SUPERANNUATION AND SAVING

Steven Morling and Robert Subbaraman

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ABSTRACT

The system of providing for retirement income in Australia has undergone marked changes over the past two decades, particularly in the 1980s when changes in pension entitlements and superannuation legislation encouraged a sharp rise in superannuation saving. However, there has been no obvious pickup in aggregate household saving, raising the possibility that households may have offset the increase by reducing other forms of saving. Our results suggest that, in the past, there has been a significant degree of substitution between superannuation and other forms of saving, although the offsets have not been complete. Our estimates are not very precise, but they suggest that, over the past 35 years, about three-quarters of superannuation saving has been offset by changes in other saving. The results are consistent with the results of recent overseas studies which find large offsets between saving through retirement income plans and other forms of saving.

It is too early to tell whether the new superannuation arrangements will generate significant increases in aggregate household saving, although a number of features of the new arrangements suggest that offsets between superannuation and other forms of saving are likely to be smaller than in the past. In particular the new arrangements rely heavily on compulsory rather than voluntary saving, as well as expanding the coverage of superannuation among those wage and salary earners who are most likely to be liquidity constrained. For these reasons the new arrangements are likely to generate increased superannuation saving with smaller offsets against other saving than earlier schemes.

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1. INTRODUCTION

Traditionally, Australia's retirement income system has relied mainly on the age pension. For many years the main alternative source of retirement income, employer-sponsored and personal superannuation, was not widely used. Over the past decade, however, there has been substantial reform of government pension entitlements and superannuation legislation, designed primarily to promote the use of private saving for retirement and to boost private and national saving. Access to government pensions was restricted and the role of superannuation was broadened. As a result, superannuation has become an increasingly important form of household saving.

While these initiatives continue to expand superannuation coverage and have increased the flow of household saving into superannuation funds, the net effect on aggregate household saving is not clear. There has been no obvious pickup in aggregate household saving over the past decade corresponding to the rise in superannuation, and it is possible that households may have partly offset the rise in superannuation saving by reducing other forms of saving.[1] This paper looks at this issue: specifically, to what extent have flows into superannuation increased aggregate household saving?

Theory does not provide a clear guide to the degree of substitution that we might expect. In standard models of saving behaviour, saving is determined by households' intertemporal consumption preferences and resources are transferred between periods by a portfolio of assets which, at the margin, are regarded as perfect substitutes. In these models, a shift in the allocation of resources to superannuation will not increase aggregate saving, but will result in a one-for-one reduction in other forms of saving. In more realistic models, however, superannuation and other forms of saving are regarded as less than perfect substitutes and, as a result, increased superannuation will not be fully offset by falls

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[1] This is part of the broader question of the effect of superannuation on national saving.

in other types of saving. Capital market frictions, such as incomplete information or liquidity constraints may also inhibit substitution, so that complete offsets do not occur.

We might also expect to see different degrees of substitution depending on the source of the superannuation saving. For example, personal contributions, and to a lesser extent employer-funded contributions, may be regarded as reasonably good substitutes for other forms of saving. Savers may have reasonable information about these flows and some control over whether the saving is allocated to superannuation or to other types of saving. They may have less information and less effective control, however, over other forms of superannuation saving, such as interest earnings and capital gains on superannuation assets. While increased superannuation saving through higher net contributions may be expected to be offset by some reduction in other saving, it is far less likely that increased superannuation saving through higher earnings would have the same effect.

The empirical evidence on this question is mixed. Some overseas studies find that superannuation and other forms of saving are independent (Venti and Wise 1987, 1990, 1991, 1992). More recent studies, however, conclude that higher saving through retirement saving schemes is largely offset by falls in other forms of saving (Engen, Gale and Scholz 1994; Gale and Scholz 1994; OECD 1994; Faruqee and Husain 1995). These studies are not particularly useful, however, because there are significant differences between overseas private pension schemes and Australia's superannuation scheme. For Australia, Edey and Britten-Jones (1990) observed that increased flows into superannuation had not resulted in any obvious increases in aggregate private saving in Australia by that time. Goode (1994) finds evidence of partial substitution.

While these studies, and ours, provide some insights into household saving behaviour, the recent changes in superannuation arrangements in Australia mean that past saving behaviour of households may not be a good guide to future behaviour, particularly as it applies to superannuation saving. The new system has important compulsory elements whereas older schemes relied more on voluntary superannuation. There are also other important differences between the new and older systems and it would be wrong to simply extrapolate these results when assessing the likely impact of the new superannuation arrangements. Nevertheless, an understanding of past behaviour should provide a sounder foundation for assessing the likely impact of current and future superannuation arrangements on household saving behaviour.

The paper is organised as follows. Section 2 describes trends in superannuation, particularly developments over the past decade that have boosted superannuation saving. Section 3 provides an analytical framework for looking at the interaction of superannuation with other forms of saving. Section 4 looks at household saving behaviour in Australia over the past few decades and examines some of the main factors which may have influenced saving over this period. Section 5 presents empirical evidence on the relationship between superannuation saving and other household saving. Section 6 concludes the paper.

2. TRENDS IN SUPERANNUATION SAVING

Prior to the 1980s, Australia relied largely on a flat-rate age pension to provide retirement benefits. Superannuation was voluntary and covered only a small proportion of wage and salary earners.[2] Despite generous tax concessions for voluntary superannuation and a number of attempts to promote an employment-related retirement income scheme,[3] aged pensions remained the primary vehicle for the provision of retirement benefits.[4] At the same time, a large part of household saving was allocated to housing which, partly because of its favourable tax treatment, was the main form in which households accumulated wealth for retirement. Superannuation provided only a small part of retirement incomes.

Net contributions to life insurance and superannuation averaged about one per cent of GDP in the 1960s and 1970s. Fund earnings (mainly interest and dividends) added a further one to one and a half per cent. Capital gains (which are not included in the national accounts measure of saving) had only a small effect over the period (Table 1).

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2 For some employees, for example in the public sector, participation in a superannuation scheme was generally required as a condition of employment.

3 See the Hancock Report (1976).

4 See Stemp (1991), Bateman *et al*. (1991) and Saving for our Future (1995) for background information on earlier superannuation and retirement income policies.

Table 1: Superannuation Saving
(Per cent of GDP)

	Net contributions	Interest earnings	Capital gains	Total
1960s	1.1	1.3	-0.1	2.4
1970s	1.0	1.4	0.1	2.5
1980s – 1st half	0.5	1.9	1.0	3.4
1980s – 2nd half	1.1	2.8	2.4	6.3
1990s	0.8	2.6	0.7	4.0

Source: ABS Cat. No. 5204.0, Table 49; ABS Cat. No. 5232.0, Table 21; Reserve Bank of Australia *Bulletin*, Tables C.12, C.13 and C.15.

In the second half of the 1970s and in the 1980s, a number of initiatives were introduced, expanding the coverage of superannuation and increasing its role in the provision of retirement incomes. Access to government pensions was restricted in 1976 with the introduction of an income test and further restricted with the extension of the income test in 1983 and the introduction of an assets test in 1985.

Superannuation arrangements were changed to encourage increased coverage and the retention of funds in the system. Approved Deposit Funds (ADFs) were introduced in 1983, allowing eligible termination payments to be rolled over while maintaining the favourable tax treatment available to superannuation funds. This had the effect of keeping funds in the system that would have otherwise flowed into alternative forms of saving. Net contributions to these funds averaged about one per cent of GDP over the second half of the 1980s and they were responsible for a significant part of the rise in total net contributions over the late 1980s.[5]

Coverage was further broadened through the introduction of productivity award superannuation. Under the 1985 Accord agreement, unions accepted a 3 per cent employer superannuation contribution, to be paid into an industry fund, as part of a broader wages agreement. As a result, superannuation coverage increased sharply, particularly in the private sector where coverage had been low.

On the other hand, several changes were made to taxation arrangements for superannuation funds which reduced the attractiveness of superannuation saving

5 See Edey, Foster and Macfarlane (1992).

relative to other types of saving. Prior to 1983, employer contributions were fully tax deductible and fund earnings were not taxed. Only 5 per cent of lump sum payments were included in recipients’ taxable income. In 1983 a tax rate of 30 per cent was introduced on lump sum payments.[6] In 1988, a 15 per cent tax on earnings and a 15 per cent capital gains tax were also introduced as well as a contribution tax of 15 per cent on employer contributions.[7] There were however, offsetting reductions to the tax on final benefits.

As a result of the changes in superannuation legislation, particularly the introduction of ADFs, net contributions to insurance and superannuation funds increased to about 1.5 per cent of GDP by the end of the 1980s and fund earnings, buoyed by strong economic growth and high nominal interest rates, increased total saving through superannuation to over five per cent of GDP. Improved provision for preservation and portability also appears to have been important (Stemp 1991).

Only a small part of the rise in net contributions in the second half of the 1980s was sourced from new employer contributions. Despite the move to award-based superannuation in the mid 1980s and expanded superannuation coverage, employer contributions did not increase substantially (Table 2). One reason for this is that many of the schemes were defined benefit schemes where employees are entitled to a predetermined payout on retirement. Strong fund earnings caused by rising asset prices and higher interest rates resulted in some schemes being over-funded, allowing some employers to reduce or suspend contributions and in some cases to withdraw surplus funds. Strong earnings and higher employee contributions provided the bulk of the increase in superannuation saving.

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6 Lump sum benefits accruing after 1 July 1983 were taxed at the lower of 30 per cent or the recipient’s marginal tax rate.

7 The introduction of dividend imputation around this time partly offset the effect of the new taxes.

Table 2: Superannuation Contributions
(Per cent of GDP)

	Inflows			Outflows
	Employer	Employee	Total	
1960s	n.a.	n.a.	3.3	1.7
1970s	2.0	1.6	3.7	2.3
1980s – 1st half	2.3	1.4	3.6	2.7
1980s – 2nd half	2.5	3.0	5.5	3.7
1990s	3.0	5.2	8.2	5.7

Source: ABS Cat. No. 5204.0, Tables 49 and 50; Employer and employee inflows data are available from 1973/74 and total inflows and outflows data are only available up to 1991/92. Inflows data are before administrative expenses.

