THE PERFORMANCE OF THE NEW ZEALAND ECONOMY: SAVINGS AND HOUSING

BY

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A thesis
submitted to the Victoria University of Wellington
in fulfilment of the requirements for the degree of
Doctor of Philosophy

Victoria University of Wellington
2019

Publication

Four of the seven chapters in this thesis are based on a number of previously published papers that have subsequently been revised. In particular, Chapters 2, 3, and 4 of this thesis are based on three separate journal articles. These are Law et al. (2017), Law and Scobie (2018) and Law (2016), respectively. Chapter 5 of this thesis is based on a working paper. This paper is Law and Meehan (2013). Where these papers were co-authored I was the lead author and undertook the majority of drafting and analysis in each case.

Disclaimer

Access to some of the data used in this thesis was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this thesis are the work of the author, not Statistics NZ.

Abstract

Recent policy changes and looming pressures in New Zealand have the potential to significantly impact the living standards of those who will enter retirement in the coming decades. In particular, a voluntary subsidised savings scheme known as KiwiSaver was introduced in 2007. Population ageing will increase the costs associated with New Zealand Superannuation (NZS), a universal government-funded pension paid for out of general taxation. In addition, rapid house price growth has made home ownership difficult for many, yet home ownership is likely to improve the living standards of retirees. These developments raise a number of important policy questions, which this thesis addresses. A variety of empirical approaches are employed, ranging from descriptive analysis to the application of regression techniques, including those designed to address specific econometric problems such as sample selection bias and unobserved heterogeneity. Data is primarily sourced from longitudinal and cross-sectional surveys. However, when required this is supplemented with house price, life expectancy and administrative data.

Chapters 2 and 3 of the thesis provide an evaluation of the performance of KiwiSaver, a subsidised voluntary savings scheme aimed at increasing the retirement wealth of a target population. The first of these chapters uses data from a cross-sectional survey conducted in 2010 and designed specifically for the purpose of evaluating KiwiSaver. Four key dimensions of performance are assessed using a variety of empirical techniques. Results suggest that only one-third of contributions to KiwiSaver represent additional savings. Regression analysis, designed to account for sample selection bias due to survey routing, finds no relationship between KiwiSaver membership and expected retirement income outcomes. Measures of target effectiveness and

leakage suggest that KiwiSaver has been only modestly successful in reaching its target population and that leakage to the non-target population was high, at 93%. Finally, the scheme's possible effect on national saving was examined, accounting for its costs, membership projections, government behaviour and additional savings by members. KiwiSaver's effect on net national saving appears limited at best.

Chapter 3 analysis the extent to which membership of KiwiSaver has been associated with greater accumulations of net worth. The chapter uses two linked sources of data, Statistics New Zealand's longitudinal Survey of Family, Income and Employment (SoFIE) and administrative data from the Inland Revenue Department on KiwiSaver membership. These data cover the period 2002 to 2010. Two approaches are employed to measure KiwiSaver's impact, difference-in-differences (where the outcomes of interest are changes in net worth) and various panel regression techniques. Results appear consistent with those of Chapter 2. That is, neither approach suggests KiwiSaver membership has been associated with any positive effect on the accumulation of net worth.

Chapter 4 examines the implications for national savings of three retirement income policy options designed to improve the fiscal sustainability of NZS. These options include lifting the age of eligibility for NZS by two years, lowering the rate of indexation of NZS payments and making private saving compulsory then using those accumulations to reduce NZS entitlements. A model is developed that employs population and longevity projections allowing estimation of the contributions that many overlapping age cohorts might make to national savings in response to policy change. Government contributions to national savings, resulting primarily from reduced NZS payments, are also considered. Results suggest that even seemingly modest changes to retirement income policies could lead to substantial cumulative changes in national savings by 2061. However, lifting the age of eligibility for NZS appears able to generate superior improvements in the government's fiscal position compared to the other two policy options over the medium term.

Chapter 5 examines patterns of home ownership and housing affordability across groups and over time, as well as various factors associated with the likelihood of each. The analysis draws on two surveys, the Household Economic Survey (HES) and SoFIE, and covers a period when the median house price in New Zealand increased by over 50%. A model which may be suggestive of whether or not an individual or couple is likely to find home-ownership affordable is applied. This model incorporates information relating to four important influences on affordability, in particular, income, net worth, house prices, and the structure of mortgage contracts (including the interest rate and mortgage term). While housing affordability was high for some groups during at least part of the period of analysis, for other groups affordability was persistently low, such as for singles and those on relatively low incomes. However, for nearly all groups examined housing affordability declined substantially over the period.

The final analytical chapter of the thesis extends the analysis of Chapter 5 to examine the potential benefits to housing affordability of the introduction of price level adjusted mortgages (PLAMs). These require lower repayments during the early years of a mortgage and higher repayments during latter years as compared to conventional mortgages. The analysis uses SoFIE and the model of housing affordability from Chapter 5, but with one important difference, a price level adjusted mortgage is assumed under various rates of inflation. Results are then compared to those derived from the housing affordability model under the assumption of a conventional mortgage. Findings suggest that PLAMs could indeed significantly improve housing affordability for prospective homeowners if they were available.

Acknowledgements

I would like to thank my supervisors John Creedy and Norman Gemmell, who I also had the pleasure of working with at the New Zealand Treasury, for their outstanding supervision, encouragement and support. I have particularly appreciated their pragmatism, desire to inject evidence into policy making, breadth and depth of knowledge, and patience. Grant Scobie, a valued colleague and friend for the better part of two decades, also deserves thanks. While not officially one of my supervisors, he too has provided guidance and is responsible for my interest in many of the topics explored in this thesis.

I would also like to thank Statistics New Zealand, and in particular John Upfold and Fiona Smillie, for facilitating access to much of the data used in the analysis presented in this thesis. Andrew Coleman provided helpful discussion during the early stages of the work on housing affordability and price level adjusted mortgages. Gerald Minnee, my manager when I began doctoral study, helped to make combining work and study possible. Steen Videbeck and Lisa Meehan have also both been very supportive. Finally, reviewers and the editors of the New Zealand Economic Papers, Gail Pacheco and Arthur Grimes, contributed to improving the quality of several of the chapters in this thesis as they progressed through the publication process.

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Chapter 1

Introduction

An individual's living standards in retirement depend on a wide variety of factors, but income levels and whether or not an individual owns their own home are recognised as of particular importance. Importantly, recent policy changes, and looming pressures, in New Zealand have the potential to significantly impact the living standards of those who will enter retirement in the coming decades. This thesis examines the impacts of a number of specific policies likely to affect the income, consumption, or living standards more broadly, of retirees in New Zealand. These include policies affecting New Zealand's subsidised personal retirement savings scheme, Kiwisaver; the universal New Zealand state pension, New Zealand Superannuation; and policies affecting households' housing assets.

Kiwisaver, a voluntary, subsidised, defined contributions savings scheme, was introduced in 2007, at significant fiscal cost, with several elements of the schemes design being informed by insights from behavioural economics. KiwiSaver's introduction was prompted by a view that savings rates in New Zealand appeared to be low and declining, and that there may be some who would reach retirement with an accumulation of wealth insufficient to allow them to sustain their pre-retirement standard of living (see, for example, Treasury, 2007). The available micro-evidence relating to individual and household saving as well as retirement income adequacy, however, does not necessarily support this view (see, for example, Scobie, Gibson and Le, 2005; Le, Scobie and Gibson, 2009; Scobie and Henderson, 2009; and Le, Gibson and Stillman, 2012).

The KiwiSaver scheme has undergone numerous changes since it was introduced. Most of these have been progressively to reduce the generosity of the subsidies associated with the scheme. However, other parameters of KiwiSaver have also been adjusted including the minimum contribution rates for both employees and employers. Indeed, a Bill before parliament in 2018 seeks to make further changes to contribution rates, shorten the length of contribution holidays and allow those over the age of 65 to join KiwiSaver.

In comparison, there appears to be little political will to make changes to New Zealand Superannuation (NZS), a universal government-funded pension intended to ensure a basic standard of living for the elderly. This is despite the fact that the fiscal sustainability of NZS will come under increasing pressure in the future due to population ageing. In 2010 the costs of NZS, which are met out of general taxation, were approximately 4.3% of GDP. By 2015 this figure had increased to 4.8% and, if the parameters of NZS remain unchanged, the costs of NZS are projected to rise to 7.9% of GDP by 2060 (Treasury, 2013 and 2016). While the current fiscal costs of NZS are relatively low when compared to public expenditures on pensions in other OECD countries, the projected proportional increase is significant and will likely necessitate changes to the policy in the future that will diminish its generosity. Indeed, a number of OECD countries, among which New Zealand's public pension system is an outlier in many respects, have already made changes to their public pension systems that will mitigate the effects of population ageing (OECD, 2017).

Another important development with the potential to affect living standards in retirement is the prolonged period of rapid house price growth that has taken place in New Zealand. Between 2004 and 2008 the median house price increased by over 50% and, unlike in many other countries following the Global Financial Crisis (GFC), New Zealand has not seen a sharp reversal of this trend. Indeed, more recent house price growth has also been strong, at over 40% between 2013 and 2017. This has made home ownership increasingly difficult for many New Zealanders, yet home ownership is often seen as a

means of providing greater security of living standards for retirees by avoiding the costs and volatility of the rental housing market.

Unsurprisingly, housing has therefore been a topic of considerable policy interest in New Zealand over recent years. For instance, the Productivity Commission has undertaken three separate enquiries relating to housing, one of which focussed specifically on housing affordability, while the other two related to the use of land for housing and urban planning respectively (Productivity Commission 2012, 2015 and 2017). Various policy changes have been implemented. Following the GFC credit restrictions were introduced including the imposition of loan-to-value ratio (LVR) restrictions. In addition, the current government is taking a particular interest in housing affordability. For example, it has pledged to build 100,000 'affordable homes' over the next ten years, taken steps to ban foreign ownership of existing houses (with some exceptions) and limit migration. Further, the Tax Working Group (an advisory body established by the government in late 2017) will investigate whether a system of capital gains taxation, land taxation or other housing taxation measures would improve the tax system and housing outcomes.

These developments raise a number of important policy questions that this thesis will address. With respect to KiwiSaver, an understanding of whether or not the scheme has met its explicit and implicit objectives is important in order to guide New Zealand policy makers' decisions about its future direction. This could range from extending KiwiSaver or making it compulsory, to taking steps to improve targeting, rolling the scheme back or even abolishing KiwiSaver altogether. Given the rising costs of NZS, an understanding of how various changes to the system could bring about fiscal savings would be useful in order to balance competing public spending pressures in the future. The importance of any implications for individual and national savings associated with such changes would be strengthened if it were the case that KiwiSaver has failed to meet its objectives in this respect.

In relation to housing, understanding patterns of housing affordability across groups and over time would provide insight into the extent of any problem, and

serve to identify those most affected, providing valuable information for potential policy intervention. To this end, it would also be useful to know if any policy options to improve housing affordability had been left unexplored in the New Zealand context, and if so, provide an estimate of their potential benefits.

The analysis undertaken in this thesis is driven by the important developments and policy questions that are described above. These are likely to impinge on individuals' living standards in retirement and are currently of high relevance to New Zealand. The thesis will provide several examples of how suitable empirical techniques can be applied to analyse practical presenting policy issues, given a variety of data and methodological constraints.

The thesis is organised in two parts, one which contains analysis relating to savings and another on housing affordability in New Zealand. A variety of empirical approaches are employed, ranging from descriptive analysis to the application of regression techniques, including those designed to address specific econometric problems such as sample selection bias and unobserved heterogeneity. Data is primarily sourced from longitudinal and cross sectional surveys. However, when required this is supplemented with house price, life expectancy and administrative data.

The savings part of this thesis is comprised of three chapters. The first two of these examine the performance of KiwiSaver in terms of a number of important dimensions. The effects of three alternative retirement income policy options, primarily on national savings, are considered in the final chapter of this section.

International evidence suggests that the evaluation of KiwiSaver would be prudent for a number of reasons. Important elements of the schemes design were informed by insights from behavioural economics. In particular, the idea that, because of issues such as bounded rationality and limited self control, there may be some individuals who make sub-optimal decisions with respect to their retirement savings. These people would likely benefit from being 'nudged' in the right direction, that is, they would save more for their retirement (see, for example, Thaler and Sunstein, 2008).

KiwiSaver's automatic enrolment feature, where new employees are automatically enrolled in the scheme when starting a new job and can only choose to opt-out after a minimum period of six weeks where contributions are deducted from their wages, is a good example of the influence of behavioural economics on KiwiSaver's design. However, the design of KiwiSaver also includes more traditional elements to increase retirement savings, in particular, various financial incentives, most notably in the form of tax advantages. In addition, much of the behavioural economics literature showing that various nudges significantly increase saving within retirement accounts, for example, in the form of automatic enrolment or prior agreement to automatically save more out of future pay rises, has left a critical issue unexplored. That is, whether or not total savings are increased or other forms of savings are merely displaced (see, for example, Thaler and Benartzi, 2004).

In fact, numerous studies have found that schemes such as KiwiSaver may generate little additional saving as other forms of saving are displaced. For instance, Yang (2018) takes advantage of a pension reform in Taiwan requiring employers to contribute a proportion of employees' wages to individual retirement accounts to study this issue. The paper employs a difference-in-differences approach, using employees in unaffected sectors as a control, and finds significant substitution between contributions to these workplace pensions and other forms of saving. Another example is that of Chetty et al. (2014) which examined 41 million observations on savings for the population of Denmark and found that each additional dollar of government expenditure on subsidies increased total saving by only one cent. However, the study also suggests that features shared by KiwiSaver, such as automatic enrolment, may have more success in generating additional savings.

Closer to home, Australian evidence provides a range of estimates of additional saving due to the Australian compulsory superannuation scheme. For example, Morling (1995) estimates additionality to be only 26 cents for each dollar of contributions, while Connolly and Kohler (2004) puts this figure at 62 cents. In the case of KiwiSaver, very early evidence based on a survey undertaken only

a few months after the scheme's introduction estimated that around two-thirds of members' contributions to KiwiSaver would displace other forms of savings (Gibson and Le, 2008).

New Zealand's economic, institutional, regulatory and tax environment, as well as the design features of KiwiSaver, are of course different to many of the examples discussed above. Different outcomes may therefore be expected. This thesis further explores the extent to which retirement savings policy generates additional saving, and the merits of such policy more generally, by examining in detail the performance of KiwiSaver several years after its introduction.

The first chapter to evaluate KiwiSaver's performance aims to address four important and related questions. First, to what extent do KiwiSaver contributions represent additional saving? Second, is KiwiSaver membership associated with better expected retirement income outcomes? Third, how has KiwiSaver performed in terms of standard measures of programme efficacy such as target effectiveness and leakage? Finally, the likely impact of KiwiSaver on national savings is examined.

To this end a variety of empirical techniques are applied to data from a national cross-sectional survey of 825 people conducted in 2010, designed specifically for the purpose of evaluating KiwiSaver. Both KiwiSaver and non-KiwiSaver members were asked to provide a wide range of current demographic and economic information as well as information about their expectations for the future. While the survey design allows the first dimension of KiwiSaver's performance to be assessed relatively easily - that is the extent to which KiwiSaver contributions represent additional saving - other questions are more challenging to answer. For example, survey respondents are only asked about their expectations for the future if they indicate that they have undertaken some degree of financial planning. Therefore, regression techniques which account for possible sample selection bias due to survey routing are necessary to assess whether KiwiSaver membership is associated with better retirement income outcomes.

The objective of the second chapter evaluating KiwiSaver's performance is to analyse the extent to which membership of KiwiSaver has been associated with greater accumulations of net worth. The chapter utilises two linked sources of data which cover the period 2002–2010. The first is Statistics New Zealand's Survey of Family, Income and Employment (SoFIE), a longitudinal survey which includes a wide range of socio-economic variables, as well as details of individuals' assets and liabilities. Information on KiwiSaver membership comes from administrative data provided by the Inland Revenue Department.

Two approaches to examine this important issue are employed, the first of which is difference-in-differences (DiD) analysis. The DiD analysis compares outcomes (in this case changes in net worth) before and after the introduction of a programme such as KiwiSaver, across two groups (those in the programme and those not). In this way those who are not members of the scheme form a control group. However, as membership in KiwiSaver is not randomly assigned, it is unlikely that DiD analysis properly accounts for the effects of other variables on changes in net worth. To address this limitation various fixed and random effect panel regression models are estimated in which changes in net worth are related to many factors simultaneously.

Results from both chapters evaluating KiwiSaver's performance suggest that the scheme has had little success in terms of meeting its stated objectives, at significant fiscal cost. In particular, according to respondents only one-third of their contributions to KiwiSaver represent additional savings and regression analysis finds no relationship between KiwiSaver membership and expected retirement income outcomes. Further, neither DiD nor more sophisticated panel regression analysis found any positive association between KiwiSaver membership and net worth accumulation. Standard measures of programme efficacy such as target effectiveness and leakage suggest that KiwiSaver has been only modestly successful in reaching the target population and that leakage to the non-target population was high, at 93%. Finally, after considering the costs of the scheme, membership projections, government

behaviour and additional savings by members, the effect of KiwiSaver on net national saving appears limited at best.

The final chapter in the savings part of this thesis examines the implications for national savings of three alternative retirement income policy options designed to improve the fiscal sustainability of New Zealand Superannuation (NZS). These options include lifting the age of eligibility for NZS by two years, lowering the rate of indexation of NZS payments and making private saving compulsory then using those accumulations to reduce NZS entitlements. As each option represents a shift in part from a Pay As You Go (PAYGO) toward a Save As You Go (SAYGO) retirement income system, they are likely to have more substantial effects on individuals' saving behaviour and hence national savings than KiwiSaver.

Indeed, Talosaga and Vink (2014) found that when the age of eligibility for NZS was previously increased from 60 to 65 years of age between 1992 and 2001 the average saving rates of affected households increased. Similarly, Lachowka and Myck (in press), who also use a difference-in-differences regression approach, examine the relationship between public pension wealth and private saving following Poland's 1999 pension reform with around one quarter of the variation in public pension wealth due to the reform being transmitted to household saving. In addition, cross-country evidence provided by Samwick (2000) suggests that countries with PAYGO retirement income schemes have lower saving rates than those that do not.

A simple model is therefore developed which assumes individuals will respond to any reduction in the generosity of NZS by increasing their level of saving, at least in part. The model employs population and longevity projections allowing estimation of the contributions that many overlapping age cohorts might make to national savings in response to policy change. Government contributions to national savings, resulting primarily from reduced NZS payments, are also considered. Results suggest that even seemingly modest changes to retirement income policies could lead to substantial cumulative changes in national savings by 2061. However, lifting the age of eligibility for NZS appears

able to generate superior improvements in the government's fiscal position compared to the other two policy options over the medium term.

Part 2 of the thesis turns to the topic of housing and is comprised of two chapters. The first of these examines patterns of home ownership and housing affordability, as well as the factors associated with each. The second chapter in this section makes use of a simple model in order to examine the extent to which the availability of a particular mortgage lending mechanism - price level adjusted mortgages (PLAMs) - may improve housing affordability for some individuals.

Research has been undertaken on a wide variety of topics relating to housing in New Zealand. These include, for example, the responsiveness of housing supply to changes in demand (Grimes and Aitken, 2006; and Productivity Commission, 2012), and the effects of regulation and urban planning rules on house and land prices (Grimes and Liang, 2009; and Grimes and Mitchell, 2015). Grimes et al. (2014) and Cochrane et al. (2010) examine the relationship between infrastructure provision and urban growth, while Roskruge et al. (2013) explores the link between home ownership and social capital formation. The importance of housing wealth in the household's portfolio, implications for retirement income and saving rates, as well the relationship between housing wealth and consumption have also been explored (Van Zijll de Jong and Scobie, 2006; Scobie, Le and Gibson, 2007; De Veirman and Dunstan, 2008; and Smith, 2010).

Perhaps most relevant to the current housing policy landscape in New Zealand is the work on housing in relation to migration, demographic change, tax and macro prudential policy. Indeed, demographic change and migration flows have the potential to generate significant movements in the demand for residential housing. A number of studies in New Zealand have examined the relationship between population changes and housing from macro, micro and theoretical perspectives. Estimation of house price changes associated with demographic change or past migration (including the importance of compositional differences) is the main focus of these studies. However, effects on home

ownership rates, household formation and differences between generations are also covered (see, for example, Coleman and Landon-Lane, 2007; Coleman, 2014a; Productivity Commission, 2012; and McDonald, 2013).

The way housing is taxed can affect the attractiveness of investing in housing, its affordability and therefore the demand for housing. A number of papers have considered the effects of capital gains, land and property taxes more generally on house prices or related outcomes such as home ownership rates or welfare. These studies have mostly examined the issues from a conceptual perspective (see, for example, Hargreaves, 2008; Coleman and Scobie, 2009; Coleman, 20010; Coleman and Grimes 2010; and Productivity Commission, 2012).

Finally, in terms of macro prudential policy, the Reserve Bank of New Zealand (RBNZ) introduced limits on high loan-to-value ratio (LVR) lending which took effect in 2013. According to the RBNZ this policy intervention was designed to help slow the rate of house price inflation and housing credit growth, and hence reduce the consequences of any substantial downward correction in house prices that might occur at some point in the future. A number of papers have considered the effects of the introduction of LVRs, not only in terms of their likely effects on house prices, but also in relation to the vulnerability of new mortgage borrowers or whether the effects of LVRs are symmetrical (in terms of easing or tightening). These have been from both macro and micro perspectives, using Vector Autoregression (VAR) and panel data techniques, applied to aggregate and micro data (see, for example, Bloor and McDonald, 2013; Price, 2014; McDonald, 2018; and Dunstan and Skilling, 2015).

Despite the breadth of literature relating to housing in New Zealand, some gaps remain. In particular, while various measures of housing affordability have been presented and their merits discussed (see, for example, Robinson et al., 2006; and House Price Unit, 2008) some relevant data remain unexploited and there is scope for more detailed analysis. Further, although the effects of inflation on housing affordability are well understood (see, for example, Modigliani and Lessard, 1975; and Coleman, 2008), available tools which might limit the

consequences of inflation for housing affordability have not been studied in detail. That is, while Coleman (2012) discusses the merits of price level adjusted mortgages and their potential application in New Zealand, a detailed investigation of the potential benefits and how those might be distributed, using appropriate individual survey data, is missing. The analysis in this section of the thesis contributes to the New Zealand literature on housing by addressing these issues.

The first chapter in Part 2 therefore explores several important elements and outcomes of housing affordability in New Zealand. In particular, the chapter examines how patterns of house prices, housing expenditures and home ownership have changed over time and across groups. In addition, a model which may be suggestive of whether or not an individual or couple is likely to find home ownership affordable is applied. The model incorporates information relating to four important influences on affordability including income, net worth, house prices and the structure of mortgage contracts (including the interest rate and mortgage term). Panel logistic regressions are also employed to examine how the likelihood of home-ownership and housing affordability depend on a wide range of demographic and economic variables. SoFIE is again the primary source of data for this analysis. However, it is supplemented with information on expenditures from the Household Economic Survey (HES) as well as house price data.

The final chapter in the housing part of this thesis extends the above analysis to examine the potential benefits to housing affordability of the introduction of PLAMs. These can help to address an important issue known as mortgage-tilt, which is caused by inflation. Compared to a conventional mortgage, PLAMs require lower payments during the early years of a mortgage and higher payments during later years. The housing affordability model is again applied to data from SoFIE but with one important difference. A price level adjusted mortgage is assumed under various rates of inflation. Results are then compared to those derived under the assumption of a conventional mortgage,

thus providing an indication of the potential initial improvement to housing affordability that might result if price level adjusted mortgages were available.

These chapters illustrate a number of important developments with respect to housing affordability in New Zealand over a period of particularly high house price inflation. In particular, significant price increases occurred throughout the house price distribution between 2004 and 2008 and rates of home ownership declined. While housing affordability was high for some groups during at least part of this period, for other groups affordability was persistently low, such as for singles and those on relatively low income. In addition, for nearly all groups examined housing affordability declined substantially between 2004 and 2008 as house prices and annual interest rates increased at a rate that far outpaced income growth. Importantly, results also suggest that PLAMs could indeed significantly improve housing affordability for prospective homeowners if they were available.

In summary, the remainder of this thesis proceeds as follows. Four key dimensions of the KiwiSaver scheme's performance are assessed in Chapter 2. Chapter 3 continues the evaluation of KiwiSaver and focuses on estimating the scheme's impact on net worth accumulation. In Chapter 4 the implications for household and national savings of three retirement income policy options designed to improve the fiscal sustainability of NZS are considered. Patterns of home ownership and housing affordability, as well as the factors associated with each, are illustrated in Chapter 5. PLAMs and their potential benefits in terms of housing affordability are examined in Chapter 6. The final chapter draws results together, discusses policy implications and concludes.

PART I

SAVINGS

Chapter 2

KiwiSaver: An Evaluation of a New Retirement Savings Scheme

2.1 Introduction

KiwiSaver is a voluntary, defined contributions savings scheme aimed at increasing the retirement wealth of its target population. Key features include automatic enrolment of new employees, a minimum employee contribution rate, compulsory matching contributions by employers, and government incentives to join and contribute. In order to access all features of KiwiSaver, members must be employed and be between 18 and 65 years of age. However, anyone under 65 may join. Savings accumulated in KiwiSaver accounts are generally not accessible until members turn 65.

The specifics of many of KiwiSaver's features have changed since it was introduced in 2007. In 2010, when the data used in this chapter were collected, minimum employee and employer contributions were each set at 2% of a member's gross salary or wages (if employed). Government subsidies included a $1,000 kick-start contribution, an annual tax credit matching member contributions and capped at $1,042.86 a year, and an exemption from employer superannuation contributions tax (ESCT).

Changes announced in Budget 2011 subsequently reduced these subsides. In particular, employer contributions are no longer exempt from ESCT, and the maximum member tax credit is now $521.43 a year and requires a $2

contribution from the member for each $1 of tax credit. However, minimum employee and employer contributions were increased from 2% to 3%.[1] Later changes announced in Budget 2015 also abolished the kick-start contribution. Changes to KiwiSaver seem set to continue, with a Bill before parliament in 2018 seeking to make additional changes to contribution rates, shorten the length of contribution holidays and allow those over the age of 65 to join KiwiSaver.

KiwiSaver's introduction was prompted by a view that household saving in general appeared to be low and declining, and that there may be some who would reach retirement with an accumulation of wealth insufficient to allow them to sustain their pre-retirement standard of living (see, for example, Treasury, 2007). The available micro-evidence relating to individual and household saving, however, does not necessarily support this view (see, for example, Scobie, Gibson and Le, 2005; Le, Scobie and Gibson, 2009; Scobie and Henderson, 2009; and Le, Gibson and Stillman, 2012).

Setting aside the issue of whether or not there is cause for concern with regards to saving rates or retirement income adequacy in New Zealand, international evidence suggests that an evaluation of KiwiSaver would be prudent. This is because numerous studies have found that such schemes may generate little additional saving as other forms of saving are displaced and, in addition, that their design is likely to be important (see, for example, Chetty et al., 2014).

Given KiwiSaver's significant fiscal cost, ongoing design changes, uncertainty as to whether or not a problem exists for KiwiSaver to solve and international evidence suggesting that the benefits of retirement income policies such as KiwiSaver may be limited, an evaluation of the scheme is vital. Chapters 2 and 3 of this thesis are closely related and aim to provide an understanding of whether or not KiwiSaver has met its explicit and implicit objectives in order to guide New Zealand policy makers' decisions about its future direction. This could range from extending KiwiSaver or making it compulsory, to taking steps

[1] For further details of the scheme see http://www.kiwisaver.govt.nz or http://www.ird.got.nz/kiwisaver.

to improve targeting, rolling the scheme back or even abolishing KiwiSaver altogether. Further, the success, or otherwise, of KiwiSaver has implications for other retirement income policies such as New Zealand Superannuation (NZS), as discussed in Chapter 4.

Chapter 3 evaluates the performance of KiwiSaver in terms of its effects on the accumulation of net worth amongst its members. The analysis utilises two linked sources of longitudinal data that allows the identification of KiwiSaver membership and the measurement of the net worth of approximately 10,000 individuals four times over the eight-year period to 2010. Both difference-in-differences (where the outcomes of interest are changes in net worth) and panel regression techniques are applied. However, neither approach suggests KiwiSaver membership was associated with any positive effect on net worth accumulation.

In the current chapter data from a cross-sectional survey conducted in 2010, designed specifically for the purpose of evaluating KiwiSaver, are used to examine four key dimensions of the performance of the scheme. In particular, using a variety of empirical techniques, the following questions are addressed:

1. to what extent do KiwiSaver contributions represent additional saving?;
2. is KiwiSaver membership associated with better expected retirement income outcomes?;
3. how has KiwiSaver performed in terms of standard measure of programme efficacy such as target effectiveness and leakage?; and
4. what has been KiwiSaver's likely impact on national savings?

The results of this chapter appear broadly consistent with those of Chapter 3, particularly with respect to the second question above, and suggest KiwiSaver has performed poorly on all dimensions. While a small portion of KiwiSaver contributions represent additional saving, regression analysis which accounts for potential sample selection bias finds no relationship between KiwiSaver

membership and expected retirement income outcomes. Target effectiveness appears low and leakage to the non-target group is extremely high. In addition, after accounting for a variety of factors other than KiwiSaver's effect on household saving, the schemes effect on national saving is likely to have been negligible.

The remainder of this chapter proceeds as follows. The next section briefly outlines the methodology and data that is used. Section 2.3 outlines results, beginning with an examination of the factors associated with KiwiSaver membership before addressing each of the four key questions outlined above. Conclusions are drawn together in Section 2.4.

2.2 Data and methodology

The analysis in this chapter uses data from a survey of individuals undertaken by Colmar Brunton on behalf of the Inland Revenue Department (IRD), as part of the KiwiSaver Evaluation Programme.[2] The survey involved face-to-face interviews with 825 people aged 18-65 and was conducted between January and March 2010.

The 825 surveyed individuals consisted of 557 randomly selected members of the general public aged 18-65 years and a booster sample of an additional 268 KiwiSaver members. Of the 825 individuals, 474 were KiwiSaver members made up of 206 from the general survey population and 268 from the booster sample. The remaining 351 were not members. The response rate for the general sample was 75% and for the booster sample it was 57%. Survey weights were used in the analysis wherever possible. These weights were constructed to ensure KiwiSaver membership, age and gender were in line with the general population, making use of both administrative data from IRD and the Census.

[2] For more details, see Colmar Brunton (2010) and Inland Revenue (2010).

The survey included a rich set of demographic and economic variables as well as many relating specifically to KiwiSaver. Importantly, variables designed to establish a counterfactual or to help understand respondents' expectations about the future were also included. For instance, respondents were asked to provide an assessment of how, in the absence of KiwiSaver, they would have used their KiwiSaver contributions. They were also asked their expected income in retirement, and the income they expected would be required either to meet their basic needs or to live comfortably in retirement.

For a number of variables, rather than provide exact dollar amounts, respondents were asked to indicate which of a series of incremental bands best fitted their circumstances. The mid-points of these bands were used as the values for further calculations.[3] More details of the survey design and methodology, as well as detailed summary statistics can be found in a technical report (Colmar Brunton, 2010).

A number of empirical techniques are applied throughout the analysis. These include various descriptive techniques to examine additional savings associated with KiwiSaver membership or to calculate measures of the programmes target effectiveness and leakage, for example. Various regression techniques, including those designed to account for potential sample section bias due to survey routing, are applied to examine factors associated with KiwiSaver membership, additional savings, and expected retirement income outcomes. In addition, some results are used to build a simple model to examine the effect that KiwiSaver may have had on national saving. Further details are available, where appropriate, throughout the chapter.

Where regression analysis is undertaken an extensive set of conditioning variables are used. These include: age, gender, income, wealth, number of dependent children, labour force status, occupation, ethnicity, home ownership, risk attitude, NZS main source of retirement income, self-assessed health

[3] Some of these bands were open ended. In these cases the starting point of the band was used for all respondents in those bands respectively. For example, the top income band was $100,000 and above, and this was filled in with $100,000 for each member of this group.

status, marital status, education, year jointed KiwiSaver and the experience of traumatic event(s).[4] Importantly, KiwiSaver membership is also included where appropriate. In general, when presenting the results of regression analysis, tables have been restricted to include only those variables which are statistically significant. With respect to categorical variables, or groups of categorical variables, any effects presented are relative to each set of variables respective base case. Unless otherwise stated, these are New Zealand European, male, being employed full-time, having a professional occupation, not owning a house, being in excellent health, being single, having low risk tolerance, having experienced no traumatic events since joining KiwiSaver and not expecting NZS to be ones main source of income in retirement.

2.3 Results

This section first, examines the factors associated with KiwiSaver membership and then whether KiwiSaver represents additional savings or a substitution from other forms of saving. Expected retirement income outcomes are estimated and the factors associated with these are examined. Finally, the effectiveness of the scheme is assessed by calculating measures of target effectiveness and leakage, and KiwiSaver's possible impact on national savings is estimated.

2.3.1 KiwiSaver membership

To understand KiwiSaver's impact and its effectiveness in reaching the target population, the characteristics of those who joined the scheme compared with those who chose not to are examined. In particular, the following question is posed: what factors most influenced the probability that a person would be a KiwiSaver member? This question is addressed by estimating a logit model in which the dependent variable (membership status) was coded 1 if the respondent was a KiwiSaver member and 0 otherwise. A summary of the

[4] The exact set of conditioning variables included in regressions varies with the particular question being addressed.

results for those variables having a statistically significant effect is given in Table 2.1. Heteroscedasticity is not a particular concern in relation to the regression analysis presented in this chapter, or indeed throughout this thesis. Nevertheless, it should be noted that for all regressions presented in this chapter, white-adjusted standard errors are calculated, hence results are robust to heteroscedasticity.

Table 2.1: Factors that influence the probability of being a KiwiSaver member (%)

Variable	Probability of being a KiwiSaver member (%)		
	Initially	After the change	Marginal effect (percentage points)
Other ethnicity	35	52	+17
Expect NZS to be main income source	33	48	+15
Employed part-time	39	51	+12
Net effect of age (5-year increase)			+6
Age	37	25	(-13)
Age squared	37	56	(+19)
Self-employed	39	26	-13
Has a partner	48	32	-15
Other occupations	43	22	-21

Notes: Results are weighted and based on the entire sample of 825. The relationship with age is nonlinear and the results shown apply to a 5year increase in age from the mean age of 40.2 years. Only variables whose coefficients were statistically significant at least at the 10% level are listed in the table.

The overall probability of being a KiwiSaver member is 38.5%. The results are presented as marginal changes in the probability that an individual is a member of KiwiSaver. For example, the probability of those who do not expect NZS to be their main source of income being KiwiSaver members is 33% (found in the column headed 'Initially'). Holding all other factors constant at their mean values, the probability of being a KiwiSaver member given the individual does expect NZS to be their main source of income is 48% (found in the column headed 'After the change'). The difference between these two probabilities is therefore the marginal effect of expecting NZS to be the main source of retirement income, which in this particular case is 15% (found in the column headed 'Marginal effect'). Alternatively stated, a typical individual is 15 percentage points more likely to be a KiwiSaver member if they expect NZS to be their main source of retirement income.

A legitimate question is whether or not the direction of causation could be reversed, that is, that being a KiwiSaver member causes the respondent to expect that New Zealand Superannuation would be their main source of income. Potential endogeneity issues such as this are very common in empirical economics. They are also usually very difficult to explicitly address as to do so requires the identification of suitable instruments for the offending variable and the application of instrumental variable techniques, such as three-stage least squares, for example.

Good instruments are very difficult to find because they must be associated with the explanatory variable for which endogeneity is a concern but not directly influence the dependant variable themselves and be uncorrelated with the error term. In the present case, potential instruments are limited to the variables contained within the survey conducted by Colmar Brunton and variables meeting the requirements for a good instrumental variable are not obvious. Furthermore, because the survey does not provide data over time, a Granger causality test to shed further light on the direction of causation between variables is not possible.

However, it does seem unlikely that being a KiwiSaver member would cause one to expect that New Zealand Superannuation would be their main source of income. If anything, one would hope that those in KiwiSaver would no longer need to rely so heavily on NZS as their main source of income in retirement as increasing savings is an objective of the scheme. If this were generally the case, there would be a negative association between KiwiSaver membership and reliance on NZS, in contrast to the positive association shown in Table 2.1. Nevertheless, to the extent concerns exist about endogeneity between the dependant variable and any explanatory variables within the empirical models presented throughout this thesis, care should be taken in interpreting results. That is, coefficient estimates for explanatory variables where the direction of causation is not clear, should be taken to represent association rather than causation.

The last column of Table 2.1 indicates those factors that increase or decrease the likelihood of KiwiSaver membership, respectively. One of the most significant factors, belonging to the other ethnicities category (compared with NZ European) has a major effect, but applies to only a small share of the sample. Likewise being classified as other occupations (compared with professionals) reduces the probability of being a KiwiSaver member but again this result, while statistically significant applies to only 10.8% of the sample.

Those employed part-time relative to full-time were more likely to have joined KiwiSaver, and the probability of joining increased modestly with age. Those with a partner, relative to un-partnered, and those who were self-employed, relative to full-time employed, were less likely to be KiwiSaver members. Note that other variables, such as gender, income, wealth, home ownership and education, were not significant.

2.3.2 Additional saving

KiwiSaver was designed as a mechanism to foster increased individual savings and greater preparedness for retirement. However, experience with subsidised schemes such as KiwiSaver indicates that while some additional savings may be achieved there is inevitably a degree of substitution that occurs, as individuals switch their saving from non-subsidised to subsidised forms. One measure of the success of KiwiSaver therefore will be the extent to which KiwiSaver membership is associated with additional savings, as distinct from members simply having diverted funds from other savings vehicles or debt reduction. The analysis that follows is based on a question that asked respondents how the contributions they were making currently to KiwiSaver would have been used in the absence of the scheme.

Each respondent was given 10 points to allocate across various categories, some of which related to saving and debt reduction, while others related to consumption. The averages shown in the last column of Table 2.2 refer to the mean score across all individuals reporting an allocation to a particular

category. For example, when asked how many of their 10 points they would have allocated to spending on daily activities and normal outgoings in the absence of the scheme, on average respondents used 3.58 of their 10 points on this item.

Table 2.2: Alternative uses of KiwiSaver contributions

Use of funds, had the respondent not joined KiwiSaver		Score		
		Not homeowners	Homeowners	Overall
Would have been spent on consumption	Spend on daily activities and normal outgoings	4.36	2.87	3.58
	Other	0.08	0.07	0.07
	Sub-total	*4.44*	*2.94*	*3.64*
Would have been saved or used to reduce debt	Superannuation scheme	0.73	0.96	0.85
	Other saving or investment for retirement	1.46	2.20	1.85
	Saving or investment other than for retirement	1.73	0.89	1.29
	Pay off mortgage or other debt	1.64	3.01	2.36
	Sub-total	*5.56*	*7.06*	*6.36*
	Total	10.00	10.00	10.00

Notes: Results are weighted and based on 503 observations. 18 missing observations on alternative uses of KiwiSaver contributions have been excluded. The number of observations is greater than the total number of respondents who were KiwiSaver members as the additionality question was asked of respondents who were either members themselves, or whose partner was a member, on the basis that financial decisions tend to be made at the level of the economic family unit. The total score adds to 10 in all cases as each respondent was asked to allocate 10 points across the stated categories. The category of 'other' has been assigned to consumption in the absence of any further information.

KiwiSaver members report that on average they would have applied 64% of the money they are now contributing to KiwiSaver to other forms of saving and/or debt reduction. In other words 64% of the money in KiwiSaver represents, on average, a substitution from funds that would have already been applied to savings or debt reduction in the absence of the scheme. The remaining 36% is, on average, money that would have otherwise been consumed (see Table 2.2, last column). It is possible that as a result of raising the level of awareness about the need for retirement savings, respondents would in general now consume less and save more, thus causing the additional saving due to KiwiSaver to be underestimated. However, the survey provides no basis for evaluating this possibility.

Another limitation of the current analysis of the additional saving due to KiwiSaver is that it relies on subjective responses and, in addition, is based on

cross-sectional data. Therefore, it does not control for unobserved heterogeneity. However, Chapter 3 applies difference-in-differences and regression analysis to longitudinal data from a New Zealand household panel survey that includes detailed information on individuals' assets and liabilities over time, and fails to find any positive effect of KiwiSaver membership on net worth accumulation.

Gibson and Le (2008) provided an early estimate of additionality based on a nationwide survey carried out a few months after the introduction of KiwiSaver. They estimated that only between 9% and 19% of KiwiSaver balances represented new saving by members, with the remaining balances being either existing saving or debt reduction that had been shifted into KiwiSaver, or government and employer transfers. However, a more comparable figure to the estimate of additionality derived above is the ratio of additional member saving to total member saving. The authors estimated this to be between 23% and 48%, the midpoint of this range is 36% and corresponds precisely to the estimate from the present analysis.

Although New Zealand's economic, institutional, regulatory and tax environment, as well as the design features of KiwiSaver, are of course unique, it is nevertheless of interest to enquire about the performance of similar schemes in other countries in terms of generating additional savings. For instance, Yang (2018) takes advantage of a pension reform in Taiwan requiring employers to contribute a proportion of employees' wages to individual retirement accounts to study this issue. The paper employs a difference-in-differences approach, using employees in unaffected sectors as a control, and finds significant substitution between contributions to these workplace pensions and other forms of saving. Another example is that of Chetty et al. (2014) which examined 41 million observations on savings for the population of Denmark and found that each additional dollar of government expenditure on subsidies increased total saving by only one cent. However, the study also suggests that features shared by KiwiSaver, such as automatic enrolment, may have more

success in generating additional savings. A number of similar studies related to the United States are summarised by Toder (2006).

Closer to home, Australian evidence provides a range of estimates of additional saving due to the Australian compulsory superannuation scheme. For example, Morling (1995) estimates additionality to be only 26 cents for each dollar of contributions, while Connolly and Kohler (2004) puts this figure at 62 cents. In addition, in a more recent study Connolly (2007) estimated that the scheme had increased retirement savings by the equivalent of an additional two years of retirement consumption.[5]

The extent to which KiwiSaver contributions would otherwise have been saved, including through debt reduction, may well be different for those who own a home. Some homeowners will be repaying mortgages, and for many, reducing mortgage debt gives the highest and surest return to saving.

To examine the effect of home ownership respondents were grouped into two categories, those owning and those not owning a home, respectively. Table 2.2 shows that homeowners on average would have allocated around 15 percentage points more of their contributions to other forms of saving or paying down debt than non-homeowners in the absence of KiwiSaver (7.06 versus 5.56). It is interesting that this difference is not solely due to mortgage repayment. Homeowners would have also allocated more of their contributions to both superannuation schemes and other savings or investments for retirement than non-homeowners. This pattern may result both because homeowners with a mortgage may have been motivated to reduce debt, while those who are mortgage-free might be at the stage of making greater provision for retirement.

To examine the distribution of saving, respondents were then assigned a score between 0 and 10 representing the sum of the points they allocated to the saving and debt reduction categories listed in Table 2.2, or in other words, the

[5] For a discussion of the Australian scheme and implications for New Zealand, see Guest (2010).

extent to which their KiwiSaver contributions are substitutes for other forms of saving. For example, a respondent who allocated one of their 10 points to spending on daily activities, another three to a superannuation scheme and six points to debt repayment would have been assigned a value of 9 (= 3 + 6). In contrast, had all of their KiwiSaver contributions come from current consumption, they would have been assigned a score of zero.

