think people are under-saving", in fact means that "we believe you are saving less than the amount that we have deemed would be for your own good".

Suppose we were to find that say, 20% of people in a particular income decile were saving at rates below some norm determined by "someone". The possibility that these individuals are operating with a different concept of what is the best rate for them, cannot be ruled out. They may, for example, have different expectations about future outcomes (their health, life expectancy, retirement income policies, etc), or they simply may have different preferences for consumption now versus tomorrow. Had we captured adequately those characteristics of this group, it is entirely possible we would have found that their observed rates of saving were compatible with the rate which was optimal for them. Of course this still leaves open the possibility that they had incomplete information, and that the provision of better retirement planning information may have lead them to alter their current rate of saving.

We find that between 10 and 15% of people could be expected to fall below 60% of median predicted retirement income for this cohort. The actual proportion would vary depending on the proportion of the housing wealth that was converted to retirement income.

The effect of NZS is to make the distribution of retirement wealth much less unequal. It provides a significant floor under the retirement income of the lower income and wealth deciles. For the lowest groups it represents over 90% of total retirement wealth. One consequence of this is that the prescribed savings rates are low or even negative for the lowest income deciles. In short, the evidence suggests that among the lowest 40% of the income distribution, lifetime welfare would be reduced if these groups were to increase current savings and thereby reduce their pre-retirement consumption.

5.2 Unfinished business

The assumptions made in this study about asset accumulation for retirement have been somewhat restrictive. They have largely ignored differences in the composition of the

stock of retirement wealth and with the exception of housing have not allowed for any further bequests.

Clearly the rate and nature of asset decumulation will depend on the expectations a person holds about their life expectancy, the rates of inflation and interest that might prevail and the probability of poor health leading to unanticipated expenses.

Do those who expect to live longer have greater accumulation and/or a slower rate of decumulation? Does an individual's expectation of longevity or health status influence the form of asset holdings as well as the level? To what extent does the cost of annuities in the market effect the rate of asset accumulation and the rate of decumulation? What responses in wealth might we expect from a change in the retirement tax rates? How do people respond to changes in the means or asset testing eligibility for nursing home care Do changes in these policies induce changes in the amount of retirement wealth people will accumulate and the rate of decumulation?

An important aspect warranting further work is the relation between wealth accumulation and the retirement decision. If this were the case, then allowance would need to be made for the fact that the retirement age which we have taken as fixed, would need to be allowed to vary systematically with the level of accumulated wealth. Arguably the two would be simultaneously determined. Compton (2001) based on evidence for Canada, finds no evidence that wealth explains the decision to retire. Type of occupation, the labour force status of the partner and health and disability are the dominant factors influencing the decision to retire. Similar results are reported for the USA by Burkhauser, Cahill, Quinn and Weathers (1998). In the case of couples, there may well be spillover effects of the incentives to retire facing one partner on the decision taken by the other. In a study for the USA, Coile (2003) finds that these are not necessarily symmetric. Men tend to respond in their retirement decisions to their partner's incentives, but women's decision to retire are not influenced by the incentives facing their partners.

The life cycle model which underpins this paper has rich implications. Consider the question of the decision to retire. Why might people plan to leave the labour force early? As noted by Kirsanova, Sefton and Weale (2003) there are two possibilities: declining wages (perhaps due to ill health) and unanticipated gains in wealth (from asset revaluations or inheritances). Lower wages means the opportunity cost of leisure is lower and people would be expected to respond by substituting more leisure for work in response to this change in the relative price. Do those retiring early face declining real wages or have above average levels of wealth? Further work is needed here.

Some limited research has shown that many people (especially at younger ages) do not expect to receive the current level of NZS when they reach retirement.[28] To what extent do those who expect significantly lower NZS payments hold greater levels of private retirement wealth? Has the creation of the NZS Fund altered these expectations and hence the rate of accumulation of retirement wealth? These are all testable questions, the answers to which would greatly enhance our understanding of the determinant of retirement wealth amongst New Zealand householders.

[28] In a survey conducted in September 1999 as part of the Super 2000 Taskforce, 27% of respondents reported that they expected to have a higher standard of living in retirement while 38% felt there standard of living would decline. When asked whether they were concerned that many New Zealanders would not have an a comfortable retirement, 77% agreed with the statement. Of all 30 year old respondents, 50% expected to retire at or before age 60, while only 4% of all respondents believed the current level of NZ Superannuation payments would be sustained over the next 20-30 years (UMR Insight Ltd 1999)

We recognise that the consumption smoothing model, with or without uncertainty, is a stylised representation of how decisions are made. In fact the evidence is that some if not all individuals do not actually behave this way, leading to the so called "retirement puzzle."(Banks *et al* 1998) find that for British data, well-educated males with occupational pensions are able to largely smooth consumption across retirement. However they find a considerable number take a drop in living standards. In this study we have found that due to the presence of NZS, the consumption levels of a large segment of the lower income earners could be sustained with their current stock of retirement wealth. Note however, this finding does not refer to what they actually choose to do. That is a separate matter that the single sample cannot adequately address. We have attempted an initial answer to this question by examining evidence from the HES.

Because of the limitations of the HSS it is not possible to state whether households in the survey are in fact saving "too little" or "too much". The survey has provided a valuable snapshot of the assets and liabilities of New Zealanders. The current net worth observed in the survey reflects the past decisions that people have made about how much to accumulate. But by its very nature, it cannot reveal their present rate of saving. Repeated surveys at periodic intervals in future would add further critical insights into the pattern of accumulation across households.

However even were we endowed with a series of cross-sectional surveys of the type of the HSS, we would still be faced with the challenge of determining whether the observed pattern of saving revealed by such a series of surveys was in some sense "adequate". There is no single answer to that question. In this paper we have made estimates of the accumulation that those who are currently aged 45-55 could expect to have by the time they retire. This so-called retirement wealth is an amalgamation of their current net worth, their future earnings and the value of NZS. This stock of wealth is the basis for their flow of post-retirement income. We have addressed the question of adequacy by estimating the replacement and saving rates that would be implied were people to attempt to smooth their level of consumption. Other approaches should be tried.[29]

The paper is silent on the well-being of retirees.[30] That well-being is unquestionably related to income. It seems reasonable to presume that a smaller proportion of the financially well-off lack well-being than is the case for the poor. They live longer and have healthier lives for one thing. Well-being depends on assets in the broadest sense – the environment (natural capital), a sense of inclusion and belonging to family and having access to institutions (social capital), education and skills (human capital) and money (or financial capital).

Unquestionably, further work needs to consider the impact of uncertainty. By assuming that future income, retirement dates and life expectancies are known and plans are met and not subsequently adjusted, we have been able to build profiles of potential retirement income for different individual and household characteristics, grounded in measures of net worth from the HSS. In no way do the present results purport to predict the outcome for any one individual. That would depend on the preferences of the particular person, the choices they make, the economic and policy environment prevailing. Over their working lives, as they approach retirement, and during retirement, together with the impact of exogenous, unanticipated events (health status, changes in asset prices, death of a partner, etc).

[29] Studies based on microsimulation offer another potential approach.

[30] See Ministry of Social Development (2001)

5.3 The value of repeated surveys

The HSS was a snapshot of the net worth of New Zealand households at a particular point in time. It is an extraordinarily rich and valuable set of data, providing for the first time measures of assets and liabilities at the level of the individual household.