The strong growth in superannuation saving started to slow towards the end of the decade as the recession ushered in a period of labour market adjustment. Net contributions fell sharply and with slower growth and lower nominal interest rates, funds' earnings also fell.

A major change to superannuation arrangements occurred in 1992 with the introduction of the Superannuation Guarantee Charge (SGC). The SGC was a major innovation, changing the emphasis from largely voluntary and contractual contributions that characterised earlier schemes to a system based on a core of compulsory employer (and to a lesser extent, employee) contributions, supplemented by voluntary contributions.[8] The SGC scheme encourages employers to contribute a minimum proportion of employees earnings to superannuation funds. Employers who do not comply are subject to a charge which is redistributed to uncovered employees in the form of contributions to a superannuation fund. The charge, which also includes an interest component and administrative expenses, is not tax deductible for employers, and as a result, is more expensive than the originally prescribed contributions.

8 Award superannuation, introduced in 1985, was an earlier move towards compulsion.

Existing employer contributions and voluntary employee contributions remain an important part of the overall superannuation policy, but the SGC extends the coverage of the scheme and puts a floor under the level of employer contributions.

The initial minimum level of employer contributions under the SGC was set at 4 per cent of earnings, increasing to 9 per cent of earnings by 2002/03. A compulsory 3 per cent employee co-contribution was also foreshadowed. Where the existing level of contributions is equal to, or above, the mandated level, no additional contributions are required.

At the same time as the new contribution rates were introduced the regulatory framework governing superannuation arrangements was also tightened.[9] Under the new legislation, contributions must be made into complying funds which must satisfy prudential and reporting standards.[10] Other requirements relating to vesting, portability and preservation were also tightened. Under the SGC arrangements, superannuation must be fully vested so that an employee retains full title to their own contributions, employer contributions and accrued interest, even if they leave employment or change jobs prior to retirement. Benefits must be fully portable so that an employee is able to move benefits from one fund to another.[11] Benefits must also be fully preserved until the preservation age, which is legislated to rise from 55 to 60 over the next 20 years.

Under the new arrangements, concessional tax rates on superannuation benefits only apply if benefits fall within the reasonable benefits limit (RBL) (set in July 1995 at $418,000 for lump-sum, and $836,000 if at least half the benefit is taken as a pension). RBLs for pensions are more generous than for lump-sums, as part of government policy to encourage retirees to finance retirement via an income stream rather than a cash payment.

Despite the SGC initiatives, there was initially no pickup in contributions. The initial settings were only marginally above award superannuation rates and, for some

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9 An expanded regulatory framework, the *Superannuation Industry Supervision (SIS) Act*, was introduced in 1994.

10 Concessional tax treatment is not available to funds which do not satisfy these requirements.

11 The vesting and portability arrangements apply to SGC contributions but not necessarily to non-SGC superannuation.

employers, the legislated rates were below the rates already being contributed. Net contributions were close to zero in 1992/93 and 1993/94, although there is some doubt about the accuracy of the data. Fund assets continued to grow, however, as a result of strong net earnings growth which more than offset lower net contributions.

Further changes to superannuation arrangements were made in the 1995/96 Budget. As foreshadowed in earlier statements, employee co-contributions to superannuation of 3 per cent of earnings were introduced, with the contributions to be phased in over a three-year period from 1997/98. The government also announced that it would provide superannuation contributions to the accounts of employees and the self employed. The government's contribution will be capped at 3 per cent of earnings and, under a means test, will reduce to zero at taxable incomes of twice average weekly ordinary-time earnings. The government contributions will lag employee contributions by one year.

The initiatives, assuming they are fully implemented mean that by 2002/03, superannuation contributions will rise to a minimum of 15 per cent of earnings for most employees: 9 per cent employer contributions, 3 per cent employee contributions and 3 per cent government contributions. On the Budget's estimates, the superannuation arrangements would eventually raise national saving by about 4 per cent of GDP.

Table 3: Prescribed Minimum Superannuation Contributions

	Employer SGC contributions[(a)] %	Employee contributions %	Government contributions[(b)] %	Total %
1993/94	5	—	—	5
1994/95	5	—	—	5
1995/96	6	—	—	6
1996/97	6	—	—	6
1997/98	6	1	—	7
1998/99	7	2	1	10
1999/00	7	3	2	12
2000/01	8	3	3	14
2001/02	8	3	3	14
2002/03	9	3	3	15

Notes: (a) Employer's payroll more than $1 million.
(b) Means-tested contributions.

Source: Saving for our Future (1995).

Leaving aside the cyclical behaviour of contributions and earnings, the broad pattern of superannuation saving over the 1980s was marked by significantly increased coverage, higher average contribution rates and a shift in the allocation of saving towards superannuation.

The extent to which increased superannuation saving added to aggregate saving, however, is unclear. Aggregate household saving fell over this period, but this decline is equally consistent with superannuation saving adding, or not adding, to total saving. It is possible, for example, that aggregate saving may have declined even more sharply than it did if not for the increase in superannuation saving over the period. We need to look more closely at the determinants of saving and the linkages between different types of saving before we can identify what the likely effects have been.

3. SUPERANNUATION AND SAVING – SOME THEORY

3.1 Models of Saving Behaviour

Saving is a decision about how much of current income should be retained to finance some future contingency. Models of saving behaviour differ in how they attempt to formalise these decisions, but they are linked by the common theme of intertemporal choice.

Life-cycle/permanent income models have provided the theoretical underpinnings for much of the research on aggregate wealth accumulation over the past few decades and they are a useful starting point for looking at the effects of superannuation on saving behaviour. There are other models, however, also consistent with the basic theory of intertemporal allocation, that give additional insights into saving behaviour and asset choice. More complex formulations, for example, relax some of the strict assumptions underlying the basic life-cycle model and extend the basic model of intertemporal choice to allow other factors such as uncertainty and liquidity constraints to influence consumption and saving behaviour. These models do, however, retain many of the useful features of the basic life-cycle model and are largely extensions on a common theme.

Models of consumption and saving behaviour often have strong microeconomic foundations. The standard mechanism for modelling consumer behaviour is the maximisation of utility subject to a linear budget constraint. In the life-cycle model consumers' intertemporal preferences are widely represented by a utility function of the form of equation (1) in which preferences are intertemporally additive, and where the single period subutility functions are increasing and concave:[12]

$$u = v_1(c_1) + v_2(c_2) + \ldots v_T(c_T) \tag{1}$$

The form of the utility function is quite important, because it governs consumers' attitudes towards uncertainty. In simple formulations, increases in uncertainty do not affect saving. Lifetime consumption profiles are introduced by writing:

$$v_t(c_t) = (1+\delta)^{-t} v(c_t, z_t) \tag{2}$$

where z captures variables that influence the desirability of consumption at different points in the life cycle (such as demographic factors) and δ is the rate of time preference.

Utility is maximised subject to a lifetime budget constraint. Lifetime income is comprised of initial assets A_1 and a stream of future labour income, y. Funds held over from period to period earn a real return, r.

$$\sum_{1}^{T} \frac{c_t}{(1+r)^t} = A_1 + \sum_{1}^{T} \frac{y_t}{(1+r)^t} \tag{3}$$

Solving the optimisation problem gives the familiar formulation in which current consumption is a function of current real non-human wealth, A, and the present value of future labour income, H.

$$c_t = g(A_t + H_t) \tag{4}$$

12 The overview of consumption theory and the simple exposition of the basic life-cycle and permanent income models in Section 3.1 is closely based on Deaton (1992).

where γ depends on the parameters and variables of the utility function, the rate of time preference and the interest rate. In this simple framework, households accumulate wealth during the pre-retirement period by consuming less than current income; after retirement, wealth is gradually run down to finance consumption. Saving is positive during the pre-retirement phase of the life-cycle and negative during the retirement phase. Assuming there are no initial endowments and no bequests, saving will average zero over the life-cycle.

Permanent income theory yields similar results. Consumption is determined by permanent income, which itself is close to the annuity value of lifetime resources shown in equation (4). However, compared with the life-cycle model, permanent income theory places more emphasis on the way in which individuals form their expectations of future income and about how consumption and saving respond to changes in income, particularly in the short term. Individuals will consume out of permanent income, but transitory shifts in income will not affect consumption. Like the life-cycle model, permanent income theory predicts that people save when current income is high relative to some measure of average lifetime incomes and dissave when current income is below lifetime income.

The formation of expectations of future income emphasised by the permanent income theory can be combined with the variables suggested by the life-cycle approach. It is unclear how consumer expectations of lifetime incomes are formed in practice, but the statistical properties of the data provide some information about how labour income actually evolves and how consumers may value expected future labour income (Deaton 1992). If, for example, labour income is an I(1) series (that is, stationary in differences), shifts in current income are permanent and could be thought of as shifts in permanent income. If, on the other hand, income is stationary around a deterministic trend, trend growth in income might provide a better measure of permanent income.

Assuming that labour income follows the latter process, and that future labour income is related to trend labour income, y_L, by q, equation (4) becomes:

$$c_t = \gamma(A_t + q\, y_{L\,t}) \tag{5}$$

Replacing *c* with (*y*-*s*) and dividing by disposable income, *y*, gives an expression for the saving rate, (*s/y*):

$$\frac{s_t}{y_t} = 1 - q\left[\left(\frac{A_t}{y_t}\right) + q\left(\frac{y_{Lt}}{y_t}\right)\right] \tag{6}$$

Aggregation of (6) yields a loosely specified aggregate saving function in which saving depends on human and non-human wealth, the real interest rate, and demographic characteristics of the population, *D*.

$$\frac{s_t}{y_t} = a_0 + a_1\left(\frac{A_t}{y_t}\right) + a_2\left(\frac{y_{Lt}}{y_t}\right) + a_3 r_t + a_4 D_t + e_t \tag{7}$$

One of the most important insights provided by this simple specification of the life-cycle model is that human and non-human wealth play a central role in saving decisions. The theory predicts that, given expected income, an increase in real wealth will allow a rise in lifetime consumption and reduce the share of current disposable income that is saved. Higher wealth allows households to enjoy a higher level of lifetime consumption, even though current labour income is unchanged. Both non-human and human wealth are negatively related to saving in this framework.