Table 2.3: Extent to which KiwiSaver members would have saved their contributions to KiwiSaver in the absence of the scheme

Extent of saving (saving score)	Those who own house		Do not own house		Total	
	%	Cumulative	%	Cumulative	%	Cumulative
0 (none)	12.6	12.6	17.2	17.2	14.9	14.9
1	0.0	12.6	1.4	18.6	0.7	15.6
2	2.7	15.3	5.7	24.3	4.2	19.8
3	4.3	19.6	4.9	29.2	4.6	24.4
4	4.2	23.8	4.8	34.0	4.5	28.9
5	8.2	32.0	14.1	48.2	11.2	40.1
6	4.0	36.0	8.7	56.9	6.4	46.5
7	6.7	42.7	7.4	64.3	7.1	53.6
8	10.1	52.8	11.1	75.4	10.6	64.1
9	6.8	59.5	4.2	79.6	5.5	69.6
10 (maximum ie, 100%)	40.5	100.0	20.4	100.0	30.4	100.0
Total	100.0		100.0		100.0	

Notes: A score of zero corresponds to those KiwiSaver members who indicated all of their contributions would have been spent on daily activities and normal outgoings, had they not been in KiwiSaver. At the other end of the scale corresponding to a score of 10, are those present KiwiSaver members who indicated that all of their contributions would have been invested in some form of saving (both retirement and other types) and/or used to pay of mortgage or other debt.

The results are summarised in Table 2.3. For the total sample, 47% of respondents had a score of 8 or higher (indicating high levels of substitution). Amongst the group not owning their home this share was 36% while for home-owners it was 57%. Over 40% of homeowners would have saved the entire amount of their contributions to KiwiSaver, in the absence of the scheme, compared with only 20% of non-homeowners. In fact, 10 (i.e., all contributions would have been saved) was the most prevalent score amongst both homeowners and non-homeowners.

It appears that home ownership does have an important bearing on the extent of saving. However, the results in Table 2.3 do not control for other factors

which might influence individual saving behaviours. To allow for this, a regression model was estimated in which the dependent variable was the saving score and the explanatory variables a full set of factors drawn from the survey (age, gender, region, marital status, occupation, education, etc.). The results indicated that those owning their own home would have saved 12 percentage points more of their KiwiSaver contributions than non-homeowners in the absence of the scheme. For example, consider the case of two respondents with similar characteristics. The first, who does not own their own home, may have had a saving score of 6. The model on average predicts that the second respondent, who did own their own home, would have had a saving score of 7.2.

In addition, respondents with higher levels of education would also have saved 4 percentage points more of their contributions for every additional year of education. In contrast, those in part-time employment as opposed to full-time employment tended to spend more of their contributions (12 percentage points more), as did females as opposed to males (7 percentage points more).

2.3.3 Retirement income outcomes

This section explores respondents' expectations about their retirement incomes and the level of income they would require, either to meet their basic needs or to live comfortably, in retirement. In particular, these variables are used to calculate measures of respondents expected retirement income shortfalls (or surpluses). These measures are then summarised, drawing out any differences between KiwiSaver and non-KiwiSaver members. A Heckman selection model is then estimated to examine the effects of various factors, including KiwiSaver membership, on the level of respondents' retirement income shortfalls (or surpluses).

Before being asked questions about expected income in retirement, respondents were first asked if they had thought about financial planning for retirement. Those answering not at all, that they don't know or who refused to

answer were not questioned further about their retirement income expectations and are therefore excluded from the following analysis.

Adequacy of retirement income has to be measured against some reference point. The survey specified two such points. The first was based on asking respondents for an estimate of the income they would need to have just enough to live on. The second asked for an estimate of the income needed to live comfortably in retirement. The results for both cases are summarised in Table 2.4.

Respondents were left to self-define what the requirements are for basic and comfortable living and therefore the responses provided will reflect differing sets of expectations as to what is necessary. In Addition, respondents were asked to provide economic family unit-based estimates. That is, if the respondent was partnered at the time of the survey, they were asked to provide figures for the totals required for both themselves and their partner and if the respondent was un-partnered, they were asked to provide figures for themselves only. In order to make figures for partnered and non-partnered respondents comparable, the responses of those who were partnered were multiplied by 60%.

Table 2.4: Summary of key measures for retirement income adequacy

Variable	Lower Quartile	Median	Upper Quartile
Expected income in retirement ($)	25,000	35,000	54,000
Retirement income needed to meet needs ($)	21,000	33,000	45,000
Retirement income needed to feel comfortable ($)	29,600	45,000	55,000

Notes: All dollar values refer to annual incomes.

At each of the three points examined across the distributions (the lower quartile, median, and upper quartile) income needed to meet basic needs is below the expected retirement income. However, income needed for living comfortably in retirement exceeded the income expected in retirement in each case. The minimum level of income expected in retirement was $1,800 by a person who apparently discounted any chance of receiving NZS.

The extent of any shortfall in expected retirement incomes is now considered in more detail. Clearly there will be a distribution with some individuals expecting to have an income in excess of the amount they feel they would need either for meeting basic living standards or being comfortable in retirement. However, there will be some individuals whose expected incomes in retirement would fall short of one or both of the adequacy targets (see Table 2.5).

Table 2.5: Extent and size of any shortfall or excess in expected retirement incomes

	Variable	With respect to amount needed to meet basic needs			With respect to amount needed to be comfortable		
		KiwiSaver	Non-KiwiSaver	Combined	KiwiSaver	Non-KiwiSaver	Combined
Those reporting a shortfall in expected retirement income	Share of total (%)	8	14	22	23	27	50
	Mean shortfall ($)	-9,900	-14,100	-12,600	-13,900	-16,200	-15,100
	Median shortfall ($)	-6,000	-10,000	-6,800	-12,000	-12,000	-12,000
	Average income ($)	42,000	37,900	39,400	46,200	45,200	45,700
Those reporting an excess of expected retirement income	Share of total (%)	33	45	78	17	33	50
	Mean excess ($)	+9,200	+12,000	+10,800	+6,100	+4,700	+5,200
	Median excess ($)	+5,200	+9,000	+6,000	0	0	0
	Average income ($)	52,100	56,300	54,500	55,000	57,200	56,400

Notes: The respondents included in this analysis are those aged 25 and over, and who had given some thought to financial planning for retirement. 18% of those over 25 were excluded because they had not thought at all about retirement planning.

With respect to the basic needs threshold, 78% of respondents provided estimates that indicated their income would exceed the amount needed to cover basic needs. This proportion was similarly high for both KiwiSaver members (80%) and non-members (76%).

Of those reporting a shortfall with respect to basic needs, only about a third were KiwiSaver members and their mean shortfall was $9,900 compared to the larger mean expected shortfall of $14,100 reported by non-KiwiSaver members. It is possible that these non-KiwiSaver members are planning to increase their savings at a later date, rely on an inheritance or simply accept a lower standard of living. However, their current mean income, at $37,900, was below that of KiwiSaver members, at $42,000.

Among those expecting an excess with respect to basic needs, about 40% were members of the KiwiSaver scheme. Non-members reported a larger expected surplus than members ($12,000 versus $9,200).

Up to this point, factors other than KiwiSaver, which might affect the various measures of retirement income shortfalls / excesses, have not been controlled for. A regression model is now estimated in order to identify those factors associated with the size of any differences (either positive or negative) between respondents expected income and that which is required. Separate equations are fitted for the basic needs and comfortable cases.

In generating observations of the expected shortfall in retirement incomes, respondents had to satisfy three conditions. First, they had to be 25-years-old and over. Second, they had to have thought at least a little about financial planning for retirement. Finally, they had to be able to give an estimate of their expected income in retirement. From the total sample of 825 observations, 696 were aged 25 and over. Of those 696, 573 had done some financial planning, and of those, 367 could provide an estimate of their expected retirement income.[6]

In this case, standard regression techniques may result in biased coefficient estimates. Therefore, a Heckman selection model is instead utilised, a procedure specifically designed to control for any sample selection bias that may result from survey routing of the type described above.

The Heckman procedure involves first estimating a participation equation involving all 825 survey respondents. In this case, a probit regression was estimated in which the dependent variable assumed a value of one if the three conditions specified above were satisfied, and zero otherwise. This is then used to calculate an adjustment factor (the inverse Mills ratio) that is included in the second-stage regression, in which the size of the expected shortfall (a

[6] These numbers refer to weighted values, see Figure 2.4.

continuous dependent variable) is estimated.[7] In each stage, the explanatory variables were the large set of independent variables used throughout this study.[8] The results of the second stage regression are summarised in Table 2.6.

Table 2.6: Factors that significantly change the expected shortfall or excess in retirement income

Variable	Unit change	Expected shortfall in retirement income			
		With respect to basic needs		With respect to comfortable	
		Change	Significance	Change	Significance
A: Factors that significantly decrease the expected shortfall or increase the excess					
Respondent income	$1,000	+$105	+++	+$75	++
Self-employed	1	+$10,200	+++	+$4,100	+
Unemployed	1	+$8,900	++	ns	
Part-time employment	1	ns		+$7,000	+
Not in the labour force	1	+$10,800	+	ns	
Asian	1	ns		+$330	+
B: Factors that significantly increase the expected shortfall or decrease the excess					
Female	1	ns		-$3,500	(-)[9]
Own house	1	ns		-$4,800	-
Maori	1	ns		-$220	-
Very good health	1	ns		-$3,900	--
Fair health	1	ns		-$11,600	--

Notes: Only variables that were statistically significant for at least one sub-group are shown. Dollar values preceded by a (+) indicate that increasing the associated variable reduces the expected shortfall or increases the excess. (+++) or (---) indicates significance at the 1% level, (++) or (--) indicates significance at the 5% level and (+) or (-) indicates significance at the 10% level. Being female as opposed to male is significant ant approximately the 11% probability level. (ns) indicates non-significance.

Amongst the standard explanatory variables (e.g., age, gender, income, etc.) used throughout this analysis, KiwiSaver membership status is included in an

[7] Full Maximum Likelihood estimation was actually used here, where both stages are estimated simultaneously. However, the discussion above more closely matches Heckman's two-step procedure, being somewhat easier and more intuitive to explain.

[8] To satisfy exclusion restrictions a number of variables relating to occupational class were omitted from the selection equation. Also, in the participation equation, the number of years respondents expected to be in retirement was included, whereas in the second stage, this variable was replaced with the expected age of retirement.

effort to determine whether, and the extent to which, KiwiSaver membership is a factor that explains an expected shortfall or surplus in retirement income.

Consider first the results in the block headed ‘with respect to basic needs’. Two factors significantly reduced the expected shortfall or increased the excess of expected retirement income relative to that required. These factors were income and labour force status. Those with higher incomes, all else equal, were likely to have a smaller shortfall or larger excess. For every $1,000 of extra income, the gap was reduced by $105, indicating a modest but statistically significant effect. Relative to those in fulltime employment, respondents who were self-employed, unemployed or not in the labour force had expected shortfalls some $10,000 less (or excesses of $10,000 more). This could well represent the fact that the expectations of retirement income of those individuals not in full-time employment were much more closely matched to their living costs, albeit at more modest levels. Alternatively, particularly in the case of those not in the labour force, this could represent an active choice, given they already have significant wealth or have a high-wealth partner.

The second block of results examines the factors that are associated with the relation between expected income and the amount needed for living comfortably in retirement. Again income (with a modest effect) and labour force status are associated with a lower shortfall (or greater excess). In this case, however, there is an additional set of significant variables associated with a greater shortfall (or reduced excess). Females are shown to have a shortfall some $3,500 greater than that for males, Maori a shortfall of $220 more than Europeans and those reporting less than excellent health have a significantly increased shortfall.

Health status has the largest effect, with those reporting only fair health having a shortfall some $11,600 greater (or an excess smaller by this amount) relative to those reporting excellent health. This could reflect that those with inferior health expect higher medical costs in retirement and hence the amount they perceive they would need for comfortable living, all else equal, would be commensurately greater. At the same time, their poorer health during their

working life may impede their ability to accumulate savings for retirement, as a result of reduced labour force participation. There is well documented New Zealand evidence on the association between both health and labour force participation (Enright and Scobie, 2010; and Holt, 2010), and wealth and health (Anastasiadis, 2010; and Carter et al., 2009), respectively.

A possibly counter-intuitive outcome relates to home ownership. Typically it is thought that those owning a home enjoy a higher standard of living than those who are paying rent in retirement. However, current findings suggest that home ownership is associated with a greater shortfall. This could arise if aspirations differ, for example, that homeowners set a higher bar for the income they would need to live comfortably.

While one might argue that endogeneity issues may affect these results, it is very difficult to explicitly address any potential endogeneity issue for the reasons already discussed earlier in this chapter. In this particular case, there is the additional practical complication that even if good instrumental variables were available, combining the procedures to address both sample selection bias and simultaneity would, by no means, be trivial.

On the face of it, the most obvious potential source of endogeneity in the regressions presented in Table 2.6 relates to the likelihood of being employed or part of the labour force. That is, one might argue that having a greater shortfall in expected retirement income would drive an increase in likelihood of being employed or part of the labour force so that this shortfall in expected retirement income might be addressed. However, consideration of the way variables in the model are measured would suggest that even if this were the case, it should not be affecting results. That is, explanatory variables are measured at a point in time, whereas the dependant variable represents expectations about the future. If an individual were driven to be more engaged in the labour force to reduce any expected retirement income shortfall they might have then this ought to be represented in improved expectations about their retirement income shortfall / excess. Their new employment status would be observed when they were surveyed and other factors affecting their

retirement income shortfall or surplus (to the extent that they are observed) are already accounted for by the model.

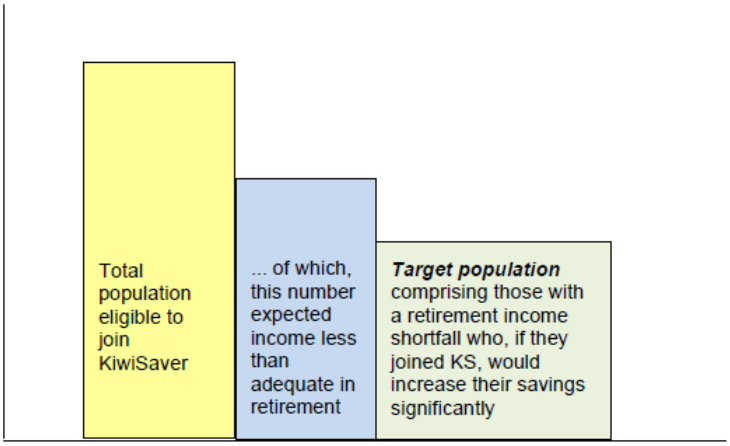
Finally, KiwiSaver membership was, of course, included as an explanatory variable. It was not, however, found to be statistically significant. In other words, all else equal, KiwiSaver membership was not found to improve expected retirement income outcomes. That is, KiwiSaver membership was associated with neither reduced expected shortfalls nor increased excesses of retirement income over the amount respondents required either to meet their basic needs or to be comfortable in retirement. This result is robust to any selection bias that may have resulted owing to survey routing and is an important point to bear in mind when considering the results in the following section.

2.3.4 Target effectiveness and leakage

In this section the effectiveness of the KiwiSaver scheme in reaching its target population, as described in the purpose of the Act, is explored. That is, KiwiSaver aims to enhance the savings for retirement of those individuals who would not otherwise be in a position to enjoy standards of living in retirement comparable to those in pre-retirement. In addition, the extent of any leakage, that is, the proportion of KiwiSaver members who are considered to fall outside KiwiSaver's target group, is estimated.

Figure 2.1 represents graphically the steps in identifying the target population of KiwiSaver as specified in the Act. As living standards are extremely difficult to measure, the target population is defined by two conditions which can be measured. It is those people eligible to join KiwiSaver who: (a) had an expected shortfall in their retirement income relative to either basic needs or living comfortably; and (b) if they were to join KiwiSaver, would increase their savings significantly.

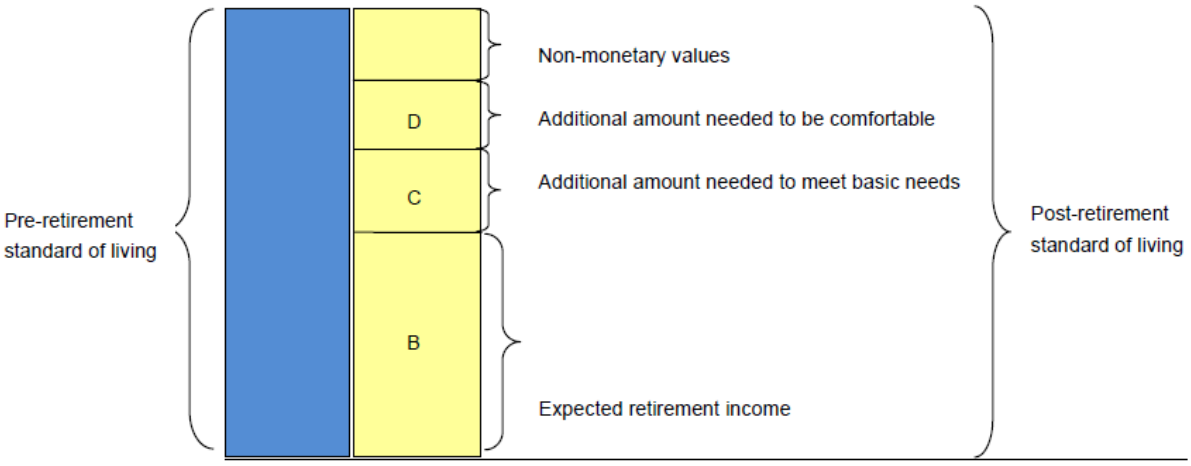
Figure 2.1: Identifying the target population



The survey does not give any indication of the additional amount of saving that would be sufficient to close any gap, and ensure income in retirement was able to meet basic needs. Furthermore, meeting basic needs does not necessarily imply that post-retirement living standards would match their pre-retirement level.

The various components of pre- and post-retirement living standards are illustrated in Figure 2.2 for the case where the individual has a shortfall in their expected retirement income relative to both comfort and needs. Data from the survey provide estimates of areas labelled B, C and D. The expected basic needs gap is measured by C, while the expected gap relevant to a comfortable standard of living is given by C + D. Of course only a portion of survey respondents report an expected retirement income shortfall (see Table 2.5).

Figure 2.2: Pre and post-retirement living standards



It should be noted that the Act refers to living standards not pre- and post-retirement incomes. It is possible that living standards which incorporate a range of non-monetary dimensions may well be comparable even if monetary income is lower. For example, an individual may well place a high value on leisure time and this could more than compensate for a reduced monetary income. The standard rule of thumb for income replacement rates, which are invariably less than 100%, in part reflects the value that might be placed on non-monetary aspects as well as the fact that some expenses associated with working are no longer needed in retirement.

Two sets of measures relating to target effectiveness and leakage are calculated. The first refers only to one characteristic of the target population, that is, that they have a shortfall in their expected retirement income. This can be visualised with reference to Figure 2.3. In this case target effectiveness is defined as the number of KiwiSaver members who have a shortfall as a proportion of all those who have a shortfall (comprising both KiwiSaver and non-KiwiSaver members). This corresponds to the ratio D/(D+F). The target effectiveness of the programme would be 100% if all those who reported an expected shortfall in retirement income relative to meeting basic needs were KiwiSaver members.

Leakage refers to those who are benefitting from KiwiSaver membership but who were not expecting a shortfall in retirement income. Again with reference to Figure 2.3, this corresponds to 1-(D/B)=(E/B). While it is possible that some

of those KiwiSaver members who report no expected shortfall (Box E) may be doing so as a result of having joined KiwiSaver, Section 2.3.3 provides evidence to the contrary. That is, the results of regression analysis that included KiwiSaver membership as well as a large number of other conditioning variables likely to affect retirement income outcomes, all else equal, suggest that KiwiSaver membership does not improve expected retirement income outcomes. KiwiSaver membership was associated with neither reduced expected shortfalls nor increased excesses of retirement income over the amount respondents required either to meet their basic needs or to be comfortable. Therefore, it seems unlikely that this possibility would have a material impact on either the measure of target effectiveness or leakage.

It is not possible to apply the stylised breakdown in Figure 2.3 to all survey respondents as a particular series of filters were applied to the questions in the survey related to expected retirement incomes. Specifically, the questions related to retirement income were directed only at those 25 years and older, who had undertaken some financial planning and who could provide estimates of expected retirement income. Again, recall from Section 2.3.3 that the results of a Heckman selection model (a procedure specifically designed to take account of potential bias resulting from sample selection issues such as these) found no relationship between KiwiSaver membership and improved retirement income outcomes. Therefore, it is unlikely that the survey routing described above will have a material impact on either measures of target effectiveness or leakage.

Table 2.7 shows estimates of both target effectiveness and leakage based on the sub-group of respondents who were able to provide estimates of retirement income and the income they required to meet their basic needs or to be comfortable. The weighted sample counts required to make these calculations can be found in the blue shaded section of Figure 2.4. On the basis of needs, of all those with an expected shortfall, 37% were KiwiSaver members. Of the total KiwiSaver membership, 80% did not report having any expected shortfall.

Both measures improve when the calculations are based on the income respondents expect to require in order to be comfortable in retirement.

Table 2.7: Target effectiveness and leakage measures for KiwiSaver

	Based on needs	Based on being comfortable
Target effectiveness	37%	46%
Leakage	80%	43%

A second set of measures for target effectiveness and leakage are now calculated. In particular, It is not sufficient that an individual with an expected shortfall is a member of KiwiSaver for the programme to have been effective. Indeed, it must also be the case that having joined KiwiSaver, the individual would have reduced their consumption spending thus making additional retirement savings over and above those they would have made, had they not joined KiwiSaver. The corollary is that, if they would have saved the funds specifically for retirement or in some other form of saving, then there would be no net additional savings. In this case, despite having a shortfall and being a KiwiSaver member, they would not be contributing to the effectiveness of the programme by making additional savings for retirement to close some of the expected gap in their retirement income.

These measures can again be visualised with reference to Figure 2.3. The target group is depicted as Box I. It captures those KiwiSaver members (Box B) who have a shortfall in expected retirement income (Box D) and who, in the absence of KiwiSaver, would have used their contributions for current consumption (Box I). Target effectiveness is then calculated as (I/D), conditional on being in KiwiSaver. Leakage is calculated as 1-(I/B)=(H+E)/B.

As before, it is not possible to apply the stylised breakdown in Figure 2.3 to all respondents due to routing. For the estimates presented in Table 2.8 the weighted sample counts in the blue shaded section of Figure 2.4 are again used. Some additional information is also required. In particular, the weighted counts for those KiwiSaver members with expected retirement income gaps, who in the absence of KiwiSaver would have used a significant proportion of

their contributions for current consumption. Setting this proportion at anything over 30% (that is, when at least 30% of an individual's KiwiSaver contributions represent new saving) yields weighted counts of 10 and 33 when the retirement income gaps are based on basic needs and being comfortable respectively.

Table 2.8: Target effectiveness and leakage measures for KiwiSaver adjusted for savings behaviour

	Based on needs	Based on being comfortable
Target effectiveness	33%	46%
Leakage	93%	78%

The result of making the adjustment for savings behaviour is to reduce the estimate of target effectiveness and raise the estimated leakage to the non-target group. These results suggest that KiwiSaver has been only modestly successful in reaching the target audience as stated in the Act, and a significant part of any benefits leak to individuals outside of the target group. Indeed, calculations based on basic needs suggest that for every member of the target population that is a member of KiwiSaver, another 14 members are not part of the target population (i.e. a total of 15). Similarly, based on being comfortable, this ratio is 1:4.

Given the significant fiscal costs associated with KiwiSaver, the cost per member who belongs to the target population will likely be substantial. For instance, assuming the parameters of the scheme continued as they were when the survey used in this study was conducted in 2010, membership by salary and wage earners for the 2011/12 year was projected to be 945,000. Similarly, ongoing costs for this group in that year were projected to total around $823 million. ($670 million from member tax credits and a further $153 million from the employer superannuation contribution tax exemption). This means for each of these KiwiSaver members, the ongoing cost per year was projected to be around $870. The cost per member from the target population based on basic needs is over $13,000 per year ($870*15) and based on being comfortable it is around $4,000 per year ($870*5). These estimates would be higher still if the costs of additional members such as children, together with the $1,000 kick-

start contribution, the first-home deposit subsidies and administration costs incurred by Inland Revenue were included.

Figure 2.3: Measuring the effectiveness of KiwiSaver (stylised framework)

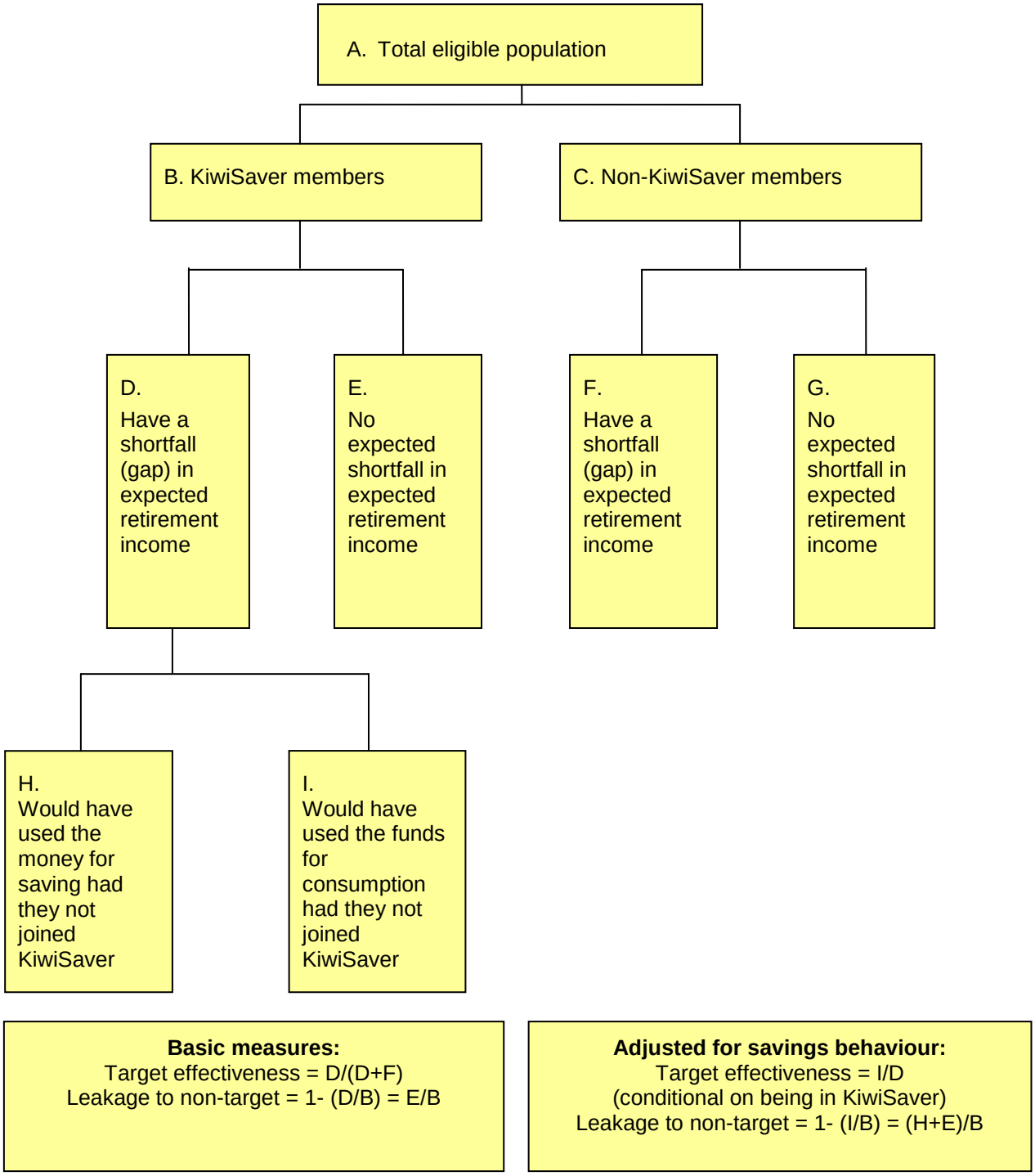
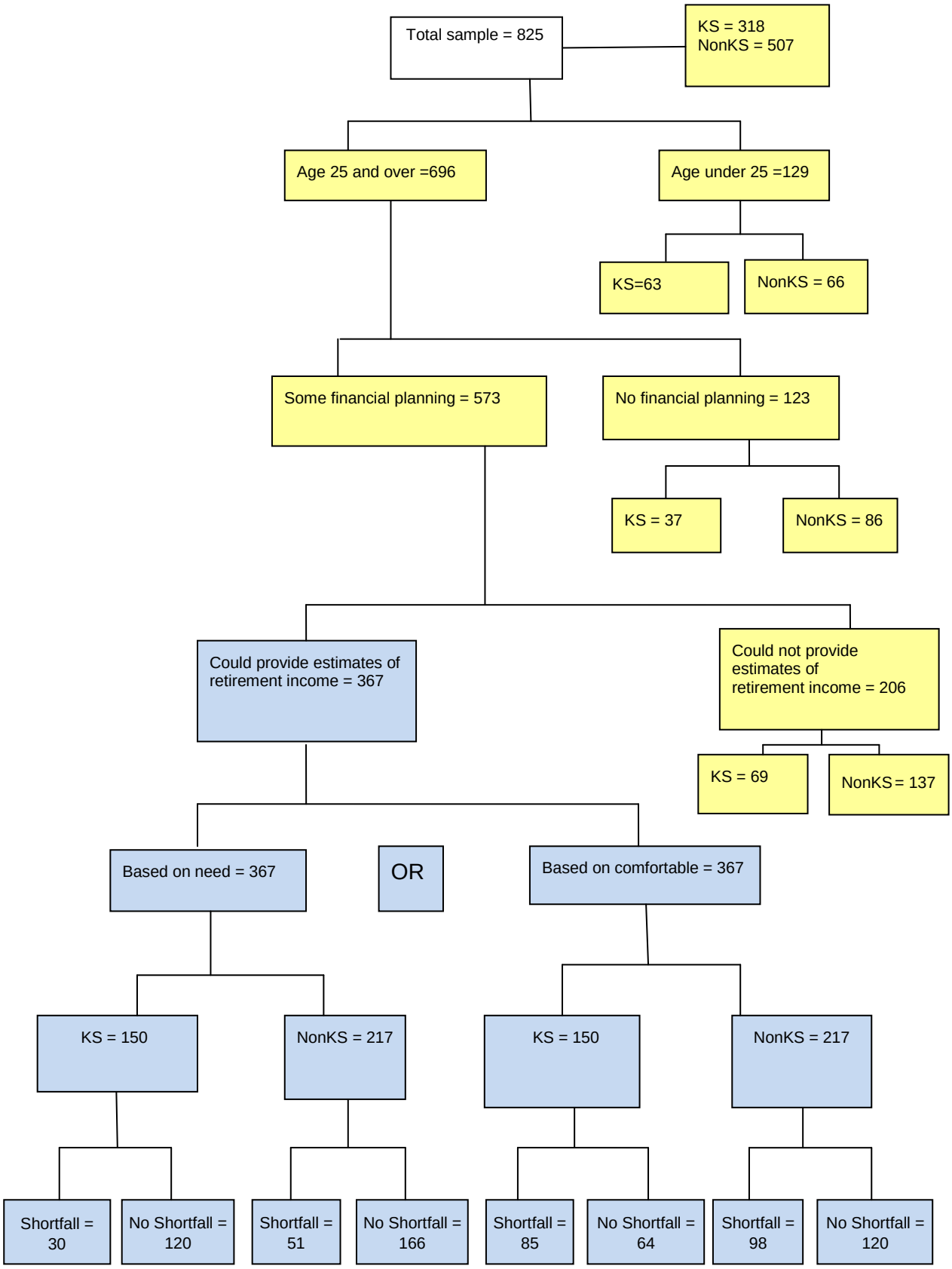


Figure 2.4: Breakdown of the sample (weighted numbers)



2.3.5 Implications for national saving

In this section the results from previous sections are drawn upon to consider any implications of the introduction of KiwiSaver for national savings. The KiwiSaver settings which applied in 2010, when the survey used in the current analysis was conducted, are assumed. Estimates of the likely effects on national savings (had the programme continued unchanged) begin shortly thereafter, in the 2011/12 year.

As shown in Table 2.2 of Section 2.3.2, the extent of additional saving by respondents in the survey was on average 36%. Clearly, those on low incomes have limited scope for substitution and their additionality would be expected to be much higher. Conversely, those on higher incomes would have additionality less than the average. As a result, the estimates for individuals need to be weighted by income to get an aggregate estimate of additionality. As high-income individuals contribute a disproportionate share of total saving, weighting in this manner reduces aggregate additionality to 29%.[9] In other words, each additional dollar a member allocates to their KiwiSaver account, results on average in a net increase in saving of 29 cents.

This figure applies to the contributions made by members. However, the total amount applied to a member's account in KiwiSaver is made up of their own contributions, plus those of their employer and finally direct taxpayer-funded contributions from the government. It is therefore necessary to consider the extent of additionality that is associated with employer and government contributions.

At one extreme, an argument could be made that all of the contributions by employers and the government are pure net additions to a household's overall retirement accumulation. In the very short run, it is possible that this is in fact

[9] This figure was obtained first by fitting an OLS regression with the dependent variable being the respondents' additional saving score and the independent variable being the respondents' income. The parameter estimates were then applied to the KiwiSaver income distribution supplied by Inland Revenue and weighted by income. As additional saving on average declined with income, the weighted measure required for estimates of national saving is lower than the unweighted measure.

the case. However, for this to hold in the longer term would imply that people do not take into account their overall KiwiSaver balances when making decisions about their overall savings portfolio. This seems improbable, and would be inconsistent with the evidence that a significant number of people make no provision for retirement beyond the expectation of NZS. Furthermore, employer contributions are simply part of an overall remuneration package, and as wages and salaries will be commensurately lower when employers are making these payments to KiwiSaver, individuals will quickly realise that it is their money rather than a gift from employers that is being contributed.[10] They may then view this in a similar light as their own direct contributions.

An assumption of a life-cycle model of savings is that individuals seek to smooth their consumption over their pre- and post-retirement years. In order to do this, they forgo some consumption during their working lives in order to accumulate a stock of wealth at the time of retirement.[11] The size of that stock will be determined so as to achieve the desired level of post-retirement consumption. In other words, given their desired standard of living, their life expectancy, expected asset returns and prices, and taking into account public policies such as taxation and pension eligibility, they will aim to achieve a target level of wealth at retirement.

The recent boom in house prices in New Zealand, to the extent that some part was sustainable, arguably increased the wealth of homeowners. This revaluation of asset prices is generally referred to as passive saving in contrast to making conscious decisions to forgo current consumption (termed active saving).[12] Hull (2003) and De Veirman and Dunstan (2008) find that passive and active saving are negatively related, reinforcing the view that money is fungible and different forms of saving are potential substitutes in achieving a retirement-income wealth target. This evidence is consistent with the view adopted here in which, in the long run, all contributions to KiwiSaver are viewed

[10] In reality, the compulsory employer contribution is very much like a payroll tax. Therefore, the final incidence of this will depend on the relative elasticities of supply and demand for labour.
[11] Whether retirement occurs at a point in time or consists of a phased withdrawal from the labour market is immaterial here.
[12] For an analysis of active and passive saving, see Le et al. (2012).

in a similar manner. That is, all contribute to achieving a long-run goal. Were this not to reflect actual saving behaviour, one would expect to see either large and widespread bequests (over-saving) or substantial drops in post-retirement living standards (under-saving). Typically, neither is observed.

The following estimates, summarised in Table 2.9, are partial in the sense that they relate to KiwiSaver accounts held by employees. Two cases are presented. Preferred estimates pertain to the long run in which individuals look at the total amount of their KiwiSaver balances regardless of the source when making decisions about their saving for retirement and additionality is set at 29%, as discussed above. The second case is a sensitivity analysis in which additionality is set at much higher levels for both Crown and employer contributions to individuals' KiwiSaver accounts. In both instances, each additional dollar of subsidy provided by the Crown to an individual's KiwiSaver account represents a dollar less saving by the Crown.[13]

In the long run, when members adjust their overall saving behaviour such that net additionality is 29% on all contribution sources, the costs to the government exceed the additional saving with the result that the scheme would reduce total national saving. Less than $1 of additional household saving is generated for each dollar of government contributions. Recall that in the case of Denmark, Chetty et al. (2014) found that each additional dollar of government expenditure on subsidies increased total saving by only one cent.

Sensitivity analysis allowing for much higher levels of additionality yields modest net additions to saving. This arises as the total additional saving by members exceeds the costs to the government. The fiscal costs (identical for both cases) shown in the last column are made up of the initial kick-start grant, the member tax credit and exemption from the employer superannuation contribution tax. Of these, the largest share (some 75%) is made up of the member tax credits.

[13] This is the case regardless of whether the Crown is running a deficit or a surplus; that is, if the Crown is running surpluses, the effect of KiwiSaver subsidies will be to reduce the surplus, all else equal, and hence result in less public saving.

Table 2.9: Impact of KiwiSaver on national savings and the fiscal costs

Year	Change in national saving ($m)		Fiscal costs ($m)
	Short-term (sensitivity analysis)	Long-term (preferred estimates)	
2012	281	-49	949
2013	312	-25	967
2014	329	-4	958
2015	329	-13	991
2016	330	-15	1,006
2017	326	-26	1,033
2018	322	-37	1,061
2019	316	-48	1,090
2020	310	-61	1,120
2021	304	-75	1,152
Net present value	2,322	-245	7,521

Notes: Results are based on KiwiSaver members with employer contributions. Changes in national savings are equal to additional savings by households net of the fiscal costs. The sensitivity analysis (short-run values) assumes additionality applying to employee contributions of 29%, employer contributions of 39% and Crown contributions of 59%, respectively. Preferred estimates (long-run values) are based on an additionality applying to all contributions of 29%. Fiscal costs comprise the initial grant, member tax credits and the exemption for the Employer superannuation contribution tax. Net present values are the discounted sum of the 10-year flows, using a discount rate of 6%.

There is yet another dimension to the long-run view of retirement saving. Setting aside the issue of bequests, households accumulate retirement wealth so they can draw that down for income in retirement. In other words, in the long-run equilibrium, regardless of whether the additionality was 100%, the net effect is that household saving would be zero as the accumulations would be matched by the decumulations.

Also worth noting is that this analysis does not attempt to account for any changes in investment returns that might result from any change in the flow of saving into the capital markets or their allocation. However, it is not necessarily the case that this would increase national saving.

For example, consider the thought experiment where a couple buying a house was first allowed to use the resources allocated to their KiwiSaver account to pay down their mortgage and only when this was repaid began saving specifically for retirement. Compared to the case where they paid down their mortgage at a slower rate and put resources into KiwiSaver at the same time, estimates suggest that this couple could have had around 25% more financial

wealth at retirement. Given that a significant proportion of people are likely to own a home with a mortgage at some point throughout their life, this effect may significantly reduce national saving.

These estimates of course are based on a number of assumptions around income, house value, wage growth, initial mortgage term, the proportion of their budget they allocate to saving or paying down debt, and others. However, the main factor driving this result is the superior after-tax real returns from paying down one's mortgage as opposed to investing in a retirement fund such as KiwiSaver. So long as this is the case, then the general result is robust to these other assumptions.

2.4 Conclusions

The KiwiSaver scheme has been a major addition to New Zealand's retirement savings options. It is a voluntary scheme, with new employees having to actively opt-out of the scheme. It is also subsidised, yet it is not clear that there is a particular problem with respect to household saving or retirement income adequacy that is in need of being addressed. In addition, International evidence suggests that KiwiSaver's success, in terms of generating significant additional saving amongst its members, is by no means guaranteed. Therefore, it is important to inquire about the efficacy of KiwiSaver with respect its explicit and implicit objectives.

This chapter has examined participation in the scheme and the extent of changes in saving behaviour. Overall, about one third of the eligible population were members of the scheme. Those expecting NZS to be their main source of retirement income were significantly more likely to be KiwiSaver members. Those who were partnered and self-employed were less likely to be KiwiSaver members. Most other variables, including gender, income, wealth, education and health were not statistically significant predictors of Kiwisaver membership.

A crucial question is the extent to which the scheme has engendered additional household savings. Results suggest that for each dollar of member contributions to the scheme, saving in alternative vehicles is reduced by 64 cents (substitution). In other words, members of the scheme have increased their net saving (additionality) by 36 cents on average (29 cents when weighted by income).

Those owning their own home would have saved 12 percentage points more of their KiwiSaver contributions than non-homeowners had they not been members of KiwiSaver, after correcting for differences in age, income, family status, education, and so on. It is interesting that this difference is not due solely to mortgage repayment. Homeowners also indicated that they would have contributed more to other superannuation schemes, saving and investments for retirement in the absence of KiwiSaver. In addition, respondents with higher levels of education would also have saved 4 percentage points more of their contributions for every additional year of education. In contrast, those in part-time employment as opposed to full-time employment tended to spend more of their contributions (12 percentage points more), as did females as opposed to males (7 percentage points more).

An analysis was undertaken of the income respondents expected to have in retirement in relation to that which they reported would be required to meet either their basic needs or to be comfortable. The results indicated that only 22% have a shortfall in expected retirement income based on needs. In contrast, some 50% reported an expected shortfall with respect to being comfortable. These results were broadly similar for both KiwiSaver members and non-members.

By comparing the expected outcomes of KiwiSaver members and non-members using regression analysis which controlled for an extensive set of variables likely to affect retirement income expectations, it was possible to test whether KiwiSaver membership was associated with changes in retirement income expectations. Only a few factors help explain respondents' expected retirement outcomes. In particular, factors that decrease retirement shortfalls (or increase

the excess) include income and an employment status other than full-time employment. Factors that increase retirement shortfalls include having very good or fair health relative to excellent health, and home ownership.

Importantly, KiwiSaver membership was not statistically significant. In other words, all else equal, KiwiSaver membership was not found to improve expected retirement income outcomes. That is, KiwiSaver membership was associated with neither reduced expected shortfalls nor increased excesses of retirement income over the amount respondents required either to meet their basic needs or to be comfortable. This result is robust to any selection bias that may have resulted owing to survey routing.

In conducting any evaluation, it is critical that the yardstick against which success is to be measured is clearly specified and quantifiable. The analysis of the effectiveness of the KiwiSaver scheme in this chapter centres on the stated purpose of the Act. This refers to a target population who would not otherwise have been in a position to enjoy a standard of living in retirement comparable to their pre-retirement level.

Using information on respondents' expected retirement outcomes and the degree to which KiwiSaver had changed their saving behaviour, measures of target effectiveness and leakage for the scheme were calculated. Target effectiveness ranged from a third to a half, while leakage was as high as 93%, when the measure was based on retirement income shortfalls with respect to meeting basic needs, and 78% based on being comfortable. In other words, of all those eligible to join KiwiSaver, less than half of all those in the target population became members, and for each one of those a further 4 to 14 people joined from outside the target population. This implies that the ongoing cost of the scheme per target member could have exceeded $13,000 per year had KiwiSaver continued as it was in 2010.

