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Abstract

This paper investigates household saving behaviour in Australia, as well as the drivers behind the recent rise in the aggregate household saving ratio. Our results explaining differences in saving behaviour across households are consistent with theory and previous findings. As might be expected, households' saving ratios tend to increase with income, but decrease with wealth and gearing. Financially constrained and migrant households tend to save more than other households, all else equal. While saving differs substantially across age groups we find that, at least in part, this reflects differing circumstances.

Our results suggest that the rise in household saving between 2003/04 and 2009/10 was driven by changes in the saving behaviour associated with certain household characteristics, rather than changes in characteristics: households with less secure income and/or those vulnerable to asset price shocks, higher-educated households, younger households with debt and older households with wealth increased their propensity to save. While our results inform which households changed their saving behaviour, we are unable to definitively conclude what caused this change in behaviour. Our interpretation of these results is that precautionary saving motives, a reduction in future income expectations for higher-educated households, an effort to rebuild wealth after the financial crisis and changing attitudes to debt contributed to the rise in the household saving ratio, although other interpretations of the data are possible.

JEL Classification Numbers: D14, E21

Keywords: household saving, micro data

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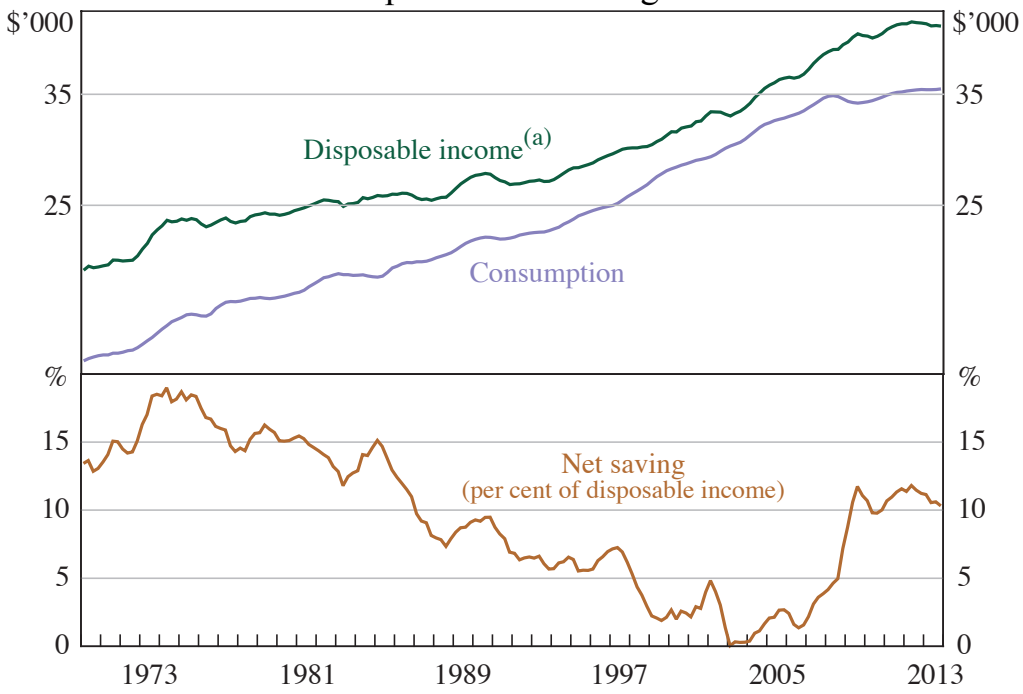
1. Introduction

Between the early 1970s and the early 2000s the aggregate household saving ratio in Australia steadily declined, from around 20 per cent to around zero (Figure 1). This trend was driven by a number of factors, including an increased availability of credit, falling real interest rates, more stable economic outcomes, rising asset prices, rising household income and income expectations, and high household confidence. The importance of various factors waxed and waned over the three decades, but it is likely that all contributed to some extent to a higher rate of growth in consumption compared with income, and so the fall in the saving ratio seen over this period.