Interest rate effects, however, are ambiguous. Higher real interest rates make saving more attractive by making future consumption cheaper relative to current consumption.[13] On the other hand, higher real interest rates increase future income and reduces the need to save to achieve any given level of consumption.

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13 The general rate of return concept used here is a proxy for the rate of return available on a mix of financial and real assets. In Australia, where leveraged housing wealth is a large component of total household wealth, the returns available from foregoing consumption should also reflect the returns available from investing in housing (such as imputed dwelling rent and capital gains). In the empirical work, we use a more conventional measure of real interest rates under the assumption that returns available on different assets, after adjusting for risk and other factors, will generally move together over time.

Demographic factors affect consumption and saving by changing the proportions of individuals within the different life-cycle groups. Higher proportions of individuals in the pre-retiree age group (roughly 45 to 64) would be expected to increase saving. Higher proportions in the retiree age groups (65+) would be expected to lower saving. As a result demographic factors such as life expectancy, average retirement age and labour market participation may influence consumption and saving. Other factors bearing on the need to save for retirement, such as social security provisions, may also affect consumption and saving.

The life-cycle model can be extended to include other variables to the list of possible influences on saving behaviour. The addition of precautionary motives is particularly important. Precautionary motives, although consistent with the basic theory of intertemporal allocation, are ruled out by the assumption of certainty or certainty equivalence that supports the life-cycle model (Deaton 1992). The quadratic subutility functions that underlie the permanent income hypothesis do not support a precautionary motive for saving. However, other, more analytically complex formulations of the utility function do allow for precautionary saving.

Potentially, this is very important, because in practice we know that households face uncertainty about their lifespan, health, future earnings and lifetime expenses. Cabellero (1990) has shown that uncertainty as to the permanence of a shock to income can have large effects on saving behaviour. Even shifts in permanent income may have only a sluggish effect on consumption spending (and therefore change saving) if households are uncertain.[14]

In models that include precautionary motives, households will save more (borrow less) earlier in life than in the certainty equivalence case because of the possibility that they may experience an unfavourable event. In extreme cases, households may choose not to borrow at all. The utility that households gain by having a stock of assets to draw against, if required, more than offsets the loss from forgoing some immediate consumption opportunities. Older households will dissave less than in the certainty equivalent case because of uncertainty about lifespan, medical costs and asset returns. Because older households will maintain a buffer against uncertainty, (accidental) bequests are also likely to occur.

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[14] For example, see Skinner (1988) and Engen *et al.* (1994).

In terms of our aggregate saving function, precautionary motives are likely to increase the level of saving while reducing the sensitivity of the saving rate to life-cycle influences. Theory suggests that a measure of volatility of income, $\tilde{Y}$, may be an appropriate measure of uncertainty, but in practice uncertainty is difficult to measure directly and indicators are often used to model states likely to be associated with higher uncertainty. Two possible indicators are the rate of inflation, Π, and the change in the rate of unemployment, ΔU, both of which would be expected to be positively related to uncertainty (Carroll 1992). These measures of uncertainty are added to equation (7) to give:

$$\frac{s_t}{y_t} = a_0 + a_1\left(\frac{A_t}{y_t}\right) + a_2\left(\frac{y_{Lt}}{y_t}\right) + a_3 r_t + a_4 D_t + a_5 \Delta\tilde{Y}_t + a_6 \Pi_t + a_7 \Delta U_t + e_t \quad (8)$$

Liquidity constraints are also ruled out by assumption in the standard life-cycle models but are often linked with saving behaviour. Life-cycle models assume that capital markets are perfect and that households are able to borrow against lifetime incomes. However, studies find that, in practice, up to half the population is liquidity constrained (or act as if they are) and borrowing constraints are likely to prevent many households from optimising according to the predictions of the life-cycle model.[15] One implication of this is that consumption is more likely to follow current household income than in the standard life-cycle model.

The effects of liquidity constraints on saving, however, are unclear. In an extreme case, continuously binding liquidity constraints imply that individuals bound by this constraint do not save. If liquidity constraints are not continuously binding, however, expectations of possible future constraints may induce people to hold more assets as a buffer stock against future needs than would otherwise be the case (Deaton 1992). The inability to borrow may increase consumption uncertainty and strengthen the precautionary motive for saving. If constraints are more (less) binding when income is low (high), liquidity constraints may increase the sensitivity of aggregate saving to shifts in aggregate income. Households will save when income is relatively high and run down saving during periods when lower incomes and liquidity constraints would otherwise cause a sharp decline in consumption spending.

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15 See McKibbin and Richards (1988), Lattimore (1994) and Blundell-Wignall, Browne and Tarditi (1995).

3.2 Introducing Superannuation into Saving Models

The basic life-cycle model focuses on the intertemporal allocation of resources, but does not give much attention to the types of assets that facilitate the process. Assets are assumed to be riskless and superannuation assets and other forms of savings are effectively assumed to be perfect substitutes.

The effects of changing the level and conditions of superannuation saving in this framework are quite clear. An increase in superannuation saving, for example, resulting from an increase in the returns available on superannuation relative to returns available on other assets (and assuming aggregate returns remained unchanged) would result in a shift in saving, at the margin, into superannuation saving and a reduction in one of the other forms of saving. An increase in superannuation saving resulting from a compulsory levy would have a similar effect. The levy would raise total saving above preferred levels and households would adjust other saving downward to compensate for the increase. In both cases, a rise in superannuation would result in a one-for-one reduction in other forms of saving with no increase in aggregate saving, under the extreme assumptions of perfect certainty and perfect substitutability.

Once uncertainty and capital market imperfections are introduced, however, the likely effects of superannuation on other types of saving are more complex. If income flows are uncertain and households have to rely on a portfolio of risky assets to provide for future consumption, and to provide insurance in different states of the world, consumption decisions and portfolio choice are not independent. In this framework, assets are no longer perfect substitutes and we would not expect to see one-for-one offsets between superannuation and other types of saving.

Households will allocate the sum of non-human wealth and labour income between consumption and a selection of assets that may differ in terms of riskiness, return and liquidity, and across a number of other dimensions. Households will choose a portfolio of assets so that, having regard to the different characteristics of available assets, the marginal utility obtained from holding each asset is the same. Increments to the stock of assets (saving) will be apportioned accordingly.

As with other forms of saving, the proportion of new saving held in the form of superannuation will depend on the characteristics of that asset compared with the characteristics of other assets that could potentially be added to the portfolio. Saving may be encouraged to flow into superannuation assets by concessional tax treatment which raises the yield on superannuation assets above that of most other assets, or as a result of institutional arrangements such as compulsory levies and long-term contractual arrangements. The extent to which households will offset these increases (decreases) in superannuation saving with decreases (increases) in non-superannuation saving will depend on the degree of substitutability, at the margin, between the different forms of saving. If superannuation saving can provide households with an equivalent, or better, level of future consumption (for example, in terms of yield) and/or the same insurance against future contingencies (for example, in terms of liquidity and risk), then it is likely that higher superannuation saving would be wholly or partly offset by lower non-superannuation saving. In practice, however, it is likely that informational problems and capital market imperfections will reduce the perceived substitutability of the different forms of saving and reduce the extent to which households will be prepared to substitute superannuation for other forms of saving.

Savers who are myopic or likely to be liquidity constrained may place a high discount rate on superannuation saving because benefits are generally not available until retirement. As a result, they may not reduce other forms of saving to compensate for (forced) higher superannuation saving. Even if they do value superannuation saving as highly as other retirement saving, they may not reduce other saving if credit market frictions may prevent them from borrowing against lifetime income to return to a desired consumption path.

Savers who are concerned about uncertainty prior to retirement are also likely to regard superannuation assets as an imperfect substitute for other forms of savings. Increased superannuation saving may be a good substitute for retirement saving for some households, but a poor substitute for other forms of saving aimed at meeting contingencies prior to retirement.

A similar lack of substitutability may apply in the case of savers who are concerned about insuring against post-retirement uncertainty. These savers may have limited knowledge of employer contribution rates and may be unaware of the rate at which superannuation assets are likely to accumulate over time.[16] They may also be unaware of taxation arrangements and uncertain of the fee structures (such as entry, exit and management fees) related to the administration of their superannuation savings. In this case, households may maintain other retirement saving even if superannuation saving increases.

Even savers who are fully informed and who optimise according to standard life-cycle theory may place a low value on superannuation assets if holdings of superannuation assets have unfavourable tax consequences or reduce entitlements to public pensions and benefits.

In summary, there are a number of factors, including information problems, credit market frictions and institutional arrangements, which suggest that aggregate household saving may not be independent of the form in which saving is held and that changes in superannuation saving may therefore change total saving. A crude, but simple, way of allowing for this possibility is to augment equation (8) by directly including superannuation saving, s^s:

$$\frac{s_t}{y_t} = a_0 + a_1\left(\frac{A_t}{y_t}\right) + a_2\left(\frac{y_{Lt}}{y_t}\right) + a_3 r_t + a_4 D_t + a_5 \Delta\tilde{Y}_t + a_6 \Pi_t + a_7 \Delta U_t + a_8 \frac{s^s_t}{y_t} + e_t \tag{9a}$$

Noting that total saving is the sum of superannuation saving, s^s, and non-superannuation saving, s^n, we can rewrite equation (9a) as:

$$\frac{s^n_t}{y_t} = a_0 + a_1\left(\frac{A_t}{y_t}\right) + a_2\left(\frac{y_{Lt}}{y_t}\right) + a_3 r_t + a_4 D_t + a_5 \Delta\tilde{Y}_t + a_6 \Pi_t + a_7 \Delta U_t + (a_8 - 1)\frac{s^s_t}{y_t} + e_t \tag{9b}$$

which is the basic form of the estimating equation used later in the paper. If increases in superannuation saving are offset one-for-one by reductions in other forms of saving, the coefficient on superannuation saving (a_8-1) would equal -1 and the equation would collapse to the extended life-cycle model represented by

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16 Even where savers can predict future entitlements accurately, changes in superannuation saving through either contributions or earnings may have little effect on behaviour. In the case of defined benefit schemes, for example, employees are entitled to clearly defined benefits on retirement and these payments are at least partly independent of measured contributions.

equation (8). If there were no offsets, $(a_8\text{-}1)$ would equal 0. In this case, an increase in superannuation saving would increase aggregate saving by a similar amount.