The scheme may have had broader objectives not explicitly stated in the Act. For instance, an implicit objective of KiwiSaver may have been to increase national saving. When weighted by income only around 29% of respondents'

contributions to KiwiSaver were estimated to represent new saving. With the government effectively borrowing one dollar for each dollar it contributes to KiwiSaver, it is not surprising then that results suggest KiwiSaver would likely have made only a minimal contribution to national saving had it continued in its original form. Indeed, KiwiSaver could have actually reduced national saving.

In summary, the results of this chapter suggest that KiwiSaver has performed poorly with respect to each of the four key dimensions examined. This calls into question the value of the scheme and its ongoing existence. In addition, the analysis provides support for many of the changes to the policy which were announced in Budgets 2011 and 2015, and in particular, those which reduced the subsidies associated with KiwiSaver. In the next chapter the evaluation of KiwiSaver continues with an examination of its effects, if any, on the accumulation of net worth by its members.

Chapter 3

KiwiSaver and the Accumulation of Net Worth

3.1 Introduction

As described in the previous chapter KiwiSaver is a voluntary, defined contributions savings scheme aimed at increasing the retirement wealth of its target population. Key features include automatic enrolment of new employees, a minimum employee contribution rate, compulsory matching contributions by employers, and government incentives to join and contribute. In order to access all features of KiwiSaver, members must be employed and be between 18 and 65 years of age. However, anyone under 65 may join. Savings accumulated in KiwiSaver accounts are generally not accessible until members turn 65.

The specifics of many of KiwiSaver's features have changed since it was introduced in 2007. In 2010, the latest year that is included in the dataset used in this chapter, minimum employee and employer contributions were each set at 2% of a member's gross salary or wages (if employed). Government subsidies included a $1,000 kick-start contribution, an annual tax credit matching member contributions and capped at $1,042.86 a year, and an exemption from employer superannuation contributions tax (ESCT).

Changes announced in Budget 2011 subsequently reduced these subsides. In particular, employer contributions are no longer exempt from ESCT, and the maximum member tax credit is now $521.43 a year and requires a $2

contribution from the member for each $1 of tax credit. However, minimum employee and employer contributions were increased from 2% to 3%.[14] Later changes announced in Budget 2015 also abolished the kick-start contribution. Changes to KiwiSaver seem set to continue, with a Bill before parliament in 2018 seeking to make additional changes to contribution rates, shorten the length of contribution holidays and allow those over the age of 65 to join KiwiSaver.

KiwiSaver's introduction in 2007 was prompted by a view that household saving in general appeared to be low and declining, and in particular, there may be some who would reach retirement with an accumulation insufficient to allow them to sustain their pre-retirement standard of living (see, for example, Treasury, 2007). The available micro-evidence relating to individual and household saving, however, does not necessarily support this view (see, for example, Scobie, Gibson and Le, 2005; Le, Scobie and Gibson, 2009; Scobie and Henderson, 2009; and Le, Gibson and Stillman, 2012).

Setting aside the issue of whether or not there is cause for concern with regards to saving rates or retirement income adequacy in New Zealand, international evidence suggests that the evaluation of KiwiSaver would be prudent. This is because numerous studies have found that such schemes may generate little additional saving as other forms of saving are displaced. For instance, Yang (2018) takes advantage of a pension reform in Taiwan requiring employers to contribute a proportion of employees' wages to individual retirement accounts to study this issue. The paper employs a difference-in-differences approach, using employees in unaffected sectors as a control, and finds significant substitution between contributions to these workplace pensions and other forms of saving. Another example is that of Chetty et al. (2014) which examined 41 million observations on savings for the population of Denmark and found that each additional dollar of government expenditure on subsidies increased total saving by only one cent. However, the study also suggests that features shared

[14] For further details of the scheme see http://www.kiwisaver.govt.nz or http://www.ird.got.nz/kiwisaver.

by KiwiSaver, such as automatic enrolment, may have more success in generating additional savings.

The previous chapter presented an evaluation of the performance of KiwiSaver in terms of four key dimensions. The analysis utilised a comprehensive survey conducted by Colmar Brunton in 2010 on 825 people that included both members and non-members of KiwiSaver. The key findings of the analysis were that:

1. approximately 1/3 of contributions to KiwiSaver represented new savings, while 2/3 would have resulted anyway in the absence of the scheme;

2. no association was found between KiwiSaver membership and expected retirement income outcomes;

3. in terms of standard measures of programme efficacy (target effectiveness and leakage) KiwiSaver was found to have performed poorly, with leakage to the non-target group estimated to be 93%; and

4. after accounting for other factors, including the schemes impact on public saving, KiwiSaver's effect on national saving was found to be negligible.

On the whole these findings suggest that KiwiSaver has performed poorly. In addition, international evidence implies that the benefits of KiwiSaver may be limited, the fiscal costs of KiwiSaver are significant, its design continues to change and there is limited evidence of a problem for KiwiSaver to solve. Therefore, a robust and comprehensive evidence base with respect to the performance of KiwiSaver is critical in order to guide New Zealand policy makers' decisions about its future direction.

While comprehensive, the analysis of Chapter 2 does have a number of limitations. In particular, parts of the analysis relied on subjective responses and were based on cross-sectional data. Therefore, the analysis was not able to control for unobserved heterogeneity, for example.

The analysis presented in the current chapter addresses these issues and continues the evaluation of KiwiSaver. The objective is to analyse the extent to which the KiwiSaver scheme has resulted in greater accumulations of net worth amongst its members, relative to that which might have been expected in the absence of the scheme. Though this objective clearly relates to all of the key findings of the earlier evaluation presented in Chapter 2 (and particularly the first and second), the approach used and the data employed in the current analysis are very different.

The chapter utilises two linked sources of data, the Survey of Family, Income and Employment (SoFIE) and administrative data from the Inland Revenue Department (IRD). SoFIE is a longitudinal data set which includes, as well as a wide range of socio-economic variables, details of individual assets and liabilities. Administrative data from IRD provides individual KiwiSaver membership information. The resulting linked data set covers the eight-year period to 2010. Asset and liability data were measured four times during this period and form the basis for analysing changes in net worth.

The analysis is based on two approaches. The first uses a difference-in-differences (DiD) technique. This technique compares outcomes (in this case changes in net worth) before and after the introduction of a programme such as KiwiSaver, across two groups (those in the programme and those not). In this way those who are not members of the scheme form a control group.

The DiD analysis only holds one factor constant at a time however. To address this limitation various fixed and random effect panel regression models are estimated in which changes in net worth are related to many factors simultaneously. These include: KiwiSaver membership; income; net worth; age; gender; partnership status; home and investment property ownership; ethnicity; if the respondent was born in New Zealand; education; labour force and health status. With four observations over time on assets and liabilities in SoFIE it is possible to measure three changes in net worth for each of approximately 10,000 individuals. This provides nearly 30,000 observations for inclusion in each regression.

Results appear consistent with those of the evaluation of the performance of KiwiSaver undertaken in Chapter 2, particularly with respect to the second of the previous chapters main findings as described above. That is, neither the DiD or regression analysis presented in the current chapter suggest that KiwiSaver membership has had any positive effect on net worth accumulation.

The remainder of this chapter proceeds as follows. Section 3.2 describes the data. In order to inform the choice of an appropriate outcome measure, section 3.3 presents information on both the distributions and movement within those distributions, of net worth, changes in net worth and savings rates respectively. Sections 3.4 describes the DiD method and presents results. Panel regression techniques are outlined and results discussed in section 3.5. Conclusions are drawn together in the final section.

3.2 Data

This chapter uses individual unit record data from two sources. The first is the longitudinal Survey of Family, Income and Employment (SoFIE). The preparation of SoFIE for analysis is similar to that of Chapters 5 and 6 of this thesis, except that the timing of the current analysis allows the incorporation of the full eight waves of the survey. The second data source is administrative. Provided by the Inland Revenue Department (IRD), this data gives information relating to KiwiSaver membership.

SoFIE, the primary data source for the analysis undertaken in this chapter, is a longitudinal survey conducted by Statistics New Zealand (SNZ) where the original sample members are tracked and surveyed each year. It began in October 2002 with an original sample size of about 11,500 households, amounting to over 22,000 individuals 15 years of age and over. It concluded in September 2010 after running annually for a total of eight years (waves). The core survey collects annual information on individual and family characteristics,

as well as labour market and income spells. In alternate years health, and assets and liabilities modules are included respectively.

The assets and liabilities module was included in SoFIE waves 2, 4, 6 and 8, and forms the basis for assessing the effects of KiwiSaver membership on net worth accumulation. This module allows for the measurement of net worth at the individual rather than family level, which is relatively rare internationally. Further, it was designed to be comprehensive and so should capture the vast majority of individuals' net worth and its various components.

Interviews for each wave were evenly spread over a 12 month period so that some households were interviewed in October and others the following September. However, all asset values are indexed to the mid-point of the relevant wave. Asset values for wave 2 are therefore indexed to approximately 31 March 2004, wave 4 asset values to 31 March 2006, wave 6 asset values to 31 March 2008 and wave 8 asset values to 31 March 2010.

Indexation was important during this period, with strong house price growth at times potentially leading to non-trivial increases in individuals' net worth even within the interview period of a particular wave. Fortunately respondents in SoFIE were asked not only for the value of any residential property they owned but also to provide a valuation date. This date is used, together with detailed regional house price indices from Quotable Value (QV) (aggregated to the six major SoFIE regions) to index housing assets as described in the previous paragraph.[15] For all other assets the Consumer Price Index (CPI) was used.[16]

SoFIE required careful cleaning in order to minimise loss of observations due to question non-response or apparent errors in recording of individual

[15] In a number of cases respondents failed to provide valuation dates. In these cases it is assumed that the distance between the respondents' interview date and valuation date was the same as the average of that distance for those respondents that were able to provide valuation dates. This distance was between two and three years depending on the survey wave.

[16] Scobie and Henderson (2009) provide further discussion of the practicalities of indexing various assets and liabilities in SoFIE.

information.[17] Wherever possible the longitudinal nature of the data was leveraged to attempt to correct for this. For example, if an individual was observed owning a house worth just $1 in wave four their housing assets in other waves were examined. If it turned out that that same person in wave two owned a house worth say $900,000 and in wave 6 worth $1,100,000 the value recorded in wave four was changed to $1,000,000. Although this particular example was not common in the sample, such errors could generate substantial movements in net worth for individuals over time if left uncorrected. This is important in the current context.

Similar anomalies or non-response were observed for small numbers of respondents across most of the variables used in this analysis and so are too numerous to mention here. For more information about SoFIE and some of the problems researchers can expect to encounter, see, for example, Scobie and Henderson (2009) or Carter et al. (2010).

Although the final wave of SoFIE included a module on KiwiSaver, for the current analysis information on KiwiSaver membership is instead sourced from administrative data from IRD. The primary reason for this is that the administrative data provides a more complete picture of KiwiSaver membership over time. In addition, it appears that KiwiSaver membership in SoFIE may have been underreported, likely due to the way respondents were routed to the KiwiSaver module.[18] A detailed comparison of the KiwiSaver information contained within SoFIE and provided by IRD is available in Samoilenko and Law (2014) including, for example, KiwiSaver membership rates indicated by the respective data sources. While the process of preparing a dataset combining both SoFIE and IRDs administrative data was completed as part of the current analysis, SNZ independently 'matched' individuals' present in both datasets. In particular, assigning a common individual identifier, or person

[17] To construct a usable panel data set for analysis SoFIE also required manipulation and formatting, with the data originally being stored in around 20 separate files with different (often incompatible) formats.
[18] This issue is unlikely to have affected the value of assets recorded in KiwiSaver however.

specific identifier, to individuals present in each data set thereby allowing them to be linked. Details of this process are provided by Gray (2012).

A number of restrictions to the sample are required for analysis. First, only those eligible to join and enjoy the full benefits of KiwiSaver based on their age at wave 1 are included (ie, those aged 15 to 60). Second, SNZ only provides longitudinal survey weights for those respondents who were original in scope sample members of SoFIE. As these weights are required for much of the analysis, a further restriction to the sample is necessary. A further requirement, imposed by the difference-in-differences analysis set out in Section 3.4, is that individuals have a complete longitudinal history having responded to all eight waves of SoFIE. Finally, to allow for the calculation of savings rates, only those individuals with positive incomes are included.[19] Even with these restrictions a large sample remains, covering approximately 10,000 individuals in each year between 2002 and 2010. 39% of these individuals were KiwiSaver members in 2010, which is remarkably similar to the membership levels reported in Chapter 2.

3.3 Outcome measures

Given the available data, there exist a range of possible outcome measures that could be used to examine the performance of KiwiSaver in terms of facilitating improved retirement income outcomes for its members. These include net worth, changes in net worth and savings rates, with the latter being the most analytically appealing. However, it is well understood that survey data on assets, liabilities and personal income can be prone to measurement error.[20] As each potential outcome measure may be more or less prone to such measurement error, the choice of outcome measure in this case cannot be

[19] In particular, the sum of income from all sources in waves 1 and 2, 3 and 4, 5 and 6, and 7 and 8, respectively, each had to be positive for every individual.

[20] Assuming this measurement error is random its effects on regression results will be to potentially reduce the precision of coefficient estimates. However, it will not bias coefficient estimates as these outcome measures are used as dependant rather than explanatory variables in regressions.

made solely based on its analytical appeal. Therefore, in order to inform the choice of an appropriate outcome measure, this section presents information on both the distributions and movement within those distributions, of net worth, changes in net worth and savings rates respectively.

3.3.1 Distributions

The distribution of the nominal unweighted estimates of net worth (derived as the sum of an individual's assets less the sum of their liabilities) for each of waves 2, 4, 6 and 8 are summarised in Table 3.1. Both the mean and median levels of net worth increase substantially over time.[21] However, as the sample members age with successive waves, part of this observed increase is simply due to an ageing effect as typically individuals accumulate wealth over their working lives. In three of the four waves, over five percent of observations on net worth are negative. The spread between the 1st and 99th percentiles also increases over time ranging from approximately $1 million in wave 2 to $1.6m in wave 8. Similarly, the inter-quartile range increases from $180,000 in wave 2 to $290,000 in wave 8.

Table 3.1: Distribution of net worth ($)

	Survey wave			
	2	**4**	**6**	**8**
1st percentile	-31,446	-37,052	-44,494	-38,435
5th percentile	-1,466	-2,276	-1,680	1,012
10th percentile	3,066	3,964	6,534	10,089
25th percentile	23,365	30,636	40,112	50,183
50th percentile (median)	90,776	119,590	149,543	168,484
75th percentile	203,173	258,032	311,429	340,493
90th percentile	363,051	461,672	539,845	587,258
95th percentile	506,952	664,795	741,948	809,307
99th percentile	983,264	1,378,290	1,501,057	1,561,014
Mean	154,162	200,329	238,282	257,242

Table 3.2 presents distributions for the changes in individual net worth that occur between waves 2 to 4, 4 to 6, and 6 to 8 respectively. The smaller

[21] The large difference between the mean and median levels of net worth is indicative of a skewed distribution with a long right-hand tail, that is, a small number of individuals with very high levels of net worth. Similar findings are reported by Le et al. (2012).

average increase in net worth between wave 6 and 8 relative to increases in net worth between earlier waves is likely a reflection of the impact of the global financial crisis which occurred during these years. Compared to net worth, the distributions of changes in net worth appear more concentrated, particularly around the middle. In particular, the inter-quartile range remains relatively constant over the period, at around $80,000.

Table 3.2: Distribution of changes in net worth between waves ($)

	Changes between survey waves		
	2 to 4	**4 to 6**	**6 to 8**
1st percentile	-382,112	-577,032	-623,736
5th percentile	-130,279	-190,754	-236,124
10th percentile	-56,872	-85,535	-109,585
25th percentile	-6,482	-10,870	-19,392
50th percentile (median)	15,914	16,220	8,577
75th percentile	71,329	74,468	58,773
90th percentile	174,412	186,803	172,490
95th percentile	303,920	301,935	298,581
99th percentile	807,558	760,286	769,270
Mean	46,166	37,954	18,959

The distributions of individual savings rates between waves 2 to 4, 4 to 6 and 6 to 8 are provided in Table 3.3.[22] These are calculated by dividing the change in net worth for an individual between any two consecutive waves (that include asset and liability information) by their gross income over the period. For example, the saving rate for an individual between waves 2 and 4 is simply net worth in wave 4 less net worth in wave 2 divided by the sum of income earned in waves 3 and 4.[23] Formally and expressed as a percentage:

$$\left[\frac{Net\ worth\ in\ wave\ (j)\ -\ Net\ worth\ in\ wave\ (i)}{Income\ in\ wave\ (i+1)\ +\ Income\ in\ wave\ (j)}\right] * 100$$

Given the wide range in both levels and changes in net worth already discussed, it is not surprising that when adding income into the equation in

[22] In comparing the median rates with saving rates estimated from the national accounts, it must be recalled that the rates reported here apply essentially to the working age population as distinct from the aggregate household saving rates, which logically are much lower.
[23] Recall that while respondents assets and liabilities are measured in SoFIE only every second year, income is measured every year.

order to calculate savings rates, those savings rates have a very wide dispersion. In particular the spread between the 1st and 99th percentiles of savings rates is close to, or above, 3,000% for most of the period. That is thirty multiples of income. The inter-quartile range for savings rates is also substantial, at well over 100% for most of the period.

Table 3.3: Distribution of implied saving rates (%)

	Survey wave		
	2 to 4	**4 to 6**	**6 to 8**
1st percentile	-1049%	-1190%	-1385%
5th percentile	-214%	-254%	-301%
10th percentile	-97%	-113%	-145%
25th percentile	-12%	-17%	-27%
50th percentile (median)	26%	22%	12%
75th percentile	103%	96%	68%
90th percentile	261%	262%	215%
95th percentile	486%	467%	418%
99th percentile	2185%	1766%	1623%
Mean	464%	92%	263%

3.3.2 Transitions

As well as consideration of the distributions of potential outcome measures it is helpful to consider the extent that individuals move within these distributions over time. In particular, lack of persistence over time may be indicative of measurement error. This subsection therefore presents transition probability matrices for net worth, changes in net worth and savings rates respectively.

In the present case these indicate the conditional probability that an individual beginning a period in a particular quintile of a distribution, will be in that quintile (or any other) at the end of that period. Such transition probabilities can be calculated over any time period. Given the available data 2, 4 and 6 year transition probabilities are calculated for net worth and presented in Table 3.4.

These results give a picture of the extent of mobility within the distribution of net worth. In the absence of any mobility across quintiles of the distribution the diagonal elements of each matrix (bold italics) would be 1.00 and all off-

diagonal elements would be zero. The greater is the value of the off-diagonal elements the greater the degree of mobility. For example, consider the top left hand corner element in panel A of 0.74. This indicates that on average a high proportion of individuals (74%) who were in the first quintile of the net worth distribution in Waves 2, 4 or 6, were also located in the first quintile of the distribution two years later, in Waves 4, 6 or 8, respectively. Reading across that first row of panel A, on average 18% of those in the first net worth quintile had moved up to the second quintile of the net worth distribution by the next wave containing asset and liability information.[24]

Table 3.4: Quintile transitions of net worth

Start-year quintile	End-year quintile				
	1	**2**	**3**	**4**	**5**
	A: Average 2-year transition frequencies (2 to 4; 4 to 6; and 6 to 8)				
1	***0.74***	0.18	0.04	0.03	0.01
2	0.19	***0.52***	0.18	0.06	0.04
3	0.04	0.19	***0.52***	0.19	0.06
4	0.02	0.06	0.21	***0.54***	0.18
5	0.01	0.04	0.06	0.19	***0.71***
	B: Average 4-year transition frequencies (2 to 6: and 4 to 8)				
1	***0.68***	0.21	0.05	0.04	0.02
2	0.23	***0.46***	0.19	0.07	0.05
3	0.04	0.20	***0.46***	0.22	0.08
4	0.02	0.08	0.23	***0.47***	0.19
5	0.02	0.05	0.07	0.20	***0.66***
	C: 6-year transition frequencies (2 to 8)				
1	***0.65***	0.22	0.06	0.05	0.03
2	0.25	***0.42***	0.19	0.09	0.04
3	0.05	0.22	***0.42***	0.22	0.09
4	0.03	0.09	0.24	***0.43***	0.21
5	0.02	0.06	0.09	0.21	***0.63***

While the level of persistence in net worth diminishes somewhat with the length of transition there are some clear patterns common to all transition lengths in Table 3.4. First, those individuals who begin the period in either the top or bottom quintile of the net worth distribution are likely to remain in those same quintiles at the end of the period. In general there is also a degree of persistence in the middle of the net worth distribution with over 50% of

[24] The rows and columns of each matrix of transition probabilities sum to 1.

individuals starting in quintiles 2, 3, or 4, remaining in those same quintiles 2 years later for example. Further, in most cases where individuals do transition to a different net worth quintile over time, it is most often one immediately adjacent to that where they started. In other words, someone beginning the period in say quintile 3 is far more likely to end the period in either of quintiles 2 and 4 than quintiles 1 or 5.

Transition probabilities for the second potential output measure, changes in net worth, are provided in Table 3.5. As these results are in effect analysing changes in the changes of net worth, there is now one less observation available in each of panels A and B, and panel C no longer applies.

Table 3.5: Quintile transitions of the changes in net worth

Start-year quintile	**End-year quintile**				
	1	**2**	**3**	**4**	**5**
	A: Average 2-year transition frequencies				
1	*0.15*	0.14	0.15	0.21	0.37
2	0.06	*0.30*	0.33	0.19	0.12
3	0.10	0.28	*0.26*	0.22	0.14
4	0.21	0.18	0.18	*0.25*	0.18
5	0.48	0.10	0.08	0.14	*0.20*
	B: 4-year transition frequencies				
1	*0.24*	0.18	0.16	0.19	0.23
2	0.10	*0.29*	0.33	0.17	0.11
3	0.13	0.24	*0.26*	0.22	0.16
4	0.21	0.18	0.15	*0.25*	0.20
5	0.32	0.12	0.10	0.16	*0.30*

Compared to levels of net worth it is clear that there is more volatility over time in changes in net worth. Typically there is only a 20% to 30% chance that a change in an individual's net worth (at the beginning of the period) say between waves 2 and 4, and 4 and 6, would be in the same quintile of a distribution of changes in net worth between waves 4 and 6, and 6 and 8 (at the end of the period). Further, the probability that an individual could be at any point in the distribution at the end of the period, regardless of their starting position (rather than just moving to an adjacent quintile) is non-trivial. In fact, those starting the period in either quintiles 1 or 5 (of the distribution of changes in net worth) have

more chance of moving to the opposite end of the distribution at the end of say 2 years than anywhere else within it.

Finally, Table 3.6 presents transition probabilities for the last remaining potential output measure, savings rates. The patterns of transition probabilities in this case are very similar to those for changes in net worth. There is possibly somewhat more volatility, particularly in the case of four year transitions. This is not surprising, however, as savings rates are changes in net worth divided by gross income, introducing additional variation through incomes.[25]

Table 3.6: Quintile transitions of saving rates

Start-year quintile	End-year quintile				
	1	**2**	**3**	**4**	**5**
	A: Average 2-year transition frequencies				
1	0.14	0.15	0.15	0.20	0.35
2	0.08	0.26	0.31	0.22	0.14
3	0.11	0.27	0.27	0.22	0.14
4	0.22	0.21	0.19	0.22	0.17
5	0.45	0.12	0.09	0.15	0.20
	B: 4-year transition frequencies				
1	0.23	0.18	0.18	0.19	0.22
2	0.13	0.26	0.28	0.19	0.14
3	0.14	0.23	0.25	0.22	0.16
4	0.21	0.18	0.18	0.23	0.20
5	0.29	0.14	0.11	0.17	0.28

A simple numerical example illustrates how such volatility in savings rates is possible and might, for example, come about through measurement errors in net worth. Suppose an individual reported total assets of say $320,000 in Wave 4 and when surveyed in Wave 6 failed to recall an item of $50,000, when listing all his or her assets. Even if all other assets and liabilities were to remain unchanged, then the estimate of the saving rate between waves 4 and 6 (for an income of $35,000 over the period) would be -143% ((-50,000/35,000)*100). Now, further suppose that when surveyed again in wave 8 this individual recalled and correctly reported this asset. All else equal, the saving rate for this individual between waves 6 and 8 would increase to 143% (i.e. a change in

[25] Indeed, if one regresses the savings rate on its lag the estimated coefficient is negative and highly statistically significant.

savings rates between the two periods of 286%). Compound this with say a fall in income, for whatever reason, to $5,000. Then the savings rate between wave 6 and 8 becomes 1,000% (a change in savings rates between the two periods of 1,143%. Referring to the distributions of savings rates provided in the previous subsection and in particular in Table 3.3, even the first of these examples is more than sufficient to move this individual from the bottom quintile of the savings distribution (for savings between waves 4 and 6) to the top quintile in the following period.

3.3.3 Conclusion on the appropriate outcome measure

For the remainder of the analysis in this chapter a single outcome measure will be used in order to assess the impact of KiwiSaver. That measure will be changes in net worth (as opposed to levels of net worth). As indicated, this choice is informed by both the analytical virtues of each potential outcome measure and their potential to be affected by measurement error.

While observations on the level of net worth display the most persistence over time the distributions of net worth in each wave of SoFIE containing assets and liabilities are relatively dispersed. Further, of the three outcome measures it may be relatively more prone to endogeneity (is it KiwiSaver membership that causes higher net worth or higher net worth that causes KiwiSaver membership).

Savings rates are perhaps the most intuitively appealing outcome measure, with contributions to KiwiSaver typically set as a percentage of an individual's gross income. However, the distributions of savings rates are highly dispersed with a range of more than 30 times income typical. Further, individual savings rates are not stable over time (in fact they are negatively autocorrelated). To put this in context, a KiwiSaver member may typically have total contributions in any given year of say 6% of gross income. It seems highly unlikely that even an extremely

well specified regression model would have much success in being able to isolate the effects of KiwiSaver membership on individual savings rates.[26]

Changes in net worth are also somewhat volatile over time but have narrower distributions and may be less likely to suffer from endogeniety problems than the level of net worth. When using changes in net worth as the dependant variable in the regression analysis undertaken in Section 3.5, it is possible to address, at least partially, measurement error by including the initial level of net worth as an explanatory variable. Further, income, the missing component from the saving rate, is also included as an explanatory variable in regressions. This was also the approach taken by Le et al. (2012) when using SoFIE while attempting to understand the factors associated with net worth accumulation.

3.4 Difference-in-differences

This section reports the results of an analysis based on the method of difference-in-differences (DiD). This technique has been used extensively internationally (see, for example, Card and Krueger, 1994; and Yang, 2018) and in New Zealand (see, for example, MED, 2011) for policy and programme evaluation. Section 3.4.1 describes the methodology and the results are summarised in Section 3.4.2.

3.4.1 The difference-in-differences method: brief outline[27]

Given the choice of outcome measure explained in the previous section the objective here is to estimate the direct impact of KiwiSaver membership on

[26] To foreshadow results somewhat, when the dependant variable in regressions of Section 3.5 (changes in net worth) was replaced with savings rates, regressions were able to explain only about one hundredth of the variation in savings rates that they were able to explain in changes in net worth. I.e. the R^2 for regressions where the dependant variable was changes in net worth was typically in the order of 0.15 while the R^2 for regressions with the savings rate as the dependant variable was around 0.0015.

[27] More detailed explanations are available in Wooldridge (2009), and in the context of evaluating firm assistance programmes in New Zealand in MED (2011).

changes in net worth. The intuition for using difference-in-differences in this context and its application is straightforward.

The need for estimation (using DiD or any other method) arises as it is not possible to directly measure the impact of KiwiSaver on an individual's pattern of net worth accumulation. This is because while the accumulation of net worth is observable for members of KiwiSaver after they have joined, the counterfactual is not. That is, the pattern of net worth accumulation for those same individuals over the same time period that would have resulted had they not joined KiwiSaver is not observable.

To estimate KiwiSaver's impact, the change in net worth that occurs before and after the introduction of KiwiSaver (in this case between waves 2 and 4, and 6 and 8 respectively) for those individuals who eventually become KiwiSaver members is first compared. Any difference cannot be solely ascribed to the effects of KiwiSaver membership, however, as other factors may also influence net worth accumulation. The change in net worth occurring before and after the introduction of KiwiSaver must also be compared to a control group (in this case those that do not join KiiwiSaver). By taking the difference-in-differences between these two groups an estimate of the effect of KiwiSaver on net worth accumulation is provided which attempts to hold constant the effects of other influences on net worth accumulation. Figure 3.1 illustrates with an example.

The vertical line marks the introduction of KiwiSaver in July 2007 (falling in the fifth wave of SoFIE). The net worth of two groups is considered both before and after this point, that is, those individuals that will eventually join KiwiSaver (blue) and those that will not (green). Assignment to these groups is based on an individual's KiwiSaver membership status in the final wave of SoFIE.[28]

[28] Hence the comparison groups are fixed over time. Another possibility for assignment to the KiwiSaver membership group would be to base this on KiwiSaver membership status at wave 6. However, at wave 6 few people had joined KiwSaver, as at this stage the scheme was very new. In section 3.5 the effect that such differences could make to estimates of the impact of KiwiSaver on the net worth accumulation of its members is explored further.

Figure 3.1: Estimating the impact of KiwiSaver on net worth accumulation by DiD

Before the introduction of KiwiSaver, Figure 3.1 shows both of these groups accumulating net worth (between waves 2 and 4) at approximately the same rate. The vertical distance **A** is the change in net worth for eventual KiwiSaver members and **B** is the change in net worth for non-KiwiSaver members. In the case illustrated **A** = **B** for expositional convenience, however, in reality this may not be the case.

After the introduction of KiwiSaver, both KiwiSaver members and non-members experienced an increase in their respective rates of accumulation of net worth. In other words, **C** > **A** and **D** > **B**. However, KiwiSaver members experienced a greater change in the speed of net worth accumulation, i.e. (**C** – **A**) > (**D** – **B**).

This is all the information that is required for the DiD estimator of the effect of KiwiSaver on the accumulation of net worth of those belonging to the scheme. The estimate is the difference of the differences, (**C** – **A**) – (**D** – **B**), and is positive in this example. Crucially, if in order to ascertain the effect of KiwiSaver on net worth accumulation one simply compared say changes in net worth

accumulation of KiwiSaver members before and after the introduction of the scheme the effect of KiwiSaver would have been overestimated; that is (**C** – **A**) > (**C** – **A**) – (**D** – **B**). Similarly, though not in the case of this illustrative example as **A** is set equal to **B** for convenience, if one simply compared the net worth accumulation of KiwiSaver members with non-members between waves 6 and 8, the effect of KiwiSaver on net worth accumulation would likely be incorrect. That is, (**C** – **D**) ≠ (**C** – **A**) – (**D** – **B**).

3.4.2 Results: difference-in-differences analysis

Results of the DiD analysis described above are now presented. These are weighted using the longitudinal sample weights available in SoFIE at wave 8. Reported changes in net worth between survey waves are the averages of the changes in net worth of those individuals belonging to the group of interest.[29]

Table 3.7 shows that on average both KiwiSaver members and non-members experienced positive changes in net worth (i.e. they accumulated net worth) between consecutive asset and liability waves of SoFIE in all cases. However, the rate of growth in net worth for both groups was much lower later in the period (between waves 6 and 8) than it was earlier in the period. This likely reflects, at least partially, the impact of the Global Financial Crisis (GFC). However, in terms of comparisons between KiwiSaver members and non-members it is important to remember that the GFC will have affected both groups. In the regression analysis undertaken in Section 3.5 some of the factors that might have resulted in individuals being affected differently by this shock will be accounted for.

[29] As before these are nominal changes in net worth, with inflation being common to both KiwiSaver members and non-members. In section 3.5 the effects of house price inflation on net worth accumulation are allowed for.

Table 3.7: Net worth changes of KiwiSaver members versus non-members

KS membership status	Period	Relationship to Figure 3.1	Mean change in NW ($)
Members	Wave 2-4	**A**	42,011
	Wave 4-6		43,909
	Wave 6-8	**C**	9,487
	Difference	(**C** – **A**)	-32,524
Non-members	Wave 2-4	**B**	43,519
	Wave 4-6		37,435
	Wave 6-8	**D**	26,659
	Difference	(**D** – **B**)	-16,860
Difference-in-differences		(**C** – **A**) - (**D** – **B**)	**-15,664**

What is particularly interesting in the current context, however, is that the reduction in the rate of asset accumulation was more pronounced amongst KiwiSaver members than non-members. In particular, the rate of asset accumulation slowed by approximately $32,500 for KiwiSaver members compared to approximately $16,900 for non-members. In other words KiwiSaver members suffered a greater decline in net worth accumulation relative to non-members. Hence, the difference-in-differences estimator of the effect of KiwiSaver on the net worth accumulation of its members is negative and considerable at approximately -$15,700.[30]

As membership of KiwiSaver was not randomly assigned, as individuals self select into the scheme, there is likely to be bias in this estimate, although *a priori*, the direction of any such bias is not clear. It is possible that differences in characteristics between KiwiSaver members and non-members may be important for net worth accumulation. To the extent that these are not fully accounted for, they may be confounding results. As a first step toward correcting for the influence of other factors, a series of DiD estimates are made, each conditioning on one selected characteristic at a time. These include age, gender, partnership status, home ownership status, highest qualification, income, and net worth. Table 3.8 summarises these DiD estimates.

[30] As KiwiSaver was introduced in wave 5, the change in net worth between waves 4 and 6 is not used in the calculation of the DiD estimator. It is included in Table 3.7 for completeness and illustration only.

Table 3.8: Summary of the difference-in-differences estimates by characteristic ($)

Characteristic		KS members difference (**C** – **A**)	Non-KS members difference (**D** – **B**)	Difference-in-differences (**C** – **A**) - (**D** – **B**)
Age	15-24	8,617	8,764	-147
	25-34	8,339	-13,706	**22,045**
	35-44	-46,509	-8,814	-37,695
	45-54	-68,160	-52,559	-15,601
	55-60	-54,688	-12,946	-41,742
Gender	Male	-23,362	-18,502	-4,860
	Female	-40,330	-15,197	-25,133
Partnered	Never	-28,348	-10,219	-18,129
	Sometimes	-15,555	-17,156	**1,600**
	Always	-43,552	-19,186	-24,336
Home ownership	Never	-19,419	-10,949	-8,470
	Sometimes	-49,844	-15,961	-33,883
	Always	-32,306	-23,055	-9,250
Highest qualification	None	-15,343	-2,337	-13,006
	School	-42,529	-26,984	-15,544
	Post school vocational	-24,135	-16,738	-7,397
	Bachelor degree	-3,076	-19,200	**16,124**
	Higher degree	-115,113	-12,297	-102,816
Income quintile	1	-8,763	3,738	-12,501
	2	-12,742	-7,440	-5,302
	3	-16,045	6,052	-22,097
	4	-28,090	-10,475	-17,615
	5	-103,833	-75,396	-28,437
Net worth quintile	1	-19,609	-2,634	-16,975
	2	-24,357	-27,287	**2,929**
	3	-44,702	-35,505	-8,567
	4	-24,706	-29,543	**4,837**
	5	-52,838	7,753	-60,592

The right most column of Table 3.8 provides the DiD estimator for the effect of KiwiSaver membership on the accumulation of net worth for each case. The two columns immediately preceding this show the differences between changes in net worth that occurred between waves 2 and 4, and waves 6 and 8, for KiwiSaver members and non-members, respectively.

The results are broadly consistent with the overall DiD estimate in Table 3.7. There is evidence that membership of the KiwiSaver scheme is associated with

greater net worth accumulation relative to those not in the scheme in only five of the 28 cases examined (in bold). The DiD estimator is positive although small for those individuals belonging to the second and fourth quintiles of the net worth distribution or who have been partnered for only part of the analysis period. The effect of KiwiSaver membership on net worth accumulation may be positive and larger for those individuals aged between 25 and 34 or who have a bachelors degree.

There is no evidence of a positive effect on net worth accumulation from KiwiSaver membership for any subgroup when classified by gender, home ownership or income. The groups who may be most adversely affected by KiwiSaver membership include those individuals with a higher degree or who belong to the top quintile of the net worth distribution.

To summarise, the results of the analysis in this section suggest that KiwiSaver membership is associated with reduced net worth accumulation. However, there are two clear limitations to the DiD analysis presented.

First, the classification of continuous variables such as income, age or net worth, is restricted to discrete categories, with a consequent loss of information. Second, and more critical, is the fact that only one conditioning factor at a time is considered, when clearly the impact of KiwiSaver membership is likely conditioned by a whole series of factors acting together. To address these issues, the next section reports the results of a series of multivariate panel regressions.

3.5 Regression analysis

The underlying rationale for the panel regression analysis presented in this section is that changes in net worth are likely to be influenced by a wide range of variables in addition to KiwiSaver membership. Some of these variables are observed and measured in SoFIE while others are not. It is only by properly

correcting for the influence of these variables that one can expect to isolate the true effect of KiwiSaver membership on changes in net worth.

However, as membership in KiwiSaver was not randomly assigned,[31] it is unlikely that the DiD analysis of the previous section would have properly accounted for the effects of other variables on changes in net worth. Panel regression techniques allow for both observed and unobserved heterogeneity across the sample to be controlled for. Section 3.5.1 describes the panel regression methods employed. The results are summarised in Section 3.5.2.

3.5.1 Methodology

Given that changes in net worth have been chosen as the most appropriate outcome measure by which to assess KiwiSaver's performance, a panel of data with the dimensions i = 9,930 and t = 3 is available for regression analysis.[32] In other words, for each of 9,930 survey respondents there are three repeated observations on changes in net worth that occur between waves 2 and 4, 4 and 6, and 6 and 8, respectively.

The variables available cannot possibly capture all influences on net worth accumulation. In other words, there is likely to be unobserved heterogeneity across the sample. In the current context this could be, for example, due to different preferences for risk (perhaps related to health or longevity) or an individual's underlying propensity to save. In both cases, these differences could be systematically related to an individual's decision to join KiwiSaver.

Ordinary cross-sectional techniques cannot deal with this unobserved heterogeneity in the same way that techniques which use panel data can. In fact application of ordinary cross sectional techniques to panel data in the

[31] The analysis in Chapter 2 found very few variables were useful in predicting whether or not an individual was more or less likely to have joined KiwiSaver, including income or wealth. The few factors that were useful predictors of KiwiSaver membership were being older, expecting New Zealand Super to be ones main source income in retirement, being of other ethnicity, being partnered, being self-employed and having an occupation of other.

[32] Though a balanced panel is not necessarily required for the regressions in this section, one is enforced for consistency with the difference-in-differences analysis of the previous section.

presence of unobserved heterogeneity can lead to incorrect standard errors and biased coefficient estimates.

Use of panel data permits models of the form:

$$\Delta NW_{it} = \alpha_i + \gamma_t + \beta_{KS} KS_{it} + \mathbf{X}_{it}\boldsymbol{\beta} + u_{it}$$

where the subscript refers to individual *i* as before, *t* refers to the time period,[33] α_i is an unobserved individual-specific effect that represents the permanent cross-individual heterogeneity, γ_t captures time-specific effects, and u_{it} is a time-varying idiosyncratic error.

The dependant variable (ΔNW_{it}) is the change in net worth that occurs between consecutive waves of SoFIE that contain asset and liability information (for example, between waves 2 and 4) for each individual *i*. $\mathbf{X}_{it}$ is a vector containing a large set of explanatory variables and $\boldsymbol{\beta}$ is a vector of the corresponding parameter values. The primary variable of interest in the current analysis is KS_{it} which is a categorical variable equal to one if an individual *i* is a member of KiwiSaver at time *t* and zero otherwise. The estimate of β_{KS} and its statistical significance therefore will provide an indication as to whether or not KiwiSaver has been associated with greater asset accumulation amongst its members.

Most explanatory variables are defined at the start of the period for which the change in net worth is being estimated, i.e. at wave 6 when estimating the change in net worth that occurred between waves 6 and 8. One exception is income, which is the sum of the income an individual earns over the period of asset accumulation that is included in regressions (in the current example, the sum of income earned in waves 7 and 8).

[33] The time dimension here is complicated. As will be explained shortly in some cases this represents the difference in a variable over time, in others the sum of that variable over time or a variables value at the start or end of a period. Precision to this degree in the notation is not necessary however for the current purpose.

The other important exception is KiwiSaver membership. In some regressions membership is classified based on whether or not the respondent was a member of KiwiSaver at the end of the period over which changes in net worth are measured. In others this classification is based on membership of KiwiSaver at the start of the period. These two approaches were adopted due to rapid growth in KiwiSaver membership over the period.

The first approach has the advantage of classifying many more respondents as KiwiSaver members (over twice as many). However, it means that individuals classified as KiwiSaver members may not actually have been members over the entire period for which changes in net worth are measured. For example, when estimating changes in net worth between wave 6 and 8, an individual classified as a KiwSaver member might have only joined the scheme in wave 7. If the true effect of KiwiSaver on members net worth accumulation is positive this could result in the effect of KiwiSaver being underestimated. It is to allow for this possibility that the alternative approach is also adopted. Descriptions of all of the variables used in regressions are provided in Table 3.9.

There are two common panel techniques that will be used to estimate the model. The first is Random Effects (RE) and the second is Fixed Effects (FE). Each of these approaches has advantages and disadvantages in the current context.

Under the right conditions the RE approach is the most efficient, providing the greatest power to identify any effect from KiwiSaver membership, for example. The RE approach also allows coefficient estimates to be obtained for variables that are constant over time, such as ethnicity. However, the approach requires that the unobserved individual-specific effects (α_i) are uncorrelated with the explanatory variables. This assumption is often difficult to sustain, including in the present case. For example, it might be that an individual's inherent preference for saving or risk (unobservable traits) might be correlated with their health, income or level of education.

Table 3.9: Variables used in the models

Variable name	Definition	Measurement over period
Change in Net Worth	Dependant variable - the change in net worth for a given individual between consecutive asset and liability waves of SoFIE ($)	End less Start
KS Member	A dummy variable equal to one if the respondent is a KiwiSaver member	End or Start
Net Worth	The level of an individual's net worth ($)	Start
Income	The gross income of an individual earned over the period ($)	Sum
Owns Home	A dummy variable equal to one if the respondent owns the home they live in	Start
Owns Investment Property	A dummy variable equal to one if the respondent owns an investment property	Start
Has a Mortgage	A dummy variable equal to one if the respondent has a mortgage	Start
Partnered	A dummy variable equal to one if the respondent is partnered	Start
Age	The age of the respondent	Start
Age Squared	The age of the respondent squared	Start
Female	A dummy variable equal to one if the respondent is female	Start
European	A dummy variable equal to one if the respondent is European. This category of ethnicity will be excluded from regressions.	Start
Maori	A dummy variable equal to one if the respondent is Maori	Start
Pacific Islander	A dummy variable equal to one if the respondent is a Pacific Islander	Start
Asian	A dummy variable equal to one if the respondent is Asian	Start
Other Ethnicity	A dummy variable equal to one if the respondent is an Ethnicity other than Maori, Pacific Islander, Asian or European	Start
Years of Schooling	The number of years of schooling received by the respondent	Start
Born in New Zealand	A dummy variable equal to one if the respondent was born in NZ	Start
Employed Full Time	A dummy variable equal to one if the respondent was employed full time. This category of employment will be excluded from regressions.	Start
Employed Part Time	A dummy variable equal to one if the respondent was employed part time	Start
Unemployed	A dummy variable equal to one if the respondent was unemployed	Start
Not in the Labour Force	A dummy variable equal to one if the respondent was not in the labour force	Start
Overseas	A dummy variable equal to one if the respondent worked overseas	Start
Excellent Health	A dummy variable equal to one if the respondent reported that they were in excellent health. This category of health status will be excluded from regressions.	Start
Very Good Health	A dummy variable equal to one if the respondent reported that they were in very good health	Start
Good Health	A dummy variable equal to one if the respondent reported that they were in very good health	Start
Fair Health	A dummy variable equal to one if the respondent reported that they were in very good health	Start
Poor Health	A dummy variable equal to one if the respondent reported that they were in very good health	Start
Wave 8 Dummy	A dummy variable equal to one when considering the final net worth change (between waves 6 and 8)	End
Wave 6 Dummy	A dummy variable equal to one when considering the penultimate net worth change (between waves 4 and 6)	End

The FE approach, on the other hand, allows for arbitrary correlation between the α_i and explanatory variables. The FE estimator is less efficient than the RE estimator however, and it is not possible to obtain coefficients for variables that are constant over time, such as gender.[34]

3.5.2 Results

Results of both RE and FE (unweighted and weighted) regressions are summarised in Table 3.10.[35] In this set of regressions, KiwiSaver membership is defined at the end of each respective period over which changes in net worth are examined. As previously discussed, this approach has the advantage of classifying the greatest number of respondents as KiwiSaver members.