The value of this survey could be greatly enhanced however, were it to be repeated at regular intervals, giving estimates of the stocks of assets and liabilities at different points in time. This would permit estimates to be made of household saving rates. This would provide an additional and arguably superior source of information about saving behaviour than the measures based on flows on income and consumption spending. The present single survey has provided a picture of what saving people have undertaken in the past as evidenced by their accumulated stock of net worth. It can tell us nothing about their current level or pattern of saving.

A single survey of net worth has another inherent limitation.- it is not possible to isolate cohort effects. What are the implications? In short we cannot assume that the net worth of a current 35 year old will be comparable to that of a current 65 year old when they reach that age in 30 years time. Belonging to different age cohorts means that the social and economic climate which shapes an individual's saving behaviour is different for each cohort. Repeated surveys provide an opportunity to estimate these cohort effects and importantly to test the effect of policies on saving behaviour.[31]

Repeated surveys would also offer the opportunity to examine the effect of labour force participation on net worth and retirement income, as well as the decision to retire. In this study we assumed that retirement takes place at a defined (and pre-specified) age. Increasingly retirement is an process rather than an event, as people live longer and healthier lives. Some of today's younger workers may still be active in the labour force beyond an age corresponding to the life expectancy of the their grandparents. Trends in future retirement wealth will be shaped by changes in work patterns and further rounds of the HSS would provide a basis for measuring those changes.

[31] For an example of a cohort analysis of savings based on the Household Economic Survey, see Gibson and Scobie (2001).

Appendix A – Derivation of the basic model of joint determination of replacement and saving rates[32]

The framework outlined in this appendix is drawn from Moore and Mitchell (1997). They argue that it is necessary to develop a framework which allows the replacement rate and the pre-retirement savings rate to be jointly determined. The reasons for this are twofold. In the first place in view of a household's actual and projected income and assets, the saving rate needed to achieve some pre-specified replacement rate may be unfeasible. Secondly, the replacement rate depends in part on the rate of taxation in retirement, which in turn depends on the level of retirement income, itself a determinant of the replacement rate. Only in the case that the tax rates in retirement were pre-determined would this second issue be avoided.

The starting point is the condition that real assumption (ie, income net of taxes and saving) be equal before and after retirement, as given by:

$$(Y_p - T_p - S) = Y_r - T_r \qquad \text{(A.1)}$$

where

Y_p	=	pre-retirement gross income
T_p	=	pre-retirement taxes
S	=	savings
Y_r	=	post-retirement gross income
T_r	=	post-retirement taxes

Next define

	s	=	pre-retirement savings ratio	$= (S / Y_p)$
and	R	=	replacement ratio	$= (Y_r / Y_p)$

so that substituting these definitions in (1) and dividing the Y_p gives

$$1 - (T_p / Y_p) - s = R - (T_r / Y_p) \qquad \text{(A.2)}$$

Now let $T_p = t_p Y_p$ and $T_r = t_r Y_r$ where t_p and t_r are the pre and post retirement proportional tax rates, so that

$$s = (1 - t_p) - (1 - t_r) R \qquad \text{(A.2')}$$

Equation (A.2') defines a set of combinations of s and R which satisfy the condition specified in (A.1). By first finding a value for R, we can then solve for the corresponding value if s that satisfies (A.2').

[32] The authors gratefully acknowledge the contribution of Le Thi Van Trinh of the University of Waikato in the development of this appendix

The post-retirement income flow (Y_r) can be converted to a lump sum at retirement by applying an annuity factor (α). This expresses the stream of post-retirement income in terms of a stock in wealth at the time of retirement. In other words, where a person to have accumulated this amount they would be able to receive a lifetime annuity of Y_r.

Denoting the "required" wealth needed to generate Y_r as W_r then

$$W_r = a\,Y_r = a\left[(l-s)Y_p - T_p + T_r\right] \tag{A.3}$$

The amount of saving needed to reach this required level of retirement income (w_r) will depend on:

- the existing stock of net wealth (w_p)
- the expected returns on investment
- future income
- tax rates

We define (w_p) as the projected level of wealth so that the shortfall is:

$$W_r - W_p = a\left[(1-s)Y_p - T_p + T_r\right] - W_p \tag{A.4}$$

We are now in a position to derive the rate of saving needed to reach the required level of wealth. This rate is the share of pre-tax income the household would need to save in order to have the level of income Y_r in retirement.

The amount accumulated by retirement would then be:

$$W_p = \sum_{t=1}^{T} Y_a\left(1+g\right)^t\left(1+r\right)^{T-t} s = sY_a[\sum_{t=1}^{T}\left(1+g\right)^t\left(1+r\right)^{T-t}] = sY_aZ \tag{A.5}$$

where:

Y_a	=	actual income in year $t = 1 \ldots$T
g	=	annual growth rate of income
r	=	after tax real rate of return on saving

Using (A.4) and (A.5) we can solve for the saving rate[33], s:

$$s = \frac{a\left(Y_p - T_p + T_r\right) - W_p}{Y_p\left[a + Z/(1+g)^T\right]}$$

where $Y_p = Y_a(1+g)^T$. Now dividing by Y_p gives:

[33] Note the saving rate is defined as a constant share of pre-retirement income.

$$s = \frac{a\,t_r R + a\,(1 - t_p) - \dfrac{W_p}{Y_p}}{a + \dfrac{Z}{(1+g)^T}} \qquad \text{(A.6)}$$

where T is the number of years from the person's current age until the pre-determined age of retirement. Note again that s is a linear function of R.

Now equating (A.2') and (A.6) we have:

$$\frac{a\,t_r R + a\,(1 - t_p) - \dfrac{W_p}{Y_p}}{a + \dfrac{Z}{(1+g)^T}} = \left(1 - t_p\right) - \left(1 - t_r\right) R,$$ which after collecting terms in R gives

$$R\left[\frac{a\,t_r}{a + Z/(1+g)^T} + (1 - t_r)\right] = (1 - tp) - \left[\frac{a\,(1 - t_p) - \dfrac{W_p}{Y_p}}{a + Z/(1+g)^T}\right] \qquad \text{(A.7)}$$

Now consider the coefficient of R on the LHS of (A.7)

$$= \frac{a\,t_r}{a + Z/(1+g)^T} + (1 - t_r) = 1 - \left[\frac{t_r Z}{a\,(1+g)^T + Z}\right] \qquad \text{(A.8)}$$

while the RHS of (A.7) can be written as:

$$= (1 - tp) - \left[\frac{a\,(1 - t_p) - \dfrac{W_p}{Y_p}}{\dfrac{a\,(1+g)^T + Z}{(1+g)^T}}\right] = \frac{Z(1 - t_p) + \dfrac{W_p}{Y_p}(1+g)^T}{a\,(1+g)^T + Z} \qquad \text{(A.9)}$$

Now substitute (A.8) and (A.9) in (A.7) and solve for R:

$$R = \frac{\dfrac{\mathrm{Z}(1 - t_p) + \dfrac{W_p}{Y_p}(1+g)^T}{a\,(1+g)^T + \mathrm{Z}}}{\dfrac{a\,(1+g)^T + \mathrm{Z} - t_r \mathrm{Z}}{a\,(1+g)^T + \mathrm{Z}}} \qquad \text{(A.9)}$$

so that

$$R = \frac{\left(1 - t_p\right)\mathrm{Z} + \dfrac{W_p}{Y_p}\left(1+g\right)^T}{\left(1 - t_r\right)\mathrm{Z} + a\,\left(1+g\right)^T} \qquad \text{(A.10)}$$