Empirical evidence on the likely size of the coefficient on the superannuation saving term in equation (9b) is limited. Overseas private pension schemes are quite different to Australia's superannuation scheme, and they are not very useful in assessing the effects on saving of the Australian scheme. A recent OECD paper, however, suggests there is an increasing body of evidence pointing to at least partial substitutability between saving in retirement saving schemes and other forms of saving (OECD 1994). A recent IMF study on saving in Asia also reports substantial offsets (Faruqee and Husain 1995). It finds little evidence that compulsory provident fund saving has increased the trend rate of saving in Malaysia and finds that, in Singapore, about three-quarters of the rise in compulsory saving has been offset by a reduction in other saving. Recent US studies also find evidence of substantial offsets.[17]

Australian empirical evidence is limited, although Goode (1994) finds evidence of partial substitution. The FitzGerald (1993) report uses a ratio of 50 per cent substitution, although the measure is an assumption rather than an estimate.[18]

4. THE AUSTRALIAN EXPERIENCE

As in several other countries, the aggregate net household saving ratio in Australia, as conventionally measured, has steadily declined over the past two decades. Saving rose sharply in the early 1970s, before peaking at over 14 per cent of household disposable income in 1974/75. By the mid 1990s, the saving rate had fallen below 5 per cent.

It is widely believed, however, that part of the large rise in measured saving in the 1970s was purely mechanical – the result of an upward measurement bias that occurs during periods of high inflation. National accounts measures of saving do not adjust interest payments to households for that component which simply compensates savers for the decline in the real value of assets generating the income

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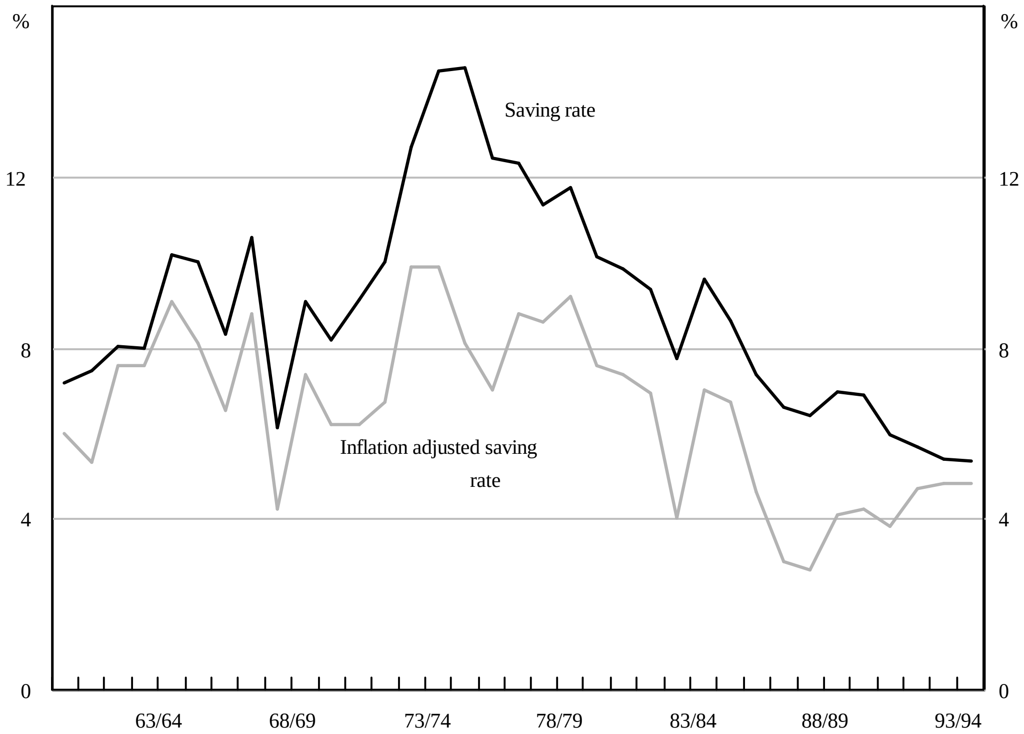
17 See Gale and Scholz (1994), Joines and Manegold (1991) and Engen *et al*. (1994). For contrary evidence see Venti and Wise (1987, 1990, 1991, 1992).

18 See FitzGerald and Harper (1993).

flows. As a result, net interest receipts (and hence saving) are higher during periods of high inflation than would otherwise be the case. A crude adjustment to the net saving rate is shown in Figure 1.

Figure 1: Net Household Saving
(Per cent of household disposable income)



Even with the adjustment, however, the saving rate has still generally fallen over the past couple of decades. The fall, however, has not been uniform across all forms of saving. The superannuation component of measured saving averaged about 4 per cent of disposable income during the 1960s and 1970s, before rising to close to 8 per cent during the 1980s. More recently, superannuation saving declined to less than 3 per cent of disposable income. By implication, the aggregate of other forms of household saving fell substantially in the 1980s before recovering somewhat in the early 1990s.

In itself the observation that non-superannuation saving fell during a period when superannuation saving rose sharply does not necessarily imply a causal relationship. While changes in superannuation saving have the potential to explain part of the shifts in other saving, it may be that other factors, quite independent of superannuation, have caused much of the observed behaviour of other saving. The extended life-cycle/permanent income model outlined in Section 3 identifies a number of possible factors which, in addition to shifts in superannuation saving, may help explain patterns of saving in Australia over the past few decades.

4.1 Non-Human Wealth

In Australia, as in many other countries, non-human wealth increased sharply in the 1980s, after moderate growth in the preceding two decades.[19]

Much of the rise, however, was a result of increases in the value of housing and it is unclear how important wealth effects have been in this case. Life-cycle theory predicts that higher housing wealth would decrease the propensity of home owners (usually older households) to save out of current income. However, housing is a relatively illiquid form of asset holding and it is likely that, in the past, borrowing restrictions prevented many households from optimally borrowing against housing wealth for consumption purposes. Financial deregulation may have made it easier for households to access dwelling wealth in recent years, but it is still unlikely that households would have responded to increases in dwelling wealth to the same extent that they would have if the increase in wealth had come from a rise in the value of more liquid financial assets.

It is also possible that the negative effect on saving by older households may have been partially offset by increased saving by younger households, because non-home-owners have to accumulate a substantial deposit before lending finance is available. The effect of higher house prices in the 1980s may have been to increase the amount of funds that younger households needed to accumulate as a deposit to purchase the more expensive housing (Lattimore 1994).[20]

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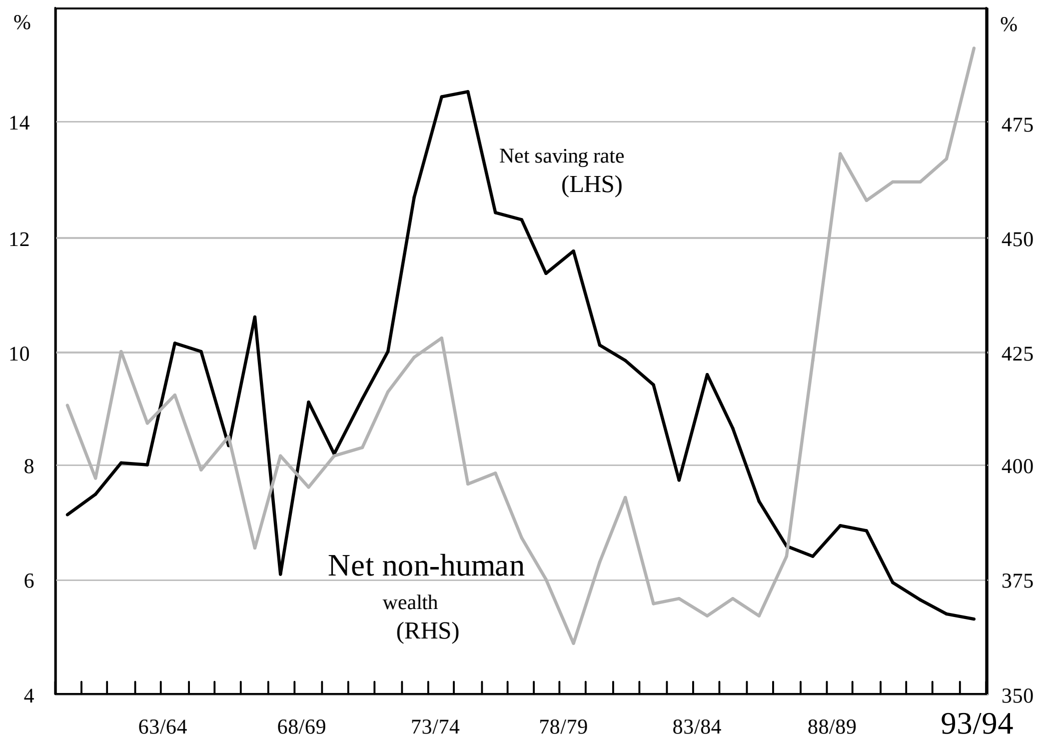
19 Our measure of non-human wealth shown in Figure 2 includes financial assets such as household holdings of currency, deposits with financial institutions, government bonds, equities and superannuation assets as well as real assets such as dwellings and consumer durables. This measure is net of households' financial liabilities.