The left hand column lists the explanatory variables. As is made clear in Table 3.9, a significant number of these are categorical as distinct from continuous variables. In most cases the categorical variables are not grouped and so are straight forward to interpret. For example, the coefficient estimate on the variable labelled 'owns home' provides an estimate of the average effect on net worth accumulation of owning the home in which the respondent lives, compared to others who do not own their home.

There are four groups of categorical variables, however. These are ethnicity, employment status, time period, and health status. The coefficients reported for each category of a group are the differences between the particular category and an omitted category. The respective omitted categories for each group are European, full-time employed, the first time period over which net worth changes are measured and excellent health. In the first column of results, the coefficient estimate on the variable labelled 'good health', for example, should

[34] An alternative to either RE or FE is Correlated Random Effects (CRE). This approach models the correlation between the α_i and explanatory variables. However, given the model employed and the short time dimension of the panel, CRE is unlikely to be appropriate.

[35] As heteroscedasticity is not a particular concern in relation to the regression analysis presented in this chapter, white-adjusted standard errors have not been calculated. Nevertheless, recall that even if heteroscedasticity were present, estimators and predictions based on them remain unbiased and consistent, though they would no longer be BLUE (Best Linear Unbiased Estimators).

be interpreted in the following way. On average, those individuals reporting a good health status had a change in net worth of $31,939 less than those individuals reporting excellent health (the omitted category).

When the model is estimated using RE the effect of KiwiSaver membership on changes in net worth is estimated to be -$10,024 and is statistically significant. In other words, KiwiSaver membership is associated with a smaller accumulation of net worth compared to those not in KiwiSaver after allowing for the effects of a large range of other conditioning variables.

Four variables are positively associated with changes in net worth and are statistically significant. These are income, property ownership (both own home and investment property) and years of schooling. For example a $1 Increase in income is associated with 27 cents greater change in net worth. The overall effect of age (considering both variables age and age squared) is also positive. Conversely, those with a mortgage had a significantly smaller change in net worth than those not holding a mortgage. All ethnic groups had significantly lower increases in net worth than Europeans (the omitted category), and all those reporting any health status less than excellent, likewise had a lower increase in net worth (relative to excellent health).

Table 3.10 also presents the results of the model when estimated using FE. As explained in the previous subsection, those variables whose values are not observed to vary over time (specifically gender, ethnicity and whether born in New Zealand) are eliminated by the estimation procedure. Results for two versions of FE estimation are presented. The first uses unweighted data, as does the RE estimation procedure. The second provides FE estimates that are weighted using the longitudinal sample weights available in SoFIE at wave 8.

Table 3.10: Regressions on changes in net worth

Variable	RE	FE	FE (weighted)
KS Member (End)	**-10024.40***	**-3902.23**	**-6375.28**
	(4492.66)	**(5169.47)**	**(5499.25)**
Net Worth	-0.46**	-1.26**	-1.26**
	(0.01)	(0.01)	(0.06)
Income	0.27**	0.04**	0.07
	(0.01)	(0.01)	(0.06)
Owns Home	65205.43**	7021.96	1911.78
	(4755.77)	(7254.31)	(14213.84)
Owns Investment Property	72477.26**	-2531.46	-4811.74
	(5063.39)	(7130.79)	(12153.08)
Has a Mortgage	-40242.11**	4139.71	6232.15
	(4670.05)	(6639.49)	(9287.98)
Partnered	-9906.91**	-12287.28	-17123.07*
	(3814.00)	(7027.48)	(7541.96)
Age	5831.41**	-11128.48	-11167.04
	(977.87)	(11301.42)	(12413.85)
Age Squared	-32.96**	64.49	120.99**
	(11.52)	(34.52)	(39.28)
Female	3710.95		
	(3485.63)		
Maori	-35048.47**		
	(5485.95)		
Pacific Islander	-50696.58**		
	(9383.10)		
Asian	-26931.05**		
	(8619.29)		
Other Ethnicity	-49625.63**		
	(13903.73)		
Years of Schooling	7785.04**	-5657.37	-5097.57*
	(748.29)	(3383.35)	(2089.48)
Born in New Zealand	-5820.36		
	(5108.95)		
Employed Part Time	-2915.62	-6648.23	-4186.57
	(4615.33)	(6034.95)	(5904.60)
Unemployed	-23108.75	-6593.04	-7908.05
	(13212.97)	(13809.87)	(5888.54)
Not in the Labour Force	1117.19	-14931.28*	-10853.18
	(5040.81)	(7193.69)	(8237.25)
Overseas	-5050.57	-6641.12	-7058.19
	(138639.10)	(134291.60)	(8707.32)
Very Good Health	-14142.70**	124.00	-1513.12
	(3781.17)	(4411.95)	(4289.42)
Good Health	-31939.08**	-4581.49	-5478.19
	(4614.80)	(5738.85)	(5487.58)
Fair Health	-43345.88**	-1929.44	1410.08
	(7800.36)	(9568.40)	(7120.90)
Poor Health	-66504.14**	-6214.24	-4295.93
	(14103.52)	(17039.92)	(8334.15)
Wave 8 Dummy	-897.00	103463.60*	89481.26
	(4349.07)	(43685.78)	(49485.94)
Wave 6 Dummy	6003.41	62422.55**	55239.17*
	(4043.04)	(22015.99)	(24681.99)
Constant	-185819.90**	657127.50	535145.20
	(22054.87)	(451505.70)	(487158.10)
Observations	29790	29790	29790
R-Squared	0.1943	0.1200	0.1330

Notes: Standard errors are given in parentheses. Significance levels are denoted either ** (1% level) or * (5% level).

The two versions are provided because the unweighted estimates give the most appropriate comparison with RE estimation as RE does not allow for the use of weights.[36] FE estimation does, however, provide for the use of weights so the second version allows one to consider whether omitting sample weights is likely to affect conclusions about the effects of KiwiSaver membership in particular on net worth accumulation.

The key finding is that there is no evidence of a significant effect on the change in net worth from KiwiSaver membership. This applies in the case of both the weighted and unweighted FE estimates. As in the case of the RE model, the estimated effect remains negative, implying KiwiSaver membership is associated with a smaller increase in net worth than for non-members. Not surprisingly, given the discussion of differences between FE and RE estimation in the previous subsection, the effect of KiwiSaver membership on net worth accumulation is now no longer statistically different from zero. A similar loss of statistical significance can be observed across a number of other variables in the model and in some cases coefficient estimates have changed signs. With such differences in parameter estimates between the RE and FE models FE estimates are likely to be the most robust.[37]

One variable which is statistically significant across all three model specifications in Table 3.10 (and indeed in Table 3.11) is Net Worth. Recall that this is the level of an individual's net worth at the start of each period over which changes in net worth (the dependant variable) are observed. The coefficient estimate on this variable in each case is negative which is what one would predict if the type of classical measurement error in net worth postulated in section 3.3 is present. Inclusion of net worth as an explanatory variable will

[36] This is not a particular concern however as most dimensions upon which weights are based are included in regressions, i.e. age, gender, ethnicity etc.
[37] Durbin-Wu-Hausman specification tests support FE estimation with test statistics of 8539.8 and 8545.69 for Tables 3.10 and 3.11, respectively.

have, in part at least, mitigated the potential effect of any measurement error on the results.[38]

Finally, Table 3.11 reports a similar set of results when the alternative KiwiSaver membership definition is adopted. In this set of regressions KiwiSaver membership is defined at the start of each respective period over which changes in net worth are examined. As previously discussed, this approach has the advantage of classifying only those individuals who have been enrolled in KiwiSaver for the entire period over which changes in net worth are examined. This minimises the chance that the true effect of KiwiSaver membership on net worth accumulation is diluted or obscured through inclusion of individuals with very short membership tenure.

Results are very close to those reported in Table 3.10, indicating that different definitions of KiwiSaver membership do not change the key finding.[39] In particular, the length of membership in KiwiSaver does not appear to have any material impact on net worth accumulation. The RE and FE (weighted and unweighted) estimates of the model both yield negative coefficients on the KiwiSaver membership variable. These are marginally significant when RE is applied, but not significantly different from zero when either FE specification is applied.

[38] Any such measurement error would only effect the precision of the results (make it more difficult to attain statistically significant results) but would not bias coefficient estimates.

[39] Though not reported here all regressions in this section were also estimated with the inclusion of a variable that measured the respondents' share of gross assets held in housing to better account for differences in portfolio composition. In all cases the estimated effect of KiwiSaver membership on net worth accumulation was similar to those reported. However, these are not the preferred regression specifications as the inclusion of such a variable has the potential to capture some of the treatment effect from KiwiSaver membership.

Table 3.11: Regressions on changes in net worth (alternative KS specification)

Variable	RE	FE	FE (weighted)
KS Member (Start)	**-10857.61**	**-4093.26**	**-2454.65**
	(7152.87)	**(6916.06)**	**(6458.33)**
Net Worth	-0.46**	-1.26**	-1.26**
	(0.01)	(0.01)	(0.06)
Income	0.27**	0.04**	0.07
	(0.01)	(0.01)	(0.06)
Owns Home	65231.56**	7033.75	1967.63
	(4755.96)	(7254.31)	(14210.89)
Owns Investment Property	72373.20**	-2539.83	-4779.37
	(5063.53)	(7130.86)	(12138.36)
Has a Mortgage	-40166.40**	4134.03	6219.56
	(4670.20)	(6639.69)	(9305.26)
Partnered	-9884.09**	-12260.51	-17074.25*
	(3814.26)	(7027.63)	(7541.96)
Age	5861.86**	-11206.38	-11133.19
	(977.98)	(11303.76)	(12391.39)
Age Squared	-33.41**	65.23	120.74**
	(11.52)	(34.62)	(39.81)
Female	3567.76		
	(3484.72)		
Maori	-34958.77**		
	(5485.96)		
Pacific Islander	-50861.75**		
	(9383.85)		
Asian	-26832.17**		
	(8619.48)		
Other Ethnicity	-49759.47**		
	(13904.21)		
Years of Schooling	7760.23**	-5675.88	-5159.61*
	(748.19)	(3383.14)	(2086.26)
Born in New Zealand	-5730.95		
	(5109.01)		
Employed Part Time	-3011.87	-6669.16	-4177.74
	(4615.35)	(6035.28)	(5901.77)
Unemployed	-23349.73	-6740.55	-7997.63
	(13213.93)	(13809.90)	(5861.40)
Not in the Labour Force	1274.18	-15067.30*	-10953.92
	(5041.76)	(7196.86)	(8214.11)
Overseas	-6245.88	-7544.05	-8202.56
	(138644.20)	(134288.60)	(9048.36)
Very Good Health	-14190.93**	109.52	-1609.47
	(3781.42)	(4411.87)	(4304.90)
Good Health	-31888.30**	-4584.18	-5508.21
	(4615.10)	(5738.88)	(5493.35)
Fair Health	-43089.62**	-1822.53	1500.29
	(7799.56)	(9568.80)	(7101.52)
Poor Health	-66127.30**	-6126.41	-4210.63
	(14102.31)	(17039.60)	(8320.13)
Wave 8 Dummy	-2646.95	102808.30*	87485.50
	(4221.84)	(43664.74)	(49421.83)
Wave 6 Dummy	4125.03	61717.83**	54064.16*
	(3958.06)	(21996.77)	(24751.00)
Constant	-185988.60**	659241.20	535047.80
	(22058.07)	(451525.60)	(486750.10)
Observations	29790	29790	29790
R-Squared	0.1942	0.1199	0.1330

Notes: Standard errors are given in parentheses. Significance levels are denoted either ** (1% level) or * (5% level).

To summarise, the results of the regression analysis in this section do not support the hypothesis that membership of the KiwiSaver scheme has been associated with greater net worth accumulation amongst its members. That is, most regression specifications yield coefficient estimates on KiwiSaver membership that are not statistically different from zero.

On the face of it this may not appear consistent with the first key finding of Chapter 2 that around one third of KiwiSaver contributions represented new saving. However, that finding was based on a self reported flow measure of saving whereas the current analysis relies on a stock measure of saving. Differences between the two results can, at least in part, be explained by returns on assets or inflated self reporting of additional saving flows. With respect to the second key finding of Chapter 2, consistency with results of the current analysis is more obvious. That is, no association between KiwiSaver membership and expected retirement income outcomes was found (an important element of which must be net worth at retirement).

3.6 Conclusions

KiwiSaver was introduced in 2007, prompted by a view that household saving in general appeared to be low and declining. Further, that there may be some who would reach retirement with an accumulation of wealth insufficient to allow them to sustain their pre-retirement standard of living. The objective of this chapter has been to analyse the extent to which membership of the KiwiSaver scheme has been associated with greater accumulations of net worth amongst its members.

The analysis in this chapter utilised two linked sources of data, the Survey of Family, Income and Employment and administrative data from the Inland Revenue Department. SoFIE was a longitudinal survey which included, as well as a wide range of socio-economic variables, details of individual assets and liabilities. Administrative data from IRD provided individual KiwiSaver

membership information. The resulting linked data set covered the eight-year period to 2010. Asset and liability data were measured four times during this period and formed the basis for analysing changes in net worth.

Careful consideration was given to the choice of an outcome measure upon which to base an assessment of KiwiSaver's performance. Three options were considered, that is, net worth, changes in net worth and savings rates. Changes in net worth were chosen due to their analytical appeal and superior distributional properties (particularly in relation to savings rates).

Analysis was based on two approaches. The first used a difference-in-difference technique. This technique compares outcomes (in this case changes in net worth) before and after the introduction of a programme such as KiwiSaver, across two groups (those in the programme and those not). In this way those who are not members of the scheme formed a control group.

Results of this approach suggested the accumulation of net worth by members of KiwiSaver was some $16,000 less than the comparable accumulation of non-members. Further, in an attempt to hold some of the other factors likely to affect net worth accumulation constant, the DiD analysis was repeated by age, gender, education, income, wealth, partner and home ownership status. There was a positive effect in only five of the 28 cases examined. In three of these cases the estimated effect was small. In one case, however, the estimated effect was relatively large, at $20,000 in favour of KiwiSaver members. All other cases indicated KiwiSaver members' accumulated less than non-members.

The DiD analysis only held one factor constant at a time however. To address this limitation, various fixed and random effect panel regression models were estimated in which changes in net worth were related to many factors simultaneously. These included KiwiSaver membership, income, net worth, age, gender, partnership status, home and investment property ownership, ethnicity, if the respondent was born in New Zealand, education, labour force and health status. With four observations over time on assets and liabilities in SoFIE it was possible to measure three changes in net worth for each of

approximately 10,000 individuals. This provided nearly 30,000 observations for inclusion in each regression.

The effect of KiwiSaver membership on net worth accumulation was estimated to be negative in all model specifications examined, although coefficient estimates were typically not statistically significant at conventional levels. While the findings of this chapter appear clear, caution is still warranted in their interpretation.

First there is evidence of significant measurement error in key variables. In particular, the distributions of changes in net worth are wide, and there is little correlation in these changes over time for individuals. Attempts to control for this measurement error in regressions were made, however, these may have only been partially successful. Second, the data is only available up until late 2010, meaning some KiwiSaver members would only have been enrolled for a relatively short time. However, regression estimates suggest that tenure in KiwiSaver has little effect on net worth accumulation. Finally, the period over which changes in net worth are analysed (2002 to 2010) is relatively short, potentially making it difficult to control for the effects of cyclical factors.

One should remember, however, that the results of this study are surprisingly consistent with the findings of the evaluation of KiwiSaver's performance presented in Chapter 2. In particular, the analysis of the previous chapter found no association between KiwiSaver membership and expected retirement income outcomes (an important element of which must be net worth at retirement). The analysis presented in this chapter, which used completely different techniques and data from the first evaluation, provides a second piece of evidence which suggests that KiwiSaver membership, at least until 2010, had not been associated with greater accumulation of net worth, and hence improved retirement income outcomes.

This calls into question the value of the scheme and its ongoing existence. At a minimum, the evaluation of KiwiSaver's performance presented in Chapters 2 and 3 provides support for many of the changes to the policy which were

announced in Budgets 2011 and 2015, and in particular, those which reduced the subsidies associated with KiwiSaver. However, further changes limiting KiwiSaver's scope may well be beneficial. Of course, KiwiSaver is not the only policy in New Zealand with implications for retirement income, and KiwiSaver's limited success in terms of meeting both its explicit and implicit objectives will have implications for these policies. In the next chapter, the potential effects of three policy options on household and national savings, designed to reduce the fiscal costs of New Zealand Superannuation, are examined.

Chapter 4

Retirement Income Policy and National Savings

4.1 Introduction

A central part of retirement income policy in New Zealand is New Zealand Superannuation (NZS), a universal government-funded pension intended to insure a basic standard of living for the elderly. In 2010 the costs of NZS, which are met out of general taxation, were approximately 4.3% of GDP. By 2015 this figure had increased to 4.8% and, if the parameters of NZS remain unchanged, the costs of NZS are projected to rise to 7.9% of GDP by 2060 (Treasury, 2013 and 2016).

While the current fiscal costs of NZS are relatively low when compared to public expenditures on pensions in other OECD countries, the projected proportional increase is significant and will likely necessitate changes to the policy in the future that will diminish its generosity. Indeed, a number of OECD countries, among which New Zealand's public pension system is an outlier in many respects, have already made changes to their public pension systems that will mitigate the effects of population ageing (OECD, 2017).

This chapter outlines analysis of the effect of three retirement income policy options on household and national savings in each year between 2013 and

2061.[40] Designed to reduce the future costs of NZS and canvas a broad (but by no means exhaustive) range of approaches, these policies are to:

1. raise the age of eligibility for NZS by two years (from 65 to 67);
2. index NZS payments by the average of wages and the general price level (currently NZS payments are indexed only to wage growth); and
3. introduce compulsory private saving and use those accumulations to reduce NZS entitlements.

In each case the policy is assumed to have been announced in 2013 and implemented in 2020. The first two options maintain the universality of NZS. The third option does not. NZS would no longer necessarily be received by everyone in this case and those who would receive NZS would each be entitled to different amounts. In particular NZS entitlements would be inversely related to an individual's lifetime income. Therefore, while all three options clearly have intergenerational redistributive effects, the third option also has a substantial intergenerational redistributive element to it.

Given the rising costs of NZS, an understanding of how various changes to the system could bring about fiscal savings would be useful in order to balance competing public spending pressures in the future. An understanding of how implementation of these policies might affect household and national savings is important for a number of reasons. These include links to external vulnerabilities (Saving Working Group, 2011; and Brook, 2014) and the capital stock (Coleman, 2014b), both of which impinge on economic growth. Further, Chapters 2 and 3 of this thesis suggest that the introduction of KiwiSaver in 2007 has likely had little effect on either household or national savings.

As each NZS option described above represents a shift in part from a Pay As You Go (PAYGO) toward a Save As You Go (SAYGO) retirement income system, they are likely to have more substantial effects on individuals' saving

[40] The analysis was originally undertaken to inform Treasury's 2013 Long Term Fiscal Statement.

behaviour and hence national savings than KiwiSaver. Indeed, Talosaga and Vink (2014) found that when the age of eligibility for NZS was previously increased from 60 to 65 years of age between 1992 and 2001 the average saving rates of affected households increased. Similarly, Lachowka and Myck (in press), who also use a difference-in-differences regression approach, examine the relationship between public pension wealth and private saving following Poland's 1999 pension reform with around one quarter of the variation in public pension wealth due to the reform being transmitted to household saving.

In addition, cross-country evidence provided by Samwick (2000) suggests that countries with PAYGO retirement income schemes have lower saving rates than those that do not. Schmidt-Hebbel (1998) provides a survey of empirical evidence which directly examines the relationship between PAYGO funded retirement income systems and capital accumulation or savings rates. Interestingly, the relationship between funding arrangements and saving appears to go beyond retirement income systems. For example, Gokhale et al. (1996) found an association between declining post-war saving rates in the U.S. and the expansion of the PAYGO-funded medical system.

As the approach taken to model KiwiSaver's effects on national savings in Chapter 2 made no explicit link between the policy and NZS entitlements, that approach will not be helpful in the current context. Instead, the approach taken in this chapter is to use life expectancy and population projections to consider the contributions that many overlapping cohorts, as well as the government, would make to national saving in response to a policy change given various assumptions about their propensity to save. Cohorts are also able to adjust to any policy change by altering their consumption patterns in retirement and the timing of the decision to retire. The consequences of these decisions, such as their effects on various forms of tax revenue, are also considered.

Results suggest that even seemingly modest changes to retirement income policies could lead to substantial cumulative changes in national saving by 2061. In particular, a change to the indexation of NZS is estimated to lead to

cumulative changes in national savings by 2061 of approximately 87% of GDP. Introducing compulsory private saving where accumulations are used to reduce the costs of NZS as well as lifting the age of eligibility for NZS are also both estimated to yield substantial cumulative changes in national savings by the end of the period (each by approximately 38% of GDP).

Results also suggest that each of the three policy options considered have very different distributional effects both within and across age cohorts. Within cohorts all individuals are treated the same under the first two policy options. This is not the case with respect to compulsory private saving with abatement of NZS entitlements. In fact, the tax system together with several aspects of this policy's design mean that within almost all age cohorts those in the top income decile in each year of life will lose more than six times the amount of NZS entitlements than will those in the second income decile.

Reflecting on the rationale for each policy's design however, being to improve the fiscal sustainability of NZS, lifting the age of eligibility for NZS appears able to generate superior improvements in the government's fiscal position compared to the other two policy options over the medium to long term. Indeed, in this respect the option of compulsory private saving with abatement of NZS entitlements does not generate the same annual level of fiscal improvement as lifting the age of entitlement until 2057.

The remainder of this paper is organised as follows. Section 4.2 describes three policy options designed to improve the fiscal sustainability of NZS. The modelling strategy employed to assess their implications for household and national saving, as well as the data used, are outlined in Section 4.3. Section 4.4 presents results, including the possible cumulative effect of each policy on New Zealand's net international investment position (NIIP) by 2061. Conclusions are drawn together in Section 4.5.

4.2 Retirement income policy options

A central part of retirement income policy in New Zealand is NZS, a universal government-funded pension intended to insure a basic standard of living for the elderly. Currently New Zealand residents are eligible for NZS from the age of 65, with payments generally increasing over time in line with wage growth.[41] The costs of NZS are met out of general taxation, making NZS what is commonly referred to as a PAYGO pension scheme.

If the parameters of NZS remain unchanged the scheme will expand due to increased life expectancy. In particular, an individual reaching the age of 65 in 2060 can expect to live (and receive NZS) for an additional 4.4 years compared with the same person in 2010. Three policy options to improve the fiscal sustainability of NZS examined in this chapter (primarily for their possible effects on national savings) include: raising the age of eligibility for NZS; changes to indexation of NZS payments; and introducing compulsory private saving where accumulations are used to reduce NZS entitlements. The exact details of these policies are described below.

4.2.1 Raising the age of eligibility for NZS

There are several possible variants for increasing the age of eligibility for NZS, including, for example, indexing this to improvements in life expectancy. For simplicity, however, it is assumed that the age of eligibility is increased by two years from 65 to 67. Compared to projected improvements in life expectancy this is a relatively modest increase, with life expectancy increasing by this much between 2010 and 2030.

The policy change is assumed to have been announced in 2013, but not implemented until 2020 in order to give people time to prepare. Given this

[41] To meet residency requirements for New Zealand Superannuation, an individual must have lived in New Zealand for 10 years since they were aged 20 years, of which five years must have been since they were aged 50.

timing those 60 years of age and older in 2013 will be unaffected by this policy. The universal provision of NZS will remain unchanged and payments will be the same for all those receiving NZS at any particular point in time.

To simplify the forthcoming modelling the increase in eligibility age happens all at once rather than being staggered over several years as happened when the age of eligibility for NZS was increased from 60 to 65. This simplification has a negligible effect on results.[42]

4.2.2 Changing the indexation of NZS

Currently NZS payments are linked to nominal wage growth. For this option it is assumed that a less generous indexation methodology will apply while the age of entitlement for NZS remains unchanged at 65. In particular, nominal NZS payments will increase at the average rate of wage and CPI growth. More precisely, assuming nominal wage growth of 3.5%[43] and inflation of 2%, NZS payments will increase by 0.75 percentage points less on average per year (at 2.75%) than would be the case under the status quo.

As was the case with the previous policy option, the change is assumed to have been announced in 2013, but not implemented until 2020. Given this timing and longevity projections, those 84 years of age and older in 2013 will be unaffected by this policy. The universal provision of NZS will remain unchanged and payments will be the same for all those receiving NZS at any particular point in time. However, now each retiring cohort will lose more of their lifetime NZS entitlements (that would have been received under the status quo) than the previous cohort. Over a long period NZS entitlements will be substantially less under this option than the status quo, however, the purchasing power of NZS will still be greater than it is today.

[42] This is particularly so with respect to national savings. In the absence of this simplification fiscal savings resulting from the policy change would, however, be slightly delayed.
[43] Comprising 1.5% productivity growth and 2% inflation.

4.2.3 Compulsory private saving

The final option considered is the introduction of a compulsory private savings scheme where accumulations are used to reduce NZS entitlements. This policy requires a more precise description than the previous two options. For example, one must specify exactly for whom it is compulsory, for how long, at what level of contribution, from where those contributions are sourced and so on.

Assumed is a compulsory private saving scheme, similar in all other respects to KiwiSaver as it existed in 2013 when this policy change was assumed to have been announced. All those aged between 25 and 64 inclusive with positive income that are either salary/wage earners or are self-employed must contribute. This equates to about 70% of the 25-64 year old population. Those individuals will be required to contribute 3% of their gross income as will their employers (however Employer Superannuation Contribution Tax (ESCT) will be deducted from these contributions).

Government contributions will initially include a Member Tax Credit (MTC) of up to $521 which matches individuals' contributions at fifty cents in the dollar and a kick-start of $1000 for new members. These contributions will increase in line with wage growth over time.[44]

Once an individual reaches the age of 65 their accumulations in the compulsory saving scheme are then compared with their expected lifetime NZS entitlements. For every dollar they have accumulated they will lose fifty cents of NZS, and will continue to do so until their entire expected NZS entitlements have been abated away. However, rather than have the government collect a portion of an individual's compulsory private savings accumulations the day that

[44] Though no such mechanism exists within the design of KiwiSaver the current exercise requires consideration of contributions more than a century into the future, by which time inflation would have eroded the real value of the MTC and kick-start to virtually nothing without such an assumption. It also has the significant advantage of greatly simplifying the modelling of this option.

they turn 65, a reduced stream of NZS entitlements that is unique for each individual is calculated.

This policy is again assumed to have been announced in 2013, but not implemented until 2020. With this timing all those 58 years of age and older will be unaffected by this policy.

This policy is very different from the first two options outlined. NZS would no longer necessarily be received by everyone meeting residency requirements. Individuals who do receive NZS would receive different levels of payments, even those of the same age receiving NZS at the same time. Further, saving would be imposed on some individuals for whom that was not optimal at a particular point in time or who would have done so anyway in a preferred form (for example, by paying down ones mortgage), introducing welfare costs on these people. This option may be relatively attractive to those who consider individuals cannot be relied upon to make rational decisions about their retirement provisions on their own, or who consider that ex ante redistribution is an important component of retirement income policy.

4.3 Modelling national savings

In this section the approach to modelling national savings is discussed. This approach stems from a desire to model the three policies outlined in the previous section in a consistent way and the realisation that each will result in a loss of an individual's current expected NZS entitlements.

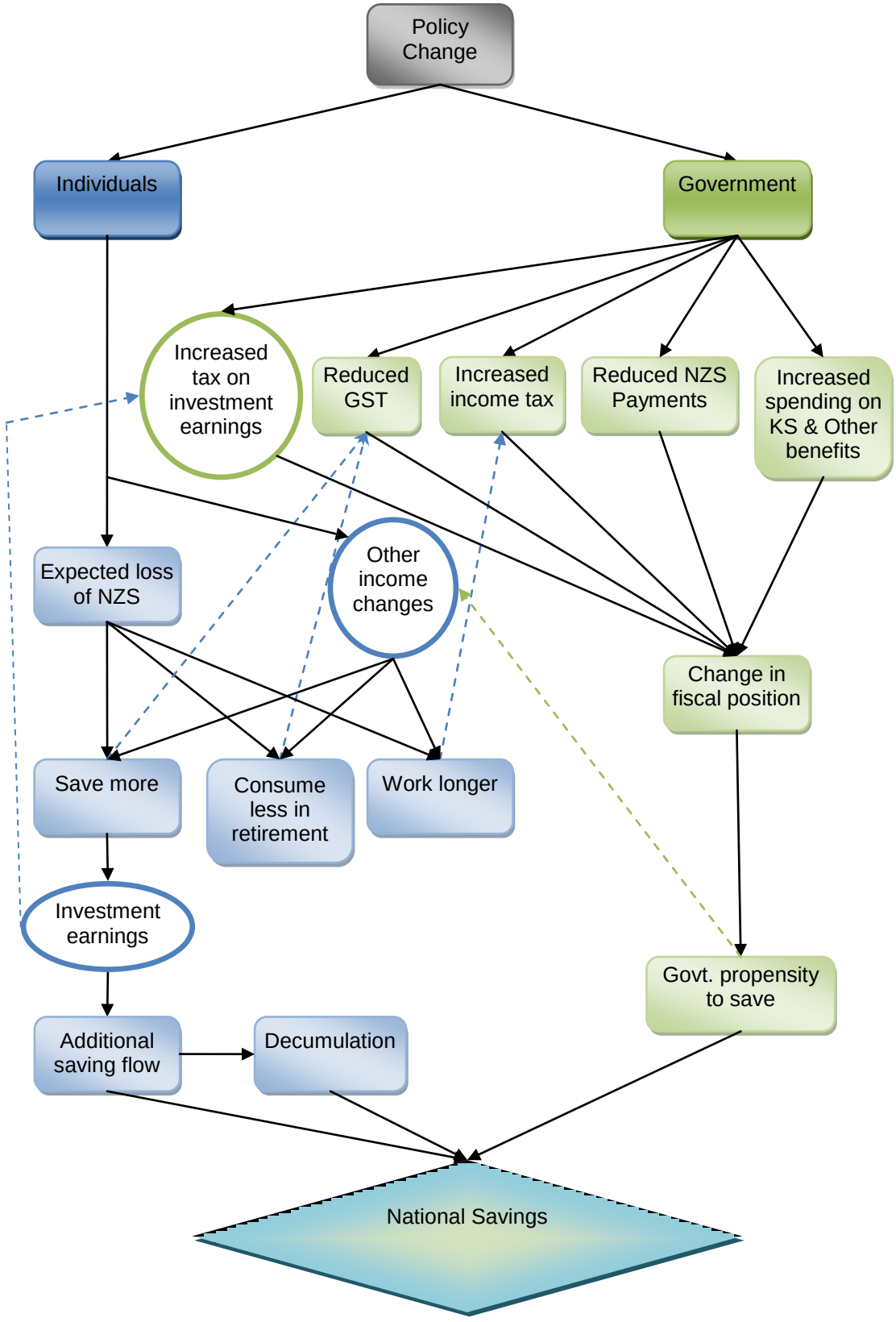
The model is outlined in Figure 4.1, with ovals representing potentially important elements that have been excluded. The effects of a retirement income policy change on national savings are considered for both individuals (in blue) and the government (in green). In the case of individuals the first step is to determine the expected loss of NZS entitlements that the policy change would bring about compared with the status quo. Individuals then choose to respond in one, or a combination of three ways. They save more over their working lives, consume

less in retirement or work longer than they otherwise would have. This allows for the calculation of additional saving flows for individuals over time and the eventual decumulation of those savings. In any given year, to calculate the total contributions that individuals make to national savings, savings flows are simply added over all individuals belonging to cohorts aged between 25 and 64 in that year, and any decumulation by individuals belonging to cohorts aged 65 and older is subtracted.

In the case of the government, the first step is to determine the effects that the policy change would have on a number of elements of its budget constraint. These include reduced expenditures on NZS and increased expenditures associated with other policies such as KiwiSaver. Depending upon how individuals choose to respond to the policy change, effects on revenues such as GST and income tax are also important. These are then combined in any given year to arrive at the overall change in the government's fiscal position. However, before estimating the effect on national savings an assumption about the government's propensity to save must first be made.

In the remainder of this section the process of modelling the contributions that individuals and the government might make to national savings in response to three distinct retirement income policy changes is described in more detail in Sections 4.3.2 and 4.3.3. First, a description of the data used is provided in Section 4.3.1.

Figure 4.1: Outline of the model



4.3.1 Data

Data requirements for this analysis are relatively modest. Population projections and life expectancies from Statistics New Zealand (SNZ) are the most important. However the Household Economic Survey is also used for information on income distributions and tax rates, as described in later sections.

Population projections for every year between 2013 and 2061 are used and provide not only an estimate of the total population of New Zealand in each of those years but also a detailed decomposition of that population by age. This allows examination of the contributions that many potentially different overlapping cohorts will make to national saving in response to each of the three policy changes considered. Cohorts are defined by their age in 2013. The youngest cohort considered will not be born until 2036 and will reach the age of 25 (the age from which adjustment to policy changes through additional saving is assumed to begin) in 2061. The oldest cohort assumed to adjust to policy changes through additional saving contains members who are 64 years of age in 2013. However, the oldest cohort considered contains members who are 83 years of age in 2013, having sufficiently long life expectancies such that a change to the indexation of NZS implemented in 2020 would still have a modest affect on them.

Life expectancies most relevant for this exercise are those conditional on reaching the age of 65 for all cohorts younger than this in 2013. The reason is that cohorts need to have some expectation about how long they will live beyond this point in order to determine how much of an effect any policy change will have on them, before they can decide how to change their saving behaviour.[45] However, as with population projections, SNZ provide this information only until 2061 yet the youngest cohort considered does not reach the age of 65 until 2101. To overcome this limitation, the average of the annual

[45] Of course, not all members of any given cohort will survive to the age of 65. However, this assumption simplifies the modelling substantially and one could argue is appropriate from a precautionary savings perspective.

improvement in life expectancy projected by SNZ to 2061 is applied for a further 40 years to 2101.

4.3.2 Individuals

The first step in ascertaining individuals' collective contributions to national savings that might result from a policy change effecting their NZS entitlements in each year between 2013 and 2061 is to calculate the total loss of expected future NZS entitlements faced by representative members of each age cohort affected by that policy change. Given the period of interest, life expectancy and the assumption that adjustment to policy change via saving begins from the age of 25 at the earliest, this calculation is required for cohorts aged between -23[46] and 83 years in 2013.[47]

The total loss in expected future NZS entitlements is measured as the stock of wealth that would be required by an individual on their 65th birthday (or at 2013 for those older than 65 in 2013) in order to provide an income stream exactly equal to their lost NZS income over retirement due to any policy change. Given a nominal interest rate (after tax and management fees) of 5% this is achieved by adding the discounted present values (to the 65th birthday) of each year's lost NZS entitlements respectively.

In the case of the first policy option considered (that of raising the age of eligibility for NZS by two years) calculating the total loss of expected future NZS entitlements faced by a representative member of any particular age cohort is relatively easy. There are only two years of lost NZS income to consider, those that will no longer be received by individuals when they are 65 and 66 years of age. The nominal value of those entitlements in any year is determined by the average after tax level of NZS entitlement (approximately $15,000 in 2013) and the rate of growth in wages, which is assumed to be 3.5% per annum.

[46] That is, those who will not yet be born for 23 years (from 2013).
[47] Those aged 65 and older in 2013 will not be assumed to save more or work longer as a result of policy change. However, in the case of a change to the indexation of NZS entitlements they will still respond by lowering consumption, hence an estimate of their total loss of NZS entitlements is still required.

In the case of the second policy option considered (that of changing the way NZS is indexed), calculation of the total loss of expected future NZS entitlements is more complicated. It requires calculation of the difference between the nominal value of NZS entitlements under the status quo (when indexed to wage growth at 3.5% per annum) and those under the new indexation regime (when indexed to the average rate of wage and CPI growth at 2.75% per annum) in every year from 2020 to 2128. For each cohort a subset of the discounted present values (at the 65th birthday, or in 2013 for those already older than 65) of these differences are then summed depending upon the year in which its members reach 65 and their conditional life expectancy at 65 (or in 2013 for those already older than 65). For example, for the cohort who turns 65 in 2020 and has a conditional life expectancy of 20.7 years, it is the differences in NZS entitlements between 2020 and 2041 that are relevant.

In the case of the final policy option considered, the first step in the calculation of any losses in expected future NZS entitlements is to estimate balances in the compulsory private saving scheme for members of each cohort at their 65th birthday. This is not straightforward, however, because the tax system, together with the design of this particular policy option, treats individuals very differently depending upon their incomes. To account for this, estimates of retirement balances for ten representative individuals for every cohort are calculated using the income, tax and policy information in Table 4.1 below.

Recall from the previous section that only individuals aged between 25 and 64 who are employed are expected to contribute to the scheme. The average income values for each income decile are therefore calculated for these sources of income only and for individuals who are self-employed or salary and wage earners of this age using the Household Economic Survey from Statistics New Zealand. With income on average being negative for those belonging to the bottom income decile,[48] only those belonging to income deciles 2 through

[48] Driven by negative self employment income.

10 will be compelled to contribute to the scheme. This group amounts to approximately 70% of the population aged 25 to 64 in any given year.[49]

Table 4.1: KiwiSaver contributions and returns by income decile (2013 starting values)

Income decile	Average income	PIE tax rate	ESCT tax rate	KS contribution (% of gross income)				Nominal return
				EE	ER	MTC	Total	
	($)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
1	-2,258	0	0	0	0	0	0	0
2	15,042	17.5	10.5	3.0	2.7	1.5	7.2	5.4
3	25,889	17.5	17.5	3.0	2.5	1.5	7.0	5.4
4	34,113	17.5	17.5	3.0	2.5	1.5	7.0	5.4
5	40,737	17.5	17.5	3.0	2.5	1.3	6.8	5.4
6	48,399	28	17.5	3.0	2.5	1.1	6.6	4.7
7	56,782	28	30	3.0	2.1	0.9	6.0	4.7
8	67,142	28	30	3.0	2.1	0.8	5.9	4.7
9	82,739	28	33	3.0	2.0	0.6	5.6	4.7
10	147,204	28	33	3.0	2.0	0.4	5.4	4.7

Notes: PIE stands for Portfolio Investment Entities. ESCT stands for Employer Superannuation Contribution Tax, and EE, ER and MTC stand for Employee, Employer and Member Tax Credit respectively.

The marginal tax rates provided are those that would apply given the average level of income for each income decile given current tax settings. For each income decile the annual after-tax flow of funds into the compulsory saving scheme can be calculated in terms of a percentage of gross income, being the sum of employee (EE), employer (ER) and government (MTC) contributions. While employee contributions (of 3% of gross income) are paid into the saving scheme before tax, employer contributions (also 3% of gross income) are deposited net of ESCT, with the rate at which this is applied depending upon income. Similarly, while the MTC initially matches employee contributions at a rate of 50 cents in the dollar, the total amount is capped so that as a proportion of gross income it diminishes as income rises.

Together ESCT and MTC design lead to considerable differences in the flows of funds into the compulsory saving scheme across the income distribution. For

[49] An obvious implication of this being that approximately 30% of the population of each age cohort will be assumed to suffer no loss in expected NZS entitlements due to this policy option. An equivalent assumption (from the point of view of the additional national savings that would result) would be that each individual spent 70% of their life between the ages of 25 and 64 in employment.

example, individuals in deciles 2 and 10 contribute in total 7.2% and 5.4% of gross income each year respectively. Further, after accounting for differences in tax rates applied to earnings from Portfolio Investment Entities, those belonging to the top 5 income deciles earn considerably lower after tax and management fees nominal returns on their investment than those belonging to the bottom 5 income deciles. In particular, assuming nominal before tax returns of 7.5% per annum and management fees of 1%, those in the bottom half of the income distribution will earn returns of 5.4% per annum after tax compared to only 4.7% for those in the top half of the income distribution.

Ignoring income mobility[50] but allowing the income of members of each income decile to grow over time at an annual rate of 3.5% (along with all tax thresholds, the MTC and the kick-start), there is now sufficient information to calculate total accumulations held in the compulsory scheme for each representative member of all income deciles and age cohorts respectively at their 65th birthday. In particular, an annuity formula that allows for growth in nominal payments over time is applied. This simply requires the level of nominal income the representative individual earns in the first year they join the scheme, total contributions to the scheme as a share of that income, the growth rate of income, the appropriate interest rate and the total number of years they will contribute.

Losses of NZS entitlements are then calculated by comparing these accumulations to the discounted present value (at each cohort's 65th birthday) of NZS entitlements under the status quo for all representative members of each cohort, which in turn depends upon the year in which that cohort reaches the age of 65 and its conditional life expectancy at 65. For every dollar of accumulations in the compulsory scheme, fifty cents of NZS entitlements will be lost up until the point at which these have been exhausted. For example, if an individual accumulates $200,000 in the compulsory saving scheme by the age of 65 and the discounted present value of their future NZS entitlements under

[50] That is, the movement of an individual throughout the income distribution over his or her lifetime.

the status quo at that point were $400,000, they would lose $100,000, or 25% of their NZS entitlements. Another individual reaching the age of 65 at the same time but with say $1m accumulated in the compulsory saving scheme would lose all their NZS entitlements.