We return now to the question of t_r. It is argued that in the context of the New Zealand system of taxation, private retirement saving is made from after-tax pre-retirement income $(Y_p - T_p)$ and the earnings on the investments are taxed. However, once those accumulated funds are withdrawn (in this case to purchase an annuity) then there is no further taxation on the income received in retirement. Furthermore, New Zealand Superannuation payments are received net of tax. Hence under this system (denoted TTE) and unlike the USA, $t_r = 0$. With this simplification we can solve for R for each individual having T years remaining until retirement, such that

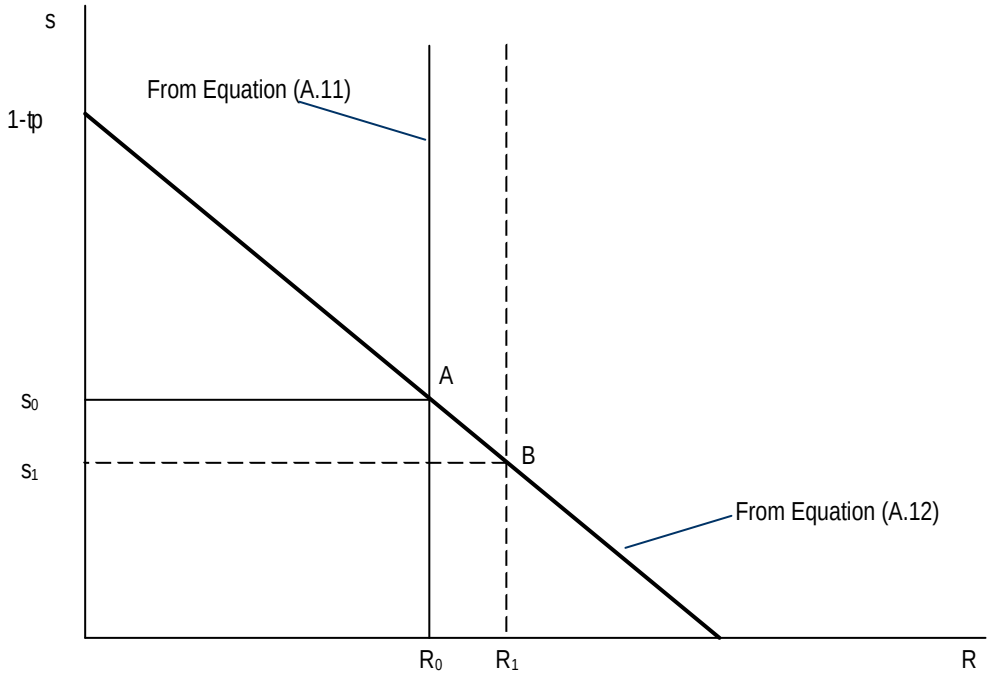
$$R = \frac{\left(1-t_p\right)\mathrm{Z} + \frac{W_p}{Y_p}\left(1+g\right)^T}{\mathrm{Z} + a\left(1+g\right)^T} \qquad \text{(A.11)}$$

and then substitute this value to find s from

$$s = (1-t_p) - R \qquad \text{(A.12)}$$

The linear relation between s and R specified in (A.12) is shown in Appendix Figure 1 as a negatively sloped line with slope equal to –1. It is derived from the condition that pre- and post-retirement consumption levels are equal (refer to (A.1)).

Appendix Figure 1 – Joint determination of the saving rate (s) and the replacement rate (R)

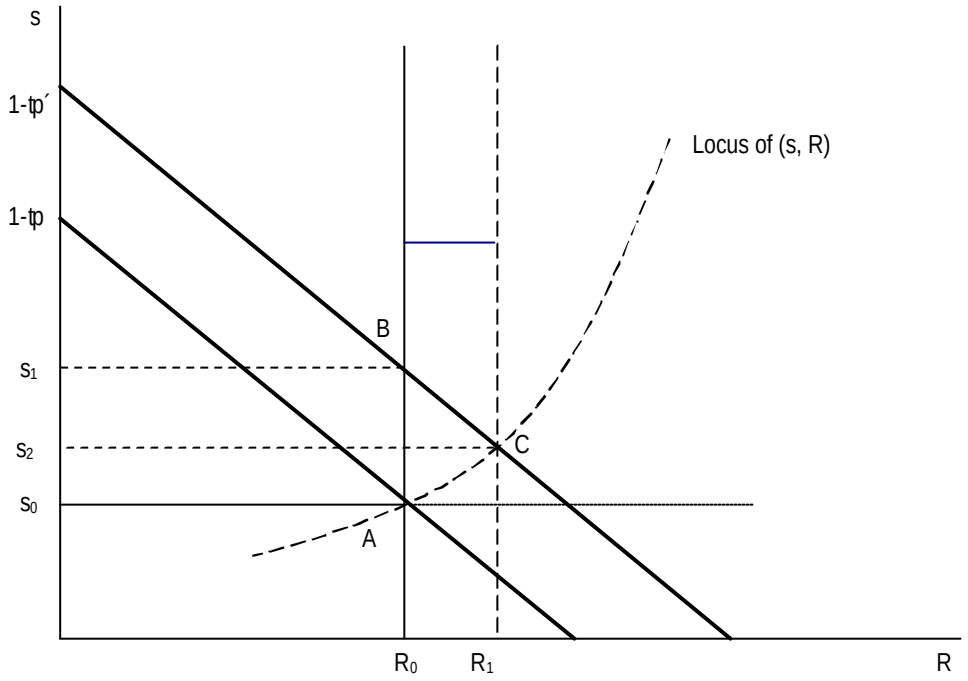


The maximum value s can take is $(1-t_p)$, which would imply (unrealistically) that all after-tax income was saved. For a given individual, (A.11) specifies a replacement rate (R_0) and the intersection at point A determines the corresponding saving rate (s_0). A higher value of initial wealth (W_a) and hence projected wealth (W_p) would lead to a greater replacement rate ($R_1 > R_0$) and all else being equal, this would allow a lower rate of saving ($s_0 < s_1$). For

example, to the extent that New Zealand Superannuation is viewed as part of retirement wealth (W_p) then given an increase (decrease) in the level of payment, the model would predict a decrease in the level of the saving rate.

Consider the effect of a reduction in the pre-retirement tax rate from t_p to t_p'. This will raise the intercept on the s axis from $(1-t_p)$ to $(1-t_p')$ as , $t_p' < t_p$. This is shown by an outward shift of the s-R line in Appendix Figure 2.

Appendix Figure 2 – Effect of a reduction in the pre-retirement tax rate (t_p) on the rate of saving (s) and the replacement rate (R)



Initially this would raise the saving rate to s_1 corresponding to the intersection at B. However as is evident from (A.11), R is negatively related to t_p, so a fall in t_p will result in an increase in R. This will now lead to a new saving rate of s_2, corresponding to the point C; ie, the new (s,R) combination lies in the north-east quadrant from A and the lower tax rate would induce a higher saving rate ($s_2 > s_0$) and a higher replacement rate ($R_1 > R_0$). Only in the case that the marginal propensity to consume exceeded unity could the saving rate fall below its initial level of s_0. By making successive changes to the tax rate the locus of equilibrium combinations of s and R is traced out as shown in Appendix Figure 2. The key theoretical proposition to emerge from this comparative statics exercise is that lower pre-retirement tax rates can lead to higher saving rates and simultaneously, higher replacement rates.