20 See Simes and Horn (1986) and Lattimore (1994) for Australian evidence of non-human wealth effects.

Figure 2: Household Non-Human Wealth and Saving
(Per cent of household disposable income)



4.2 Human Wealth

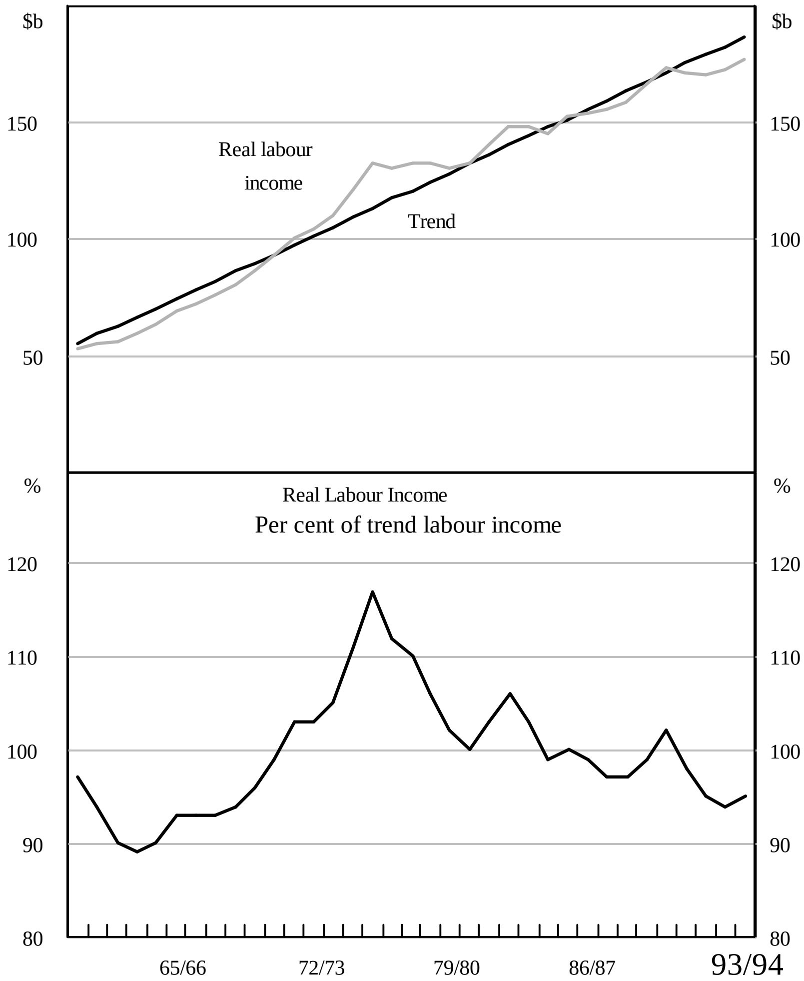
Life-cycle/permanent income models also give an important role to human wealth effects but, without a clear understanding of how expectations of future labour income are formed, human wealth is difficult to measure.

The evolution of actual labour income, however, provides some guide. The simple linear trend of real labour income shown in Figure 3 shows a profile of permanent income that would be consistent with the way in which actual labour income evolved.[21] According to life-cycle/permanent income theory, if households knew with certainty that income would evolve in this way, they would save more when current disposable household income was high relative to the long-run average growth path of labour income and save less when current disposable household income was low relative to the long-run average growth path of labour income. While it is unlikely that households would be able to predict the future course of

21 A linear, rather than log-linear, specification of the time trend was preferred because of the declining growth rates in labour income over the sample period.

labour income with anything like this degree of certainty, the broad trends in saving in Australia appear to correspond reasonably well with deviations of current income from this long-run trend in labour income.

Figure 3: Human Wealth



A related point is made by EPAC (Whitelaw and Howe 1992) who argue that the slowdown in income growth since the mid 1970s (due to slower productivity and/or employment growth over much of the period) has been an important factor in explaining the general decline in saving in Australia. They point to the correlation between the domestic saving rate and the deviation in the level of per capita income from its long-run trend as evidence that consumers are slow to adjust consumption when income growth slows.

It also appears that there is considerable inertia with respect to consumers' response to short-term cyclical changes in income, a point also noted by EPAC (Whitelaw and Howe 1992). Permanent-income theory suggests that if short-term movements in income are dominated by transitory movements, current consumption will be invariant to short-run changes in income and saving will move closely with income. If there is uncertainty as to the permanence of any shock to income, even shifts in permanent income may not have an immediate effect on consumption spending and may increase saving in the short term Caballero (1990). Precautionary saving and the presence of liquidity constraints may also increase the short-term sensitivity of saving to changes in income. Edey and Britten-Jones (1990) find that short-run changes in the saving rate are well explained by changes in income.

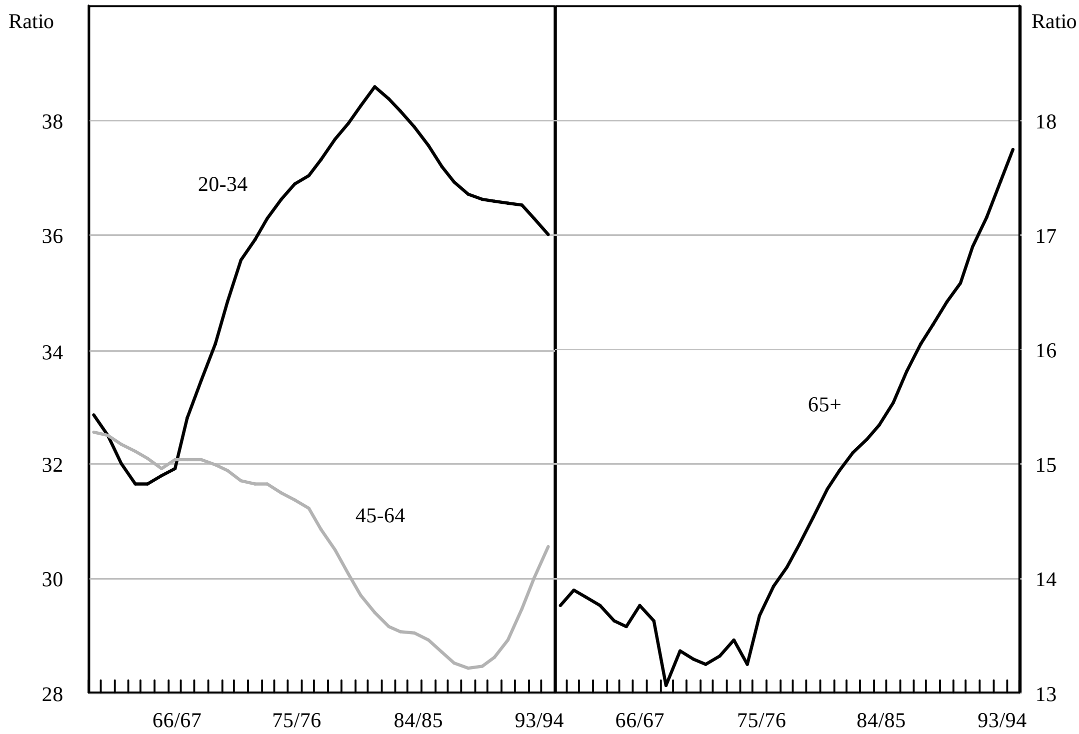
4.3 Demographic Factors

In the life-cycle model, demographic factors such as age distribution, life expectancy, retirement age and labour market participation may all influence aggregate saving. Precautionary and bequest motives may reduce their influence somewhat, but demographic factors are still likely to be important.

There have been quite large shifts in the relative proportions of different life-cycle groups in the Australian population as well as marked changes in income profiles within some of these groups. The proportion of the population in the 45-64 year age group (predicted to be the main savers in the life-cycle theory) fell in the 1960s and 1970s, but has risen quite sharply over the past decade. The proportion in the older age groups, 65+, which the life cycle theory predicts to be dissavers, has been growing steadily.

Participation rates have also changed markedly. For example, Foster (1992) notes that participation rates of older workers have declined, further reducing the proportion of the population in those groups expected to be accumulating wealth for retirement, and increasing the retiree proportion of the population who are expected to be dissavers.

Figure 4: Demographic Characteristics[(a)]



Note: (a) Calculated as the prescribed age group divided by the working population aged 15-64.
Source: ABS Cat. No. 3201.0, Table 1.

The large shifts in the demographic characteristics of the Australian population should be associated with quite pronounced movements in saving rates and it is likely that at least some of the fall in the saving can be attributed to these factors.[22] There are however a number of factors that may mitigate against the importance of demographic factors. Precautionary and bequest motives, and illiquid wealth holdings, may each reduce the propensity of older households to run down assets in retirement to the degree predicted by the simple life-cycle model. Improved provision of social security may also have reduced the degree to which households accumulate wealth for retirement and the degree of subsequent dissaving.

Edey and Britten-Jones (1990) and Whitelaw *et al*. (1988) point to data from the Household Expenditure Survey which show that retirees reduce consumption in retirement in line with lower incomes, rather than maintaining consumption and dissaving at the rate suggested by the simple life-cycle model. If this is the case,

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22 See Smith (1990), Lattimore (1994) and Bateman *et al*. (1991) for Australian evidence on the effects of demographic factors.

there will be less variation in saving rates across different age groups and a weaker influence of demographic factors than the simple theory predicts.

4.4 Interest Rates

The life-cycle model ascribes an important role for real interest rates in the households intertemporal decision making process but the net effect on household saving is not clear. Edey and Britten-Jones (1990) argue that for Australia, the substitution effect should dominate because, in aggregate, the household sector receives a very small proportion of its income in the form of net interest payments. Empirical evidence is mixed, but overseas studies have generally found interest elasticities to be small and insignificant. Edey and Britten-Jones (1990) find similar results for Australia.

4.5 Indicators of Uncertainty

Uncertainty is difficult to measure at an aggregate level. Theory suggests that income volatility is an appropriate measure of uncertainty, but inflation and changes in the rate of unemployment are two measures which have also been used as indicators of uncertainty in other studies.[23] Other proxies such as changes in hours worked, growth in employment, strike activity and labour market turnover could also be used.

Inflation may affect saving behaviour by causing typically risk-adverse households to save more for precautionary purposes. High inflation may be associated with financial or real shocks to the economy and with increased variability of income flows.