Figure 1: Household Income, Consumption and Saving
Per capita annual rolling sum



Notes: In 2011/12 dollars; deflated using the household final consumption expenditure implicit price deflator; disposable income and consumption are plotted using a log scale

(a) After tax and net interest payments

Sources: ABS; RBA

However, in the latter half of the 2000s, the household saving ratio reversed this decline, and is now at a level similar to that of the mid 1980s. This is an important change in household behaviour, particularly given the fact that household consumption accounts for a little over half of GDP.

The extent to which the higher saving ratio is sustained will depend on what caused the change in saving behaviour. For example, if saving rose due to an unexpected boost to income that households believed to be temporary, standard theory would suggest that saving will fall again as the boost to income dissipates. Conversely, earlier large increases in housing prices and the expectation for further large increases to come, as well as the associated run-up in housing debt, may have encouraged and enabled households to reduce their saving over the 1990s and early 2000s.[1] In this case, a reassessment by households of the likely future path of housing prices, and an associated levelling off in the aggregate stock of housing debt, may have led to a more enduring increase in saving.

In this paper we investigate the drivers of the rise in the household saving ratio over the past decade or so. By examining aggregate data on household income and consumption, we can observe that saving rose around the mid to late 2000s, reflecting both an increase in income growth and a fall in consumption growth (Figure 1; see also Stevens (2011)). Even if one assumes that the rise in income was due to factors outside the household sector's control, it is difficult to draw conclusions from the aggregate data about what drove the changes in consumption behaviour, or how households responded to their higher income levels. Instead we turn to household-level data and examine the link between various household characteristics and saving behaviour. To do this, we use the Household Expenditure Survey (HES) from the Australian Bureau of Statistics (ABS) detailing household income and expenditure in 2003/04 and 2009/10.

The period we consider saw times of rapidly rising asset prices and strong economic growth, as well as times of rising unemployment and financial crisis, with the population slowly ageing throughout. By considering how the saving behaviour of different households changed, we aim to understand the relative

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[1] See, for example, Dynan and Kohn (2007) for a discussion of the link between house prices, borrowing and saving in the United States, or Iacoviello (2004) for a general equilibrium model of house prices, debt and consumption.

importance of life-cycle factors, credit constraints, precautionary motives and household wealth on saving behaviour.

It is important to note, however, that we cannot directly test the effect of, for example, precautionary motives on saving behaviour, since there is no variable that measures how much risk a household perceives itself to face. Rather, we examine how saving relates to various household characteristics that are correlated with, for example, risk around future income, such as skill level or reliance on investment returns for a large share of income. To the extent that saving varies with household characteristics deemed to indicate a higher degree of income risk, we draw the inference that it is this underlying risk factor that is driving saving behaviour, but this is open to debate.

While we believe ours to be the first study that focuses on the recent rise in household saving in Australia using the Household Expenditure Survey data, other papers have analysed household saving behaviour using micro data. For Australia, Harris, Loundes and Webster (2002) use household-level data from Melbourne Institute surveys to consider the household characteristics that lead a household to identify with a type of saving behaviour that ranges from 'running into debt' to 'saving a lot'. The authors find that households with higher income and wealth, households that own their own home and households with a more positive economic outlook tend to identify themselves as active savers. Their findings suggest several saving hypotheses help to explain variation in household saving behaviour, highlighting the need to consider multiple hypotheses for the rise in saving.

More recently, Berger-Thomson, Chung and McKibbin (2009) use the Household, Income and Labour Dynamics in Australia (HILDA) Survey to examine how uncertainty affects households' consumption decisions. The authors find that households that are worried about their future employment status have lower marginal propensities to consume out of current income compared with households that are not concerned about their future employment status, and so save more.

Using the Household Expenditure Survey, Islam, Parasnis and Fausten (2013) examine the saving behaviour of migrants in Australia. They find that migrant households tend to save more than otherwise-similar native-born households, but

that they also tend to have lower incomes, and that the latter result dominates, resulting in less saving overall.