Appendix B – Derivation of the utility maximising model[34]

Let x denote 1 plus the rate of time preference, and d is 1 plus the discount rate. Let $b = -(1-\frac{1}{h})$, where h is the intertemporal elasticity of substitution between all pairs of time periods. Hence $h = 1/(1+b)$ Assuming no borrowing constraints and equal borrowing and lending rates of interest, and no interest-income taxation, the individual's problem is to maximise:

$$U = \sum_{t=1}^{T} x^{-(t-1)} c_t^{-b} \tag{1}$$

subject to the budget constraint:

$$\sum_{t=1}^{T} d^{-(t-1)} c_t = W \tag{2}$$

where consumption and wealth are measured net of taxes. The Lagrangean for this problem is:

$$L = U + l\left(W - \sum_{t=1}^{T} d^{-(t-1)} c_t\right) \tag{3}$$

The T first-order conditions, for $t = 1,...,T$ are

$$\frac{\partial L}{\partial c_t} = -bx^{-(t-1)} c_t^{-b-1} - l\,d^{-(t-1)} = 0 \tag{4}$$

Rewrite as:

$$-bx^{-(t-1)} c_t^{-b} = l\,c_t d^{-(t-1)} \tag{5}$$

and sum over all t so that:

$$-bU = l\,W \tag{6}$$

Also from (4), division gives for periods t and 1:

$$\left(\frac{c_t}{c_1}\right)^{-b-1} = \left(\frac{d}{x}\right)^{-(t-1)} \tag{7}$$

so that:

$$\begin{aligned} c_t &= c_1\left\{\left(\frac{d}{x}\right)^{-(t-1)}\right\}^{-\frac{1}{1+b}} \\ &= c_1\left(\frac{d}{x}\right)^{h(t-1)} \end{aligned} \tag{8}$$

Substitute (8) into (1)

[34] This appendix was written by John Creedy.

$$U = c_1^{-b} \sum \left\{ \left(\frac{d}{x} \right)^{h(t-1)} \right\}^{-b} x^{-(t-1)} \tag{9}$$

This can be rearranged as:[35]

$$U = c_1^{-b} \sum \left(x d^{\,b} \right)^{-h(t-1)} \tag{10}$$

Using (4) for $t = 1$, along with (6), gives

$$-b c_1^{-b-1} = l \tag{11}$$

$$= -\frac{b U}{W} \tag{12}$$

substituting for U from (10) gives:

$$c_1^{-b-1} = \frac{1}{W} c_1^{-b} \sum \left(x d^{\,b} \right)^{-h(t-1)} \tag{13}$$

and

$$c_1 = W \left[\sum \left(x d^{\,b} \right)^{-h(t-1)} \right]^{-1} \tag{14}$$

$$= kW \tag{15}$$

where $k = \left[\sum \left(x d^{\,b} \right)^{-h(t-1)} \right]^{-1}$. Hence, consumption in t is given by:

$$c_t = k \left(\frac{d}{x} \right)^{h(t-1)} W \tag{16}$$

If it is assumed that $d = x$, the consumption is no longer time dependent and (16) reduces to:

$$\bar{c} = kW \tag{17}$$

[35] Collecting terms in x gives $x^{-h(t-1)\left(\frac{1}{h}-b\right)} = x^{-h(t-1)}$, since $\frac{1}{h} = 1 + b$.

Appendix Table 1 – Mean value and composition of wealth by wealth decile: Unpartnered respondents aged 45-55

Wealth Decile	Total Wealth	Net Housing Wealth	Net Financial Wealth	Pension Wealth	Superannuation Wealth
1 (= lowest)	96,605	-10,180	68	738	105,979
		-11%	0%	1%	110%
2	123,857	660	2,892	524	119,782
		1%	2%	0%	97%
3	140,127	1,569	5,731	247	132,580
		1%	4%	0%	95%
4	162,074	15,047	12,798	846	133,382
		9%	8%	1%	82%
5	202,303	43,793	25,873	6,183	126,454
		22%	13%	3%	63%
6	257,382	52,087	71,496	4,045	129,754
		20%	28%	2%	50%
7	305,979	62,231	96,328	11,981	135,439
		20%	31%	4%	44%
8	407,508	141,418	103,727	25,455	136,908
		35%	25%	6%	34%
9	529,308	211,367	111,010	60,322	146,609
		40%	21%	11%	28%
10 (= highest)	932,872	181,600	543,501	65,981	141,790
		19%	58%	7%	15%
Total Sample					
Mean	313,941	69,222	96,720	17,294	130,706
		22%	31%	6%	42%
Median 10%	230,034	58,408	39,615	1,747	130,263
Ethnic Sub-groups (mean)					
Pakeha	340,320	74,823	111,460	17,204	136,832
		22%	33%	5%	40%
Maori-Pacific	184,042	16,841	52,515	7,448	107,238
		9%	29%	4%	58%
Gender Sub-groups (mean)					
Male	286,227	41,884	111,104	14,889	118,350
		15%	39%	5%	41%
Female	332,948	87,971	86,855	18,943	139,180
		26%	26%	6%	42%

Note:
All values are weighted to population averages and are in 2001 dollars.
The median 10% is the average value for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 2 – Median value and composition of wealth by wealth decile: Unpartnered respondents aged 45-55

Wealth Decile	Total Wealth	Net Housing Wealth	Net Financial Wealth	Pension Wealth	Superannuation Wealth
1 (= lowest)	103,522	0	-2,783	0	106,394
		0.0%	-2.7%	0.0%	102.8%
2	121,807	0	20	0	121,534
		0.0%	0.0%	0.0%	99.8%
3	138,090	0	700	0	135,399
		0.0%	0.5%	0.0%	98.1%
4	160,169	0	10,300	0	132,745
		0.0%	6.4%	0.0%	82.9%
5	202,652	47,000	15,045	0	128,973
		23.2%	7.4%	0.0%	63.6%
6	260,168	55,000	76,867	0	128,973
		21.1%	29.5%	0.0%	49.6%
7	298,865	46,750	110,800	0	136,867
		15.6%	37.1%	0.0%	45.8%
8	405,524	165,000	76,000	0	135,399
		40.7%	18.7%	0.0%	33.4%
9	524,282	240,000	38,300	37,000	152,482
		45.8%	7.3%	7.1%	29.1%
10 (= highest)	731,194	144,500	453,708	0	149,492
		19.8%	62.1%	0.0%	20.4%
Total Sample					
Median	226,820	0	20,479	0	131,552
		0.0%	9.0%	0.0%	58.0%
Ethnic Sub-groups (median)					
Pakeha	260,168	21,000	24,900	0	135,399
		8.1%	9.6%	0.0%	52.0%
Maori-Pacific	125,384	0	3,080	0	106,394
		0.0%	2.5%	0.0%	84.9%
Gender Sub-groups (median)					
Male	202,652	0	20,710	0	121,534
		0.0%	10.2%	0.0%	60.0%
Female	259,440	21,000	20,353	0	143,687
		8.1%	7.8%	0.0%	55.4%

Note:
All values are weighted to population averages and are in 2001 dollars.