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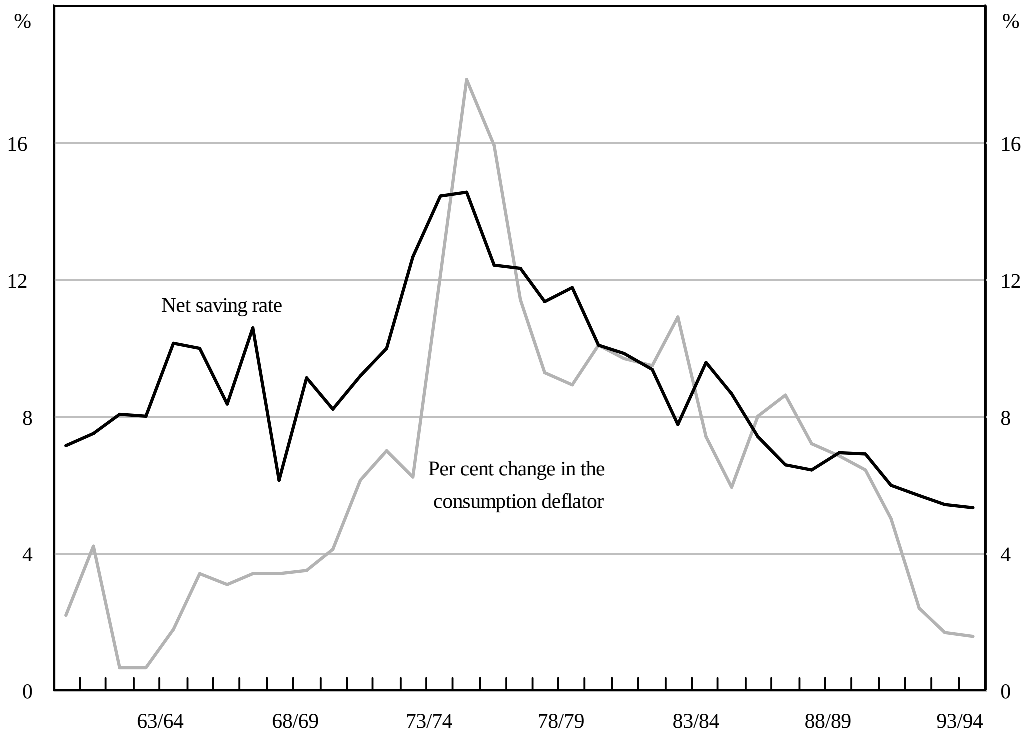
[23] See Andersen and Kennedy (1994) and Lattimore (1994).

Figure 5: Inflation and Household Saving



Fluctuations in the real economy are also likely to be associated with higher precautionary saving by risk-averse households. Increased unemployment, for example, may increase the expected variability of income flows of those households which are newly unemployed as well as those households who are at risk of becoming unemployed. Increased uncertainty may encourage households who may be affected, and particularly those who may face liquidity constraints, to increase saving in the short term.

We examine the effects of each of these possible influences on saving more formally in the next section.

5. EMPIRICAL RESULTS

Our procedure for testing the effect of superannuation on other saving follows Pitelis (1985). We estimate a model of saving in which non-superannuation saving is expressed as a function of superannuation saving and other factors that may help explain saving behaviour. The specification of the model (equation 9b) is repeated below:

$$\frac{s^n{}_t}{y_t} = a_0 + a_1\left(\frac{A_t}{y_t}\right) + a_2\left(\frac{y_{Lt}}{y_t}\right) + a_3 r_t + a_4 D_t + a_5 \Delta \tilde{Y}_t + a_6 \Pi_t + a_7 \Delta U_t + (a_8 - 1)\frac{s^s{}_t}{y_t} + e_t \quad (9b)$$

A coefficient of -1 on the superannuation saving term implies perfect substitution between superannuation and non-superannuation saving; a coefficient of 0 implies independence between the two forms of saving.

To allow for the possibility that the different components of superannuation saving may have different effects on non-superannuation saving we also estimate (9b) with net superannuation contributions and superannuation earnings entered separately. In addition, we estimate a version in which a broader measure of earnings (including capital gains) is used, rather than the narrow and less meaningful national accounts measure.

The data used in estimating equation (9b) are described fully in Appendix B. Briefly, non-superannuation saving is calculated as net household saving as measured in the national accounts less the national accounts' measure of saving through life offices and superannuation funds, expressed as a ratio to household disposable income.[24]

The superannuation saving term is the national accounts measure of saving through life offices and superannuation funds, also expressed as a ratio to household disposable income. The term is the sum of net contributions to superannuation (employer and employee contributions less claims and administrative expenses) and interest on life offices' and superannuation funds as measured in the national accounts.

The saving measures are not inflation adjusted, but inflation is included directly in the estimating equations to capture uncertainty effects as well as to control for any possible measurement bias due to the effects of inflation.

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24 The measure of household disposable income is net of employer contributions to superannuation and imputed interest on superannuation funds. More detail on how the Australian Bureau of Statistics measures superannuation saving is provided in Appendix A.

5.1 Unit Root Tests

A preliminary to time series analysis is to establish the order of integration of the data. The Augmented Dickey-Fuller (ADF) test and the Phillips-Perron Zt tests are employed over the study period 1959/60 to 1993/94, and the results are reported in Appendix C. Briefly, both test procedures show that all the variables are I(1), except the income volatility term which is I(0).[25] This is expected since income volatility is measured as a three-year moving standard deviation of real per capita household disposable income. Further tests confirm that in all cases we can reject the null hypothesis that any of the series are I(2).

While over a long time span the saving rate is likely to be stationary, we accept that large behavioural shifts have occurred over the past few decades and that the variables are I(1) over the estimation period. As a result, we use an error correction formulation which encompasses both long-run equilibrium relationships and short-run dynamics.

5.2 Estimation

The model is estimated over the period 1959/60 to 1993/94 as an unrestricted error correction model (ECM). This approach enables the long-run equilibrium relationship and the short-run dynamics to be estimated simultaneously. It is recommended over the two-step Engle-Granger procedure, particularly for finite samples, where ignoring dynamics when estimating the long-run parameters can lead to substantial bias.[26]

The unrestricted ECM is outlined in equation (10) below, where the α's are the long-run parameters, and γ is the error correction coefficient indicating how quickly

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25 Although the tests report the real bond rate to be I(1), Mishkin and Simon (1994) have shown that these tests are biased towards finding a unit root and that Monte Carlo studies suggest the real interest rate is more likely to be I(0). We share this view and therefore include the real bond rate in the dynamics of the unrestricted ECM model but not in the long run.

26 Banerjee *et al.* (1993) and Inder (1994) show that substantial biases in static OLS estimates of the cointegration parameters can exist, particularly in finite samples, and that unrestricted error correction models can produce superior estimates of the cointegrating vector.

the system returns to equilibrium after a random shock. The significance of the error correction coefficient, γ, is a test for cointegration. Kremers, Ericsson and Dolado (1992) have shown this test to be more powerful than the Dickey-Fuller test applied to the residuals of a static long-run relationship. The general model is:

$$\left.\begin{aligned}\Delta\left[\frac{S^n}{y}\right]_t = \; & f + \sum_{b=0}^{k} b_b \Delta\left[\frac{S^s}{y}\right]_{t-b} + \sum_{c=1}^{k} b_c \Delta\left[\frac{S^n}{y}\right]_{t-c} + \sum_{d=0}^{k} b_d \Delta\left[\frac{\hat{y}_L}{y}\right]_{t-d} + \sum_{e=0}^{k} b_e \Delta\left[\frac{A}{y}\right]_{t-e} \\ & + \sum_{f=1}^{k} b_f r_{t-f} + \sum_{g=1}^{k} b_g \Delta D_{t-g} + \sum_{h=1}^{k} b_h \Delta\tilde{Y}_{t-h} + \sum_{i=1}^{k} b_i \Delta\Pi_{t-i} + \sum_{j=1}^{k} b_j \Delta U_{t-j}\end{aligned}\right\} \textit{Short run}$$

$$\left.\begin{aligned}& + a_1\left[\frac{A}{y}\right]_{t-1} + a_2\left[\frac{\hat{y}_L}{y}\right]_{t-1} + a_4 D_{t-1} + a_6 \Pi_{t-1} + a_7 U_{t-1} \\ & + (a_8 - 1)\left[\frac{S^s}{y}\right]_{t-1} + g\left[\frac{S^n}{y}\right]_{t-1} + e_t\end{aligned}\right\} \textit{Long run} \qquad (10)$$

The long-run parameters (the α's)[27] are unbiased, but their t-values do not follow a t-distribution and are therefore not interpretable. The Bewley (1979) transformation is applied to provide approximately normally distributed t-statistics on those parameters.

To obtain our preferred equation, we commenced with a general unrestricted ECM using the important determinants of saving behaviour outlined in Sections 3 and 5. Insignificant regressors were sequentially deleted to arrive at a preferred specification. As a final check, F-tests were conducted on the omitted variables to ensure that they were collectively insignificant. The final equations using different measures of superannuation saving are shown in Table 4. The equations appear to be well specified, passing a host of diagnostic tests which are reported in Appendix D.

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27 Apart from the interest rate and income volatility term (which were found to be stationary and therefore not included in the long run), the coefficients on the long-run variables are the same as in equation (9b).