Chamon and Prasad (2010) examine household saving behaviour in China using household-level data between 1995 and 2005. Similar to our study, their primary aim is to uncover the reasons behind the rise in the Chinese household saving ratio over this period. The authors find that precautionary saving motives are an important determinant of this rise, with younger and older households increasing saving due to rising uncertainty and increasing housing, education and healthcare costs in China.

Attanasio and Weber (1994) examine two popular hypotheses for the sharp fall that occurred between 1986 and 1988 in the United Kingdom's household saving ratio: that it was due to a substantial rise in house prices; and that it was due to a rise in perceived permanent income. While wealth effects may have boosted consumption growth in the 1980s, the authors conclude that the sharp fall in saving is best explained by younger households upwardly revising their expectations of permanent income.

Dynan, Skinner and Zeldes (2004) examine whether households with higher permanent income in the United States save a larger fraction of their income than lower-income households. They find evidence of a strong relationship between a household's permanent income and their saving ratio, suggesting that the permanent income hypothesis (that households spend in line with their permanent level of income) does not hold.

Using micro data from the United States and the United Kingdom, Attanasio (1999) finds that consumption varies over the life cycle, which appears to contradict the life-cycle hypothesis. However, after controlling for demographic factors, he shows that variation in consumption over the life cycle is largely the result of changes in family size and composition. Similarly, Browning and Crossley (2001) argue against modelling consumption behaviour based on simple 'rules of thumb', but emphasise that the life-cycle *framework* remains relevant to the consumption literature. The authors suggest that while simple life-cycle models may not explain the data, more complex life-cycle models can; for example, precautionary motives and changing demographic factors can exist within a life-cycle framework (see also Attanasio and Weber (2010)).

The remainder of this paper is organised as follows. In Section 2 we describe the household-level datasets we use, and examine how they compare with aggregate data available in the Australian national accounts. Section 3 presents the cross-sectional results from a model of the median household's saving behaviour that is similar to those employed in Dynan *et al* (2004), Chamon and Prasad (2010) and Islam *et al* (2013), while Section 4 presents the time series results from the median regression model as well as a decomposition of the change in the mean saving ratio into parameter and characteristic effects. Modelling median saving allows us to assess determinants of the saving behaviour of a 'typical' household, while modelling mean saving allows us to quantify the size of various influences on the aggregate saving ratio. Section 5 concludes.

2. Data

The 2003/04 and 2009/10 Household Expenditure Surveys are cross-sectional surveys of a nationally representative sample of households in Australia during the survey period.[2] For each household, the surveys collect information on income and consumption, as well as a range of socio-demographic characteristics. These socio-demographic characteristics allow us to assess the saving behaviour of particular groups of households, which is not possible with aggregate data.

The ABS also conducted expenditure surveys in 1975/76, 1984, 1988/89, 1993/94 and 1998/99. We do not use these earlier surveys in our analysis since: (i) methodological changes render surveys conducted before 1998/99 less comparable to those from 1998/99 on; and (ii) the surveys conducted before 2003/04 omit important variables, such as household wealth, which can play a large role in influencing saving behaviour.

2.1 Definition of Income, Consumption and Saving

The HES collects detailed expenditure data using two methods: the 'diary' method and the 'recall' method. The diary method involves each household recording their regular expenditures in a diary over a two-week period. The recall method is used

2 The 2003/04 HES surveyed around 7 000 households, while the 2009/10 HES surveyed around 10 000 households. The sample used excludes those who give zero or negative values for income, and households where the household head is aged over 75 years. We also trim the top and bottom 2 per cent of the sample based on the saving ratio distribution.

for expenditure on durable items; households are asked to remember how much they spent on these items over a given period. The surveys also contain data on personal and household income, which are collected through interviews. The most important quantitative data that we use are household income, consumption and saving.

Disposable income includes: wage and salary payments; tips; other labour income; farm income; income of unincorporated enterprises; net rental income; imputed rent for owner-occupiers[3]; interest on savings; dividends; transfer income from the government, private institutions and other households; superannuation contributions by employers on behalf of employees; superannuation drawdowns by self-funded retirees; inheritance; gifts and other income from family members. Income is after tax and interest payments.