Appendix Table 3 – Mean value of current and projected wealth by decile of current wealth: Unpartnered respondents aged 45-55

Current Wealth Decile	Current Wealth	Projected at Age 62	Projected at Age 65	Projected at Age 68
1 (= lowest)	96,605	165,011	137,145	107,377
2	123,857	198,670	170,128	138,384
3	140,127	217,558	188,889	166,355
4	162,074	233,583	213,580	187,605
5	202,303	285,734	258,672	230,784
6	257,382	343,179	321818	301,767
7	305,979	398,155	378,331	356,935
8	407,508	506,176	488,407	469,550
9	529,308	623,963	608,229	591,532
10 (= highest)	932,872	1,118,373	1,130,124	1,142,594
Total Sample			,	
Mean				
Total wealth	313,941	406,667	387,511	367,183
Housing wealth	69,222	69,222	69,222	69,222
Financial wealth	96,720	113,701	118,861	124,337
Pension wealth	17,294	21,668	22,994	24,401
Superannuation wealth	130,706	202,076	176,434	149,223
Median 10%				
Total wealth	230,034	312,526	289,681	263,703
Housing wealth	58,408	58,134	58,408	61,942
Financial wealth	39,615	48,112	49,070	47,499
Pension wealth	1,747	2,343	2,447	2,492
Superannuation wealth	130,263	203,938	179,756	151,769
Ethnic Sub-groups				
Pakeha (mean)				
Total wealth	340,320	436,239	418,187	399,029
Housing wealth	74,823	74,823	74,823	74,823
Financial wealth	111,460	130,480	136,303	142,482
Pension wealth	17,204	21,542	22,861	24,260
Superannuation wealth	136,832	209,393	184,200	157,464
Maori-Pacific (mean)				
Total wealth	184,042	262,932	239,035	213,674
Housing wealth	16,841	16,841	16,841	16,841
Financial wealth	52,515	61,806	64,639	67,646
Pension wealth	7,448	9,846	10,449	11,088
Superannuation wealth	107,238	174,439	147,106	118,100
Gender Sub-groups				
Male (mean)				
Total wealth	286,227	382,225	363,419	343,462
Housing wealth	41,884	41,884	41,884	41,884

Current Wealth Decile	Current Wealth	Projected at Age 62	Projected at Age 65	Projected at Age 68
Financial wealth	111,104	134,537	141,144	148156
Pension wealth	14,889	18,871	20,026	21,251
Superannuation wealth	118,350	186,933	160,365	132,170
Female (mean)				
Total wealth	332,948	423,429	404,034	383,452
Housing wealth	87,971	87,971	87,971	87,971
Financial wealth	86,855	99,412	103,579	108,001
Pension wealth	18,943	23,586	25,030	26,562
Superannuation wealth	139,180	212,461	187,455	160,919

Note:
All values are weighted to population averages and are in 2001 dollars.
The median 10% is the average value for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 4 – Median value of current and projected wealth by decile of current wealth: Unpartnered respondents aged 45-55

Current Wealth Decile	Current Wealth	Projected at Age 62	Projected at Age 65	Projected at Age 68
1 (= lowest)	103,522	164,507	136,383	106,537
2	121,807	193,636	166,866	139,042
3	138,090	219,006	194,087	167,682
4	160,169	233,858	210,455	184,854
5	202,652	290,066	256,198	230,866
6	260,168	338,671	313,828	297,550
7	298,865	387,622	367,654	344,918
8	405,524	506,814	482,381	456,452
9	524,282	630,725	619,384	606,141
10 (= highest)	731,194	868,552	874,023	880,235
Total Sample				
Median				
Total wealth	226,820	314,796	289,712	263,094
Housing wealth	0			
Financial wealth	20,479			
Pension wealth	0			
Superannuation wealth	131,552			
Ethnic Sub-groups				
Pakeha (median)				
Total wealth	260,168	344,692	325,239	304,596
Housing wealth	21,000	21,000	21,000	21,000
Financial wealth	24,900	28,828	30,615	32,513
Pension wealth	0	0	0	0
Superannuation wealth	135,399	221,692	197,251	171,315
Maori-Pacific (median)				
Total wealth	125,384	188,198	161,321	132,799
Housing wealth	0	0	0	0
Financial wealth	3,080	3,096	3,101	3,108
Pension wealth	0	0	0	0
Superannuation wealth	106,394	181,875	154,997	126,473
Gender Sub-groups				
Male (median)				
Total wealth	202,652	271,117	245,503	218,320
Housing wealth	0	0	0	0
Financial wealth	20,710	25,415	26,587	28,062
Pension wealth	0	0	0	0
Superannuation wealth	121,534	193,035	166,840	139,042
Female (median)				
Total wealth	259,440	336,285	311,096	287,465
Housing wealth	21,000	21,000	21,000	21,000
Financial wealth	20,353	24,830	26,564	28,404
Pension wealth	0	0	0	0
Superannuation wealth	143,687	221,692	197,251	171,315

Note:
All values are weighted to population averages and are in 2001 dollars

Appendix Table 5 – Mean prescribed saving and replacement rates with no consumption of housing: Unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	96,605	10.1%	66.2%	9.6%	66.4%	9.1%	67.1%
2	123,857	3.1%	75.5%	2.0%	76.5%	1.9%	76.3%
3	140,127	-5.7%	82.8%	2.0%	75.2%	2.4%	74.8%
4	162,074	6.4%	69.7%	-1.8%	78.4%	-2.1%	78.2%
5	202,303	6.2%	65.5%	6.8%	62.9%	5.3%	64.8%
6	257,382	6.6%	65.7%	4.2%	67.7%	1.7%	69.8%
7	305,979	-22.4%	93.7%	-21.9%	93.0%	-21.4%	92.5%
8	407,508	-3.7%	73.8%	-5.4%	75.5%	-7.6%	76.9%
9	529,308	-16.7%	90.8%	-17.6%	91.2%	-18.7%	92.1%
10	932,872	-27.0%	89.6%	-29.6%	92.2%	-32.4%	94.9%
Total Sample							
Mean	313,941	-4.1%	77.2%	-5.0%	77.7%	-6.0%	78.6%
Median 10%	230,034	5.3%	67.8%	5.1%	66.9%	3.6%	68.9%
Ethnic Sub-groups							
Pakeha	340,320	-5.2%	77.3%	-6.3%	78.1%	-7.5%	79.1%
Maori-Pacific	184,042	4.2%	71.4%	3.8%	71.5%	3.2%	72.1%
Gender Sub-groups							
Male	286,227	0.9%	69.9%	-0.5%	71.2%	-2.2%	72.6%
Female	332,948	-7.6%	82.2%	-8.1%	82.2%	-8.7%	82.7%

Note:
All values are weighted to population averages and are in 2001 dollars.
The median 10% is the average value for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 6 – Median prescribed saving and replacement rates with no consumption of housing: Unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	103,522	14.0%	65.3%	10.9%	68.4%	10.5%	68.0%
2	121,807	5.1%	74.2%	4.2%	75.1%	1.7%	77.6%
3	138,090	-5.7%	85.0%	7.6%	71.7%	4.9%	74.4%
4	160,169	14.6%	64.4%	8.8%	70.5%	6.9%	72.4%
5	202,652	14.2%	54.7%	11.6%	54.6%	8.8%	57.0%
6	260,168	11.9%	60.8%	8.6%	64.7%	6.3%	68.0%
7	298,865	10.8%	58.0%	6.9%	60.2%	3.7%	62.6%
8	405,524	10.9%	62.1%	8.8%	65.3%	4.9%	66.5%
9	524,282	-2.3%	79.9%	-6.0%	82.8%	-9.7%	85.9%
10	731,194	-3.0%	66.7%	-6.2%	70.0%	-9.5%	73.3%
Total Sample							
Median	226,820	8.0%	67.2%	6.3%	69.2%	4.6%	71.0%
Ethnic Sub-groups							
Pakeha	260,168	8.3%	65.5%	5.9%	69.0%	4.4%	69.3%
Maori-Pacific	125,384	10.1%	68.8%	8.9%	68.9%	7.0%	69.3%
Gender Sub-groups							
Male	202,652	13.1%	59.1%	10.4%	62.1%	8.9%	65.2%
Female	259,440	3.2%	71.2%	1.1%	73.0%	0.3%	74.5%

Note:
All values are weighted to population averages and are in 2001 dollars.