Table 4.2 presents these losses expressed as a proportion of the discounted present value of expected future NZS entitlements under the status quo for a selection of age cohorts.[51] Though the tax system and MTC already serve to reduce flows into the compulsory scheme for higher income individuals (as illustrated in Table 4.1), for almost all age cohorts those in income decile 10 still lose more than six times the amount of NZS than do those in decile 2.[52]

Table 4.2: Loss of NZS entitlements by income decile and year of retirement (%)

Income decile	Retirement year (year reach 65)					
	2021	**2026**	**2031**	**2041**	**2061**	**2101**
1	0	0	0	0	0	0
2	0.4	1.5	2.6	5.0	10.6	9.5
3	0.5	2.3	4.1	8.2	17.5	15.7
4	0.6	2.9	5.4	10.7	23.0	20.6
5	0.7	3.4	6.2	12.3	26.5	23.7
6	0.8	3.8	6.9	13.2	26.5	23.7
7	0.8	4.1	7.4	14.2	28.6	25.5
8	0.9	4.7	8.5	16.4	32.9	29.5
9	1.1	5.5	10.0	19.4	38.9	34.8
10	1.7	9.1	16.7	32.6	65.6	58.7
Average	0.8	3.7	6.8	13.2	27.0	24.2

In addition, the further into the future a cohort reaches the age of 65 the more of its NZS entitlements will be lost, as that cohort will have contributed longer to the compulsory scheme, up until 2060 that is. For example the cohort that reaches the age of 65 in 2021 will only have one year of accumulations to abate

[51] If income mobility were taken into account and the income deciles in Table 4.2 were calculated on a lifetime basis it is likely that differences across those deciles in terms of lost NZS entitlements would be less. However, accounting for income mobility would have little effect on estimates of national savings consequences of this policy option.

[52] The exception being those cohorts reaching the age of 65 very shortly after the policy was implemented, having small amounts of accumulations to abate NZS entitlements with the kick-start being a non-trivial portion of those even for high income individuals. Even so, for the cohort that reaches 65 in 2021 with only one year of accumulations, those in income decile 10 still lose more than four times the amount of NZS than do those in decile 2.

against NZS, while the cohort aged 65 in 2060 will have 40 years of accumulations to abate against NZS. Beyond 2060 all cohorts reaching the age of 65 will have contributed to the compulsory scheme for the same number of years, however, as life expectancy continues to increase their losses as a proportion of expected NZS entitlements under the status quo will slowly decline.

With losses in expected NZS entitlements calculated for each of the three policy options these are compared in Table 4.3. While the values for compulsory private saving are the averages across income deciles from Table 4.2, losses across the income distribution are the same for the other two policy options.[53] It is clear that these policies have very different effects across age cohorts. Increasing the age of entitlement to NZS by two years has the most consistent effect on age cohorts through time in terms of the proportion of expected entitlements under the status quo lost, diminishing only slightly over time with improvements in life expectancy. Changes to indexation of NZS entitlements on the other hand affect cohorts reaching the age of 65 shortly after the policy change is introduced far less than those reaching that age 80 years later for example. Compulsory private saving with abatement has virtually no effect on cohorts reaching the age of 65 shortly after the policy change is introduced, but this effect grows for 40 years, before declining thereafter.

Table 4.3: Loss of NZS entitlements by policy and year of retirement (%)

	Retirement year (year reach 65)					
Policy	**2021**	**2026**	**2031**	**2041**	**2061**	**2101**
Lift age of entitlement to 67	11.0	10.7	10.6	10.2	9.7	8.6
Mixed wage & CPI indexation	7.9	11.3	14.6	20.8	31.8	49.6
Compulsory private saving	0.8	3.7	6.8	13.2	27.0	24.2

It is now possible to calculate the annual flow of savings individuals within any given cohort would need to make in order to have built up a stock of wealth at the age of 65 that would exactly offset their expected loss of NZS entitlements for each of the three policy options considered. The same annuity formula used

[53] Except to the extent that life expectancy varies with income. However, accounting for differences in life expectancy due to income is outside the scope of the current analysis.

to calculate accumulations in the compulsory savings scheme can again be used, though rearranged to give the amount of additional savings required by representatives of each cohort in the first year they begin adjusting to policy change via saving.

For any given cohort these saving flows increase with wage growth (by 3.5% per year) until the cohort reaches the age of 65. These savings earn nominal returns (after tax and management fees) of 5% per annum on average. Individuals belonging to different cohorts have more or less time to save in order to make up their expected lost NZS entitlements, however, the earliest individuals are assumed to adjust their saving behaviour is from the age of 25, providing a maximum of 40 years over which to save more than they otherwise would have.

Before aggregating these additional savings for all individuals within cohorts and then across cohorts in each year between 2013 and 2061 two further steps are required. First, individuals need not only adjust to policy changes of this sort by saving more. They may also choose to work longer, or consume less over their retirement than they otherwise would have. Hence, assumptions as to the extent to which each of these three adjustment mechanisms are adopted are required. These are outlined in Table 4.4.

Table 4.4: Adjustment mechanism parameters

Age group	**Adjustment**	**Policy option**		
(at 2013)	**mechanism**	**Indexation**	**Age**	**Compulsion**
Young	Save	0.8	0.775	0.85
(-23 to 24)	Work	0.1	0.15	0.075
	Consume	0.1	0.075	0.075
Middle	Save	0.6	0.55	0.7
(25 to 44)	Work	0.2	0.3	0.15
	Consume	0.2	0.15	0.15
Older	Save	0.4	0.3	0.6
(45 to 64)	Work	0.3	0.5	0.2
	Consume	0.3	0.2	0.2

Notes: In the case of the older group of age cohorts (those 45 to 64 years of age in 2013) because of the timing of the introduction of policies those aged 60 to 64 will be entirely unaffected by raising the age of eligibility for NZS and hence will not adjust their behaviour in any way. Similarly, those aged 58 to 64 will be entirely unaffected by compulsory private saving with abatement of NZS entitlements.

Any given cohort must fully adjust to each policy change via a combination of three mechanisms, with the parameter values indicating the relative weighting applying to each of them. A value of 0.4 attached to saving for instance indicates 40% of the loss in NZS entitlements incurred by that cohort will be made up through additional saving. To allow for differences in adjustment behaviour cohorts have been divided into three broad groups according to their age in 2013. More weight has been given to adjustment via additional saving for younger cohorts who have a greater proportion of their working lives to save over and are likely to earn higher incomes than their predecessors. Older cohorts therefore adjust relatively more via working longer and consuming less in retirement.[54]

There are also some differences in the way cohorts are assumed to adjust across policies. Compared with the indexation policy, more weight is given to adjustment by working longer for all cohorts when the age of eligibility for NZS is raised in recognition of the possibility that this may be taken by some as a signal of how long they should work. It may also be the case that finance constrained individuals with no other source of income would be strongly incentivised to continue working. Under the compulsory saving option, more weight is given to adjustment through saving. The reason for this is that it is possible that compulsion would force at least some people to save more than they otherwise would of their own accord.

Finally, to the extent individuals do adjust to each of the three policy options considered by saving more, the eventual decumulation of those savings must also be considered. In particular it is assumed that on average individuals belonging to each respective cohort will decumulate their savings in each year (after 2020 and after they have turned 65) by the amount that each policy option has reduced their NZS entitlement in that year, weighted by how much it is assumed they adjusted their saving. In other words, if a particular policy option

[54] As discussed earlier in this chapter, those 65 and older in 2013 will be entirely unaffected by raising the age of eligibility for NZS or compulsory private saving with abatement of NZS entitlements. This group will however be affected by a change to the indexation of NZS but are assumed to adjust to this only by reducing consumption.

resulted in an individual losing $100 in a particular year, and it was assumed that 50% of that individual's adjustment to the policy was through saving, then $50 of decumulation would occur.

It is now a simple matter to determine the total contribution that individuals might make to national savings in each year between 2013 and 2061 in response to each policy option. In each year effected cohort members aged 25 to 64 in that year will undertake additional saving. The total contribution that any given one of those cohorts makes to national savings in a particular year is equal to the annual flow of savings calculated (for its representative to completely offset lost NZS entitlements) multiplied by the savings parameter value for that cohort and the total projected population of individuals of the corresponding age in that year. The contributions of all cohorts aged 25 to 64 in any given year are then added. Similarly decumulation by individuals belonging to cohorts aged 65 and older in each year must be subtracted.

Adjustment to policy change via working longer or consuming less after the age of 65 than otherwise would have been the case is assumed not to affect individual's savings directly. This behaviour will potentially affect national savings indirectly through changes to government revenues however and will be discussed in the following subsection.

4.3.3 The government

Another avenue by which each of the policy options considered has the potential to effect national savings is through any effects they may have on the government's fiscal position. In the case of each option from the year 2020 onwards (2021 in the case of compulsory private saving with abatement of NZS) the government will face reduced expenditures on NZS than it otherwise would have. There will also be implications for tax revenues and in the case of the third policy option some additional expenditures associated with the compulsory saving scheme in the form of increased member tax credits and kick-start payments.

Given calculations of losses of NZS entitlements faced by individuals in the previous subsection it is straight forward to calculate the government's reduced expenditures on NZS for all years between the implementation of each policy and 2061. In the case of raising the age of entitlement to NZS from 65 to 67, reduced NZS payments by the crown in any given year are simply the nominal value of NZS in that year multiplied by the total number of people in the population aged 65 and 66 in that year. Similarly, where the indexation of NZS is made less generous, reduced NZS payments by the crown in any given year are simply the difference in the nominal value of NZS entitlements under the status quo and those under the new indexation methodology in that year multiplied by the total number of people in the population aged over 65 in that year.

In the case of the third policy option, it is assumed that rather than collect a portion of an individual's compulsory private savings accumulations the day they turn 65, a reduced stream of NZS entitlements is calculated, as illustrated in Table 4.2. However, as described in the previous subsection, this will vary depending on the cohort to which an individual belongs. Reduced NZS payments by the crown in any given year are therefore calculated by multiplying the number of individuals belonging to each respective cohort over the age of 65 by that cohorts average lost share of the nominal NZS payment that would have been received under the status quo, and then summing over all cohorts over the age of 65 in that year.

In all three cases an adjustment is made to the estimate of reduced NZS payments made by the Crown for the possibility that payments of other benefits may increase, such as the sickness benefit or housing supplement, though these are assumed to be relatively small. In particular, 5% of the reduction in NZS payments is assumed to be spent on other benefits for the first 10 years after the age of entitlement to NZS is increased, and 2.5% for the second 10 years. For the other two policy options the effect is assumed to be smaller, at 2% and 1% for the same periods respectively. The reason is that in the case of raising the age of entitlement losses in NZS payments fall relatively heavily in a

short space of time. Finance constrained individuals may therefore be more likely to need other forms of government assistance.

Additional expenditures associated with the compulsory saving scheme in the form of increased member tax credits and kick-start payments also result as greater numbers would belong to KiwiSaver than would otherwise have been the case. Increased KiwiSaver membership is calculated each year as one quarter of those aged between 25 and 64 inclusive who are salary and wage earners or self-employed (assuming that the steady state level of KiwiSaver membership amongst this group under the status quo would have been three quarters).[55] This number is multiplied by the average nominal member tax credit each year and the nominal value of the kick-start payment in the first year that the scheme is made compulsory. In subsequent years additional kick-start payments will only be made to those individuals turning 25.

Finally, two effects on government revenues are considered. Increases in income tax arise from individuals working longer than they otherwise would have and reduced goods and services tax revenues result from any reduced consumption during retirement or because of additional saving (and hence less spending) during an individuals' working life.

Additional income taxes are calculated similarly in the case of all three policies. As cohorts turn 65 they earn additional labour income in that year on average equal to the share of their total loss of NZS due to each respective policy change that was assumed to be adjusted for by working longer. This income is then multiplied by an average rate of tax on income of 25% (calculated using the Household Economic Survey). In the case of the policy option which changes the way NZS is indexed some cohorts who are already over 65 are still affected when the policy is announced, however, these cohorts are not assumed to work longer (or return to work at the age of 83 for example), rather they will only adjust by reducing consumption.

[55] Further information on KiwiSaver and aspects of its performance to date, including membership, can be found at: http://www.ird.ovt.nz/aboutir/reports/research/report-ks/

Reduced goods and services taxes are also calculated similarly in the case of all three policies. In particular, to the extent each respective cohort (between the ages of 25 and 64 inclusive) saves more during their working lives, they are also consuming less. Hence, additional household saving flows are simply summed each year and multiplied by 0.15/1.15 when the rate of GST is 15% (as lost consumption here is post tax). Post 65 cohorts also consume less as a result of each policy option by the share of their lost NZS entitlements it was assumed they would adjust to in this manner. For simplicity, it is assumed that this reduced consumption happens in the year each cohort turns 65 (or the year the policy was announced for cohorts over this age in the case of a change to indexation of NZS). Reduced consumption for this group is again multiplied in each year by 0.15/1.15 in order to calculate the loss of GST on this consumption.

In each year all changes in the government's revenues and expenditures discussed are summed to determine the total change in its fiscal position. The extent to which any change in the government's fiscal position will lead to further changes in national savings (over and above those brought about by changes in household behaviour) will depend on how the government chooses to respond. In particular, if it passes on savings from reduced NZS payments (the dominant factor of those examined) in the form of reduced taxes, or spends these in other areas such that it maintains a balanced budget there would be no additional affect on national savings. If, on the other hand, the government leaves all other revenues and expenditures unchanged reduced NZS payments will be fully passed on to increased national savings from government. In the following section results for both of these extremes will be presented.

4.4 Results

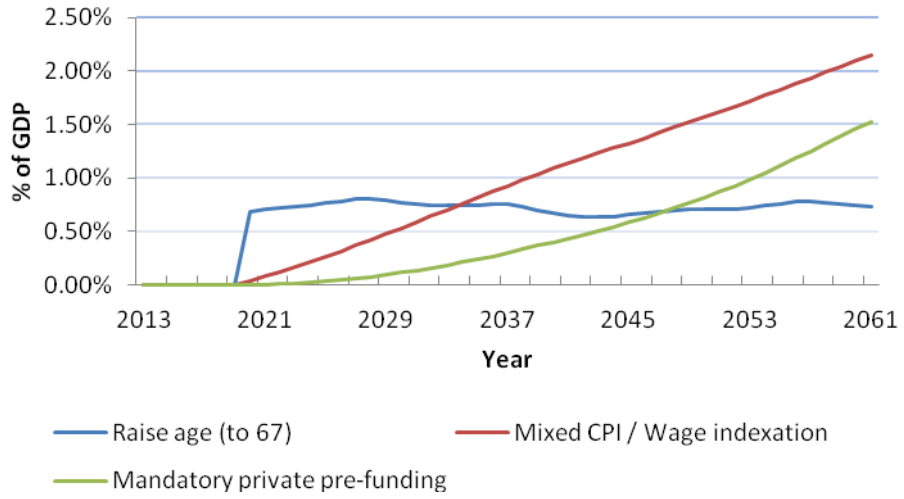
This section outlines results. In particular, the estimated effect each of the three policy options may have on the government's fiscal position as well as their annual and cumulative contributions to national savings between 2013 and

2061 are presented. The sensitivity of these to the choice of interest rate, as well as the relative weighting individuals assign to adjustment to policy change via saving more, is also examined. In all cases the effects are shown as percentages of GDP.[56]

4.4.1 Government revenues and expenditures

Figure 4.2 illustrates the effect that reduced NZS payments brought about by each of the three policy options, considered respectively, is expected to have on the government's fiscal position. Though each policy is assumed to have been announced in 2013 and implemented in 2020, they have very different effects in this respect.

Figure 4.2: Annual effect on fiscal position (from NZS reductions only)



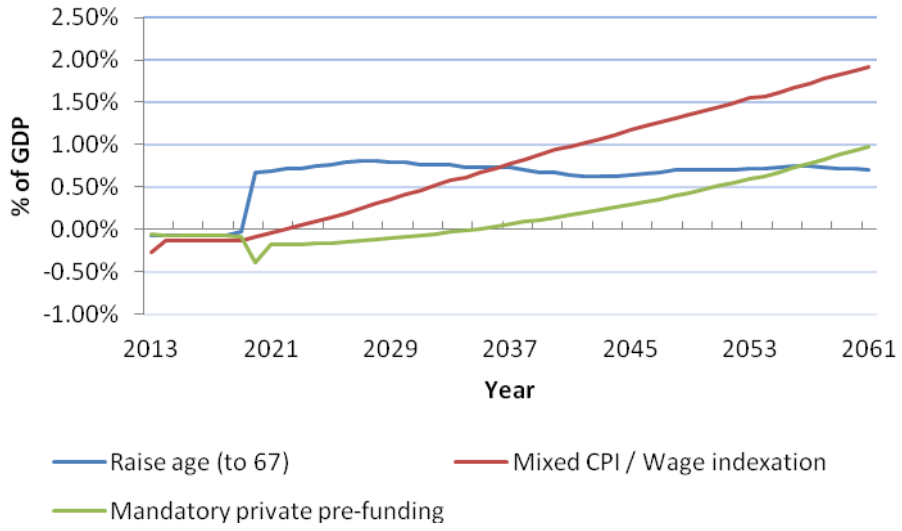
Raising the age of eligibility of NZS brings about reduced government expenditures in each year from 2020 of around 0.75% of GDP and is relatively constant over time. In the case of the introduction of a different indexation methodology, reductions in government expenditures on NZS are initially very small but grow over time such that by 2034 they are approximately equal to those generated by the first policy option and by 2061 are nearly three times as large. The third policy option (that of introducing compulsory private saving

[56] Where the nominal level of GDP in each year is assumed to grow at a rate of 4% (comprising 2% inflation, 1.5% productivity growth and 0.5% population growth).

where accumulations are used to reduce NZS entitlements) produces a similar pattern of reduced government expenditures on NZS over time, though more modest, and does not yield the same level of reductions as the first policy option until over three decades have passed.

The effect each policy option is predicted to have on the government's fiscal position after also accounting for reduced goods and services tax, increased income tax, increased pressure on other benefits (once each policy is implemented) and increased costs associated with KiwiSaver, is given in Figure 4.3. Though the picture looks similar to that shown in Figure 4.2 there are some important differences. In particular, each of the three policy options considered now has a negative effect on the government's fiscal position initially. In the case of the first two policy options this is relatively short lived. However, in the case of compulsory private saving it is not until 2036 that its effects on the government's fiscal position become positive.[57] Further, the point at which these overtake the positive effects on the fiscal position yielded by raising the age of eligibility does not occur until 2057.

Figure 4.3: Annual effect on fiscal position (total)

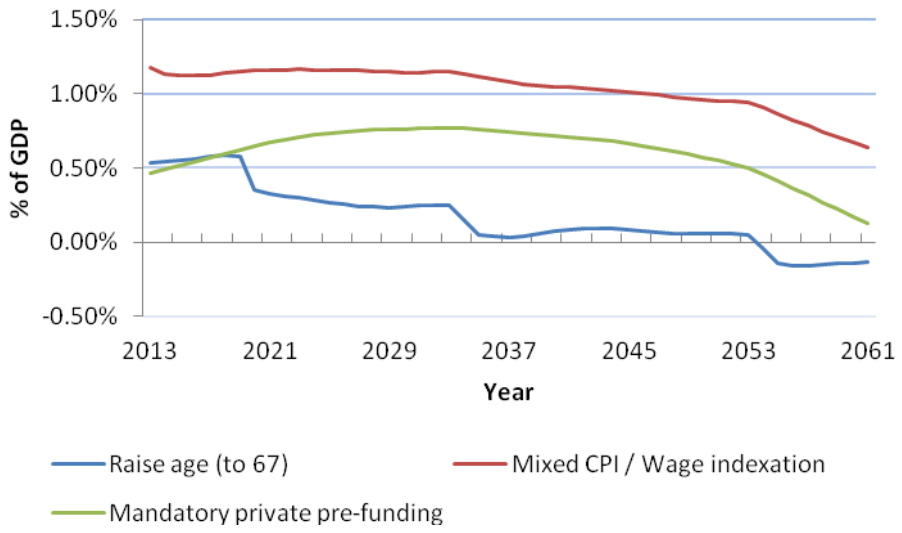


[57] Any improvements in the government's fiscal position generated by this option would be reduced to the extent that further incentives were added to the compulsory savings scheme over time.

4.4.2 National savings (annual)

Figure 4.4 shows the estimated aggregate additional household savings generated in each year between 2013 and 2061 as a percentage of GDP by each of the three policy options considered respectively. Recall that also included in these estimates is the decumulation of savings, and it is this that is responsible for additional household savings declining later in the period. Additional household savings (particularly later in the period) are underestimated however, as additional returns on higher than otherwise savings balances are not included.[58] Even so, all three policy options are estimated to generate substantial additional household savings for extended periods, particularly given reference to New Zealand's historic levels of saving.

Figure 4.4: Annual household savings impact (also national savings if government maintains balanced budget)

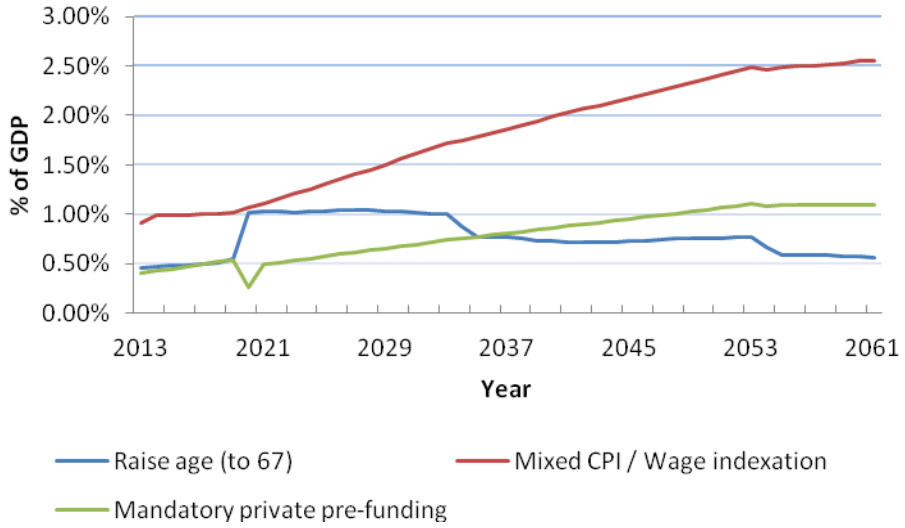


If the government responds to reduced NZS payments and changes in other revenues and expenditures by increasing expenditures in other areas or reducing taxes such that its overall fiscal position remains unchanged, then the estimates presented in Figure 4.4 also show each policy's effect on national savings. If on the other hand the government responds by increasing its own saving (in other

[58] Early in the period these will matter little as additional savings balances will be small and hence returns on those balances as a proportion of GDP will be very small. This simplification to the estimation will not change relativities between policies.

words by running larger than otherwise surpluses or smaller than otherwise deficits), the effect on national savings will be as shown in Figure 4.5.

Figure 4.5: Annual national savings impact (when the government saves)



As before, changing the way NZS entitlements are indexed yields the highest additional national savings in all years, with approximately 0.9% of GDP in 2013 rising to 2.5% in 2061. However, because of the increased fiscal costs associated with compulsory private saving and the fact that with this policy option it takes some time for cohorts reaching the age of 65 to do so with substantial amounts of saving in the compulsory vehicle that can be used to offset NZS entitlements, the relationship between this policy and that of raising the age of eligibility for NZS is somewhat different. In particular, the annual additional contributions to national savings that raising the age of eligibility is estimated to generate are considerably larger than those brought about by the compulsory private saving option for around two and a half decades.

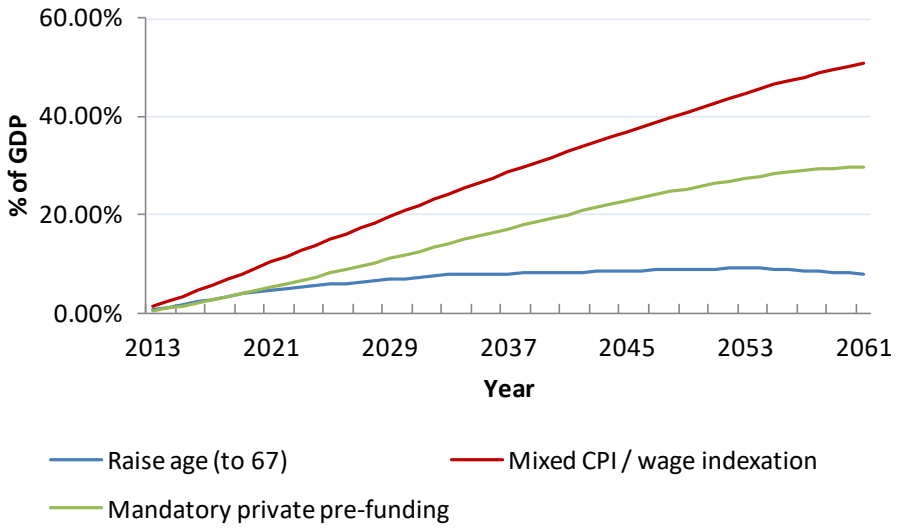
4.4.3 National savings (cumulative)

The previous subsection focused on annual additions to national savings brought about by three different retirement income policy options. For readers

concerned with some notion of macroeconomic vulnerability, the cumulative effects on national savings of each policy may be of greater interest.[59]

These are illustrated in Figure 4.6 between the years 2013 and 2061 in the case where the government responds to each policy in order to leave its overall fiscal position unaltered. By the end of the period the cumulative effect on national savings from increasing the age of eligibility for NZS is estimated to be 8% of GDP. Changing the indexation method or introducing compulsory private saving are estimated to yield cumulative changes in national savings over the same period by 51% and 30% respectively.

Figure 4.6: Cumulative national savings impact (when government maintains a balanced budget)

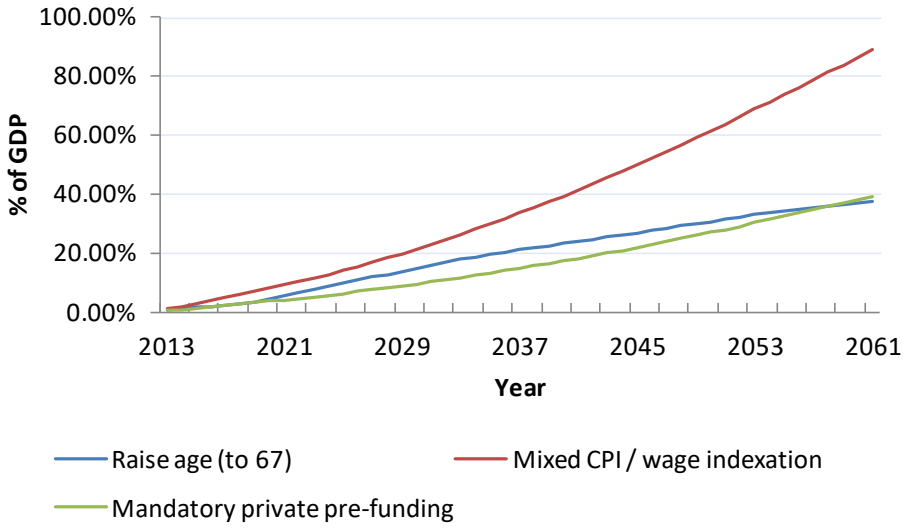


Cumulative national savings effects from these policy options will be considerably larger if instead the government responds to the largely positive changes these bring about to its revenues and expenditures by saving more. These are illustrated in Figure 4.7. With changes to the indexation of NZS the cumulative change in national savings over the period is estimated to be approximately 87% of GDP. Introducing compulsory private saving where accumulations are used to reduce the costs of NZS as well as lifting the age of

[59] These are clearly linked to New Zealand's NIIP, a key macroeconomic indicator of vulnerability, and under certain assumptions improvements in national savings would translate one-for-one to improvements in the NIIP. However, a detailed examination of retirement income policy options effects on the NIIP is outside the scope of this chapter.

eligibility for NZS are also both estimated to yield substantial cumulative changes in national savings by 2061 (each by approximately 38% of GDP). It is worth noting though that the cumulative national savings brought about by lifting the age of entitlement outpace those from compulsory private saving until 2060.

Figure 4.7: Cumulative national savings impact (when government saves)



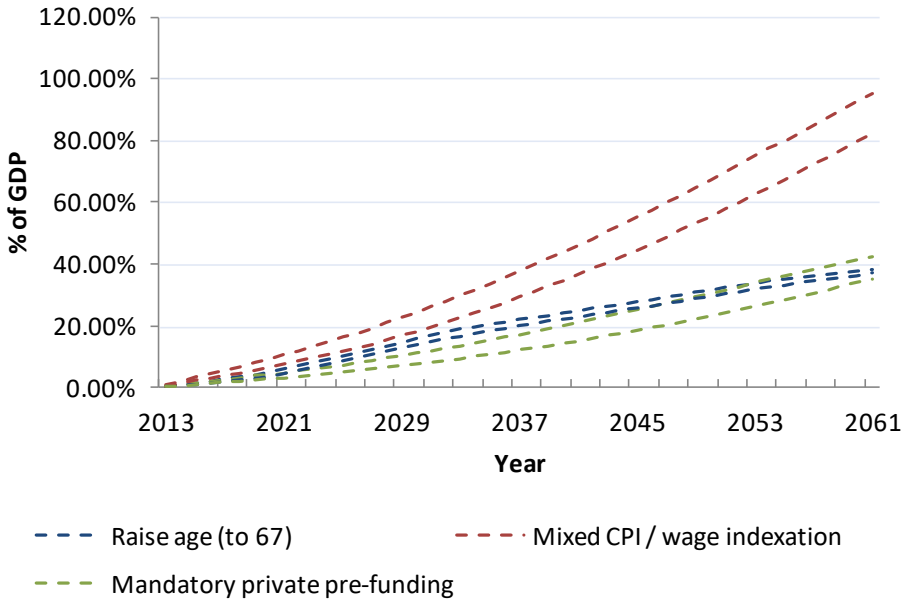
4.4.4 Sensitivity analysis

To conclude this section the sensitivity of results to the choice of key parameters is examined. In particular, the effect of changes in the interest rate as well as the relative weighting individuals assign to adjustment to policy change via saving more are considered respectively. In both cases this is illustrated by showing the evolution of cumulative national savings that would result (i.e., Figure 4.7 from the previous subsection is reproduced).

The dashed lines in Figure 4.8 show the impact on cumulative national savings of 'high' and 'low' savings responses by individuals to each policy option respectively. These are derived by changing the parameter values that set how individuals allocate adjustment to policy change over three mechanisms, saving more over their working lives, working longer and consuming less during retirement. In particular, the initial parameter values for the saving response of three broad groups of age cohorts to each policy (used to generate results in

earlier subsections and provided in Table 4.4) are increased and decreased by approximately 17.5% of their initial values respectively.[60] The parameter values for working longer and consuming less in retirement are adjusted accordingly such that they, together with the saving adjustment parameter, sum to one.

Figure 4.8: Sensitivity of cumulative national savings to saving parameter selection



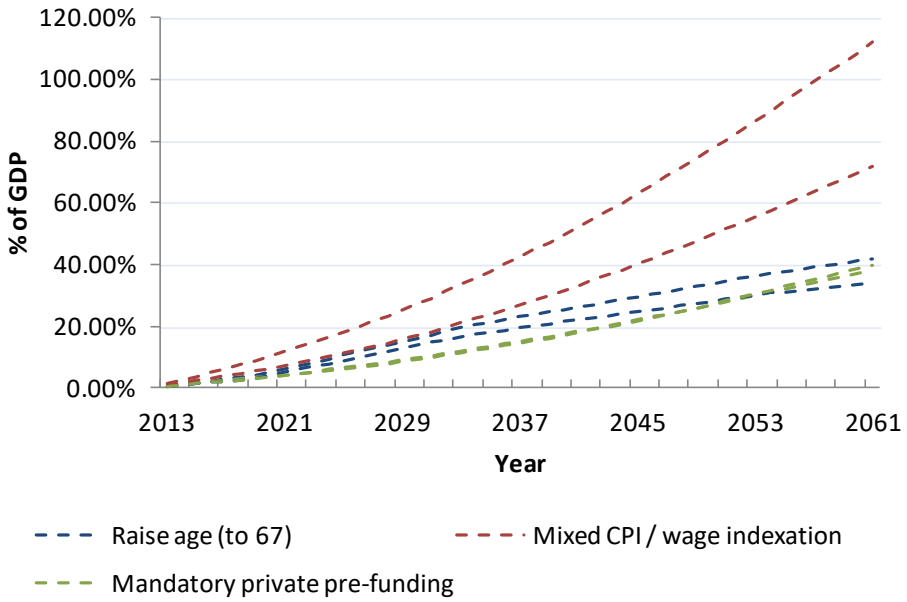
The effect is most noticeable in the case where the indexation methodology of NZS is changed, where a 'high' savings response by individuals brings about cumulative changes in national savings of approximately 13% of GDP more than a 'low' savings response by the end of the period. It is also noticeable in the case of compulsory private saving with abatement of NZS entitlements, yielding a difference in cumulative changes in national savings of around 8% of GDP by 2061. Relativities between the three policy options have not been altered. However, the timing of the point at which cumulative changes in national savings generated by raising the age of eligibility for NZS and those generated by compulsory private saving with abatement of NZS entitlements

[60] The adjustment of 17.5% (17.647 precisely) being the maximum possible increase to the saving adjustment parameter for the youngest age cohorts under the compulsory private saving scheme with abatement of NZS given initial parameter choices outlined in Table 4.4. Greater change than this would mean that there would be more than complete adjustment to the policy change by this group via saving.

are equal, occurs somewhat earlier when individual savings responses are 'high'.

Figure 4.9 illustrates the sensitivity of results to the choice of interest rate. In particular, cumulative changes in national savings are presented for each policy option where nominal interest rates (after tax and management fees) have been set to 4% and 6% respectively.[61] The higher dashed lines for each policy option are associated with the lower interest rate and vice versa.

Figure 4.9: Sensitivity of cumulative national savings to the choice of interest rate



This may seem somewhat counterintuitive but is consistent with two features in particular of the model. First, the loss of expected future NZS entitlements resulting from policy change is calculated as a stock of wealth required by an individual at the age of 65 of sufficient size to generate an income flow over the remainder of that individuals' life to offset the policy change. As interest rates rise, the stock of wealth required to do this is reduced, hence individuals need to save less over their working lives all else equal. Second, recall that individuals investment returns on higher than otherwise savings balances have

[61] Recall that results contained in previous subsections have been based on an interest rate of 5%.

not been incorporated in the model (in the sense that when earned they haven't been added to estimates of national savings). This means that as the interest rate rises, these returns rise and the saving flows required by individuals to generate a given stock of wealth at their 65th birthday is reduced.

Cumulative changes in national savings are affected most by a change in the interest rate in the case of a change in the indexation methodology of NZS. A 2% difference in the interest rate yields a 40% difference in cumulative changes in national savings as a proportion of GDP by the end of the period. Interest rates have little effect however in the case of compulsory private saving with abatement of NZS entitlements. The reason for this is that in this case as well as the effects of the interest rate discussed in the previous paragraph there is the competing effect that as the interest rate rises, accumulations in the compulsory saving vehicle will be larger causing greater loss of NZS entitlements for individuals through abatement (and greater fiscal savings for the government), necessitating a greater saving response. Again, relativities between the three policy options remain unchanged.

4.5 Conclusion

Over the next half century the ratio of working-age to older people in New Zealand is expected to fall considerably. One obvious area where this marked demographic change is likely to have important consequences is that of retirement income policy. This chapter has sought to examine the implications of three retirement income policy options, designed to improve the fiscal sustainability of NZS, for household and national savings. These policies being to: lift the age of eligibility for NZS by two years; index NZS payments by the average of wages and the general price level; and make private saving compulsory and use those accumulations to reduce NZS entitlements.

An understanding of how such policies affect national savings is important for a number of reasons. These reasons include links to external vulnerabilities and

the level of New Zealand's capital stock, both of which may impinge on economic growth, not to mention KiwiSaver's limited success in terms of increasing both household and national savings. Given the rising costs of NZS, an understanding of how various changes to the system could bring about fiscal savings is also of considerable importance in order to balance competing public spending pressures in the future.

The approach taken stems from a desire to model the three policies outlined in a consistent way and the realisation that each will result in a loss of an individual's current expected NZS entitlements. After calculating these losses for individuals belonging to each of a large number of overlapping cohorts and deciding on how they will adjust their behaviour in response, additional flows of individual savings and their eventual decumulation can be aggregated. The government's propensity to save was also considered and is important because each policy has considerable effects on its revenues and expenditures.

Results suggest that changes to retirement income policy could lead to substantial annual and cumulative changes in national saving by 2061. In particular, a change to the indexation of NZS is estimated to lead to cumulative changes in national savings by 2061 of approximately 87% of GDP. Introducing compulsory private saving where accumulations are used to reduce the costs of NZS as well as lifting the age of eligibility for NZS are also both estimated to yield substantial cumulative changes in national savings over the period (each by approximately 38% of GDP).

Although many variants of each policy considered are conceivable, the patterns of additional national savings generated over time will be similar (though the level would change). Reflecting on the rationale for each policy's design however, being to improve the fiscal sustainability of NZS, lifting the age of eligibility for NZS appears able to generate superior improvements in the government's fiscal position compared to the other two policy options over the medium term. Indeed, in this respect the option of compulsory private saving with abatement of NZS entitlements does not generate the same level of fiscal improvement as lifting the age of entitlement until 2057.

Similarly, it is clear that each of the three policy options considered (as would similar variants of each) have very different distributional effects both within and across age cohorts. Within cohorts, to the extent that life expectancies across individuals are similar, all individuals are treated the same under the first two policy options. This is not the case with respect to compulsory private saving with abatement of NZS entitlements. In fact, the tax system together with several aspects of this policy's design mean that within almost all age cohorts those in the top income decile will lose more than six times the amount of NZS entitlements than will those in the second income decile.

All options are associated with considerable intergenerational redistributive effects. However, lifting the age of entitlement to NZS has the most consistent effect on age cohorts through time in terms of the proportion of expected NZS entitlements under the status quo lost, diminishing only slightly over time with improvements in life expectancy. Changes to indexation of NZS entitlements on the other hand affect those cohorts reaching the age of 65 shortly after the policy change is introduced far less than those reaching that age 80 years later for example. Compulsory private saving with abatement has virtually no effect on those cohorts reaching the age of 65 shortly after the policy change is introduced, but this effect grows for 40 years, before declining thereafter.

Decisions about appropriate retirement income policies are complicated, requiring careful consideration of their affects on a range of factors. These include implications for retirement income adequacy and poverty reduction, distributional and welfare consequences, fiscal sustainability, equity, capital accumulation, and not least of which, the extent to which any policy might be expected to meet its objectives a priori. The aim of this chapter has not been to form a view about the merits of one retirement income policy option over another, but to inform important aspects of any such view. The analysis demonstrates that the quantification of many aspects of a policy's affects are possible with reasonable assumptions. In order to do so, a framework for estimating the national savings effects of retirement income policies has been developed that could be applied to most policies affecting NZS entitlements.

PART II

HOUSING

Chapter 5

Housing Affordability and Home Ownership during a Period of Rapid House Price Growth

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5.1 Introduction

Housing affordability has been a topic of much interest in New Zealand over recent years with a prolonged period of rapid house price growth. Between 2004 and 2008 the median house price increased by over 50% and, unlike in many other countries following the Global Financial Crisis (GFC), New Zealand has not seen a sharp reversal of this trend. Indeed, more recent house price growth has also been strong, at over 40% between 2013 and 2017. This has made home ownership increasingly difficult for many New Zealanders, yet housing affordability and home ownership are important for a wide range of reasons.

Unlike many other goods, expenditures on housing (whether renting or owning) usually absorb a large proportion of household income. Housing represents a significant share of household wealth in New Zealand (Scobie et al., 2007), with home ownership often seen as a means of providing greater security of living standards for retirees by avoiding the costs and volatility of the rental housing market. Further, as home ownership reduces mobility and provides individuals' with incentives to improve their communities, it has been linked to greater investment in social capital (DiPasquale & Glaeser, 1999). More generally, the

performance of the housing sector can have significant implications for employment, saving, investment and banking (Scobie et al., 2007).

Unsurprisingly, therefore, housing is the recipient of considerable policy attention in New Zealand. Indeed, the House Price Unit was formed in 2007 to analyse both demand and supply side factors likely responsible for this and any policy options that might reduce pressure on house prices (House Prices Unit, 2008). More recently the Productivity Commission has undertaken three separate enquiries relating to housing, one of which focussed specifically on housing affordability, while the other two related to the use of land for housing and urban planning respectively (Productivity Commission (2012, 2015 and 2017).

Various policy changes have been implemented. Following the GFC credit restrictions were introduced including the imposition of loan-to-value ratio (LVR) restrictions. In addition, the current government is taking a particular interest in housing affordability. For example, it has pledged to build 100,000 'affordable homes' over the next ten years, taken steps to ban foreign ownership of existing houses (with some exceptions) and limit migration. Further, the Tax Working Group (an advisory body established by the government in late 2017) will investigate whether a system of capital gains taxation, land taxation or other housing taxation measures would improve the tax system and housing outcomes.

The aim of this chapter is to inform the future direction of housing policy in New Zealand. Patterns and drivers of home ownership and housing affordability across groups and over time are examined in order to provide insight into the extent of any problem and identify those most affected, providing valuable information for potential policy intervention. In addition, this chapter lays the foundation for an examination of the extent to which the availability of a particular mortgage lending mechanism may improve housing affordability for some individuals, presented in Chapter 6.

While various measures of housing affordability have previously been presented and their merits discussed (see, for example, Robinson et al., 2006; and House Price Unit, 2008) some relevant data remain unexploited and there is scope for more detailed analysis. The current chapter draws out evidence from two surveys, the Household Economic Survey (HES) and the Survey of Family, Income and Employment (SoFIE) during a period of particularly rapid house price growth in New Zealand, that is, 2004 to 2008. The main advantages of HES are that it contains detailed expenditure data and has been running for several decades. SoFIE on the other hand contains asset and liability information, and though it spans a shorter period, it tracks the same individuals through time.

In particular, the chapter:

1. examines the distribution of house prices and how this has changed across time and between regions;

2. examines changes in housing expenditures (rent or mortgage payments) as a proportion of income over time and across groups;

3. examines patterns of home ownership over time and across groups; and

4. applies a model which may be suggestive of whether or not an individual or couple is likely to find home ownership affordable. This is based on whether a lower quartile priced home in their region can be purchased without mortgage payments exceeding 30% of gross-income after taking account of their income, assets, liabilities and prevailing interest rates. Comparisons are then made of housing 'affordability' across groups and over time.

These elements, or outcomes, of housing affordability are explored primarily by way of various descriptive techniques. However, panel logistic regressions are employed to examine how the likelihood of home-ownership and housing affordability depend on a wide range of demographic and economic variables.

These include: income, age, education, gender, ethnicity, New Zealand born, region, partnership status, regional house prices and mortgage interest rates.

Results show considerable increases in prices throughout the house price distribution between 2004 and 2008. However, home ownership rates declined only slightly between 2004 and 2008. Factors associated with a higher likelihood of owning a home include being partnered, female or older, having undertaken more years of schooling and living in any region other than Auckland. Higher house prices are negatively associated with home ownership as is belonging to an ethnicity other than NZ European. Interestingly, a statistically significant relationship between income and home-ownership was not found.

For non-homeowners housing affordability improves significantly with income and is much higher for couples than singles. Between 2004 and 2008 income quintiles 2 and 3 (for couples) and 5 (for singles) experienced the greatest falls in affordability. Other income quintiles either had persistently high or low levels of affordability. Across regions, Auckland had the lowest levels of housing affordability throughout the period. However, by 2008 affordability levels in other regions had deteriorated such that they were much closer to those of Auckland. Housing affordability for homeowners was much higher throughout the period than for non-homeowners.