Table 4: Unrestricted ECM

Dependent variable: Æ non-super. saving (/Y), sample period: 1959/60-1993/94

	(1)	(2)	(3)
Explanatory variables: – short run			
$Constant_t$	0.454**	0.398**	0.355**
	(3.6)	(2.9)	(3.0)
Æ Superannuation saving $(/Y)_t$	-0.761**		
	(9.2)		
Æ Net contributions $(/Y)_t$		-0.883**	-0.968**
		(7.8)	(11.9)
Æ Interest earnings $(/Y)_t$		-0.381	
		(0.9)	
Æ Superannuation profit $(/Y)_t$			-0.039
			(0.7)
Æ Non-super. saving $(/Y)_{t-1}$	-0.190*	-0.192*	-0.221**
	(2.4)	(2.1)	(2.6)
Æ Human wealth $(/Y)_t$	-0.835**	-0.855**	-0.868**
	(14.3)	(14.2)	(16.0)
Æ Unemployment $rate_t$	0.003**	0.003**	0.005**
	(3.0)	(3.5)	(4.0)
Explanatory variables: – long run			
Superannuation saving $(/Y)_{t-1}$	-0.743**		
	(6.0)		
Net contributions $(/Y)_{t-1}$		-0.952*	-1.206**
		(2.5)	(4.3)
Interest earnings $(/Y)_{t-1}$		-0.330	
		(0.5)	
Superannuation profit $(/Y)_{t-1}$			0.107
			(0.8)
Human wealth $(/Y)_{t-1}$	-0.924**	-0.956**	-1.097**
	(6.7)	(5.3)	(5.5)
Non-human wealth $(/Y)_{t-1}$	-0.030**	-0.031**	-0.033**
	(7.1)	(4.7)	(6.3)
Population ratio $45\text{-}64_{t-1}$	0.005**	0.009	0.012**
	(2.8)	(1.7)	(3.9)
$Inflation_{t-1}$	-0.123	-0.124	-0.207
	(1.2)	(1.1)	(1.4)
Summary statistics:			
Cointegration test	-0.566**	-0.548**	-0.486**
	(4.9)	(4.6)	(4.4)
$\bar{R}^2$	0.92	0.91	0.91
$\hat{s}$	0.006	0.006	0.006
Durbin-Watson statistic	1.98	1.95	2.18

Notes: t-values are in parentheses. **(*) denotes significance at the one (five) per cent levels. Superannuation saving is the sum of net contributions and interest earnings. Superannuation profit s the sum of interest earnings and capital gain. For the long-run explanatory variables, the Bewley transformation was applied to obtain interpretable t-statistics. The cointegration test proposed by Kremers, Ericsson and Dolado (1992) is employed. $\hat{s}$ is the standard error of the equation.

A note of caution is in order, however, particularly with respect to the quality of the data and the low power of the tests. The national accounts measures of saving (calculated as a residual) and superannuation flows are generally regarded as poor quality estimates. Data are only available on an annual basis and this restricts our degrees of freedom and reduces the efficiency of our estimates. On the positive side, however, the data cover a period of over 35 years and so potentially contain a lot of information. It is likely that any data deficiencies will have a more serious impact on the short-term dynamics than on the broad long-term relationships which the cointegration methodology seeks to identify.

5.2.1 Short-run results

The first point to note from Table 4 is that the parsimonious equation explains non-superannuation saving quite well. The dynamic model is specified in difference form, but still explains 90 per cent of the changes in non-superannuation saving. The error correction coefficient is significant at the 1 per cent level, supporting the hypothesis that the variables identified as significant in the long run are cointegrated. The speed of adjustment back towards long run equilibrium after a shock appears to be reasonable. The coefficient on the error correction term of -0.57 in column 1 suggests that about half of the disequilibrium is eliminated in the subsequent year, and after three years, about 90 per cent of the shock has dissipated.

The pattern of the short-term dynamics accords reasonably well with our priors. As expected, the human wealth term is very significant in the short term, reflecting the importance of the business cycle in explaining short-run shifts in the saving rate. This is consistent with a number of Australian studies including Edey and Britten-Jones (1990) which find that consumption smoothing is quite important over relatively short periods.

There was no evidence that non-human wealth or demographic factors were important in the short run. The real bond rate was not significant, consistent with theory that points to offsetting income and substitution effects, and the results of many other studies which have tried to identify interest rate effects.

The change in the unemployment rate was significant, suggesting that precautionary motives may have some influence on saving behaviour, at least in the short term.

The moving standard deviation of real per capita income was not significant, but this measure may not be a good proxy for uncertainty.

The results suggest that there are quite large, though incomplete, offsets between superannuation and other forms of saving in the short run. The coefficient on the superannuation saving term suggests that, in the short run, a one percentage point increase in superannuation is offset by a 0.75 percentage point fall in other forms of saving.

This result is conditional, however, on the restriction that the coefficients on the two components of superannuation saving are the same. Tests show that this is clearly not the case. Column 2 in Table 4 reports the results where the two components of superannuation (net contributions and earnings) are entered separately. The coefficient on the contributions term is significant and quite large, but the coefficient on the earnings term is small and insignificant. Similar results are obtained when the superannuation term is split into contributions and a broader measure of earnings that includes capital gains (column 3). The coefficient on the contributions terms is significant and close to -1, and the coefficient on the earnings term is small and insignificant. This suggests that the large short-run offsets between aggregate superannuation and other savings are largely the result of substantial offsets against contributions.

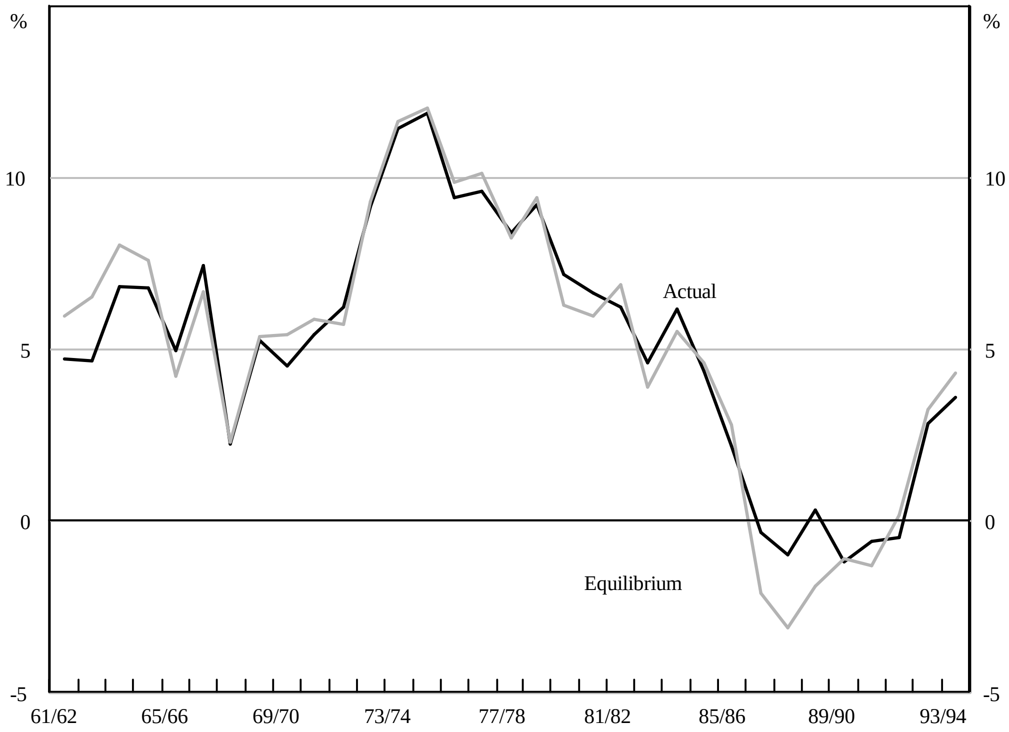
5.2.2 Long-run results

The estimated long-run relationships are reported in the bottom panel of Table 4.[28] There is evidence of cointegration between non-superannuation saving and the other variables (human and non-human wealth, the demographic term and the superannuation saving term). The long-run equilibrium equation explains most of the structural decline in the non-superannuation saving rate over the past few decades

28 Our analysis has generally ignored possible effects of corporate saving or government saving on household saving behaviour. If these sectors are ultimately the agents of the household sector and savers can 'pierce the veil', household saving may also respond inversely to changes in saving by these other sectors. There was no evidence, however, to support the inclusion of either of these terms in the cointegrating vector. The coefficients on corporate saving and public sector saving were small and insignificant.

(Figure 6), even though there are likely to be additional factors explaining changes in saving rates – financial deregulation, changing attitudes towards debt and so on.

Figure 6: Non-superannuation Saving Rate



Both wealth terms, i.e. non-human wealth and our measure of expected future labour income, have the expected signs and are significant at the 1 per cent level in the long run. The coefficient on the non-human wealth term indicates that the rise in non-human wealth is capable of explaining up to about 3 percentage points of the 13 percentage point fall in the non-superannuation saving rate between the peak in the mid 1970s and the trough in the early 1990s.

The human wealth term is more important, explaining about 6 percentage points of the fall in the non-superannuation saving rate over this period.[29] It appears that the large long-run shifts in household saving rates in Australia – the rise in the mid 1970s, and the subsequent decline – are closely related to shifts in current

29 The results were quite sensitive to the specification of this term, but alternative specifications (for example, using current rather than trend labour income as an indicator of expected future labour income) produced inferior results, both in terms of the explanatory power of the equations and the performance of individual explanators.

disposable income relative to longer-run movements in labour income. Saving rates rose sharply in the mid 1970s when current disposable income was high compared with longer-run trends in labour income and then declined as current disposable incomes fell relative to longer-run trends in labour income. This is consistent with the consumption smoothing behaviour of consumers in life-cycle/permanent income models as well as other models which are characterised by slow adjustment of consumption to income or in which consumers accumulate assets in good times as insurance against the possibility of less favourable conditions in the future.

The demographic term was also significant at the 1 per cent level with the expected sign, explaining about 2 percentage points of the fall in saving rates since the mid 1970s. Inflation was not significant at the 5 per cent level, but was retained in the final equation because of its important role in controlling for any measurement bias induced by inflation.

The results provide strong support for the inclusion of the superannuation term in the cointegrating vector (Figure 6).[30] The importance of including the superannuation term in the long and short run is highlighted by the deterioration in the equation's goodness of fit from 91 per cent to 80 per cent, if the superannuation term is excluded. The superannuation saving term was significant at the 1 per cent level and the coefficient of -0.74, implies a large (though incomplete) degree of substitution in the long run between the two saving measures for the historical period covered by the regression. However, in evaluating this result, the low quality of superannuation and saving data and the low power of statistical tests should be kept in mind.