Appendix Table 7 – Mean prescribed saving and replacement rates with 50% consumption of housing: unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	96,605	10.3%	66.0%	9.8%	66.2%	9.3%	66.9%
2	123,857	3.0%	75.5%	1.9%	76.5%	1.8%	76.4%
3	140,127	-5.7%	82.9%	1.8%	75.3%	2.2%	74.9%
4	162,074	5.2%	70.9%	-2.8%	79.4%	-3.1%	79.2%
5	202,303	2.8%	69.0%	3.8%	66.0%	2.4%	67.7%
6	257,382	3.8%	68.5%	1.6%	70.2%	-0.6%	72.1%
7	305,979	-24.9%	96.2%	-24.3%	95.4%	-23.6%	94.7%
8	407,508	-12.9%	83.1%	-14.0%	84.1%	-15.5%	84.8%
9	529,308	-37.0%	111.1%	-36.5%	110.1%	-36.2%	109.6%
10	932,872	-33.1%	95.7%	-35.2%	97.8%	-37.6%	100.1%
Total Sample							
Mean	313,941	-8.6%	81.6%	-9.1%	81.8%	-9.9%	82.4%
Median 10%	230,034	1.0%	72.0%	1.5%	70.5%	0.2%	72.3%
Ethnic Sub-groups							
Pakeha	340,320	-9.0%	81.1%	-9.8%	81.6%	-10.8%	82.4%
Maori-Pacific	184,042	3.0%	72.5%	2.7%	72.6%	2.2%	73.1%
Gender Sub-groups							
Male	286,227	-0.7%	71.6%	-2.0%	72.7%	-3.6%	74.0%
Female	332,948	-14.0%	88.5%	-14.0%	88.1%	-14.2%	88.2%

Note:

All values are weighted to population averages and are in 2001 dollars.

The median 10% is the average value for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 8 – Median prescribed saving and replacement rates with 50% consumption of housing: Unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	103,522	14.0%	65.3%	10.9%	68.4%	11.3%	68.0%
2	121,807	5.1%	74.2%	4.2%	75.1%	2.1%	77.2%
3	138,090	-5.7%	85.0%	8.1%	71.2%	4.9%	74.4%
4	160,169	13.3%	66.0%	6.7%	72.6%	6.3%	73.0%
5	202,652	12.5%	55.9%	9.6%	57.2%	7.5%	59.4%
6	260,168	9.2%	64.2%	6.6%	67.9%	3.5%	71.7%
7	298,865	6.3%	59.9%	3.9%	61.9%	1.9%	64.6%
8	405,524	3.5%	62.3%	0.5%	65.3%	-4.8%	67.8%
9	524,282	-12.1%	91.4%	-14.2%	93.5%	-16.5%	93.4%
10	731,194	-10.4%	76.2%	-13.0%	78.8%	-15.7%	81.5%
Total Sample							
Median	226,820	4.6%	70.1%	3.3%	72.2%	1.3%	74.0%
Ethnic Sub-groups							
Pakeha	260,168	4.7%	70.1%	2.7%	72.2%	0.6%	74.0%
Maori-Pacific	125,384	9.5%	69.7%	7.7%	70.3%	5.5%	71.7%
Gender Sub-groups							
Male	202,652	10.5%	60.0%	9.6%	62.7%	6.7%	65.2%
Female	259,440	-0.9%	76.7%	-2.1%	77.5%	-3.2%	78.8%

Note:
All values are weighted to population averages and are in 2001 dollars.

Appendix Table 9 – Mean prescribed saving and replacement rates with 100% consumption of housing: Unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	96,605	10.5%	65.8%	10.0%	66.0%	9.5%	66.7%
2	123,857	2.9%	75.6%	1.8%	76.6%	1.7%	76.5%
3	140,127	-5.8%	82.9%	1.6%	75.5%	2.1%	75.0%
4	162,074	4.1%	72.0%	-3.8%	80.5%	-4.1%	80.2%
5	202,303	-0.7%	72.5%	0.8%	69.0%	-0.6%	70.6%
6	257,382	1.0%	71.3%	-0.9%	72.8%	-2.9%	74.4%
7	305,979	-27.5%	98.7%	-26.6%	97.7%	-25.8%	96.9%
8	407,508	-22.2%	92.4%	-22.5%	92.6%	-23.5%	92.8%
9	529,308	-57.4%	131.5%	-55.3%	128.9%	-53.7%	127.1%
10	932,872	-39.1%	101.7%	-40.8%	103.4%	-42.8%	105.3%
Total Sample							
Mean	313,941	-13.0%	86.1%	-13.2%	86.0%	-13.7%	86.2%
Median 10%	230,034	-3.2%	76.2%	-2.1%	74.1%	-3.3%	75.7%
Ethnic Sub-groups							
Pakeha	340,320	-12.8%	84.9%	-13.3%	85.1%	-14.1%	85.7%
Maori-Pacific	184,042	1.9%	73.7%	1.7%	73.7%	1.2%	74.1%
Gender Sub-groups							
Male	286,227	-2.4%	73.2%	-3.6%	74.2%	-5.0%	75.4%
Female	332,948	-20.4%	94.9%	-19.9%	94.0%	-19.7%	93.7%

Note: All values are weighted to population averages and are in 2001 dollars. The median 10% is the average value for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 10 – Median prescribed saving and replacement rates with 100% consumption of housing: Unpartnered respondents aged 45-55

		Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Current Wealth Decile	Current Wealth	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
1	103,522	14.0%	65.3%	10.9%	68.4%	11.3%	68.0%
2	121,807	5.1%	74.2%	4.2%	75.1%	2.7%	76.6%
3	138,090	-5.7%	85.0%	8.4%	70.9%	4.9%	74.4%
4	160,169	11.7%	67.6%	5.5%	73.8%	4.3%	75.0%
5	202,652	11.1%	60.0%	8.8%	58.2%	6.1%	61.5%
6	260,168	6.7%	68.4%	3.7%	71.8%	0.8%	74.6%
7	298,865	2.1%	65.3%	-0.6%	67.1%	-2.4%	69.0%
8	405,524	-3.8%	69.6%	-5.5%	71.3%	-7.8%	73.6%
9	524,282	-17.8%	97.1%	-24.9%	97.2%	-26.4%	100.0%
10	731,194	-19.9%	81.9%	-21.8%	84.0%	-23.8%	86.2%
Total Sample							
Median	226,820	2.1%	73.4%	0.5%	73.8%	-0.7%	75.3%
Ethnic Sub-groups							
Pakeha	260,168	1.7%	73.4%	-0.1%	74.0%	-1.5%	75.5%
Maori-Pacific	125,384	7.4%	71.5%	6.3%	73.0%	4.9%	74.2%
Gender Sub-groups							
Male	202,652	8.8%	62.1%	7.0%	64.8%	5.3%	66.8%
Female	259,440	-8.4%	80.2%	-7.2%	79.4%	-7.3%	80.8%

Note: All values are weighted to population averages and are in 2001 dollars.