The remainder of this chapter is organised as follows. Section 5.2 briefly outlines the data. Sections 5.3 and 5.4 examine house prices and housing expenditures respectively. Descriptive and regression analysis of patterns of home ownership between 2004 and 2008 are presented in Section 5.5. Section 5.6 outlines a model of housing affordability and presents results separately for both non-homeowners and homeowners. Conclusions are drawn together in Section 5.7.

5.2 Data

This chapter uses unit record data from two household surveys conducted by Statistics New Zealand (SNZ). The first is the Survey of Family, Income and Employment (SoFIE) and the second is the Household Economic Survey (HES).

SoFIE, the primary data source for the analysis that follows, is a longitudinal survey where the original sample members are tracked and surveyed each year. It began in October 2002 with an original sample size of about 11,500 households, amounting to over 22,000 individuals 15 years of age and over. It concluded in September 2010 after running annually for a total of eight years (waves). The core survey collects information on individual and family characteristics, as well as labour market and income spells. In alternate years health, and assets and liabilities modules are included respectively.

At the time this analysis was undertaken only the first seven waves of SoFIE were available for analysis. The assets and liabilities module was included for three of these waves (waves 2, 4 and 6) and is required in order to examine house prices, ownership and affordability. Interviews for each wave were evenly spread over a 12 month period so that some households were interviewed in October and others the following September. However, all asset values are indexed to the mid-point of the relevant wave. Asset values for wave two are therefore indexed to approximately 31 March 2004, wave 4 asset values to 31 March 2006 and wave 6 asset values to 31 March 2008.

Indexation was particularly important during this period, with strong house price growth potentially leading to non-trivial increases in individuals' net worth even within the interview period of a particular wave. Fortunately respondents in SoFIE were asked not only for the value of any residential property they owned but also to provide a valuation date. This date is used, together with detailed regional house price indices from Quotable Value (QV) (aggregated to the six

major SoFIE regions) to index housing assets as described in the previous paragraph.[62] For all other assets the Consumer Price Index (CPI was used).[63]

Another issue is that only the total value of all mortgages is recorded in SoFIE. There is no information about the number of mortgages or to which property the mortgages are assigned. For tax benefits, investment properties usually have high loan-to-value ratios, and consistent with Le et al. (2012), mortgages are therefore allocated to investment properties up to their asset value, with any remaining mortgage value then allocated to the owner-occupied property.

SoFIE required careful cleaning in order to minimise loss of observations due to question non-response or apparent errors in recording of individual information.[64] Wherever possible the longitudinal nature of the data was leveraged to attempt to correct for this. For example, if an individual was observed owning a house worth just $1 in wave four their housing assets in other waves were examined. If it turned out that that same person in wave two owned a house worth say $900,000 and in wave 6 worth $1,100,000 the value recorded in wave four was changed to $1,000,000. Similar anomalies or non-response were observed for small numbers of respondents across most of the variables used in this analysis and so are too numerous to mention here. For more information about SoFIE and some of the problems researchers can expect to encounter, see, for example, Scobie and Henderson (2009) or Carter et al. (2010).

For most of the analysis in this chapter using SoFIE, the sample is restricted to those individuals aged 25 years and older. SNZ only provides longitudinal survey weights for those respondents who were original sample members of

[62] In a number of cases respondents failed to provide valuation dates. In these cases it is assumed that the distance between the respondents' interview date and valuation date was the same as the average of that distance for those respondents that were able to provide valuation dates. This distance was between two and three years depending on the survey wave.
[63] Scobie and Henderson (2009) provide further discussion of the practicalities of indexing various assets and liabilities in SoFIE.
[64] To construct a usable panel data set for analysis SoFIE also required manipulation and formatting, with the data originally being stored in around 20 separate files with different (often incompatible) formats.

SoFIE. As these weights are required for much of the analysis, a further restriction to the sample is necessary.[65]

Finally, as SoFIE was not designed to collect detailed expenditure data HES is also used, dating back to 1983. This allows examination, for example, of the pattern of rental and mortgage expenditures over time as well as patterns of detailed housing tenure.[66] For more information about HES see, for example, Perry (2017).

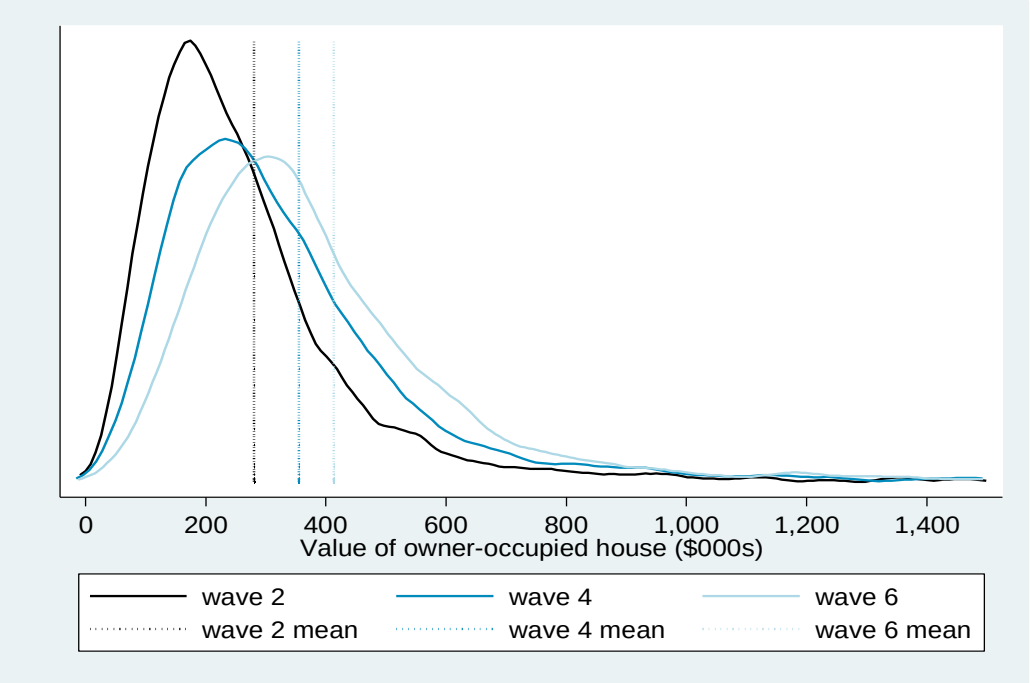
5.3 Prices

In this section changes in house prices between 2004 and 2008 are examined. Figure 5.1 gives kernel density plots of the distribution of owner-occupied house values for each of waves two, four and six of SoFIE. As described in the previous section asset values provided in these waves are indexed approximately to the first quarters of 2004, 2006 and 2008 respectively.

Owner-occupied house values increased substantially between 2004 and 2008 right throughout the distribution, with the largest change occurring between 2004 and 2006. Indeed the mean house price rose from approximately $280,000 in 2004 to $355,000 in 2006 and $415,000 in 2008.

[65] Though preferred for the current analysis, cross-sectional weights were not provided. Longitudinal weights are for the 2002 New Zealand population, regardless of survey wave.
[66] SoFIE and HES are not linked in any way. In other words, different individuals are surveyed in each case. Therefore, it is not possible to link the respective respondents' expenditures and assets, for example.

Figure 5.1: Distribution of owner-occupied house values, 2004, 2006 and 2008



Growth in owner occupied house values is explored further in Table 5.1. In particular, for each of the six major regions within SoFIE the change in house values are shown at three different points on the distribution (the lower quartile, median and upper quartile). Two points of interest are immediately apparent. First, house values at all three points on the distribution in Auckland were higher than those of any other region in both 2004 and 2008. However, all other regions experienced greater proportional increases in house values than Auckland did over the period. Second, in all regions the lower quartile experienced stronger growth in house values than the upper quartile.[67]

[67] This is also true with respect to the median, with the only exception being that of Waikato (73% versus 75% growth).

Table 5.1: Distribution of growth in regional house values, 2004 to 2008

Region	Lower Quartile			Median			Upper Quartile		
	2004 ($)	2008 ($)	%age change	2004 ($)	2008 ($)	%age change	2004 ($)	2008 ($)	%age change
Auckland	230,874	330,649	43	308,466	439,204	42	431,731	595,169	38
Waikato	135,642	234,245	73	192,706	337,742	75	282,588	452,333	60
Wellington	169,086	282,770	67	228,531	358,711	57	326,015	489,797	50
Rest of NI	114,125	190,347	67	176,804	289,031	63	260,232	403,088	55
Canterbury	159,795	248,109	55	213,060	323,665	52	308,376	449,251	46
Rest of SI	113,009	197,633	75	169,933	264,137	55	270,647	377,300	39
New Zealand	150,679	244,863	63	224,940	343,731	53	328,350	483,125	47

There are a number of possible reasons for this observation. With various tax incentives on rental property more pronounced in the 2000s than they are now, and rental property typically being toward the lower end of the quality spectrum, this may have stimulated demand more at the bottom end of the distribution. Further, with fixed land prices for example, when building new properties the returns to doing so are likely to be better for larger, better quality houses. If this is the case then the supply of lower quality houses may have increased less than high quality houses, relatively speaking, putting further pressure on lower quartile priced houses. This is consistent with data presented in the Productivity Commission's housing affordability inquiry report, which showed that land prices as a share of house values have increased over time and investment in new houses has tended to come in the form of large and relatively expensive houses (Productivity Commission, 2012).

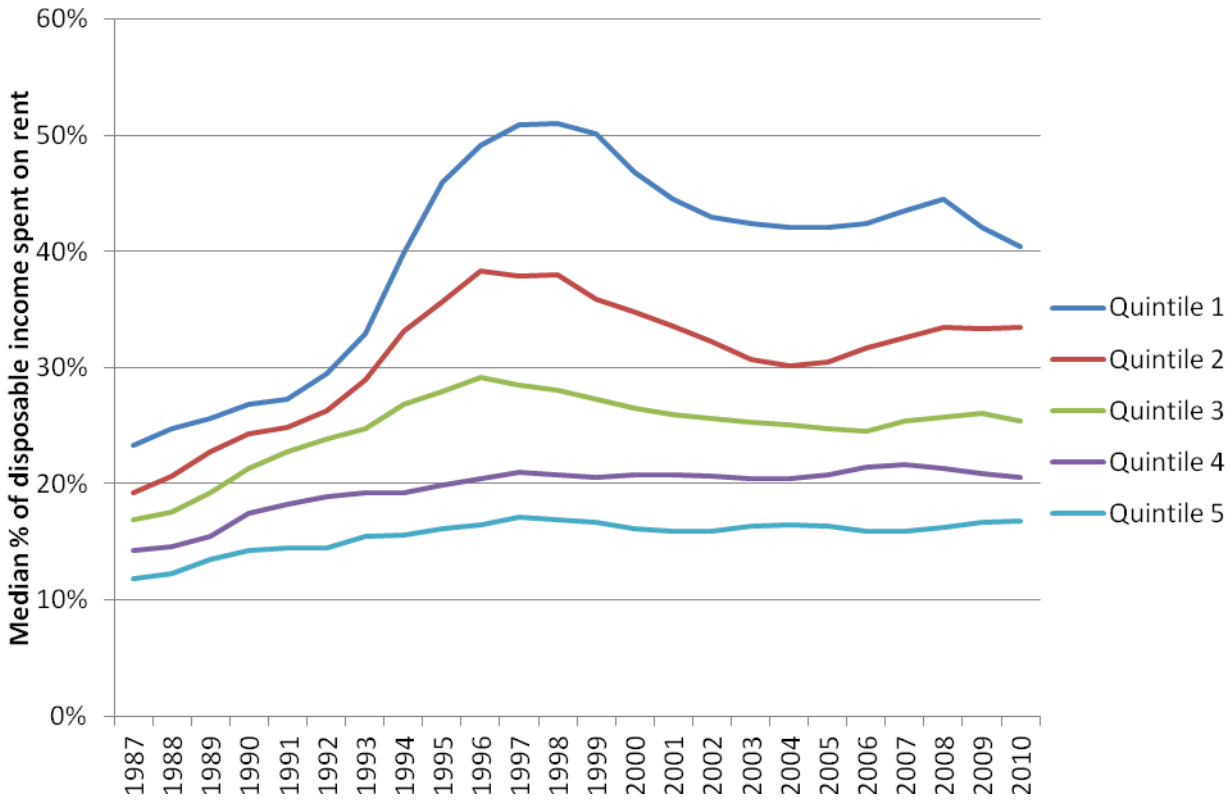
5.4 Expenditures

In this section changes in housing expenditures between 1987 and 2010 are examined using data from HES. Here, the unit of analysis is the household

rather than the individual as expenditures in HES are only available at the household level.[68]

Both median rent (Figure 5.2) and mortgage payments (Figure 5.3) are presented as a proportion of household disposable income by disposable income quintiles. In each case only expenditure on the primary residence is included. Related expenditures, such as those on utilities, rates, and depreciation are excluded.[69]

Figure 5.2: Median rent-to-disposable income by disposable income quintile



The share of household disposable income spent on rent decreases significantly with income. For the top two income quintiles, after a gradual increase from the late 1980s to the late 1990s, rent to disposable income remained relatively constant at around 16% and 21% respectively. Rent to

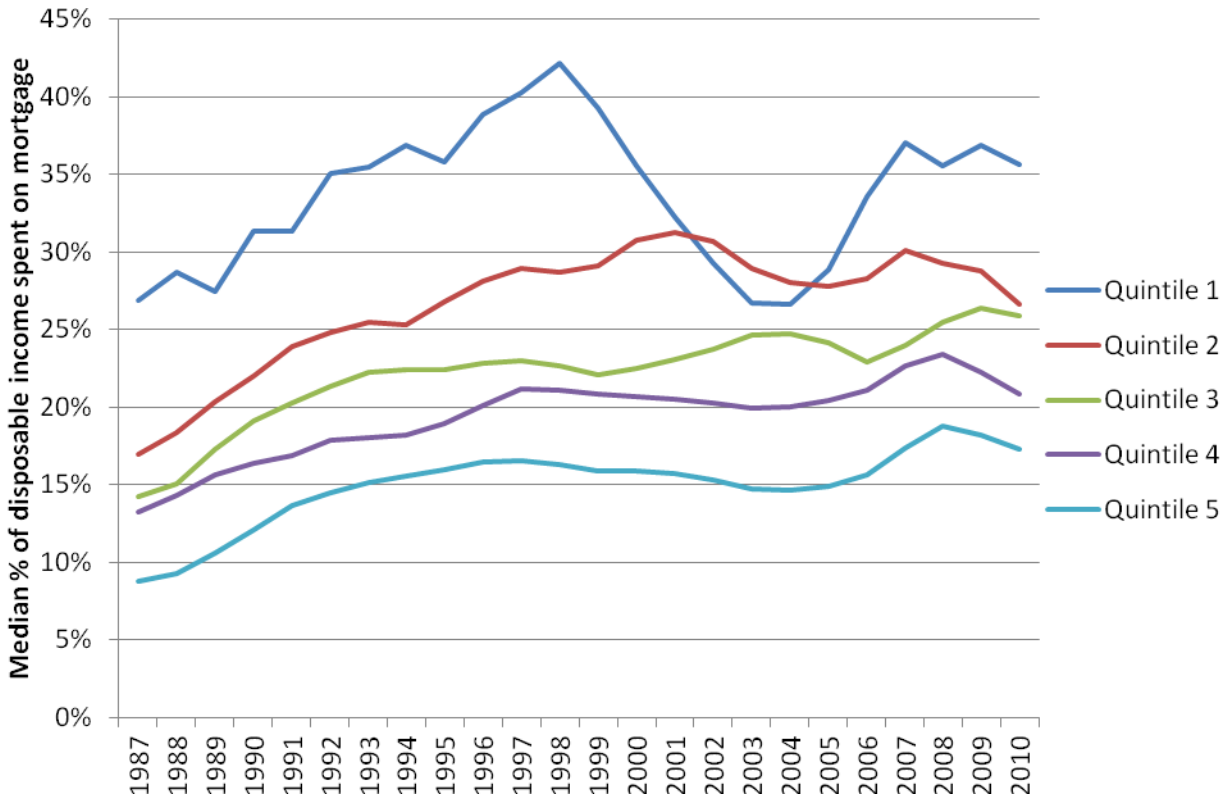
[68] While a number of methods have been developed to attribute spending to various members of the household, it is not necessary to do so for current purposes.
[69] Imputed rental is also excluded from income.

disposable income for the bottom income quintile however, peaked at over 50% in the late 1990s.

A number of policy changes occurred over the period that are likely to have affected households in lower income quintiles. In particular, Housing New Zealand (HNZ) introduced a system of market-related rents. The accommodation supplement was then introduced, and finally, HNZ began charging income-related rents. These changes roughly coincide with the strong growth, and then decline, in rent as a proportion of disposable income observed for those in the bottom two income quintiles.

Recall from Section 5.3 that between 2004 and 2008 house values in SoFIE increased significantly, for example, the median house value rose by over 50%. It is interesting then that over the same period rent to disposable income for all income quintiles remained relatively constant.

Figure 5.3: Median mortgage-to-disposable income by disposable income quintile



The pattern for mortgage payments is similar to that for rent, minus the changes likely due to policy. If anything, the amount households spent on mortgage payments as a proportion of disposable income (compared to rent) appears slightly lower. Between 2004 and 2008 all but the bottom income quintile[70] experienced only modest increases in the proportion of disposable income allocated to mortgage payments. This is not particularly surprising, however, given that many households represented here would have purchased their homes before the period of strong growth in house prices.

5.5 Ownership

Patterns of home ownership are now examined. Section 5.5.1 presents bivariate descriptive analysis of home ownership across groups and over time. To guard against the possibility of drawing spurious relationships between variables multivariate analysis is required and presented in Section 5.5.2. In particular, the results of a logistic regression of home ownership status are discussed where the relationship between a range of factors on the likelihood of owning a home are considered. These include income, age, education, gender, ethnicity, New Zealand born, region, partnership status and regional house prices.

5.5.1 Descriptive analysis

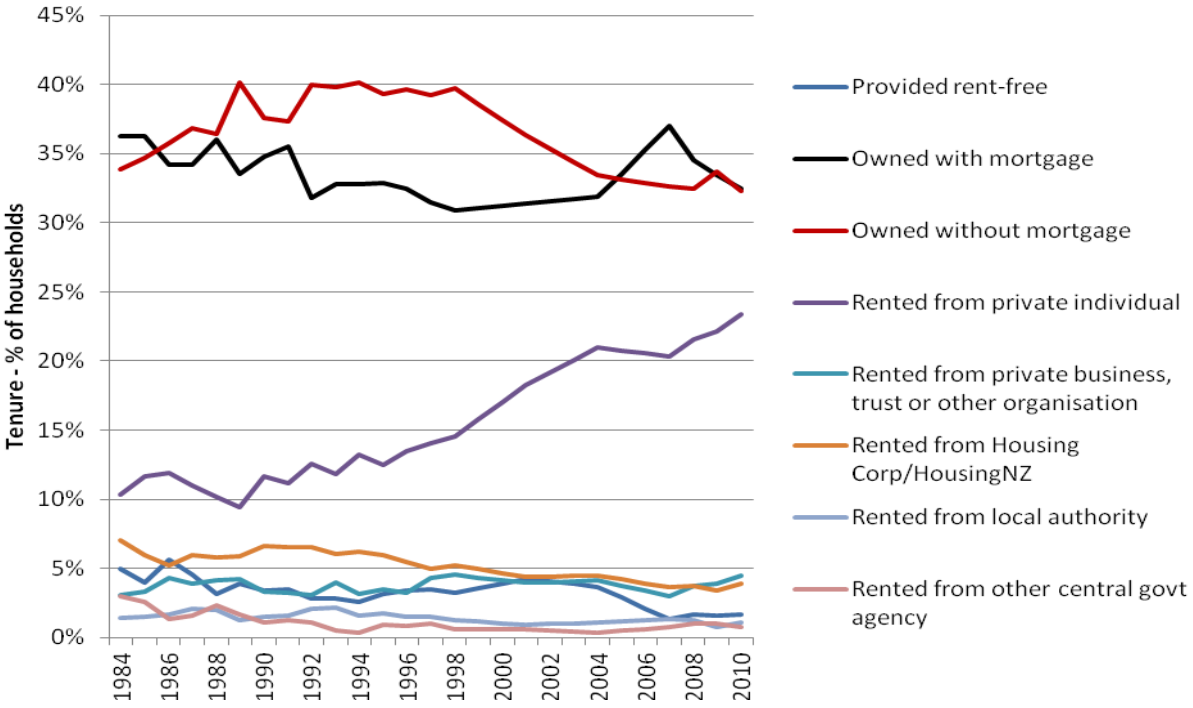
Patterns of housing tenure between 1984 and 2010 are described in Figure 5.4. Home ownership peaked in the late 1980s / early 1990s with nearly 75% of households owning the home they lived in. By 2010 this had fallen to around 65%, split evenly between those living in homes with and without mortgages respectively. With rapidly rising house prices during the 2000s and relatively

[70] The volatility of mortgage payments to disposable income for this income quintile is likely to be at least in part due to a lack of observations as relatively few households in this income quintile own a home with a mortgage.

stable rent, the proportion of household living in private rental accommodation increased substantially from the late 1990s to 2010.

Briggs (2006) suggests that at least part of the decline in home ownership over this period is attributable to the increasing number of homes held in Family Trusts. Statistics New Zealand changed questions in HES late in the period to account for this, possibly creating a discontinuity in measurement of home ownership. In the case of SoFIE, questions about family trusts were asked from the outset so no such discontinuity should exist. However, complications remain that mean home ownership may to some extent also be underreported in SoFIE (see, for example, Scobie and Henderson, 2009).

Figure 5.4: Housing tenure

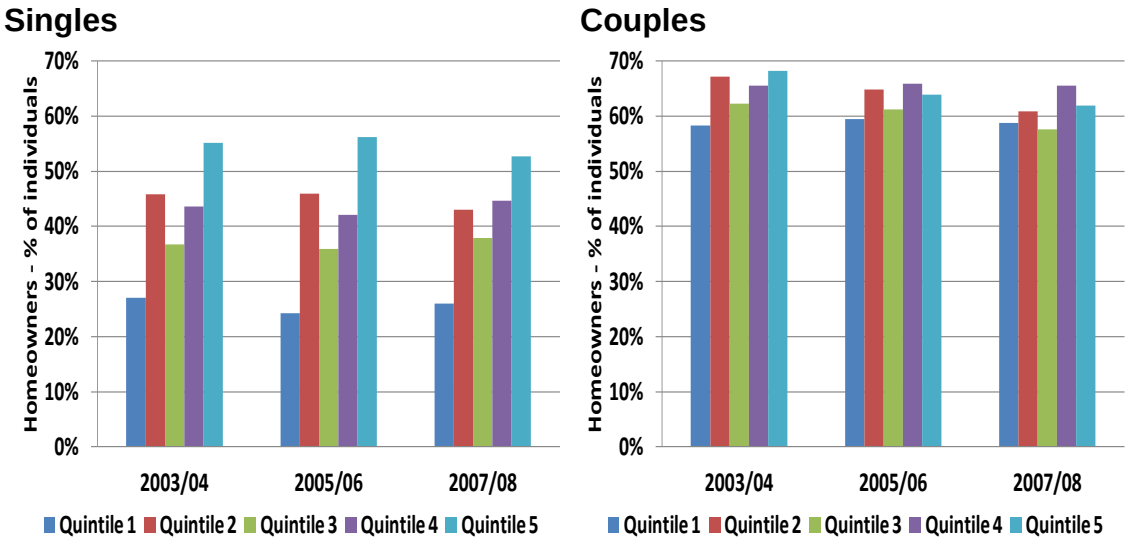


Figures 5.5 through 5.9 examine the proportions of individuals and couples who own their homes in each of waves 2, 4 and 6 of SoFIE, by income, age, ethnicity and region respectively. Generally, couples are far more likely to own their homes than singles, with the proportion of couples owning their homes

being 63% over all three waves compared to 42% for singles.[71] Overall, the proportion of individuals owning their home declined slightly between 2004 and 2008, from around 58% to 55%.

For couples there appears to be little relationship between income and home ownership. For singles home ownership increases with income for the most part (the second income quintile has relatively high home ownership but this is likely due to high numbers of retirees in this group).

Figure 5.5: Home ownership by income



Home ownership increases with age regardless of partnership status and across all three waves of SoFIE, however, the relationship is particularly strong for singles. Mortgage-free home ownership also increases with age, such that, nearly 100% of singles and over 90% of couples over the age of 65 who own their homes do so without mortgages. Given that home ownership is more prevalent amongst couples, it is interesting that conditional on owning a home, mortgage free home ownership is much more likely for singles than couples.

[71] Owner-occupied rates from HES are higher than those from SoFIE because HES rates are based on a household measure of ownership while SoFIE uses an individual-level measure. That is, HES measures whether at least one person living in the house owns it, while in SoFIE, an individual is not considered to be a homeowner unless he or she actually owns the house. To check consistency the household-level measure was also applied to SoFIE, producing similar owner-occupied rates as in HES.

Figure 5.6: Home ownership by age

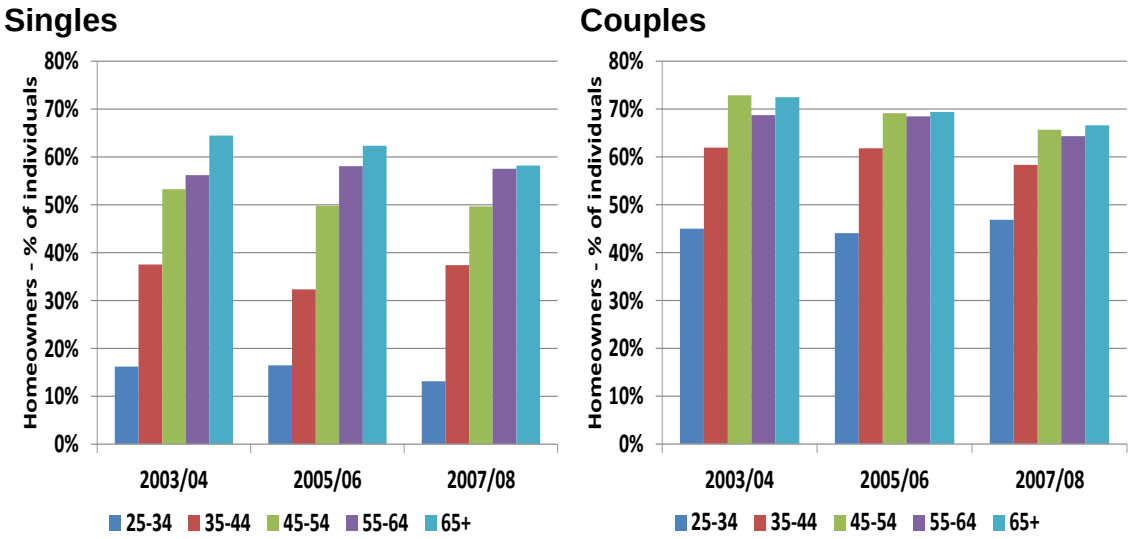
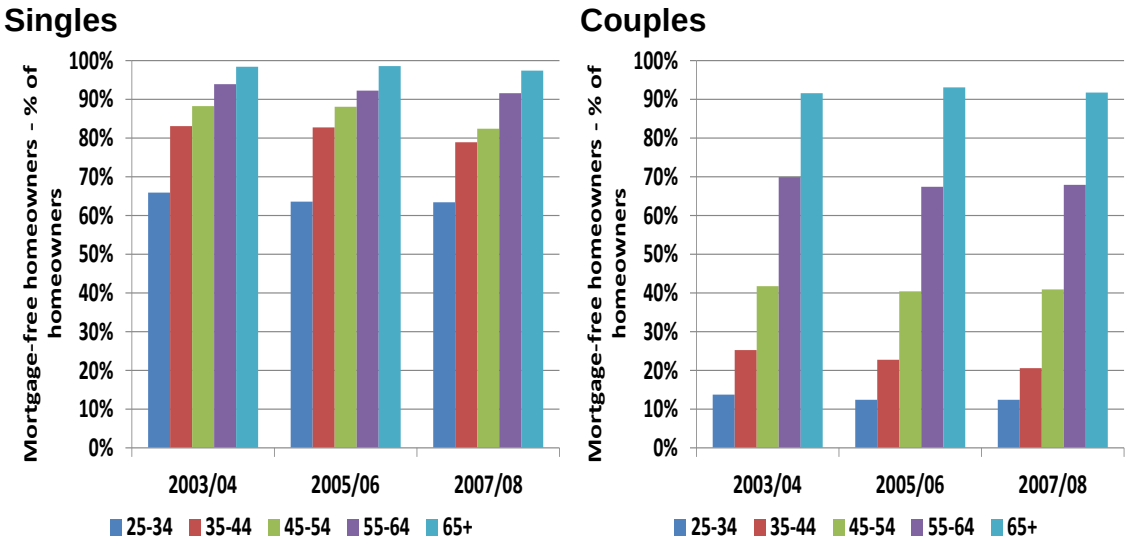
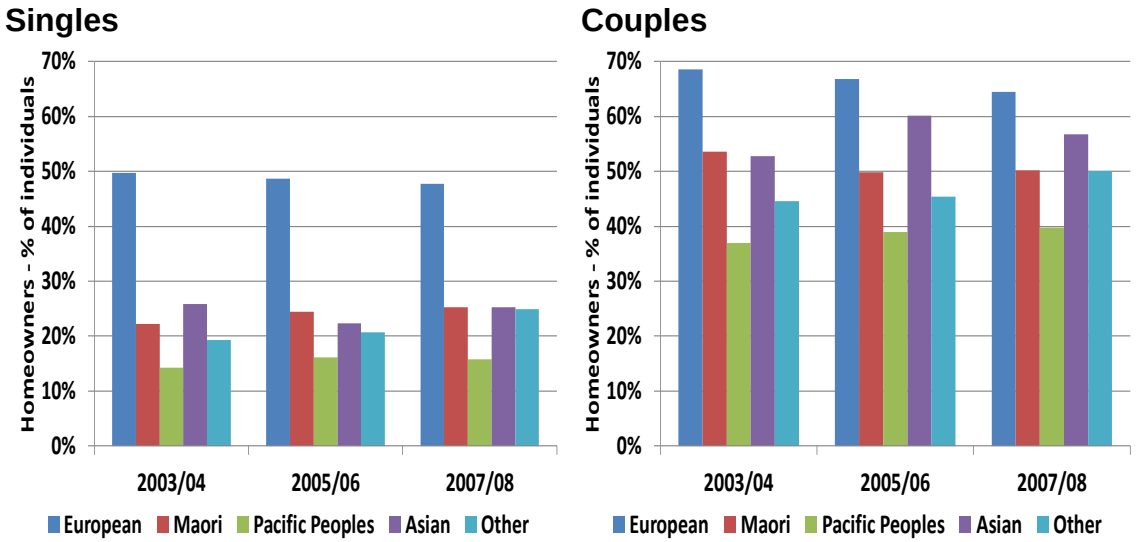


Figure 5.7: Mortgage-free home ownership by age



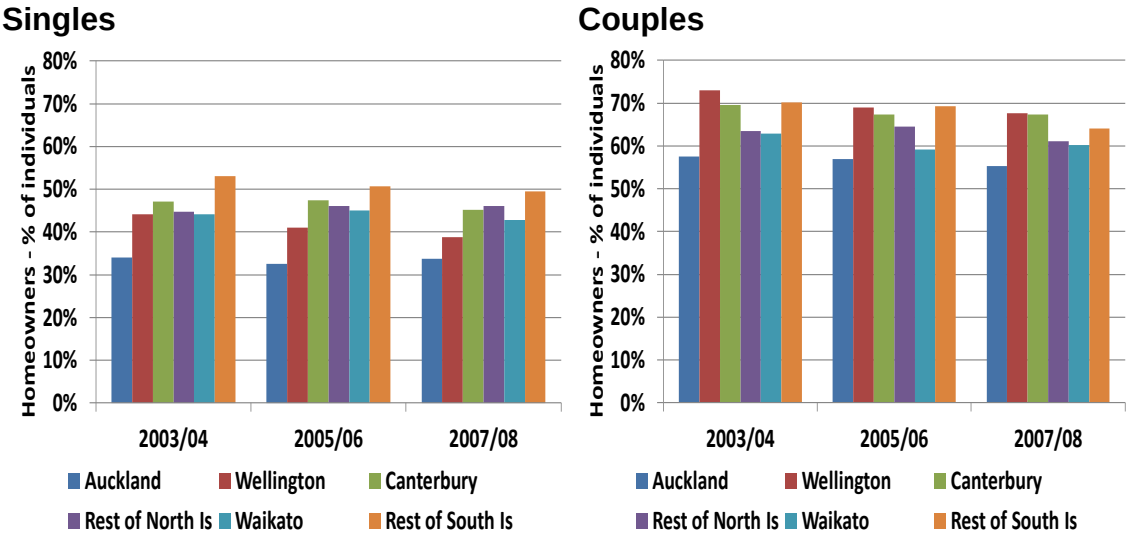
Single Europeans are around twice as likely to own their home as singles belonging to any other ethnicity. Coupled Europeans are also relatively more likely to own their home than those from other ethnicities, though the difference is less pronounced and diminished between 2004 and 2008. Regardless of partnership status and survey wave, pacific peoples have the lowest levels of home ownership.

Figure 5.8: Home ownership by ethnicity



Finally, given the discussion of house prices in Section 5.3, it is not surprising that home ownership is lower in Auckland than in any other region for both singles and couples over the entire period of analysis. The rest of the South Island (for singles) and Wellington (for couples) had the highest rates of home ownership, though particularly in the case of Wellington, these declined significantly over the period.

Figure 5.9: Home ownership by region



5.5.2 Regression analysis

While relatively simple to produce and interpret, descriptive bivariate analysis of the type presented in the previous subsection can often be misleading. This is because any apparent relationship (or lack thereof) could actually be the result of an omitted factor. For example, Figure 5.8 showed that Europeans are a lot more likely to own houses than all other ethnicities. It may be the case that this is due to different preferences for home ownership amongst different ethnic groups. However, it could also be that Europeans are older and therefore have had longer to accumulate wealth, or on average are more likely to live outside of Auckland (the region with the highest house prices in New Zealand). To guard against the possibility of drawing spurious relationships between variables in this way, multivariate analysis is required.

The results of logistic random effects panel regressions of home ownership status are presented in Table 5.2, where the effects of a range of factors likely to affect the probability of owning a home are examined simultaneously.[72] The dependant variable is equal to one if an individual owns the home they live in and zero otherwise. Explanatory variables include those discussed in Section 5.5.1 as well as gender, years of schooling, whether or not the respondent was born in New Zealand and regional house prices.

[72] Pooled logistic regressions yield similar results. As heteroscedasticity is not a particular concern in relation to the regression analysis presented in this chapter, white-adjusted standard errors have not been calculated. Nevertheless, recall that even if heteroscedasticity were present, estimators and predictions based on them remain unbiased and consistent, though they would no longer be BLUE (Best Linear Unbiased Estimators).

Table 5.2: Logistic Panel regressions of home ownership status, 2004 to 2008

Variables	Singles	Couples	Combined
Income	0.0000**	-0.0000*	0.0000
	(0.0000)	(0.0000)	(0.0000)
Years of Schooling	0.4538**	0.0338**	0.1223**
	(0.0476)	(0.0095)	(0.0194)
Age	0.8764**	0.1860**	0.5228**
	(0.0441)	(0.0101)	(0.0177)
Age squared	-0.0060**	-0.0012**	-0.0038**
	(0.0004)	(0.0001)	(0.0002)
Partnered			2.2407**
			(0.0810)
Female	1.0866**	0.1140**	0.3481**
	(0.2262)	(0.0425)	(0.0890)
New Zealand Born	1.1820**	0.2294**	0.1323
	(0.3492)	(0.0631)	(0.1291)
Regional House Price	-2.9378**	-1.0983**	-2.1505**
	(0.3611)	(0.1273)	(0.1530)
Maori	-5.3391**	0.3765**	-2.4108**
	(0.4049)	(0.0695)	(0.1596)
Pacific Islander	-5.9337**	0.9700**	-3.9320**
	(0.6326)	(0.1474)	(0.2485)
Asian	-2.5910**	1.3886**	-1.1794**
	(0.8262)	(0.1023)	(0.2350)
Other Ethnicity	-3.3665**	0.0431	-2.5249**
	(0.9938)	(0.1504)	(0.3663)
Waikato	1.5238**	0.1600	0.6372**
	(0.3698)	(0.0826)	(0.1572)
Wellington	0.5427	0.7771**	0.9306**
	(0.3522)	(0.0727)	(0.1417)
Rest of North Island	1.5073**	0.4388**	0.8507**
	(0.3120)	(0.0628)	(0.1238)
Canterbury	1.4723**	1.0748**	1.0565**
	(0.3405)	(0.0675)	(0.1365)
Rest of South Island	1.8052**	0.7854**	1.2099**
	(0.3594)	(0.0729)	(0.1440)
Constant	-33.9965**	-6.2264**	-16.4308**
	(1.4248)	(0.3266)	(0.5530)
Log Likelihood	-6023.3162	-14716.7110	-21261.7300
Observations	13910	31740	45650
Groups	7535	13985	19805

Notes: The dependant variable is one if the person owns their own home, and zero otherwise. The effects of ethnicity and region are relative to being New Zealand European and living in Auckland respectively. Person specific effects are included in all regressions. Standard errors are in parenthesis. Two stars (**) indicates that the coefficient is significantly different from zero at the 1% significance level and one star (*) indicates that it is significant at the 5% level.

Positive coefficient values associated with variables indicate that an increase in the value of that variable is associated with an increased likelihood of home ownership and vice versa. For readers interested in these results in more detail, coefficients can also be interpreted as log odds ratios. If one exponentiates the coefficient estimates then this provides odds ratios. For example, looking at the regression combining singles and couples, the ratio of the odds of owning a home (compared to not owning a home) for partnered versus non-partnered individuals is 9.4:1[73] (i.e. $e^{2.2407}$).

Results are largely what one would expect, and confirm the associations illustrated by the descriptive analysis of the previous subsection. For example, focussing again on the regression combining singles and couples, the likelihood of owning a home improves with age (but at a decreasing rate), if one is partnered or lives outside of Auckland. The likelihood is reduced if an individual is any ethnicity other than European.

With respect to the observation that the likelihood of owning a home is greater for those who are partnered, one could argue that the direction of causation actually runs in the opposite direction. That is, that a single person who owns a home might find it easier to find a partner. Potential endogeneity issues such as this are very common in empirical economics. They are also usually very difficult to explicitly address as to do so requires the identification of suitable instruments for the offending variable and the application of instrumental variable techniques, such as three-stage least squares, for example.

Good instruments are very difficult to find because they must be associated with the explanatory variable for which endogeneity is a concern but not directly influence the dependant variable themselves and be uncorrelated with the error term. In the present case, potential instruments are limited to the variables contained within SoFIE and variables meeting the requirements for a good instrumental variable are not obvious.

[73] In this example if p is the probability of a partnered individual owning a home and q is the probability of a non partnered individual owning a home, then the odds ratio is equal to (p/(1-p))/(q/(1-q)).

However, while it is likely that home ownership has undoubtedly benefited some in their search for a partner, it is more likely that in general the direction of causation runs from partnership to homeownership. This is primarily for three reasons. First, being partnered means you are likely to have access to around twice the income of someone who is not partnered, meaning that home ownership is more affordable. Second, after becoming partnered people may wish to purchase a house for the purpose of starting a family. Finally, in New Zealand relationship laws around property may actually discourage someone who owns a house independently from becoming partnered because they would risk losing half of this asset if the relationship were to dissolve. Nevertheless, to the extent concerns exist about endogeneity between the dependant variable and any explanatory variables within the empirical models presented in this chapter, care should be taken in interpreting results. That is, coefficient estimates for explanatory variables where the direction of causation is not clear, should be taken to represent association rather than causation.

It is interesting that income is not found to have a statistically significant effect on the likelihood of home ownership. However, additional years of schooling are positively associated with the likelihood of home ownership. This suggests that people's lifetime earnings, rather than income at a point in time, may be a more important determinant of whether one owns a home. It is also possible that the lack of statistical significance on income could be due to multicollinearity, that is, that income could be strongly correlated with other regressors in the model such as years of schooling and age. Indeed, these variables would feature in most regressions where income was the dependant variable. However, in the present case, the correlation between these variables is not very strong, suggesting multicollinearity is not a problem. In particular, in regressions on income used to inform variable selection for the empirical models presented later in this chapter (in Table 5.3), which include both years of schooling and age, the R-squared was only around 10%.

Three further factors not discussed in the previous subsection, but likely to influence home ownership, have been included in the regressions. In particular,

gender, whether or not the respondent was born in New Zealand and regional house prices. Being female and New Zealand born are both associated with increases in the likelihood of owning a home, though New Zealand-born is not statistically significant at conventional levels. It is probable, however, that if those individuals not born in New Zealand were split into recent arrivals (say in the last five to ten years) and those who have been living here longer, a stronger relationship would be observed. Finally, higher house prices have a significant negative effect on the likelihood of home ownership.

5.6 Affordability

Patterns of housing affordability are now examined. Section 5.6.1 describes the model of housing affordability that is applied to non-homeowners and homeowners in Sections 5.6.2 and 5.6.3 respectively. This allows comparison of housing affordability across groups and over time. Regression analysis of housing affordability, similar to that of the previous section, is also undertaken for the sample of non-homeowners.

5.6.1 The model

There are many factors that will determine whether an individual or couple will find home ownership affordable. The model used here incorporates information relating to four important influences on affordability. These are income, net worth, house prices, and the structure of mortgage contracts (including the interest rate and mortgage term). This information is then used to ask whether or not a particular individual or couple could afford to service a mortgage on a lower quartile priced house in their region, with payments not exceeding a certain proportion of their income. This model is broadly similar to that used by the House Price Unit in order to generate one of a number of measures of housing affordability that they considered. However, their analysis made use of only one year of data, and provided little detail in terms of method or results,

though they also considered the effects that wiping student loan debt might have on housing affordability (House Price Unit, 2008).

The first step in determining whether home ownership is affordable or not, according to the model used in this chapter, is to determine the amount that an individual or couple needs to borrow (if anything) in order to purchase a home. This is calculated as the difference between the cost of a lower quartile priced house in the region which they live (obtained from QV) and any positive net worth they have, which is assumed to be used as a deposit.

Required mortgage payments are then determined by the terms of the mortgage contract. A standard table mortgage is assumed for a term of 30 years, and nominal interest rates are set equal to the average of 1-year fixed mortgage rates prevailing at the time (sourced from Reserve Bank of New Zealand series).

Of course nominal interest rates are comprised of real interest rates and inflation. It is well understood that inflation can have a substantial negative effect on the affordability of housing (see, for example, Modigliani and Lessard, 1975, Fischer and Modigliani, 1978 and Coleman, 2008). This is because inflation leads to larger real principal repayments on mortgages during the early years of home ownership (an issue known as mortgage-tilt). Further illustration and discussion of the effects of inflation on housing affordability can be found in Chapter 6, where the effects of a mechanism to address the issue of mortgage-tilt on housing affordability are also examined.

As real mortgage contracts are not currently available in New Zealand the focus here is on nominal housing affordability. This reflects ‘actual’ affordability by highlighting the difficulties of meeting the terms and conditions of mortgage contracts currently available for those who need to borrow to purchase a house.