Once again, however, this result is conditional on the restriction that the coefficients on the two components of superannuation saving are the same in the long term.[31] The results in columns 2 and 3 show that when superannuation saving is split into its two components, the coefficients on the net contributions term are not significantly different from -1 and the coefficients on the earnings terms are not significantly

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30 Even when the superannuation term is excluded, there is evidence of cointegration. Of course, when the term is excluded, the equation is misspecified and the estimates are biased.

31 Standard tests reject this restriction in the case of contributions and the broader measure of earnings (including capital gains), but because of the large standard errors we are unable to reject the restriction in the case of contributions and the narrow measure of earnings.

different from zero. However, the standard errors suggest that our estimates are not very precise, particularly in the case of superannuation earnings where the large standard errors make it difficult to draw any firm conclusions. The standard errors are much smaller for the broader measure of earnings (including capital gains) and we can be more confident that in this case the coefficient is reasonably well estimated. Overall, these estimates suggest that, as best we can tell, there have been large offsets against net contributions, but only small, if any, offsets against superannuation earnings.

6. CONCLUSION

Our results suggest that, in the past, there has been a significant degree of substitution between superannuation and other forms of saving, although the offsets have not been complete. Our estimates are not very precise, but they suggest that, over the past 35 years, about three-quarters of the variation in superannuation saving was offset by changes in other forms of saving. At a more disaggregated level it appears that there has been a high degree of substitution between net superannuation contributions and non-superannuation saving, but little, if any, substitution between superannuation earnings and other saving. These estimates are generally consistent with observations by Edey and Britten-Jones (1990) and Goode (1994) as well as a number of recent overseas studies of saving through retirement income schemes.

It is too early to tell how big an effect the new superannuation arrangements will have on aggregate household saving in the long term. However, there are a number of aspects which might be expected to reduce the degree of offset between superannuation and other forms of saving. The compulsory elements of the new arrangements will force some households, who would otherwise save very little (particularly those in the initial stages of the life cycle for whom retirement is a long way off, or those on low incomes for whom it is optimal to rely on the government pension to fund retirement), to save for retirement. Liquidity constraints will limit the extent to which some of these households can offset increases in superannuation contributions by borrowing, or by reducing other forms of saving.

There is a danger, however, that some households will offset some of the increase by reducing other forms of saving and that, even those households who are currently liquidity constrained, may compensate for the increase in superannuation saving by reducing saving later in life. Households may remove superannuation assets directly (for example, by retiring early), or by consuming more than would otherwise be the case once income and wealth have increased and liquidity constraints have eased. For those households, a partial effect of the new arrangements may be to postpone consumption (and temporarily increase current saving), rather than to increase longer-term saving for retirement.

Given households' high propensity in the past to switch between superannuation saving and other forms of saving, sustainable increases in saving are only likely to occur if households can be persuaded of the need to provide for their own retirement and if institutional structures are put in place that encourage or force them to do so.

APPENDIX A: NATIONAL ACCOUNTS MEASURES OF SUPERANNUATION SAVING

National accounts measures of household disposable income include two superannuation components – employer contributions to superannuation and imputed interest on life and superannuation funds. The saving measures include employer contributions to superannuation and imputed earnings on superannuation and life office funds (offsetting their inclusion in the income measure) and other (mainly personal) contributions. Administrative expenses and claims, including surrenders and pensions, are deducted to get the net superannuation savings (Table A1).

Table A1: Superannuation Components of Saving

Total household disposable income =

Household disposable income
(excluding superannuation)

\+ Employers' contribution to superannuation

\+ Interest on life and superannuation funds

Net saving =

Total household disposable income

\- Private final consumption expenditure

Superannuation saving =

Employers' contribution to superannuation

\+ Other superannuation contributions
(including personal contributions)

\+ Interest on life and super funds

\- Administrative costs

\- Claims (including pensions and surrenders)

Non-superannuation saving =

Net saving

\- Superannuation saving

APPENDIX B: DATA SOURCES AND CONSTRUCTION

Series	Construction and source
Non-super. saving (/Y)	Net household saving less net superannuation contributions and interest earnings. Divided by household disposable income net of employer contributions and superannuation earnings. ABS Cat. No. 5204.0, Tables 49, 50 and 51. ABS Cat. No. 5232.0, Table 21.
Super. saving (/Y)	Life offices and superannuation funds net contributions plus interest earnings. Divided by household disposable income net of employer contributions and superannuation earnings. ABS Cat. No. 5204.0, Tables 49 and 50. ABS Cat. No. 5232.0, Table 21.
Net contributions (/Y)	Employer and employee contributions to life offices and superannuation funds less claims and administrative expenses. ABS Cat. No. 5204.0, Table 49. ABS Cat. No. 5232.0, Table 21.
Interest earnings (/Y)	Interest earnings on life offices and superannuation funds. ABS Cat. No. 5204.0, Table 49.
Super. profit (/Y)	Interest earnings and capital gains (realised and unrealised) on life offices' and superannuation funds. Calculated by subtracting net contributions from the change in assets of life offices and superannuation funds. ABS Cat. No. 5204.0, Table 49. ABS Cat. No. 5232.0, Table 8. Reserve Bank of Australia *Bulletin*, Tables C.12, C.13 and C.15.

Series	Construction and source
Net human wealth (/Y)	The trend in real wages, salaries and supplements (net of employer contributions) divided by real household disposable income (net of employer contributions and superannuation earnings). ABS Cat. No. 5204.0, Tables 3 and 50. ABS Cat. No. 5206.0, Table 66.
Net non-human wealth (/Y)	Household wealth (includes financial assets, consumer durables and the value of dwellings) less household liabilities. Divided by household disposable income net of employer contributions and superannuation earnings. ABS Cat. No. 5204.0, Table 50. Household wealth estimates, Reserve Bank of Australia.
Population ratio 45-64	Population aged between 45 and 64 divided by working population aged 15-64. ABS Cat. No. 3201.0, Table 1. Chapter 7, *Year Book Australia*, various issues.
Real bond yield	Nominal ten-year Treasury bond yield less the change in the log of the private consumption deflator. Annual average. Reserve Bank of Australia *Bulletin*, Table F.2. ABS Cat. No. 5204.0, Table 3.
Inflation	Log difference of the private consumption deflator. ABS Cat. No. 5204.0, Table 3.
Unemployment rate	Annual average. ABS Cat. No. 6203.0, Table 1.
Income volatility	3-year moving standard deviation of real per capita household disposable income. ABS Cat. No. 5206.0, Table 67. ABS Cat. No. 3201.0, Table 1. Chapter 7, *Year Book Australia*, various issues.

APPENDIX C: UNIT ROOT TESTS

The unit root tests are based on the testing strategy recommended by Perron (1988). Since unit root tests are widely recognised as having low power, we use both the Augmented Dickey-Fuller test (ADF) (Said and Dickey 1984) and the Phillips and Perron (1988) Zt test.[32]

Both tests are conducted over the estimation period 1960-1994. The tests share the same critical values, which is 2.96 at the five per cent significance level, and in both cases, the null hypothesis is non-stationarity. Table C1 presents the test results for the level of each series where both test procedures show that all the variables are I(1) with no drift. Subsequent tests confirmed that none of the series are I(2).

Table C1: Series in Levels

Series Level of:	Φ_3	Φ_2	Φ_1	ADF	lags	Zt	Result
Non-super saving (/Y)	1.92	1.28	1.13	1.50	0	1.67	I(1)
Super. saving (/Y)	5.50	3.74	3.93	2.76	6	1.88	I(1)
Net contributions (/Y)	2.04	1.52	4.41	2.80	3	1.89	I(1)
Interest earnings (/Y)	0.72	0.73	1.99	1.98	1	1.46	I(1)
Super. profit (/Y)	5.04	3.42	1.62	1.72	1	2.22	I(1)
Human wealth (/Y)	2.22	1.49	2.31	2.14	0	2.22	I(1)
Non-human wealth (/Y)	1.19	1.24	0.65	0.16	0	0.33	I(1)
Population ratio 45-64	2.65	1.97	2.67	2.17	1	1.43	I(1)
Inflation	1.12	0.76	1.72	1.84	1	1.72	I(1)
Real bond rate	1.89	1.39	1.04	1.30	0	1.39	I(1)
Unemployment rate	3.21	3.04	1.25	0.06	2	0.05	I(1)
Income volatility	11.26**			4.71**	1	2.93	I(0)

Notes: **(*) denotes significance at the one (five) per cent levels. The critical values for the Φ tests are from Dickey and Fuller (1981). The critical values for the ADF and Zt tests are from MacKinnon (1991).

32 This test involves making non-parametric corrections to the Dickey-Fuller test. Five lags of the residual auto-covariance were chosen.

APPENDIX D: DIAGNOSTIC TESTS

The equations appear to be well specified passing a host of diagnostic tests. The LM test for up to second order serial correlation, Jarque-Bera's normality test, the ARCH test and Breusch-Pagan's heteroscedasticity test are all insignificant at the 5 per cent level. The Chow predictive test is also used. For this test, the equation was estimated up to 1989/90 and the results used to do an in-sample prediction out to 1993/94. The prediction errors were then tested for a zero mean. In all three equations, the null hypothesis of parameter stability is accepted.

We tested for the possibility that the specification of the estimating equation in ratio form may have introduced spurious correlation between the superannuation and non-superannuation saving terms, by also including the denominator (income) in level terms in the final equation. The term was insignificant and the coefficients on the superannuation terms were largely unchanged.

Table D1: Diagnostic Tests

	(1)	(2)	(3)
Serial correlation $c^2(2)$	0.39	0.30	0.20
Normality $\chi^2(2)$	0.79	0.88	0.89
ARCH $\chi^2(2)$	0.21	0.12	0.10
Heteroscedasticity $\chi^2(k)$	0.26	0.38	0.39
Chow test F(4, n-k-1)	0.78	0.77	0.75

Notes: Marginal significance levels (p-values) are reported and **(*) denotes significance at the one (five) per cent levels. Serial correlation is the LM test for up to 2nd order serial correlation, Normality is the Jarque-Bera (1980) test, ARCH is Engle's (1982) test, heteroscedasticity is the Breusch-Pagan (1979) test and Chow's (1960) predictive test is employed to test the stability of the parameters.

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