Appendix Table 11 – Saving and replacement rates: means and medians by income decile: no consumption of housing

	Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Income Decile	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
(a) Means						
1	-58.3%	137.6%	-50.8%	130.1%	-44.4%	123.7%
2	-16.9%	96.2%	-13.4%	92.7%	-10.5%	89.8%
3	-13.0%	92.3%	-11.8%	91.1%	-11.1%	90.4%
4	-0.9%	80.2%	-2.1%	81.4%	-3.6%	82.9%
5	5.9%	73.4%	3.6%	75.7%	1.2%	78.1%
6	5.6%	73.0%	1.9%	75.4%	-1.6%	78.0%
7	13.3%	53.9%	9.6%	56.2%	6.8%	59.0%
8	12.7%	53.1%	9.4%	56.2%	6.0%	59.0%
9	2.5%	57.8%	-0.7%	60.7%	-3.8%	63.6%
10	10.0%	49.8%	6.1%	53.7%	2.3%	57.5%
(b) Medians						
1	-37.9%	117.2%	-32.7%	112.0%	-28.3%	107.6%
2	-12.6%	91.9%	-8.6%	87.9%	-5.6%	84.9%
3	-0.2%	79.5%	0.3%	79.0%	0.3%	79.0%
4	8.3%	71.0%	6.8%	72.5%	5.1%	74.2%
5	14.0%	65.3%	11.4%	67.9%	8.7%	70.6%
6	16.8%	61.8%	12.0%	65.1%	9.4%	68.0%
7	14.2%	52.6%	11.6%	54.2%	9.0%	56.8%
8	15.6%	50.2%	12.4%	53.4%	9.2%	56.5%
9	12.8%	47.0%	10.0%	49.8%	6.3%	53.5%
10	18.1%	41.7%	14.0%	45.8%	10.0%	49.8%

Appendix Table 12 – Saving and replacement rates: means and medians by income decile: with 50% consumption of housing

	Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Income Decile	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
(a) Means						
1	-69.0%	148.3%	-60.8%	140.1%	-53.7%	133.0%
2	-18.9%	98.2%	-15.2%	94.5%	-12.2%	91.5%
3	-16.7%	96.0%	-15.3%	94.6%	-14.4%	93.7%
4	-9.5%	88.8%	-10.1%	89.4%	-11.0%	90.3%
5	2.6%	76.7%	0.6%	78.7%	-1.6%	80.9%
6	0.8%	77.9%	-2.6%	79.9%	-5.8%	82.2%
7	10.4%	56.7%	7.0%	58.8%	4.3%	61.5%
8	10.7%	55.1%	7.5%	58.1%	4.2%	60.8%
9	-1.8%	62.0%	-4.6%	64.6%	-7.5%	67.3%
10	8.4%	51.4%	4.6%	55.2%	0.9%	58.9%
(b) Medians						
1	-44.1%	123.4%	-35.7%	115.0%	-28.6%	107.9%
2	-13.1%	92.4%	-9.8%	89.1%	-7.5%	86.8%
3	-0.2%	79.5%	-0.1%	79.4%	-0.6%	79.9%
4	4.0%	75.3%	3.5%	75.8%	2.9%	76.4%
5	11.2%	68.1%	9.5%	69.8%	7.5%	71.8%
6	10.6%	68.7%	7.1%	72.2%	4.1%	74.7%
7	11.0%	54.8%	8.2%	57.6%	5.4%	60.4%
8	14.3%	51.5%	11.6%	54.2%	8.4%	57.1%
9	3.9%	55.9%	1.4%	58.4%	-1.1%	60.9%
10	16.4%	43.4%	12.9%	46.9%	9.5%	50.3%

Appendix Table 13 – Saving and replacement rates: means and medians by income decile: with 100% consumption of housing

	Retirement at Age 62		Retirement at Age 65		Retirement at Age 68	
Income Decile	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate	Saving Rate	Replacement Rate
(a) Means						
1	-79.7%	159.0%	-70.7%	150.0%	-62.9%	142.2%
2	-20.8%	100.1%	-17.0%	96.3%	-13.9%	93.2%
3	-20.5%	99.8%	-18.7%	98.0%	-17.6%	96.9%
4	-18.1%	97.4%	-18.0%	97.3%	-18.3%	97.6%
5	-0.7%	80.0%	-2.5%	81.8%	-4.5%	83.8%
6	-4.1%	82.7%	-7.1%	84.4%	-9.9%	86.4%
7	7.6%	59.6%	4.4%	61.4%	1.9%	63.9%
8	8.6%	57.2%	5.6%	60.1%	2.4%	62.6%
9	-6.0%	66.3%	-8.6%	68.6%	-11.2%	71.0%
10	6.7%	53.1%	3.0%	56.8%	-0.6%	60.4%
(b) Medians						
1	-49.8%	129.1%	-41.6%	120.9%	-34.6%	113.9%
2	-13.1%	92.4%	-10.4%	89.7%	-7.5%	86.8%
3	-0.2%	79.5%	-0.1%	79.4%	-0.6%	79.9%
4	2.8%	76.5%	1.7%	77.6%	0.4%	78.9%
5	10.6%	68.7%	8.8%	70.5%	6.8%	72.5%
6	7.4%	71.5%	4.1%	73.8%	1.2%	76.2%
7	8.5%	57.3%	6.5%	59.3%	4.2%	61.6%
8	12.4%	53.4%	8.6%	57.2%	4.3%	59.8%
9	-7.6%	67.4%	-10.2%	70.0%	-11.9%	71.7%
10	14.2%	45.6%	10.7%	49.1%	7.5%	52.3%

Appendix Table 14 – Mean value and composition of wealth by wealth decile: Couples aged 45-55

Wealth Decile	Total Wealth	Net Housing Wealth	Net Financial Wealth	Pension Wealth	Superannuation Wealth
1 (= lowest)	207,501	12,155	-1,069	1,170	195,244
		6%	-1%	1%	94%
2	273,769	27,510	25,995	7,492	212,772
		10%	9%	3%	78%
3	328,100	55,208	43,172	6,919	222,801
		17%	13%	2%	68%
4	381,599	84,085	56,238	14,124	227,152
		22%	15%	4%	60%
5	452,014	124,006	87,931	22,068	218,009
		27%	19%	5%	48%
6	532,926	138,408	124,305	37,055	233,157
		26%	23%	7%	44%
7	622,319	158,663	188,678	49,408	225,570
		25%	30%	8%	36%
8	734,557	173,185	274,502	68,915	217,955
		24%	37%	9%	30%
9	954,933	179,685	481,645	63,399	230,204
		19%	50%	7%	24%
10 (= highest)	1,864,697	192,701	1,359,022	86,495	226,479
		10%	73%	5%	12%
Total Sample					
Mean	633,273	114,456	262,256	35,620	220,942
		18%	41%	6%	35%
Median 10%	492,117	125,957	113,434	29,511	223,214
		26%	23%	6%	45%

Appendix Table 15 – Median value and composition of wealth by wealth decile: Couples aged 45-55