Required mortgage payments are then offset against a proportion of the individual or couples income. Many variants are used in the literature, broadly falling into two categories (outgoings-to-income ratios and residual income

measures), each with their own strengths and weaknesses (Robinson et al., 2006). In this case the so called '30 percent rule' is adopted where an individual or couple is deemed to find it unaffordable to purchase a home if servicing the mortgage required more than 30% of their gross income.[74] This also happens to be the proportion of income above which Henderson and Scobie (2009) classify individuals as being vulnerable to unexpected shocks in their analysis of household debt in New Zealand. In cases where an individual or couple have negative net worth gross income after debt servicing costs have been deducted is used in the calculation of affordability.

This model is then applied to those aged 25 and older. Non-homeowners and homeowners are examined in turn. In the case of homeowners the model is relaxed to consider the affordability of the houses they currently own, as well as lower quartile priced houses in their respective regions.

5.6.2 Non-homeowners

Descriptive analysis

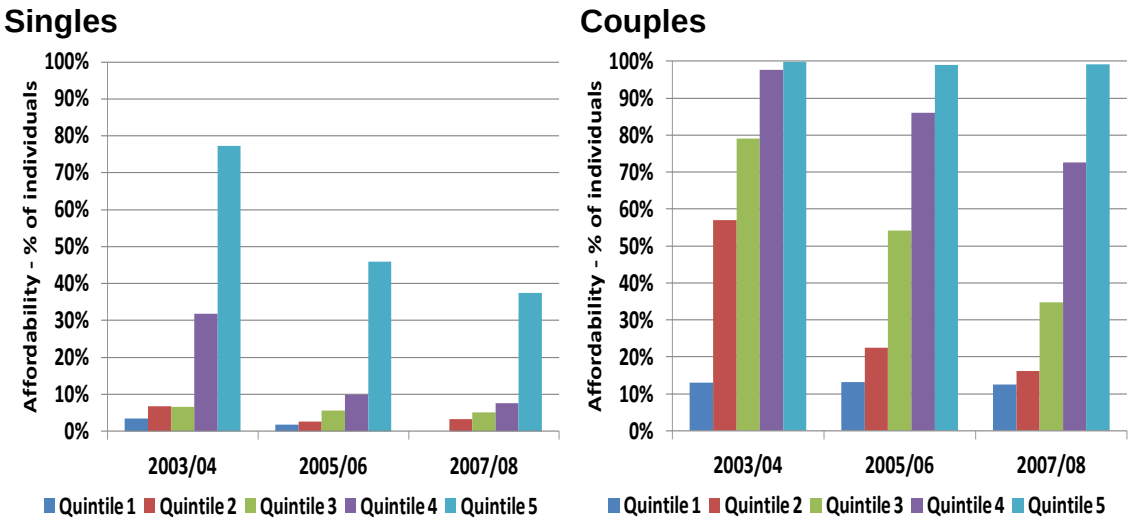
Figures 5.10 through 5.13 illustrate patterns of housing affordability for non-homeowners. In particular, the proportions of individuals and couples who, according to the housing affordability model, could afford to buy a home in each of waves 2, 4 and 6 of SoFIE are examined by income, age, ethnicity and region. Generally, couples are far more likely to find home ownership affordable than singles, with the proportion of couples being able to afford being 57% over all three waves compared to around 16% for singles. Overall, the proportion of individuals able to afford home ownership declined significantly between 2004 and 2008, from around 51% to 31%.

Housing affordability improves significantly with income, particularly for couples. Between 2004 and 2008 income quintiles 2 and 3 (for couples) and 5 (for

[74] An important advantage of this rule is that it is very easy to calculate. Residual income measures, particularly those where income is equivalised, require much more information (including the tax paid by individuals on all forms of their income) and manipulation.

singles) experienced the greatest falls in affordability. Indeed, in each case affordability levels fell to below half their 2004 levels. Other income quintiles either had persistently high or low levels of affordability over the period.

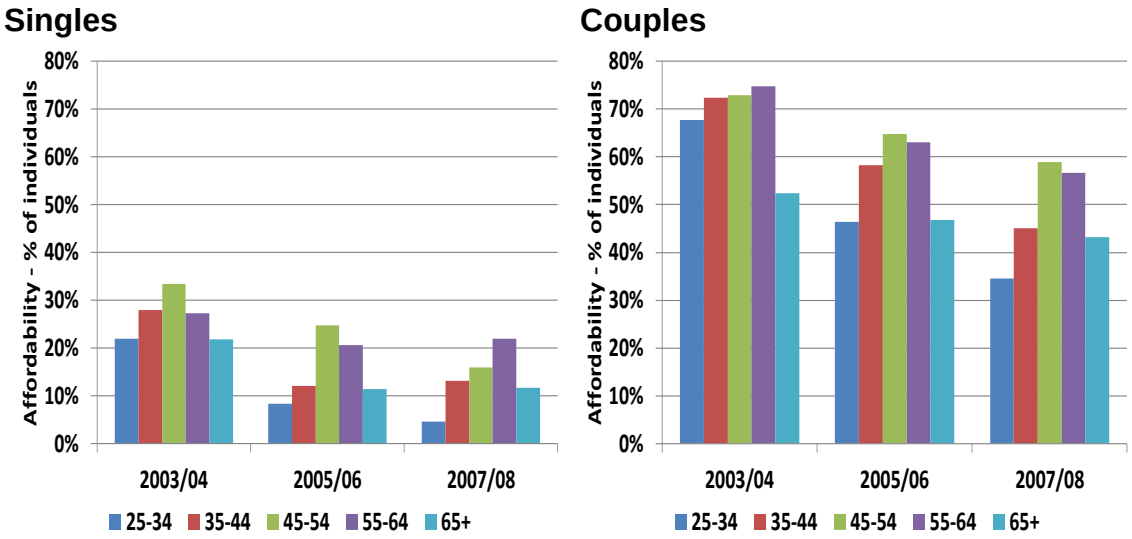
Figure 5.10: Affordability by income (non-homeowners)



Notes: The figure for quintile 1 in 2007/08 is not presented for confidentiality reasons since the number of those who could afford was very small.

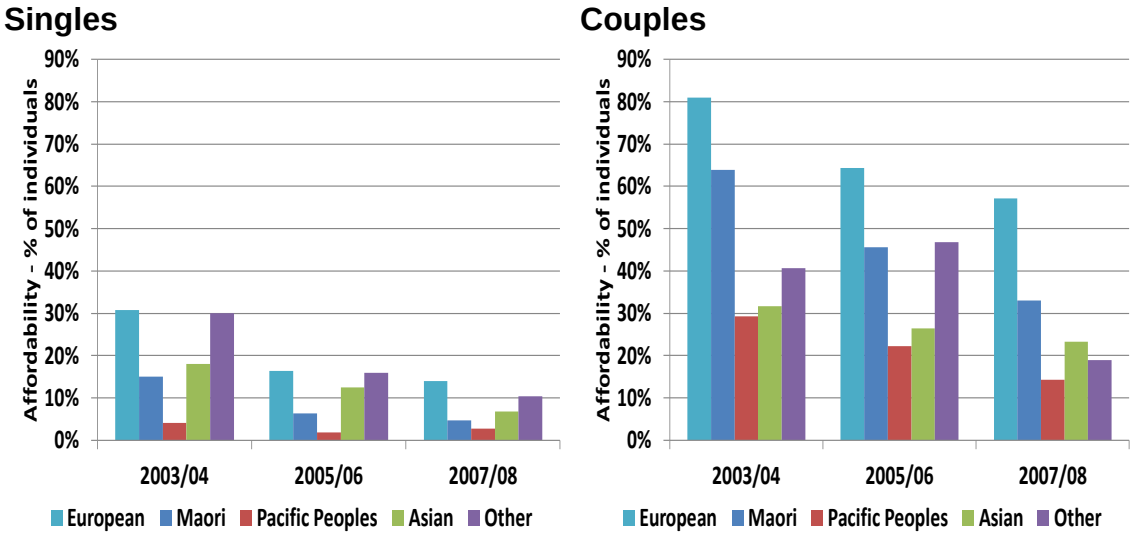
Between waves 2 and 6 all age groups experienced a decline in housing affordability, though this decline was more pronounced amongst the youngest age groups. Within each wave, for both singles and couples affordability initially increases with age, likely reflecting the higher incomes associated with greater work experience. However, beyond a certain point affordability actually decreases with age. This likely reflects that while most older people already own their home, some, such as the lifetime poor, cannot afford to buy a house. It also reflects that incomes tend to be lower in this age group due to retirement. Some older people may also have experienced adverse shocks such as marriage dissolution or other financial issues late in life, leaving them little time to recover financially.

Figure 5.11: Affordability by age (non-homeowners)



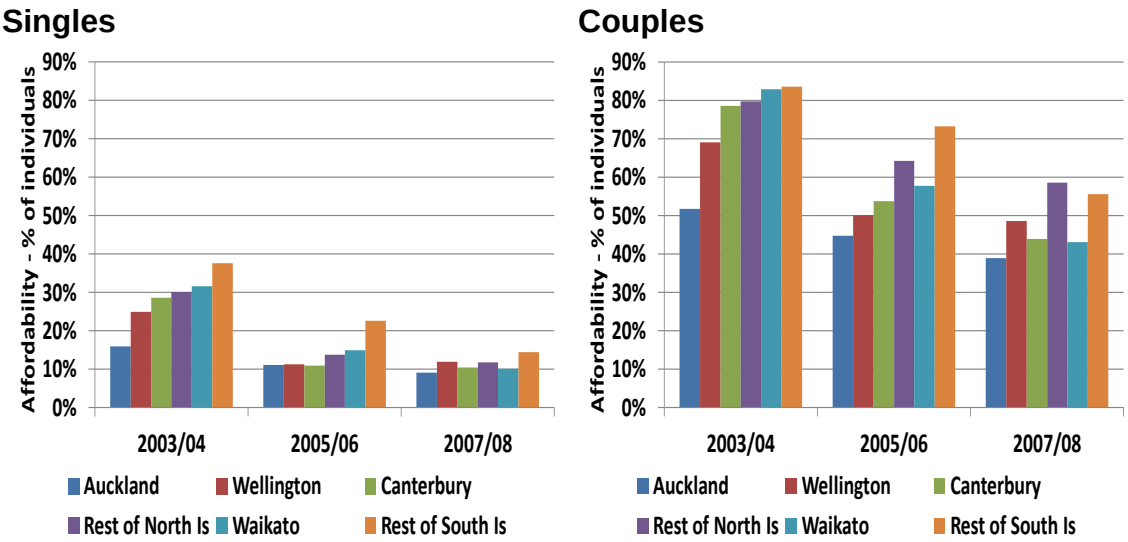
Affordability declined for all ethnic groups between 2004 and 2008. However, the capacity to buy a house varies across ethnic groups, and was highest for European New Zealanders and lowest for Pacific peoples over the entire period of analysis. This may partly reflect location choices, with some ethnic groups more likely to be concentrated in Auckland. Rather than disparities in income or net worth per se, differences between ethnicities may also be due in part to age, with Maori for example tending to be much younger on average than Europeans.

Figure 5.12: Affordability by ethnicity (non-homeowners)



Across regions, Auckland had the lowest levels of housing affordability throughout the period of analysis. However, by 2008 affordability levels in other regions deteriorated such that they were much closer to those of Auckland.

Figure 5.13: Affordability by region (non-homeowners)



Regression analysis

Just as was the case when patterns of home ownership were examined in Section 5.5, the possibility exists that bivariate analysis can yield spurious relationships. Multivariate analysis is again employed to guard against this possibility.

The results of logistic random effects panel regressions of housing affordability status (determined by the housing affordability model) are presented in Table 5.3, where the affect of a range of factors likely to affect the probability of being able to afford to purchase a house are examined simultaneously.[75] The dependant variable is equal to one if an individual can afford to buy a house, and zero otherwise. Explanatory variables are similar to those used in the regression analysis of Section 5.5. However, as income and house prices are key drivers of the housing affordability model these are excluded from the

[75] Pooled logistic regressions yield similar results.

regression,[76] interest rates remain to capture changes in the macroeconomic environment. Interpretation of coefficient estimates is also similar to that of the previous section.

Results are largely what one would expect, and again confirm the picture painted by the descriptive analysis of the previous subsection. Focussing on the regression combining singles and couples, the likelihood of being able to afford a home initially improves with age (and then declines), if one is partnered or lives outside of Auckland. The likelihood is reduced as interest rates rise, if an individual is any ethnicity other than European or is female.

[76] If all variables used to derive the dependant variable were included in the regression as explanatory variables, affordability would be perfectly predicted, and gaining an understanding of how other factors are associated with affordability would not be possible.

Table 5.3: Logistic panel regressions of Affordability status, 2004 to 2008

Variable	Singles	Couples	Combined
Age	0.2420**	0.3527**	0.2577**
	(0.0286)	(0.0267)	0.0184
Age Squared	-0.0022**	-0.0037**	-0.0026**
	(0.0003)	(0.0003)	0.0002
Partnered			4.1058**
			0.1315
Female	-0.8858**	0.0450	-0.2300*
	(0.1586)	(0.1233)	0.0933
New Zealand Born	-0.1824	0.4240*	0.1784
	(0.2368)	(0.1912)	0.1448
Interest Rate	-69.8548**	-80.9188**	-73.8592**
	(5.0735)	(3.9807)	3.0237
Maori	-2.3600**	-2.2065**	-2.1709**
	(0.2600)	(0.2033)	0.1531
Pacific Islander	-3.3380**	-3.8012**	-3.5440**
	(0.5250)	(0.2872)	0.2384
Asian	-0.7490	-3.6633**	-2.6869**
	(0.4046)	(0.3251)	0.2507
Other Ethnicity	-0.5475	-2.7837**	-2.0982**
	(0.5547)	(0.4103)	0.3280
Waikato	1.3880**	1.3903**	1.3318**
	(0.3021)	(0.2327)	0.1787
Wellington	0.9319**	0.6912**	0.7581**
	(0.2570)	(0.2068)	0.1560
Rest of North Island	1.3519**	1.4606**	1.3636**
	(0.2377)	(0.1790)	0.1380
Canterbury	0.8423**	0.5092**	0.6269**
	(0.2486)	(0.1977)	0.1502
Rest of South Island	1.3911**	1.8566**	1.5951**
	(0.2687)	(0.2279)	0.1664
Constant	-3.5126**	-0.4523	-3.2221**
	(0.7751)	(0.6438)	0.4732
Log Likelihood	-2941.1765	-4838.8974	-7863.7909
Observations	7735	9200	16935
Groups	4800	5360	9655

Notes: The dependant variable is one if the person is deemed to be able to afford a lower quartile priced house in their region (according to the housing affordability model described in Section 5.6.1), and zero otherwise. The effects of ethnicity and region are relative to being New Zealand European and living in Auckland respectively. Person specific effects are included in all regressions. Standard errors are in parenthesis. Two stars (**) indicates that the coefficient is significantly different from zero at the 1% significance level and one star (*) indicates that it is significant at the 5% level.

5.6.3 Homeowners

The financial consequences of home ownership will of course linger well beyond that point at which one chooses to buy a house. For this reason the housing affordability model is also applied to those who currently own the house they live in.

As was the case for non-homeowners, couples are more likely to find home ownership affordable than singles, however, the difference between these two groups is much less pronounced. The proportion of home owning couples able to afford a lower quartile priced house in their region according to the model was 91% on average over all three waves compared to around 82% for singles. Overall, the proportion of home owning individuals who were not required to spend more than 30% of their income to service mortgage payments declined slightly between 2004 and 2008, from around 95% to 88%.

Even so, the levels of affordability for homeowners compared to non-homeowners were much higher throughout the entire period of analysis, for example, 88% versus 31% in 2008. This is not necessarily surprising as in this analysis all homeowners are examined regardless of how long they have owned their home. It is likely that the levels of affordability for recent homeowners would be lower than for those who purchased their homes some time ago. However, the large difference between affordability of non-homeowners and homeowners does highlight the potential importance of transition into home ownership.

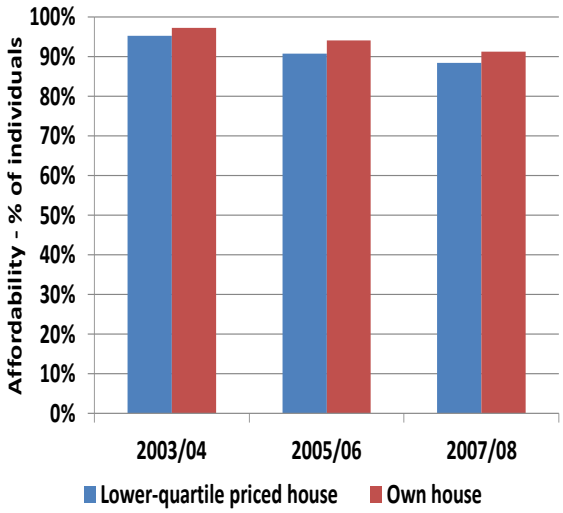
The observed relationships between affordability and each of income, age, ethnicity and region for homeowners are similar to that of non-homeowners. For example, Figure 5.14 shows the proportions of individuals and couples who, according to the model, could afford to buy a lower quartile priced home in each of waves 2, 4 and 6 of SoFIE, by income. Housing affordability improves with income, particularly for singles. The most substantial falls in affordability between 2004 and 2008 were experienced by singles belonging to the bottom two income quintiles.

Figure 5.14: Affordability by income (homeowners)

Finally, the effects of relaxing the housing affordability model for homeowners are examined in Figure 5.15. Specifically, the affordability test is changed so that rather than being able to afford a lower quartile priced house in their region, the question is whether or not they could afford their current house.

Interestingly, the result is that affordability actually increases. Given that for most homeowners (around three quarters of them) their current house would be more expensive than a lower quartile priced house in their region this is suggestive that individuals, on the whole, make rational decisions about house purchases. In other words, those who purchase relatively expensive houses can afford them, and those that may struggle to afford even a lower quartile price house tend to purchase still cheaper houses.

Figure 5.15: Affordability of lower quartile versus own home (homeowners), singles and couples combined



5.7 Conclusion

Housing affordability is important for a number of reasons. Notably, housing expenditures consume a large proportion of household income and housing represents a significant share of household wealth for many New Zealanders. Further, home ownership can provide security of living standards for retirees by avoiding the costs and volatility of the rental housing market. However, the prolonged period of rapid house price growth that has taken place in New Zealand has made home ownership increasingly difficult for many, resulting in renewed focus on housing policy.

The aim of this chapter has been to inform the future direction of housing policy in New Zealand through analysis designed to provide insight into the extent of any problem with respect to home ownership and housing affordability, and to identify those most affected. The analysis therefore provides valuable information for potential policy intervention, particularly in terms of where, and to whom, those interventions might best be targeted.

In particular, the chapter has examined how patterns of house prices, expenditures, home ownership and housing affordability have changed over

time and across groups, making use of a model suggestive of whether or not an individual or couple is likely to find home-ownership affordable. In addition, panel logistic regressions were employed to examine how the likelihood of home-ownership and housing affordability in turn depend on a wide range of demographic and economic variables simultaneously.

Results show considerable increases in prices throughout the house price distribution between 2004 and 2008. Interestingly, lower quartile house prices increased by proportionally more than upper quartile house prices in all major regions. Further, although Auckland remained the most expensive region in 2008, growth in house prices across all other major regions was higher during this period.

Home ownership rates, however, declined only slightly between 2004 and 2008. Factors associated with a higher likelihood of owning a home include being partnered, female or older, and living in any region other than Auckland. Higher house prices are negatively associated with home ownership as is belonging to an ethnicity other than NZ European. A statistically significant relationship between income and home-ownership was not found. However, higher levels of education were positively associated with home-ownership, perhaps indicating that lifetime rather than point in time income is more important for home ownership.

For non-homeowners housing affordability improves significantly with income and is much higher for couples than singles. Between 2004 and 2008 income quintiles 2 and 3 (for couples) and 5 (for singles) experienced the greatest falls in affordability. Other income quintiles either had persistently high or low levels of affordability. Across regions, Auckland had the lowest levels of housing affordability throughout the period. However, by 2008 affordability levels in other regions had deteriorated such that they were much closer to those of Auckland.

For both singles and couples affordability initially increases with age, likely reflecting the higher incomes associated with greater work experience.

However, beyond a certain point affordability actually decreases with age. This likely reflects that while most older people already own their home, some, such as the lifetime poor, struggle regardless of age. It also reflects that incomes tend to be lower in the highest age groups due to retirement.

Affordability declined for all ethnic groups between 2004 and 2008. However, the capacity to buy a house varies across ethnic groups, and was highest for European New Zealanders and lowest for Pacific peoples over the entire period of analysis. This may partly reflect location choices, with some ethnic groups more likely to be concentrated in Auckland. Rather than disparities in income or net worth per se, differences between ethnicities may also be due in part to age, with Maori, for example, tending to be much younger on average than Europeans.

Housing affordability for homeowners was much higher throughout the period than for non-homeowners. Interestingly, when the affordability test for homeowners was changed so that rather than being able to afford a lower quartile priced house in their region the question was whether or not they could afford their current house, affordability actually increased. Given that for most homeowners (around three quarters of them) their current house would be more expensive than a lower quartile priced house in their region, this suggests that individuals, on the whole, make rational decisions about house purchases. In other words, those who purchase relatively expensive houses can afford them, and those that may struggle to afford even a lower quartile price house tend to purchase still cheaper houses.

Chapter 6

Housing Affordability and Price Level Adjusted Mortgages

6.1 Introduction

The previous chapter examined patterns of housing affordability in considerable detail using data from the Survey of Family Income and Employment (SoFIE) for the period 2004 to 2008. In particular, a model likely to be suggestive of whether or not an individual or couple would find home-ownership affordable was applied. This model was based on information relating to income, net worth, house prices and the structure of mortgage contracts including the nominal interest rate and mortgage term.

While housing affordability was high for some groups during at least part of the period analysed, for other groups affordability was persistently low, such as for singles and those on relatively low incomes. For nearly all groups examined housing affordability declined substantially between 2004 and 2008 as house prices and nominal interest rates increased at a rate that far outpaced income growth.

Of course nominal interest rates are comprised of real interest rates and inflation. In quarter two of 2004 annual inflation was 2.4% in New Zealand and the inflation rate rose considerably during the period of analysis. For instance, in quarter two of both 2006 and 2008 annual inflation was 4%. Subsequently, annual inflation has been higher than this at points, for example at 5.3% in

quarter two of 2011. Although inflation has been at low levels for much of the last six years, as of the first quarter of 2017 it is again over 2%.

It is well understood that even modest rates of inflation can have a substantial negative effect on the affordability of housing (see, for example, Modigliani and Lessard, 1975; Fischer and Modigliani; 1978 and Coleman, 2008). This is because inflation results in 'front-loading' of mortgage repayments since it leads to larger real principal repayments during the early stages of home ownership, an issue known as mortgage-tilt.

Price level adjusted mortgages (PLAMs) can help to address this issue. A PLAM is a debt contract that links dollar repayments to a price index and will therefore have a different payment schedule to that of a conventional mortgage. In particular, when inflation is positive as it has been in New Zealand for over 70 years, a PLAM will require lower payments during the early years of a mortgage and higher payments during latter years, as compared to a conventional mortgage. This difference is important as incomes typically increase over time. Potential homeowners are therefore more likely to struggle to meet mortgage payments in the early years of a mortgage (Coleman, 2012).

Despite considerable resources and policy attention given to the issue of housing affordability in New Zealand, neither the impact of inflation nor tools which might limit its negative effects on housing affordability, have been studied in any detail. That is, while Coleman (2012) discusses the merits of PLAMs and their potential application in New Zealand, a detailed investigation of the potential benefits and how those might be distributed, using appropriate individual survey data, is missing. This chapter therefore extends the analysis of the previous chapter to examine the potential benefits to housing affordability of the introduction of price level adjusted mortgages.

In particular, the model of housing affordability used in the previous chapter is again applied to data from SoFIE for the period 2004 to 2008 but with one important difference. A price level adjusted mortgage is assumed under various rates of inflation. Results are then compared to those derived under the

assumption of a conventional mortgage, thus providing an indication of the potential initial improvement to housing affordability that might result if price level adjusted mortgages were available.

The years 2004 to 2008 provide a particularly good period for analysis with median house prices increasing by over 50% and inflation at relatively high levels. However, the issue of housing affordability remains important. Indeed between 2013 and 2017, for example, median house prices rose by over 40% and inflation was again around 2%. Therefore, any benefits of the availability of PLAMs suggested by this analysis are likely to be similarly important in the future.

Results suggest that PLAMs could indeed significantly improve housing affordability for prospective homeowners if they were available. For instance in 2004, even when assuming only a modest rate of inflation of 2%, the proportion of individuals likely to find home ownership affordable was estimated to be 9 percentage points higher with a PLAM than a conventional mortgage. With inflation of 4% the improvement in housing affordability in 2004 would have been closer to 19 percentage points.

The remainder of this chapter is organised as follows. Section 6.2 outlines price level adjusted mortgages in more detail and provides examples. The data, a model of housing affordability and analytical approach are described in Section 6.3. Results are presented in Section 6.4. These include details of the increase in the proportion of people who are likely to find home ownership affordable after the introduction of PLAMs under various rates of inflation. In addition, changes in the income required to service a mortgage are described. In both cases results are disaggregated on a number of dimensions including age, ethnicity, income and region. Conclusions are drawn together in Section 6.5.

6.2 Price level adjusted mortgages[77]

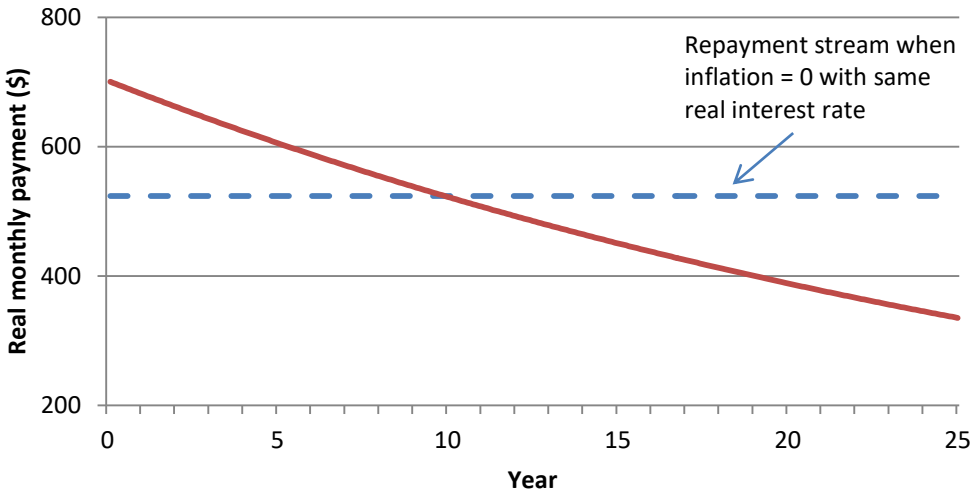
For prospective homeowners who need to borrow in order to purchase a house, any difficulty in meeting the terms of a mortgage contract relate not only to the purchase price of the house and the real interest rate, but also to inflation. This is because inflation results in 'front-loading' of mortgage repayments since it leads to larger real principal repayments during the early stages of home ownership, an issue known as mortgage-tilt (Modigliani, 1976).

Home loans in New Zealand are typically table mortgages, which require a series of payments determined by the loan's maturity term and the nominal interest rate (hereafter referred to as a conventional money mortgage). For instance, if inflation is 3% per year, the real value of monthly repayments on a 25 year loan of $100,000 with a 7% interest rate declines from about $700 at the start of the loan to $335 at the end of the 25th year. In contrast, if the inflation rate were zero, there would be a constant real repayment of about $525 a month over the life of the mortgage (Figure 6.1).[78]

[77] The illustrative examples presented in Section 6.2 of this chapter are based on the author's calculations and do not make use of data from Statistics New Zealand.

[78] Figures 6.1, 6.2, and 6.3, as well at Table 6.1, are broadly similar to some of the illustrations contained in Coleman (2012), though no detail was provided in terms of their calculation. Therefore, these tables and figures are based on the current author's own calculations.

Figure 6.1: Real monthly repayment stream of a 7% 25 year $100,000 mortgage (inflation = 3%)



A price level adjusted mortgage (PLAM) is a debt contract that links dollar repayments to a price index and can therefore help to address the issue of mortgage-tilt. PLAMs, are currently widely available, for example, in Iceland and Chile (being available in Chile for several decades), and were introduced in Denmark in 1982 during a period of high inflation (Shiller, 2002; and Lunde, 1997). When inflation is positive a PLAM requires lower payments during the early years of the mortgage and higher payments during latter years as compared to a conventional money mortgage. This difference can have a substantial effect on initial housing affordability.

Equations 6.1 and 6.2 give the initial monthly mortgage payment, *P*, required under a conventional money mortgage and PLAMs respectively:

$$P_{Money\ Mortgage} = L\frac{i(1+i)^n}{(1+i)^n-1} \tag{6.1}$$

$$P_{PLAM} = L(1+\pi)\frac{r(1+r)^n}{(1+r)^n-1} \tag{6.2}$$

where L is the initial value of the loan, r is the monthly real interest rate, n is the mortgage term in months and π is the monthly rate of inflation. The monthly real interest and inflation rates are derived from their respective annual rates

according to the formula $(1+a)^{1/12}-1$, where a is either the annual real interest rate or inflation rate. The monthly nominal interest rate, i, is equal to $(1+r)(1+\pi)-1$. In the case of the conventional money mortgage nominal mortgage payments will remain fixed over time. In the case of a PLAM the initial nominal mortgage payment rises over time in line with inflation, however, the real value of mortgage payments remains constant.[79] While annual rather than monthly rates of inflation and interest rates are discussed and presented throughout the remainder of this chapter, the examples which follow make use of Equations 6.1 and 6.2.

Table 6.1: Initial monthly repayment on a 25 year $100,000 mortgage

Inflation	Real interest rate	Nominal interest rate	Money mortgage payment	PLAM Payment	Saving
0.0%	4.0%	4.0%	$524	$524	0.0%
0.0%	5.0%	5.0%	$578	$578	0.0%
0.0%	6.0%	6.0%	$635	$635	0.0%
1.0%	4.0%	5.0%	$580	$524	9.7%
1.0%	5.0%	6.1%	$637	$579	9.2%
1.0%	6.0%	7.1%	$697	$635	8.8%
2.0%	4.0%	6.1%	$639	$525	17.9%
2.0%	5.0%	7.1%	$699	$579	17.2%
2.0%	6.0%	8.1%	$761	$636	16.4%
3.0%	4.0%	7.1%	$700	$525	25.0%
3.0%	5.0%	8.2%	$763	$580	24.0%
3.0%	6.0%	9.2%	$827	$636	23.0%

Initial monthly payments on a 25 year loan of $100,000 for both conventional money mortgages and PLAM mortgages are shown in Table 6.1, assuming various combinations of annual real interest rates and inflation rates. When inflation is zero there is no difference in initial monthly payments between the two types of mortgages, regardless of the level of the real interest rate. However, as inflation increases the difference in initial monthly payments

[79] The inflation rate appears in equation 6.2 as the initial mortgage payment is assumed to be paid at the end of the first period.

between PLAMs and money mortgages also increases. For example, when inflation is 1% the initial monthly payment on a PLAM would be approximately 10% lower than that under a conventional money mortgage. This saving increases to around 25% when inflation is 3%, assuming a real interest rate of 4% in both cases.

Although payments on a PLAM increase at the rate of inflation they will remain below those required under a money mortgage for several years. For instance, with a real interest rate of 4% and an inflation rate of 3% monthly payments on a PLAM are lower than those associated with a money mortgage for close to ten years. This difference in the inter-temporal profile of mortgage payments is important as incomes typically increase over time. Potential homeowners are therefore more likely to struggle to meet mortgage payments in the early years of a mortgage rather than in later years.

Indeed, a PLAM allows for a significantly smaller proportion of an individual or couples income to be devoted to mortgage payments than a conventional money mortgage during the early stages the mortgage (though it will be higher during the later stages). If income growth were at the same pace as inflation the ratio of mortgage payments to income would remain fixed over the life of a PLAM. However, if income growth were to outpace inflation, as is typical, the ratio of mortgage payments to income would still fall over the life of a PLAM, albeit at a slower pace than in the case of a conventional money mortgage. Further, Campbell and Cocco (2003) estimate that if households were able to adjust the timing of their mortgage payments in the manner allowed by PLAMs, their lifetime welfare would increase significantly.[80] This was particularly so for those at the bottom end of the utility distribution.

Due to the different inter-temporal profiles of monthly payments between the two mortgage types, at any given time over the life of a mortgage, the value of the remaining principal on the loan will also be different. Figure 6.2 shows the value of the remaining nominal principal over the life of both a PLAM and

[80] With welfare gains measured in terms of consumption-equivalent variations.

money mortgage, again assuming a term of 25 years, an initial loan of $100,000, a real interest rate of 4% and an inflation rate of 3%. Figure 6.3 similarly illustrates the value of the remaining real principle over the life of each mortgage type. In both cases the value of the outstanding principal at each point in time is higher for the PLAM mortgage as compared to the money mortgage. Further, the outstanding nominal principal for the PLAM is actually slightly higher than the value of the initial loan for approximately six and a half years.

Figure 6.2: Remaining nominal principal on a 25 year $100,000 mortgage (3% inflation, 4% real interest rate)

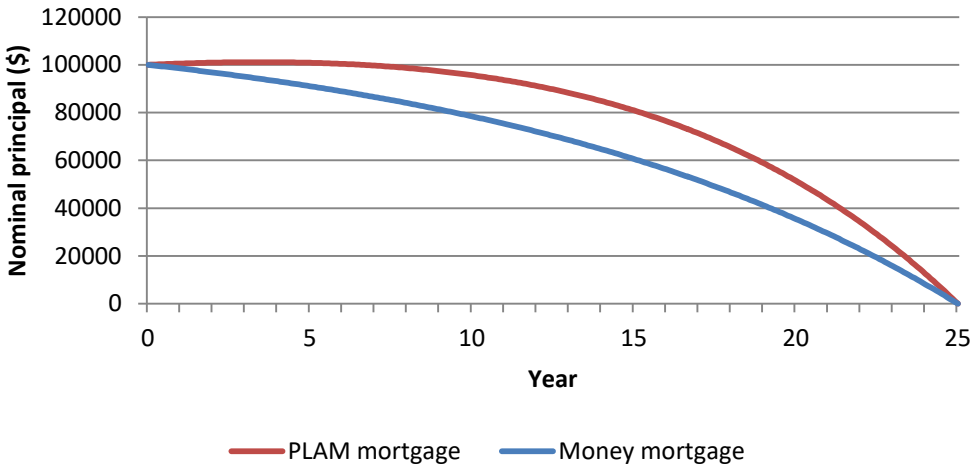
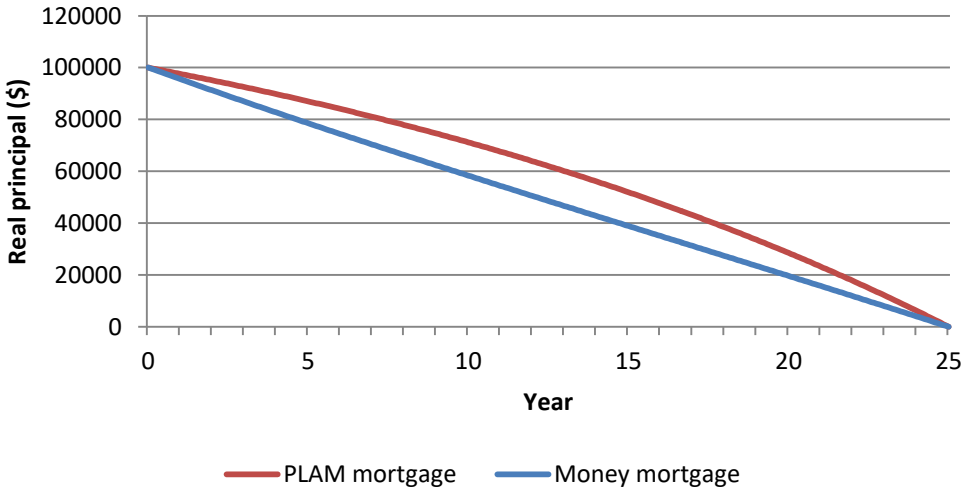


Figure 6.3: Remaining real principal on a 25 year $100,000 mortgage (3% inflation, 4% real interest rate)



A detailed assessment of the relative risks of PLAMs versus conventional money mortgages is by no means trivial, either from the point of view of the lender or the borrower, and is outside the scope of this chapter. However, it is important to realise that there may be differences between the two types of mortgages in this regard. In particular, to the extent that PLAMs may be of higher risk than conventional money mortgages (or less profitable) from the point of view of the lender, the real interest rate on PLAMs may rise above that of conventional money mortgages. If this were the case the benefits of PLAMs in terms of improving housing affordability during the early years of home ownership would be diminished. It could also make the lifetime cost of PLAMs higher than conventional money mortgages.

Figures 6.2 and 6.3 suggest that the costs associated with default, if it were to occur, may be higher with PLAMs due to larger outstanding loan balances at any given point in time as compared to conventional money mortgages. However, while the difference in value of the outstanding principal at any given point in time between the two mortgages increases with inflation, so too will wages and the nominal value of the house attached to the mortgage. This should mitigate the risk that lender will not be able to recover the outstanding debt in the event that the borrower defaults.

The probability of default, and how that probability varies over time, may also be different under the two types of mortgages. As already discussed, mortgage payments as a proportion of income will be lower in the early stages of a mortgage and higher in the later stages with PLAMs as compared to conventional money mortgages. For this reason, the risk of default may be relatively high in the later years of the mortgage, and relatively low in early years.

PLAMs may also reduce the risk of default because they are less susceptible to large interest rate rises than conventional money mortgages, as the nominal interest rate will tend to rise and fall with inflation leading to higher mortgage payments. For example, if one year after taking out a mortgage annual inflation had increased from 1% to 3%, assuming a constant real interest rate, monthly

payments on a money mortgage in year two would increase from $580 to $700 (an increase of approximately 21%). Monthly payments on a PLAM, on the other hand, having been $524 at the start of the mortgage would only increase by 3% over the course of the second year, from $529 to $545 (Table 6.1). Indeed, McCulloch (1986) concludes that PLAMs are not more risky than other types of mortgages and could even be less risky for this reason. Similarly, Campbell and Cocco's (2003) analysis for the U.S. finds a lower associated risk of default with PLAMs compared to conventional money mortgages. However, in much earlier work, also for the U.S., Vandell (1978) finds a higher risk of default with PLAMs in some circumstances, including when home equity is reduced due to lower property values or deposits, with high rates of inflation accentuating the effect.

In any event, if it were the case that PLAMs were of higher risk (from the lenders perspective) than conventional money mortgages, necessitating high real interest rates to maintain profitability, Table 6.1 suggests that real interest rates could rise significantly before the initial benefits of PLAMs in terms of housing affordability were eliminated. In particular, for this to occur, real interest rates would have to increase in the case of PLAMs by roughly the rate of inflation.

Putting aside the question of risk, the real interest rate on PLAMs could also be lower than on money mortgages because of the way these mortgages might be financed. In particular, lenders may seek to limit their exposure to inflation by raising deposits which are also linked to inflation. To the extent that people value protection against inflation on their savings they may be prepared to accept lower real interest rates on these deposits (Coleman, 2012).

The above paragraph also offers a potential explanation as to why, somewhat surprisingly and aside from issues associate with risk, PLAMs are not available in New Zealand at present. That is, options for lenders to limit their exposure to inflation are limited, with inflation indexed deposits not available and only a very small number of government issued inflation indexed bonds currently existing in New Zealand, with no privately issued inflation indexed bonds. This may well

be an impediment to the adoption of PLAMs, along with a lack of consumer understanding, legal barriers and tax considerations (Manchester, 1984; Coleman, 2012). Indeed, while only relevant to some potential borrowers in New Zealand, Knoll (1992) provides an analysis of how the tax system in the U.S. is biased against PLAMs. New Zealand's small size and limited competition in the banking sector may act as an additional impediment to the adoption of PLAMs. That is, if there are significant fixed costs associated with financial innovations of this sort and only a relatively small number of potential customers to spread these over. While outside the scope of this chapter, a more detailed analysis of these and similar issues would be important if PLAMs were to be introduced in New Zealand.

6.3 Data and analytical approach

This section first describes the data used in the analysis. It then outlines a model which may be suggestive of whether or not an individual or couple is likely to find home-ownership affordable. In addition, how the model is used to estimate the potential benefits that may result from the introduction of price level adjusted mortgages is discussed.

6.3.1 Data

The analysis in this chapter uses unit record data from the Survey of Family, Income and Employment (SoFIE), a longitudinal survey where the original sample members are tracked and surveyed each year. It began in October 2002 with an original sample size of about 11,500 households, amounting to over 22,000 individuals 15 years of age and over. It concluded in September 2010 after running annually for a total of eight annual waves. The core survey collects information on individual and family characteristics, as well as labour market and income spells. In alternate years health, and assets and liabilities modules are included respectively.

For consistency with Chapter 5 the same vintage of SoFIE is used for the analysis in this chapter which includes the first seven waves of SoFIE. The assets and liabilities module was included for three of these waves (waves 2, 4 and 6) and is required for examination of price level adjusted mortgages and housing affordability. This provides a particularly good period for analysis, with median house prices increasing by over 50% between 2004 and 2008, and inflation at relatively high levels. Interviews for each survey wave were evenly spread over a 12 month period so that some households were interviewed in October and others the following September. However, all asset values are indexed to the mid-point of the relevant wave. Asset values for wave two are therefore indexed to approximately 31 March 2004, wave 4 asset values to 31 March 2006 and wave 6 asset values to 31 March 2008.

Indexation was particularly important during this period, with strong house price growth potentially leading to non-trivial increases in individuals' net worth even within the interview period of a particular wave. Fortunately respondents in SoFIE were asked not only for the value of any residential property they owned but also to provide a valuation date. This date is used, together with detailed regional house price indices from Quotable Value (QV) (aggregated to the six major SoFIE regions) to index housing assets as described in the previous paragraph.[81] For all other assets the Consumer Price Index (CPI was used).[82]

SoFIE required careful cleaning in order to minimise loss of observations due to question non-response or apparent errors in recording of individual information.[83] Wherever possible the longitudinal nature of the data was leveraged to attempt to correct for this. For example, if an individual was observed owning a house worth just $1 in wave four their housing assets in other waves were examined. If it turned out that that same person in wave two

[81] In a number of cases respondents failed to provide valuation dates. In these cases it is assumed that the distance between the respondents' interview date and valuation date was the same as the average of that distance for those respondents that were able to provide valuation dates. This distance was between two and three years depending on the survey wave.

[82] Scobie and Henderson (2009) provide further discussion of the practicalities of indexing various assets and liabilities in SoFIE.

[83] To construct a usable panel data set for analysis SoFIE also required manipulation and formatting, with the data originally being stored in around 20 separate files with different (often incompatible) formats.

owned a house worth say $900,000 and in wave 6 worth $1,100,000 the value recorded in wave four was changed to $1,000,000. Similar anomalies or non-response were observed for small numbers of respondents across most of the variables used in this analysis and so are too numerous to mention here. For more information about SoFIE and some of the problems researchers can expect to encounter, see, for example, Scobie and Henderson (2009) or Carter et al. (2010).