Wealth Decile	Total Wealth	Net Housing Wealth	Net Financial Wealth	Pension Wealth	Superannuation Wealth
1 (= lowest)	213,984	0	2,369	0	193,023
		0%	1%	0%	90%
2	271,717	21,000	16,700	0	211,908
		8%	6%	0%	78%
3	330,490	52,000	30,795	0	218,127
		16%	9%	0%	66%
4	382,506	95,000	43,926	0	220,488
		25%	11%	0%	58%
5	454,754	133,000	65,084	1,060	220,513
		29%	14%	0%	48%
6	529,602	145,000	99,200	3,400	224,432
		27%	19%	1%	42%
7	618,971	190,000	144,525	0	224,898
		31%	23%	0%	36%
8	730,383	172,000	214,260	39,453	216,300
		24%	29%	5%	30%
9	929,736	163,000	480,800	0	230,169
		18%	52%	0%	25%
10 (= highest)	1,582,418	199,949	1,160,925	0	221,544
		13%	73%	0%	14%
Total Sample					
Median	489,380	80,783	86,200	0	218,778
		17%	18%	0%	45%
Ethnic Sub-groups (median)					
Pakeha	692,166	122,844	304,666	41,080	223,577
		18%	44%	6%	32%
Maori-Pacific	377,724	49,865	71,295	15,291	201,273
		13%	19%	4%	53%

Note:
All values are weighted to population averages and are in 2001 dollars.
Ethnicity corresponds to that of the respondent.

Appendix Table 16 – Median value of current and projected wealth by decile of current wealth: Couples aged 45-55

Current Wealth Decile	Current Wealth	Projected at Age 65
1 (= lowest)	213,984	286,071
2	271,717	351,312
3	330,490	413,636
4	382,506	456,818
5	454,754	535,952
6	529,602	629,647
7	618,971	723,866
8	730,383	861,504
9	929,736	1,108,676
10 (= highest)	1,582,418	1,899,040
Total Sample		
Total wealth	489,380	590,257
Housing wealth	80,783	125,957
Financial wealth	86,200	136,577
Pension wealth	0	38,104
Superannuation wealth	218,778	289,618
Ethnic Sub-groups		
Pakeha (median)		
Total wealth	531,136	636,000
Housing wealth	88,000	88,000
Financial wealth	103,411	128,791
Pension wealth	0	0
Superannuation wealth	221,231	285,403
Maori-Pacific (median)		
Total wealth	281,323	342,857
Housing wealth	0	0
Financial wealth	8,923	8,824
Pension wealth	0	0
Superannuation wealth	192,996	251,896

Note:

All values are weighted to population averages and are in 2001 dollars

Projected values for total sample by category of wealth are based on the means for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

The medians do sum to the total for medians since they are medians taken from different distributions.

Appendix Table 17 – Mean and median prescribed saving and replacement rates by decile of current wealth with no consumption of housing: Couples aged 45-55 retiring at age 65

Current Wealth Decile	Current Wealth	Saving Rate		Replacement Rate	
		Mean	Median	Mean	Median
1	213,984	19.4%	22.0%	58.8%	56.1%
2	271,717	22.0%	23.0%	52.1%	51.4%
3	330,490	19.3%	22.9%	56.5%	54.6%
4	382,506	17.0%	21.6%	57.5%	51.9%
5	454,754	19.2%	21.9%	52.0%	48.2%
6	529,602	8.1%	17.7%	65.5%	56.1%
7	618,971	14.5%	16.2%	56.4%	52.6%
8	730,383	7.9%	13.9%	61.5%	55.4%
9	929,736	0.3%	6.3%	69.0%	59.8%
10	1,582,418	-65.9%	-15.2%	133.7%	80.5%
Total Sample		6.3%	18.1%	66.1%	54.7%
Median 10%			12.8%		58.7%
Ethnic Sub-groups					
Pakeha		4.8%	18.0%	66.7%	53.9%
Maori-Pacific		11.4%	17.4%	65.3%	60.5%

Note:
All values are weighted to population averages and are in 2001 dollars.
The values for the median 10% refer to the means for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 18 – Mean and median prescribed saving and replacement rates by income decile with no consumption of housing: Couples aged 45-55 retiring at age 65

Income Decile	Mean Projected Income at Retirement	Saving Rate		Replacement Rate	
		Mean	Median	Mean	Median
1	20,589	-62.0%	-13.0%	141.3%	92.3%
2	36,634	-6.6%	10.9%	85.9%	68.4%
3	47,066	14.0%	18.8%	65.3%	60.5%
4	57,766	18.9%	23.8%	60.4%	56.3%
5	65,996	17.6%	24.9%	61.7%	54.4%
6	76,445	21.8%	22.1%	50.6%	49.2%
7	88,341	12.9%	16.9%	53.0%	49.3%
8	98,955	14.6%	17.6%	51.2%	48.2%
9	120,610	14.5%	17.6%	48.6%	44.4%
10	253,674	17.5%	19.5%	42.3%	40.2%
Total Sample		6.3%	18.1%	66.1%	54.5%
Median 10%			12.8%		58.7%
Ethnic Sub-groups					
Pakeha		4.8%	18.0%	66.7%	53.9%
Maori-Pacific		11.3%	17.4%	65.3%	60.4%

Note:
All values are weighted to population averages and are in 2001 dollars.
The values for the median 10% refer to the means for those respondents between the 45th and 55th percentiles of the (weighted) distribution of total wealth.

Appendix Table 19 – Predicted means and median levels of income and wealth at retirement and predicted retirement income by deciles of wealth with no consumption of housing: Couples aged 45-55 retiring at age 65

Wealth Decile	Predicted Level at Retirement		Predicted Retirement Income
	Income	Total Wealth	
(a) Means			
1	53,919	264,867	31,148
2	71,287	324,619	37,122
3	59,244	351,810	33,479
4	65,064	377,669	37,382
5	85,905	417,508	44,655
6	69,042	496,887	45,250
7	88,452	567,558	49,851
8	102,715	699,379	63,168
9	100,289	947,877	69,179
10	169,494	2,010,904	226,602
Total	86,372	643,698	57,068
(b)Medians			
1	49,741	277,878	27,899
2	62,840	316,496	32,317
3	55,815	346,008	30,457
4	60,347	377,934	31,315
5	82,534	406,343	39,756
6	65,175	471,931	36,585
7	78,813	542,129	41,463
8	88,515	671,746	49,025
9	91,684	906,981	54,782
10	106,998	1,774,797	86,126
Total	70,724	437,035	38,651

Appendix Table 20 – Predicted means and median levels of income and wealth at retirement and predicted retirement income by deciles of income with no consumption of housing: Couples aged 45-55 retiring at age 65

Income Decile	Predicted Level at Retirement		Predicted Retirement Income
	Income	Total Wealth	
(a) Means			
1	20,589	639,697	29,102
2	36,634	595,511	31,482
3	47,066	447,597	30,720
4	57,766	444,325	34,918
5	65,996	588,788	40,693
6	76,445	455,313	38,715
7	88,341	647,881	46,825
8	98,955	697,857	50,663
9	120,611	810,403	58,614
10	253,674	1,125,327	107,250
Total	86,372	643,698	57,068
(b)Medians			
1	19,300	349,690	17,814
2	36,606	402,409	25,049
3	47,327	370,558	28,634
4	58,066	375,753	32,712
5	65,505	393,057	35,642
6	76,219	394,160	37,507
7	88,629	506,052	43,672
8	97,876	554,568	47,146
9	118,819	609,843	52,801
10	207,795	830,226	83,566
Total	70,724	437,035	38,651

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