6.3.2 Estimating housing affordability and benefits of PLAMs

In order to examine the potential benefits to housing affordability of the introduction of price level adjusted mortgages the model of housing affordability used in the previous chapter is again applied but with one important difference. A price level adjusted mortgage is assumed under various rates of inflation. Results are then compared to those derived under the assumption of a conventional money mortgage, thus providing an indication of the potential initial improvement to housing affordability (that is, as measured at the start of each mortgage, respectively) that might result if price level adjusted mortgages were available.

The housing affordability model incorporates information relating to four important influences on affordability, measured in each of waves 2, 4 and 6 of SoFIE, respectively. These are income, net worth, house prices and the structure of mortgage contracts (including the interest rate and mortgage term). This information is then used to ask whether or not a particular individual or couple could afford to service a mortgage on a lower quartile priced house in their region, with payments not exceeding a certain proportion of their income. This model is broadly similar to that used by the House Price Unit in order to generate one of a number of measures of housing affordability that they considered. However, their analysis made use of only one year of data, and a different set of questions were considered, for instance, the effects that wiping student loan debt might have on housing affordability (House Price Unit, 2008).

The first step in determining whether home ownership is affordable or not, according to the model used in this chapter, is to calculate the amount that an individual or couple needs to borrow (if anything) in order to purchase a home. This is calculated as the difference between the cost of a lower quartile priced house in the region where they live (obtained from QV) and any positive net worth they have, which is assumed to be used as a deposit.

Initial required mortgage payments are then determined based on the amount the individual or couple must borrow as well as the terms of the mortgage contract they will enter into. Two mortgage contracts are considered with the results from each case then being compared. The first is a conventional money mortgage with a term of 30 years and nominal interest rates equal to the average of 1-year fixed mortgage rates prevailing at the time (sourced from Reserve Bank of New Zealand series). The second is a price level adjusted mortgage with the same term and nominal interest rates but with real interest rates assuming annual inflation of 1%, 2%, 3% and 4% respectively.

As described in the previous section a price level adjusted mortgage requires lower initial payments than a conventional mortgage which then rise with inflation over time. The size of the initial difference in required payments under each type of mortgage will depend upon the gap between real and nominal interest rates. As previously discussed, between 2004 and 2008, the time frame over which housing affordability is examined in this chapter, annual inflation varied between approximately 2 and 4%.

Required mortgage payments calculated under each type of mortgage contract are then offset against a proportion of the individual or couples income. Many variants are used in the literature, broadly falling into two categories (outgoings-to-income ratios and residual income measures), each with their own strengths and weaknesses (Robinson et al. 2006). In this case the so called '30 percent rule' is adopted where an individual or couple is deemed to find it unaffordable to purchase a home if servicing the mortgage required more than 30% of their

gross income.[84] This also happens to be the proportion of income above which Henderson and Scobie (2009) classify individuals as being vulnerable to unexpected shocks in their analysis of household debt in New Zealand. In cases where an individual or couple have negative net worth gross income after debt servicing costs have been deducted is used in the calculation of affordability.

One potential limitation of this comparative analysis of housing affordability that is not accounted for is that the availability of price level adjusted mortgages might increase house prices through increased demand for owner occupied housing by those for whom this was not possible or desirable previously. This would be most likely in the case of relatively inexpensive houses most attractive to first-time house purchasers. Such an effect could mean that the results of the present analysis overstate any potential improvement in housing affordability due to the introduction of price level adjusted mortgages. However, presumably the demand for rental accommodation would fall with the overall effect on house prices for renters purchasing their first house, for example, being minimal depending on the degree of substitutability between these housing assets.

The analysis focuses primarily on those aged 25 and older who do not own a home. As the previous chapter illustrates, it is non-homeowners rather than homeowners who appear to have greater difficulties with housing affordability. However, given homeowners are a diverse group including those who may have only owned a home for a short period, some may also benefit from the availability of price level adjusted mortgages. The results presented in the following section are weighted using the longitudinal survey weights for SoFIE provided by Statistics New Zealand. These weights are only provided for those respondents who were original sample members.[85]

[84] An important advantage of this rule is that it is easy to calculate. Residual income measures, particularly those where income is equivalised, require much more information (including the tax paid by individuals on all forms of their income) and manipulation.

[85] Though preferred for the current analysis, cross-sectional weights were not provided. Longitudinal weights are for the 2002 New Zealand population, regardless of survey wave.

6.4 Results

This section outlines results. In particular, patterns of housing affordability for non-homeowners suggested by the application of the model outlined in the previous section, when a price level adjusted mortgage contract is assumed, are first presented. These results are then compared to those suggested by the model when using a conventional money mortgage. This allows illustration of the potential benefits of the introduction of price level adjusted mortgages on a number of dimensions. These include improvements in rates of housing affordability, savings in terms of initial annual mortgage payments and the income required to service a mortgage such that payments do not exceed 30% of gross income. Differences over time, between singles and couples as well as other individual characteristics such as age, ethnicity, income and region are explored as are the effects of different levels of inflation. The section concludes with a brief examination of potential benefits of price level adjusted mortgages to existing homeowners.

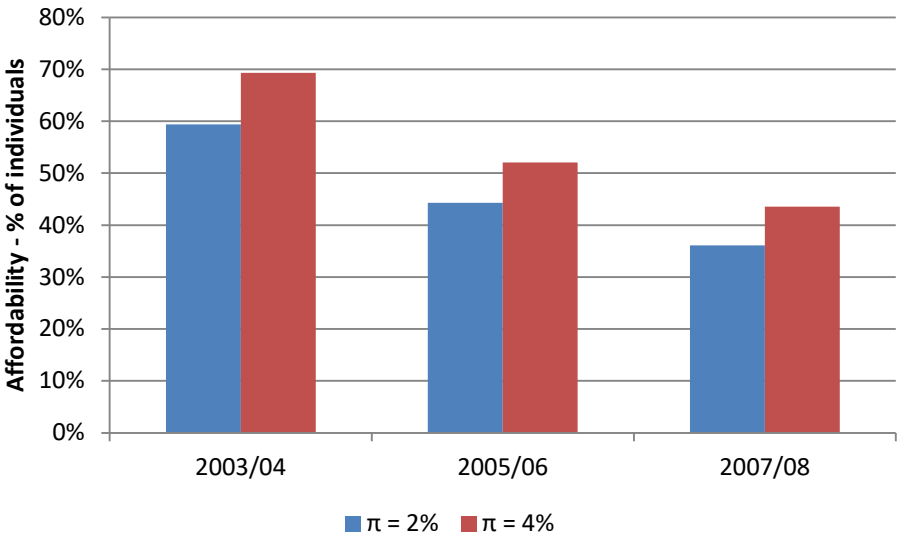
6.4.1 Housing affordability with price level adjusted mortgages

The general pattern of housing affordability for non-homeowners over time is illustrated in Figure 6.4 assuming that price level adjusted mortgages are utilised. In particular, the proportion of all individuals who, according to the housing affordability model, could afford to buy a lower quartile priced home in the region in which they live is presented for each of waves 2, 4 and 6 of SoFIE.

The proportion of individuals able to afford home ownership declined from 59% to 36% between 2004 and 2008 when the inflation component of nominal interest rates was assumed to be 2%. Similarly, when inflation was assumed to be 4%, affordability declined from 69% to 44%. House prices rose extremely rapidly over this period and explain much of this decline in affordability. Nominal interest rates also rose significantly, from approximately 6.7% in 2004 to 9.9% in 2008, in part due to inflation which increased from around 2% to 4%

over the same period. Therefore, if one considers the change in housing affordability between 2004 and 2008 for non-homeowners when utilising price level adjusted mortgages but prevailing rates of inflation the decline in affordability is somewhat smaller.

Figure 6.4: Affordability with PLAMs, 2 and 4% inflation



Again, assuming price level adjusted mortgages are adopted, Table 6.2 provides more detailed results for individuals and couples respectively. These include the values of some of the important variables calculated by the housing affordability model. Panel A shows the proportion of individuals or couples likely to find home ownership affordable in waves 2, 4 and 6 of SoFIE, assuming a variety of rates of inflation. In each case the average annual payment required to service an individual or couples mortgage is provided (Panel B). The corresponding level of gross income required to service this mortgage, such that payments do not exceed 30% of gross income, is given in Panel C.

Generally, and unsurprisingly, couples are far more likely to find home ownership affordable than singles reflecting their higher combined income and wealth, and scale economies in housing consumption or property asset ownership. Considering the case where inflation is assumed to be 2%, for example, the proportion of couples being able to afford home ownership is 66%

over all three waves compared to around 22% for singles. However, both singles and couples experienced a substantial fall in affordability over the period 2004 to 2008, from 35% to 13% and 77% to 54%, respectively. This is not surprising given average annual payments required to service a mortgage on a lower quartile priced house in each individual or couples region, accounting for their wealth, increased significantly over this short period. In particular, required mortgage payments increased from around $9,500 to over $21,000 for singles and from below $8,000 to nearly $17,000 for couples on average (Table 6.2, Panel B). Consequently, the average annual income required to service these mortgages such that payments would not exceed 30% of gross income (the threshold assumed for affordability in the model), also increased substantially. For singles, this level of gross income increased by approximately $39,000 to over $70,000 in 2008 and for couples it increased by around $30,000 to nearly $56,000 (Table 6.2, Panel B).

Table 6.2: Housing affordability for renters with PLAMs and positive inflation

Inflation rate	Singles			Couples		
(%)	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
	A: Housing affordability (% of people who can afford)					
0	25.16	13.12	10.87	69.26	54.86	47.02
1	29.53	15.04	11.54	73.39	59.82	50.15
2	34.92	17.47	13.01	77.29	65.43	53.80
3	40.41	20.47	15.05	81.45	70.00	58.54
4	48.01	24.39	17.82	84.88	73.87	63.30
	B: Mortgage payments (mean)					
0	$11,806	$19,059	$25,292	$9,547	$15,206	$19,983
1	$10,622	$17,313	$23,178	$8,589	$13,813	$18,313
2	$9,494	$15,633	$21,125	$7,677	$12,473	$16,690
3	$8,428	$14,027	$19,142	$6,815	$11,192	$15,124
4	$7,429	$12,502	$17,240	$6,007	$9,975	$13,621
	C: Income required to service mortgage (mean)					
0	$39,354	$63,530	$84,307	$31,823	$50,687	$66,611
1	$35,406	$57,711	$77,259	$28,631	$46,045	$61,042
2	$31,647	$52,111	$70,416	$25,591	$41,577	$55,635
3	$28,094	$46,757	$63,808	$22,718	$37,305	$50,414
4	$24,764	$41,674	$57,465	$20,024	$33,250	$45,403

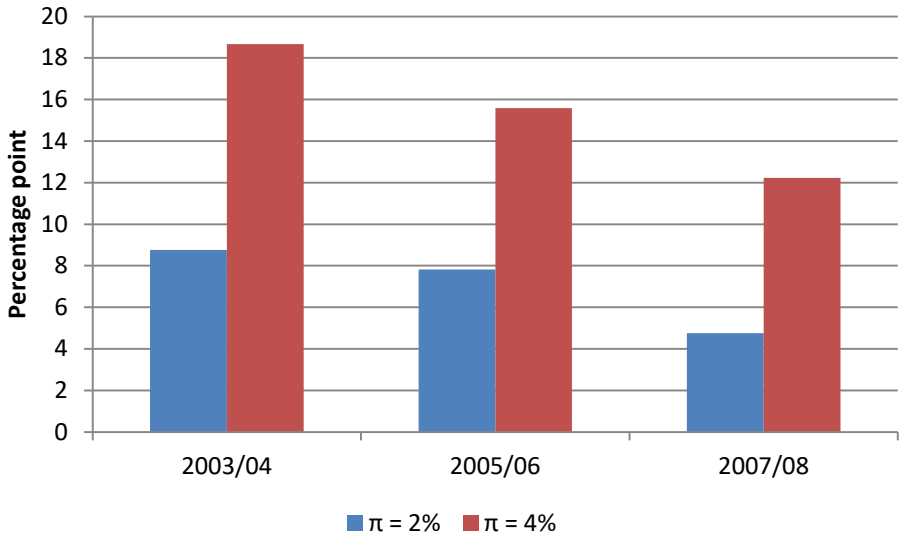
In each survey wave and for both singles and couples rates of housing affordability, when price level adjusted mortgages are adopted, increase with the assumed rate of inflation for a given nominal interest rate. Similarly, associated required mortgage payments and income levels fall. As already discussed, given inflation increased from around 2% to 4% between 2004 and 2008, housing affordability for non-home owning singles and couples therefore deteriorated somewhat less than implied by the results in Table 6.2 had inflation remained constant.

The general pattern of deteriorating housing affordability over time illustrated in this section is similar to that discussed in the previous chapter, where conventional rather than price level adjusted mortgages were assumed. However, there are some important differences, especially in terms of the levels of housing affordability predicted by the model. These differences are explored in the next section. To that end, one final point to note in relation to the results presented in Table 6.2 is that when the inflation rate is zero they are identical to the models estimates assuming conventional mortgage contracts.

6.4.2 Benefits of PLAMSs for non-homeowners

As discussed in Section 6.2, when inflation is positive, price level adjusted mortgages require individuals to make lower initial payments than conventional mortgages, all else equal, which then increase over time in line with inflation. Compared to conventional mortgages a price level adjusted mortgage will therefore, initially at least, be more affordable. The increase in the proportion of all non-home owning individuals who are likely to find home ownership affordable due to the adoption of price level adjusted rather than conventional money mortgages in the housing affordability model is illustrated in Figure 6.5.

Figure 6.5: Improvement in affordability with PLAMs, 2 and 4% inflation



Results suggest that the availability of price level adjusted mortgages could significantly improve initial housing affordability (that is, as measured at the start of each mortgage, respectively). For instance, in 2004 with inflation of just 2%, the proportion of individuals likely to find home ownership affordable was estimated to be 9 percentage points higher with price level adjusted rather than conventional money mortgages. Assuming 4% inflation, the improvement in housing affordability in 2004 is closer to 19 percentage points.

The percentage point improvement in housing affordability due to the potential availability of real mortgage contracts appears to decline between 2004 and 2008 for a given level of inflation. However, it is important to bear in mind that estimated housing affordability, regardless of which type of mortgage contract is assumed, deteriorated significantly over the period of analysis. Hence, the *proportional* increase in housing affordability in 2008 due to the adoption of price level adjusted mortgages was actually slightly higher than in 2004 (39% in 2008 compared to 37% in 2004, with 4% inflation). Further, if one takes into account the increase in inflation over the period of roughly 2%, the proportional increase in affordability in 2004 due to price level adjusted mortgages was actually closer to 17%.

Table 6.3 provides more detailed results, showing the potential benefits of price level adjusted mortgages for individuals and couples respectively. Considering the case where inflation is assumed to be 4%, the percentage point improvement in the proportion of individuals deemed likely to find home ownership affordable is around 17% for couples and 14% for singles over all three survey waves. For singles, the improvement in housing affordability was 23 percentage points in 2004 and 7 percentage points in 2008. For couples the improvement in housing affordability remained relatively constant over time at roughly 16 percentage points (Panel A).

Table 6.3: Improvement in housing affordability for renters with PLAMs and positive inflation

Inflation rate	Singles			Couples		
(%)	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
	A: Percentage point increase in housing affordability					
1	4.37	1.92	0.67	4.13	4.96	3.13
2	9.76	4.35	2.14	8.03	10.57	6.78
3	15.25	7.35	4.18	12.19	15.14	11.51
4	22.86	11.27	6.95	15.62	19.01	16.28
	B: Reduction in mortgage payments (mean)					
1	$1,184	$1,746	$2,115	$958	$1,393	$1,671
2	$2,312	$3,426	$4,168	$1,870	$2,733	$3,293
3	$3,378	$5,032	$6,150	$2,732	$4,015	$4,859
4	$4,377	$6,557	$8,053	$3,539	$5,231	$6,362
	C: Reduction in income required to service mortgage (mean)					
1	$3,948	$5,819	$7,049	$3,192	$4,643	$5,569
2	$7,707	$11,419	$13,892	$6,232	$9,110	$10,976
3	$11,260	$16,773	$20,500	$9,105	$13,382	$16,197
4	$14,591	$21,856	$26,842	$11,798	$17,437	$21,208

Potential reductions in required mortgage payments for both singles and couples are substantial. For singles, a price level adjusted mortgage would require initial payments of approximately $4,400 less than that of a conventional mortgage in 2004, rising to over $8,000 less in 2008. For couples required payments are approximately $3,500 and $6,400 less in 2004 and 2008 respectively (Table 6.3, Panel B). Consequently, the average annual income initially required to service a price level adjusted mortgage, such that payments would not exceed 30% of gross income, is also significantly less. For singles, the income levels required are $14,600 and $26,800 less in 2004 and 2008,

respectively, than that which would have been required by a conventional money mortgage. The corresponding numbers for couples are somewhat less but also substantial (Table 6.3, Panel C).

In each survey wave and for both singles and couples the benefits of price level adjusted mortgages, in all respects discussed, increase with the assumed rate of inflation for a given nominal interest rate. With inflation increasing over the analysis period, the change in the extent of potential benefits offered by price level adjusted mortgages over time, in terms of reduced payments and the income required to service those payments, is even more pronounced.

The previous chapter suggests that housing affordability differs considerably across groups. In particular, levels of housing affordability were lower for the relatively young, those with low income (particularly singles), certain ethnic groups including Maori and Pacific peoples and in regions with particularly high house prices such as Auckland. Tables 6.4 through 6.7 show the potential benefits of price level adjusted mortgages compared to conventional mortgages across a range of dimensions including income, age, ethnicity and region.

Tables 6.4 and 6.5 illustrate the improvement in the proportion of individuals able to afford home ownership due to price level adjusted mortgages with inflation of 2% and 4%, respectively. Some interesting patterns emerge. Focussing on Table 6.5, variation in the benefits of PLAMs appears most pronounced across the income distribution. In particular, PLAMs make little difference to the rates of housing affordability for singles in the lowest income quintile regardless of survey wave, but for those in the middle of the income distribution early in the period and at the top of the income distribution in 2008 the benefits are very substantial. Couples in the middle of the income distribution (as well as the bottom in 2004) also benefit significantly from PLAMs, however, couples at top of the income distribution benefit little, reflecting already very high levels of housing affordability with conventional mortgages.

Table 6.4: Percentage point increase in housing affordability for renters with PLAMs by characteristic (2% inflation)

Characteristic	Singles			Couples		
	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
Income quintile						
1	0.66	0.31	0.71	11.61	0.81	1.31
2	2.20	0.78	0.00	10.12	14.06	1.91
3	12.87	0.70	1.40	17.76	24.76	16.91
4	21.34	3.24	0.37	0.69	12.54	13.13
5	11.76	16.74	8.67	0.00	0.71	0.62
Age						
25 to 34	12.37	5.61	2.42	9.86	16.62	12.13
35 to 44	11.93	5.44	1.36	7.17	12.60	7.03
45 to 54	8.98	3.44	3.64	5.54	5.27	5.44
55 to 64	3.57	2.05	2.14	4.64	5.13	3.74
65 +	4.38	1.97	1.08	13.19	6.87	4.35
Ethnicity						
Maori	10.93	4.26	1.07	12.95	15.82	6.52
Pacific	4.03	1.07	0.00	15.07	8.95	1.75
Asian	9.22	1.98	2.64	10.10	11.23	2.02
Other	4.40	0.00	5.16	11.08	9.36	17.39
European	10.25	5.17	2.55	5.96	9.62	7.57
Region						
Auckland	6.13	2.80	0.99	11.18	9.60	5.48
Waikato	13.08	3.83	3.72	5.81	12.60	5.15
Wellington	11.55	6.07	1.61	7.63	12.28	11.20
Rest of NI	12.43	4.31	2.12	6.07	9.82	8.20
Canterbury	11.97	5.23	2.61	6.28	13.94	6.60
Rest of SI	8.62	7.14	4.59	5.87	7.10	6.17

With respect to age, young couples in particular appear to benefit substantially from PLAMs over the entire sample period. For singles, the percentage point improvement in housing affordability diminishes with age in 2004 and over time for all age categories. PLAMs increase housing affordability across all ethnicities and regions. Indeed, rates of housing affordability improve for coupled Maori by more than Europeans with PLAMs.

Table 6.5: Percentage point increase in housing affordability for renters with PLAMs by characteristic (4% inflation)

Characteristic	Singles			Couples		
	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
Income quintile						
1	1.06	0.31	0.71	30.78	5.48	2.96
2	6.15	1.85	0.00	26.82	34.39	13.93
3	42.69	2.43	2.35	19.77	41.19	38.12
4	42.17	19.06	3.87	0.69	13.27	25.54
5	22.27	32.72	28.33	0.00	0.71	0.85
Age						
25 to 34	29.33	13.21	8.86	16.57	30.19	26.36
35 to 44	25.56	14.35	7.12	15.28	19.54	17.10
45 to 54	20.71	11.51	9.38	11.89	12.06	11.45
55 to 64	11.64	6.85	4.47	10.33	10.62	11.88
65 +	10.88	4.69	2.07	24.94	12.15	12.35
Ethnicity						
Maori	27.58	12.03	7.20	24.09	29.77	20.51
Pacific	12.38	3.47	2.56	31.70	15.64	9.46
Asian	16.38	6.98	6.18	19.48	16.25	8.94
Other	10.60	2.81	6.55	20.99	13.69	35.03
European	23.68	12.74	7.48	11.55	17.65	16.40
Region						
Auckland	18.45	6.77	4.87	19.51	17.45	15.60
Waikato	23.04	9.10	9.23	12.43	22.40	13.62
Wellington	26.45	15.42	6.90	17.13	21.47	19.56
Rest of NI	27.59	14.44	8.13	13.72	18.76	14.99
Canterbury	22.96	12.08	6.12	13.92	23.21	19.47
Rest of SI	23.66	16.27	10.37	9.76	12.91	18.08

Table 6.6: Reduction in mean mortgage payments for renters with PLAMs by characteristic (2% inflation)

Characteristic	Singles			Couples		
	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
Income quintile						
1	$2,460	$3,608	$4,467	$2,310	$3,219	$3,833
2	$2,229	$3,385	$4,211	$2,109	$3,107	$3,946
3	$2,399	$3,481	$4,240	$2,013	$3,008	$3,628
4	$2,389	$3,474	$4,279	$1,871	$2,691	$3,129
5	$2,084	$3,179	$3,639	$1,045	$1,638	$1,927
Age						
25 to 34	$2,538	$3,709	$4,525	$2,324	$3,422	$4,125
35 to 44	$2,337	$3,508	$4,147	$1,831	$2,885	$3,539
45 to 54	$2,087	$3,165	$3,931	$1,579	$2,330	$3,005
55 to 64	$2,131	$3,126	$3,774	$1,424	$2,011	$2,650
65 +	$1,982	$3,035	$3,841	$1,754	$2,303	$2,797
Ethnicity						
Maori	$2,280	$3,513	$4,292	$2,098	$3,180	$3,882
Pacific	$3,209	$4,416	$5,276	$3,134	$4,110	$4,828
Asian	$2,809	$3,996	$4,987	$2,650	$3,699	$4,474
Other	$2,492	$3,703	$4,617	$2,509	$3,356	$4,704
European	$2,172	$3,210	$3,909	$1,553	$2,333	$2,823
Region						
Auckland	$3,201	$4,372	$5,176	$2,756	$3,586	$4,186
Waikato	$1,771	$3,095	$3,887	$1,303	$2,409	$3,102
Wellington	$2,345	$3,367	$4,318	$1,953	$2,938	$3,366
Rest of NI	$1,640	$2,632	$3,324	$1,187	$2,032	$2,473
Canterbury	$1,939	$3,253	$3,933	$1,564	$2,534	$3,033
Rest of SI	$1,551	$2,177	$3,018	$1,113	$1,621	$2,369

Tables 6.6 and 6.7 present reductions in mortgage payments and the income required to service those payments due to the availability of PLAMs, respectively, across income, age, ethnicity and region when inflation is assumed to be 2%. As these variables do not depend on the actual income individuals in the sample earn, but rather their wealth and house prices, differences across the various categories of interest are less significant than those observed for improvements in rates of housing affordability. However, the variation that does occur is consistent with levels of wealth increasing with age and income, and being lower for all ethnicities other than European. For all groups the reduction in mortgage payments and the income required to service these payments increases between 2004 and 2008.

Table 6.7: Reduction in mean income required to service mortgage for renters with PLAMs by characteristic (2% inflation)

Characteristic	Singles			Couples		
	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
Income quintile						
1	$8,200	$12,027	$14,889	$7,699	$10,729	$12,777
2	$7,431	$11,283	$14,037	$7,031	$10,355	$13,154
3	$7,995	$11,604	$14,134	$6,709	$10,028	$12,093
4	$7,962	$11,579	$14,263	$6,237	$8,970	$10,432
5	$6,945	$10,597	$12,129	$3,483	$5,460	$6,422
Age						
25 to 34	$8,461	$12,363	$15,084	$7,745	$11,407	$13,752
35 to 44	$7,789	$11,692	$13,824	$6,104	$9,617	$11,796
45 to 54	$6,957	$10,550	$13,103	$5,262	$7,768	$10,018
55 to 64	$7,102	$10,419	$12,579	$4,747	$6,703	$8,834
65 +	$6,605	$10,118	$12,804	$5,845	$7,677	$9,324
Ethnicity						
Maori	$7,599	$11,709	$14,307	$6,994	$10,599	$12,938
Pacific	$10,698	$14,719	$17,587	$10,445	$13,699	$16,094
Asian	$9,364	$13,320	$16,623	$8,835	$12,331	$14,914
Other	$8,306	$12,342	$15,389	$8,365	$11,187	$15,680
European	$7,241	$10,699	$13,030	$5,177	$7,777	$9,409
Region						
Auckland	$10,668	$14,572	$17,254	$9,187	$11,955	$13,954
Waikato	$5,902	$10,318	$12,956	$4,344	$8,029	$10,342
Wellington	$7,817	$11,222	$14,394	$6,509	$9,793	$11,220
Rest of NI	$5,468	$8,773	$11,079	$3,956	$6,773	$8,244
Canterbury	$6,464	$10,842	$13,110	$5,213	$8,446	$10,110
Rest of SI	$5,170	$7,255	$10,060	$3,711	$5,403	$7,896

6.4.3 Benefits of PLAMs for homeowners

Results to this point have focussed on the potential benefits of price level adjusted mortgages for those who were observed in each of waves 2, 4 and 6 of SoFIE not to own a home. The previous chapter also briefly examined housing affordability for homeowners, asking whether or not they would also find purchasing a lower quartile priced house in their region affordable given their income and wealth. Housing affordability amongst this group was very high, especially compared to that of non-homeowners, but not 100%. As the circumstances of homeowners are likely to differ considerably, for example,

some in this group may have only purchased their home shortly before being observed in the sample, some may well benefit from the opportunity to reduce mortgage payments by switching to a price level adjusted mortgage. Table 6.8 suggests that this is indeed the case.

Table 6.8: Improvement in housing affordability for homeowners with PLAMs and positive inflation (w.r.t. a lower quartile house)

Inflation rate	Singles			Couples		
(%)	Wave 2	Wave 4	Wave 6	Wave 2	Wave 4	Wave 6
	A: Percentage point increase in housing affordability					
1	1.53	1.33	1.45	0.46	0.84	1.32
2	3.61	3.91	3.13	0.89	1.75	2.85
3	4.72	6.09	4.88	1.16	2.73	3.96
4	6.32	8.21	6.39	1.41	3.50	4.88
	B: Reduction in mortgage payments (UQ)					
1	$308	$558	$631	$375	$630	$687
2	$602	$1,095	$1,244	$732	$1,236	$1,355
3	$879	$1,608	$1,835	$1,069	$1,816	$1,999
4	$1,139	$2,096	$2,403	$1,385	$2,366	$2,618
	C: Reduction in income required to service mortgage (UQ)					
1	$1,027	$1,860	$2,104	$1,249	$2,100	$2,291
2	$2,005	$3,649	$4,146	$2,439	$4,120	$4,516
3	$2,930	$5,361	$6,118	$3,563	$6,053	$6,664
4	$3,796	$6,985	$8,011	$4,617	$7,887	$8,726

While the percentage point increase in housing affordability for homeowners due to price level adjusted mortgages is somewhat less across all waves compared to non-homeowners it is non-trivial. For example by survey wave 6 when inflation was around 4% the percentage point increases in housing affordability were approximately 6 and 5 for singles and couples respectively.

Benefits of PLAMs for homeowners in terms of reduced mortgage payments and the income required to service these are presented slightly differently in Table 6.8 than previously. That is, the upper quartile rather than the mean of these variables is presented as homeowners tend to have substantially more wealth than non-homeowners. For example, some in this group will own their home freehold. Nevertheless, it appears a substantial portion of homeowners could face lower mortgage payments with PLAMs, for example, of around $2,500 in 2008 with inflation of 4%.

6.5 Conclusion

Even modest rates of inflation can have a substantial negative effect on the affordability of housing. This is because inflation results in 'front-loading' of mortgage repayments since it leads to larger real principal repayments during the early stages of home ownership, an issue known as mortgage-tilt. Price level adjusted mortgages (PLAMs) can help to address this issue, having lower payments during the early years of a mortgage and higher payments during latter years, as compared to conventional mortgages.

Despite considerable resources and policy attention given to the issue of housing affordability in New Zealand the impact of inflation or the potential role of PLAMs is seldom discussed. The analysis undertaken in this chapter has been an attempt to contribute to filling this gap.

In particular, the model of housing affordability developed in the previous chapter was again applied to data from SoFIE for the period 2004 to 2008 but with one important difference. A price level adjusted mortgage was assumed under various rates of inflation. Results were then compared to those derived under the assumption of a conventional mortgage, thus providing an indication of the potential initial improvement to housing affordability that might result if price level adjusted mortgages were available.

The analysis has some important limitations. In particular, the extent to which PLAMs might increase the demand for housing, and therefore house prices, has not been taken into account when deriving estimates of those individuals likely to find home ownership affordable due to the introduction of PLAMs. In addition, PLAM implementation issues and challenges have not been considered, however, given they are used in a few other countries they should not be insurmountable. Notwithstanding these limitations, results suggest that PLAMs could indeed significantly improve housing affordability for prospective homeowners if they were available.

For instance in 2004, even when assuming only a modest rate of inflation of 2%, the proportion of non-homeowners likely to find home ownership affordable was estimated to be 9 percentage points higher with a PLAM than a conventional mortgage. With inflation of 4% the improvement in housing affordability in 2004 would have been closer to 19 percentage points.

Although the benefits of PLAMs measured in this way appear to fall by 2008 because house prices grew at such fast rate, in terms of annual mortgage payments, potential savings due to PLAMs actually increased substantially between 2004 and 2008. In particular, given inflation of 2%, estimated average savings in initial annual mortgage payments due to PLAMs for singles went from around $2,300 in 2004 to $4,200 in 2008. Similarly, for couples savings went from around $1,900 in 2004 to $3,300 in 2008. With 4% inflation estimated average savings in initial annual mortgage payments were nearly twice this level.

The current government appears keenly interested in housing affordability. It has recently pledged to build 100,000 affordable homes over the next ten years, banned foreign ownership of existing houses (with some exceptions), taken steps to curb migration and is implementing and considering a number of changes that will affect the market for rental accommodation. In addition, the Tax Working Group (an advisory body established by the government in late 2017) will investigate whether a system of capital gains taxation, land taxation or other housing taxation measures would improve the tax system and housing outcomes.

Given the findings of this chapter PLAMs may be worth exploring further in the New Zealand context. For instance, implementation issues of PLAMs could be examined further and a trial of PLAMs could perhaps be undertaken by Kiwi Bank (a publically owned bank). This may be a more attainable goal, at a far lesser cost, with fewer unintended consequences, than many of the actions currently underway with respect to housing policy in New Zealand.

Chapter 7

Conclusion

Recent policy changes and looming pressures in New Zealand have the potential to significantly impact the living standards of those who will enter retirement in the coming decades. In particular, KiwiSaver was introduced in 2007, at significant fiscal cost, in an attempt to address concerns that saving rates in New Zealand appeared low. In addition, the fiscal sustainability of New Zealand Superannuation (NZS) will come under increasing pressure in the future due to population ageing, which will likely necessitate changes to the policy in order to diminish its generosity. Finally, there has been a prolonged period of rapid house price growth in New Zealand, which has made home ownership increasingly difficult for many New Zealanders, yet home ownership is often seen as a means of providing greater security of living standards for retirees by avoiding the costs and volatility of the rental housing market.

These developments raise a number of important policy questions, grouped under two related themes, which this thesis has addressed. In the savings part of this thesis a detailed assessment of KiwiSaver's performance against its explicit and implicit objectives was carried out. An understanding of whether or not KiwiSaver has met its objectives is of significant value as, among other things, it can inform New Zealand policy makers' decisions about the future direction of KiwiSaver. For instance, whether or not KiwiSaver should be extended and made compulsory or be rolled back, better targeted or even abolished. The third chapter in the savings part of this thesis examined the implications for individual and national savings of three alternative retirement income policy options designed to reduce the future costs of NZS. This

analysis is also of value to policy makers as it highlights how other policy options may increase saving, their fiscal implications over time and the relativities between the policy options. Such insights are of particular importance if KiwiSaver has failed to deliver in terms of meeting its objectives and are also useful in order to balance competing public spending pressures in the future.

In the housing part of the thesis patterns of home ownership and housing affordability across groups and over time, as well as various factors associated with the likelihood of each, were examined. Such an analysis is important, given current concern in New Zealand over high house prices and diminished housing affordability, as it can provide insight into the extent of any problem and identify those most affected, providing valuable information for potential policy intervention. To this end the final chapter in the housing part of the thesis examined the potential benefits to housing affordability of the introduction of price level adjusted mortgages, a policy option seldom discussed in New Zealand.

The analysis undertaken in the thesis has been driven by the important policy questions described above, which are currently of high relevance to New Zealand. It therefore provides several examples of how suitable empirical techniques can be applied to analyse practical presenting policy issues, given a variety of data and methodological constraints. Indeed, the analysis undertaken in this thesis has delivered a number of important policy insights.

Two complementary sets of analysis were undertaken to assess the performance of KiwiSaver. The first analysis made use of a cross-sectional survey undertaken in 2010 that was specifically designed for the purpose of evaluating KiwiSaver in order to answer four key questions about its performance. These questions related to the additional savings the scheme generated, its effects on expected retirement income outcomes, whether or not KiwiSaver represented value for money, and its likely impact on national savings. The second analysis of KiwiSaver's performance focussed specifically on the extent to which membership of KiwiSaver was associated with greater

accumulations of net worth. This analysis made use of a longitudinal survey (SoFIE) paired with administrative data covering the period 2002 to 2010 and applied both difference-in-differences (DID) and panel regression techniques.

Results from both analyses evaluating KiwiSaver's performance suggest that the scheme has had little success in terms of meeting its objectives, stated or otherwise, at significant fiscal cost. In particular, according to respondents, only one-third of their contributions to KiwiSaver represent additional savings and regression analysis finds no relationship between KiwiSaver membership and expected retirement income outcomes. Further, neither DiD nor more sophisticated panel regression analysis found any positive association between KiwiSaver membership and net worth accumulation. Standard measures of programme efficacy, such as target effectiveness and leakage, suggest that KiwiSaver has been only modestly successful in reaching the target population and that leakage to the non-target population was high, at 93%. Finally, after considering the costs of the scheme, membership projections, government behaviour and additional savings by members, KiwiSaver's effect on net national saving appears limited at best.

While these results may surprise the architects of the scheme they are not entirely unexpected. Indeed, international literature has found that savings schemes such as KiwiSaver can displace other forms of savings to a significant degree. Similarly, very early evidence based on a survey undertaken only a few months after KiwiSaver's introduction estimated that around two-thirds of savings in KiwiSaver would displace other forms of saving. In addition, the available evidence on individual and household saving in New Zealand suggested that the majority of people were saving adequately for their retirement. Further, KiwiSaver does not operate in a policy vacuum. In particular, a universal public pension scheme, NZS, also exists to ensure a basic standard of living in retirement.

Since its inception, KiwiSaver has undergone several changes. Most notably, the associated financial incentives in the form of member tax credits and the kick-start contribution have been reduced and abolished respectively. The

analysis of KiwiSaver's performance presented in this thesis provides clear support for these decisions. More generally, the analysis calls into question the value of the scheme and its ongoing existence. Repeated suggestions that KiwiSaver should be made compulsory or a one-off auto-enrolment exercise should be undertaken to capture those who currently do not avail themselves of the scheme, would seem to be misplaced. Rather, given the still significant costs associated with KiwiSaver and little discernible benefit, careful consideration should be given to whether or not KiwiSaver, or at least the remaining financial incentives, are needed.

The analysis of KiwiSaver's performance also provides a critique of the behavioural economics literature as it relates to saving, as aspects of KiwiSaver's design were heavily influenced by insights stemming from this field. Most notably, the automatic enrolment feature of the scheme. If issues such as bounded rationality and limited self control were indeed major factors inhibiting individuals' saving, then one might have expected a nudge in the right direction such as this to yield more benefits in terms of additional savings than Chapters 2 and 3 of this thesis would suggest. Undoubtedly KiwiSaver has led to more savings held within KiwiSaver accounts, however, this appears to be largely at the expense of other forms of saving.

On balance, the case for KiwiSaver appears relatively week. However, while there is no particular reason to expect that the results of additional analysis would be any different to those presented in this thesis, evaluation of KiwiSaver's more recent performance may provide policy makers with greater comfort to take action. If more analysis of the performance of KiwiSaver is to take place, preparations for this need to be made quickly. SoFIE concluded in 2010. This currently leaves no data in New Zealand which would allow for a similar analysis of KiwiSaver's impact on net worth as presented in Chapter 3, for instance. Further, as KiwiSaver's membership grows, or if the scheme were made compulsory, it will become increasingly difficult to evaluate KiwiSaver's performance as identifying a suitable control group for analysis will be challenging and many empirical techniques would no longer be suitable.

The final chapter in the savings part of this thesis examined three potential changes to NZS, another important part of New Zealand's retirement income policy landscape. These changes included lifting the age of eligibility for NZS by two years, lowering the rate of indexation of NZS payments (to the average of wages and the general price level) and making private saving compulsory and then using those accumulations to reduce NZS entitlements. Each of these policy options was designed to improve the fiscal sustainability of NZS and represents a shift in part from a pay-as-you-go toward a save-as-you-go retirement income system. Hence these options are likely to have more substantial effects on individuals' saving behaviour and therefore national savings than KiwiSaver.

Results suggest that even seemingly modest changes to retirement income policies could lead to substantial cumulative changes in national savings by 2061. In particular, a change to the indexation of NZS is estimated to lead to cumulative changes in national savings by 2061 of approximately 87% of GDP. The introduction of compulsory private saving where accumulations are used to reduce the costs of NZS as well as lifting the age of eligibility for NZS are also both estimated to yield substantial cumulative changes in national savings over the period (each by approximately 38% of GDP). However, lifting the age of eligibility for NZS appears able to generate superior improvements in the government's fiscal position compared to the other two policy options over the medium term.

In addition to gaining an understanding of the fiscal and savings consequences of potential changes to NZS, policy makers can also benefit from an appreciation of any distributional impacts of policy changes. In this regard the three options considered to reduce the fiscal costs of NZS have very different distributional effects both within and across cohorts. Within cohorts, to the extent that life expectancies across individuals are similar, all individuals are treated the same under the first two policy options, that is, lifting the age of eligibility for, and lowering the rate of indexation of, NZS payments. This is not the case with respect to compulsory private saving with abatement of NZS

entitlements. In fact, those in the top income decile would lose more than six times the amount of NZS entitlements than those in the second income decile. All three options are associated with considerable intergenerational redistributive effects. However, lifting the age of entitlement to NZS has the most consistent effect on age cohorts through time in terms of the proportion of expected NZS entitlements lost relative to the status quo, diminishing only slightly over time with improvements in life expectancy.

Decisions about appropriate retirement income policies are complicated, requiring careful consideration of their affects on a range of factors. These include implications for retirement income adequacy and poverty reduction, distributional and welfare consequences, fiscal sustainability, equity, capital accumulation, external vulnerabilities, and not least of which, the extent to which any policy might be expected to meet its objectives a priori. The aim of the analysis of NZS policy options, their costs and implications for saving, was not to form a view about the merits of one retirement income policy option over another, but rather, to inform important aspects of any such view. The analysis demonstrates that the quantification of many aspects of a policy's affects are possible with reasonable assumptions. In order to do so, a framework for estimating the national savings effects of retirement income policies was developed that could be applied to most policies affecting NZS entitlements.

Finally, the housing analysis undertaken in this thesis explored several important elements and outcomes of housing affordability in New Zealand. In addition, a potential avenue to improve housing affordability was examined, that is, the introduction of price level adjusted mortgages (PLAMs). As with part of the analysis of the performance of KiwiSaver, SoFIE was the primary data source used for this analysis. SoFIE was paired to a simple model of housing affordability based on an individual's or couple's income, net worth, house prices and the structure of mortgage contracts (including the interest rate and mortgage term).

This analysis illustrates a number of important developments with respect to housing affordability in New Zealand over a period of particularly high house

price inflation. In particular, significant price increases occurred throughout the house price distribution between 2004 and 2008 and rates of home ownership declined. While housing affordability was high for some groups during at least part of this period, for other groups affordability was persistently low, such as for singles and those on relatively low income. In addition, for nearly all groups examined housing affordability declined substantially between 2004 and 2008 as house prices and annual interest rates increased at a rate that far outpaced income growth.

Importantly, results also suggest that PLAMs could indeed significantly improve housing affordability for prospective homeowners if they were available. For instance in 2004, even when assuming only a modest rate of inflation of 2%, the proportion of non-homeowners likely to find home ownership affordable was estimated to be 9 percentage points higher with a PLAM than a conventional mortgage. With inflation of 4% the improvement in housing affordability in 2004 would have been closer to 19 percentage points. Although the benefits of PLAMs measured in this way appear to fall by 2008 because house prices grew at such a fast rate, in terms of annual mortgage payments, potential savings due to PLAMs actually increased substantially between 2004 and 2008.

The analysis related to housing presented in this thesis shows how the significance or otherwise of a potential policy problem can be explored. Indeed, the analysis suggests there has been an issue, at least for some, with housing affordability for some time in New Zealand. Further, it provides insights that would be useful to policy makers in order to better target any policy interventions they may be inclined to make.

The current government appears keenly interested in housing affordability. For example, it has recently pledged to build 100,000 affordable homes over the next ten years, banned foreign ownership of existing houses (with some exceptions), taken steps to curb migration and is implementing and considering a number of changes that will affect the market for rental accommodation. In addition, the Tax Working Group (an advisory body established by the government in late 2017) will investigate whether a system of capital gains

taxation, land taxation or other housing taxation measures would improve the tax system and housing outcomes.

Given this interest and the benefits of price level adjusted mortgages suggested by the analysis of Chapter 6, PLAMs may be worth exploring further in the New Zealand context. The analysis undertaken in this thesis could be enhanced by considering other housing affordability measures and assessing which of these have the most predictive power in terms of future home ownership. Implementation issues of PLAMs could be examined further and a trial of PLAMs could be undertaken by Kiwi Bank (a publically owned bank). This may be a more attainable goal, at a far lesser cost, with fewer unintended consequences, than many of the actions currently underway with respect to housing policy in New Zealand.

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