Note that the national accounts definition of income includes a number of items that are unavailable in the HES, the largest of which are imputed interest and current transfers to non-profit institutions serving households. We also cannot separately identify (and therefore exclude) capital draw-downs from investment earnings for self-funded retirees in the HES, so that income for self-funded retirees is overstated.

Consumption includes total expenditure on goods and services as well as imputed rent for owner-occupiers. Principal and interest repayments on debt, home capital improvement expenditure and life insurance and superannuation related expenses are not included in consumption.

Saving is calculated as the difference between disposable income and consumption. The main difference between our definition of saving and that from the national accounts stems from the different definition of income, as noted above. Note that our definition of saving captures only active saving and does not include any capital gains or losses.

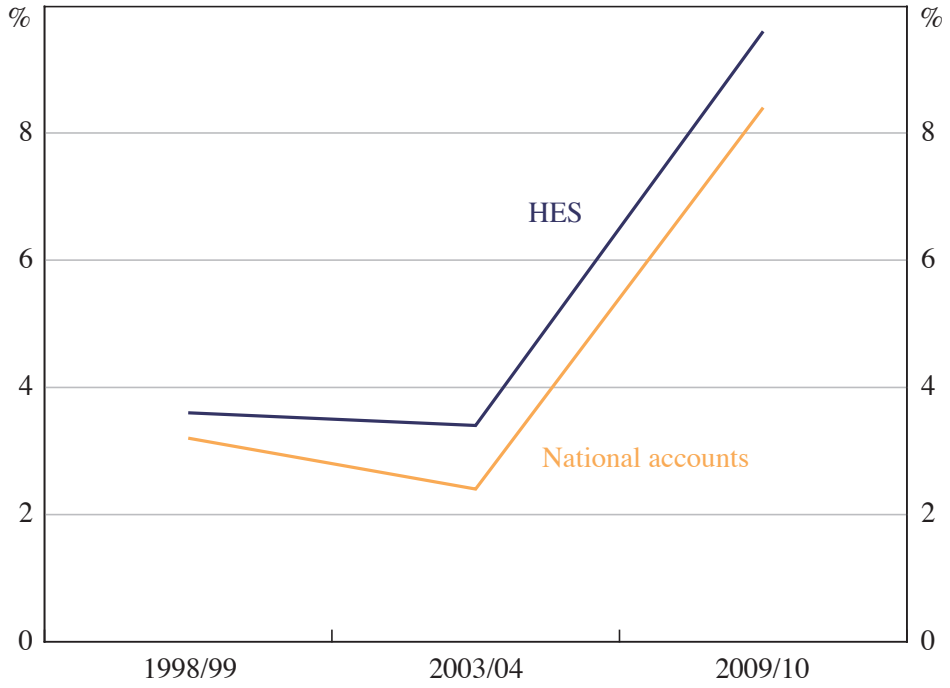
3 Imputed rent for owner-occupiers is determined using the methodology outlined in ABS (2008) for 2003/04; imputed rent using this methodology is already included in the 2009/10 HES.

2.2 Comparison of Aggregate and Micro Data

In order to use the household surveys to analyse the drivers behind the increase in the aggregate saving ratio, the surveys must be comparable with each other and with data from the national accounts. There were no major methodological changes between the 2003/04 and 2009/10 Surveys, so the two surveys should be comparable, and while the surveys do not capture all household consumption or income when compared with national accounts data, they capture a similar proportion of each. This implies that the aggregate saving ratio from the HES datasets should be consistent with the aggregate saving ratio from the national accounts.

Figure 2 compares the aggregate (mean) gross household saving ratio implied by the surveys with that implied by the national accounts, where income and consumption in the national accounts are defined so as to match the HES definitions where possible. For comparison we include the saving ratio from the 1998/99 Survey. Both measures show the saving ratio to be little changed between 1998/99 and 2003/04, then increasing sharply between 2003/04 and 2009/10.

Figure 2: Household Saving Ratio
By survey year



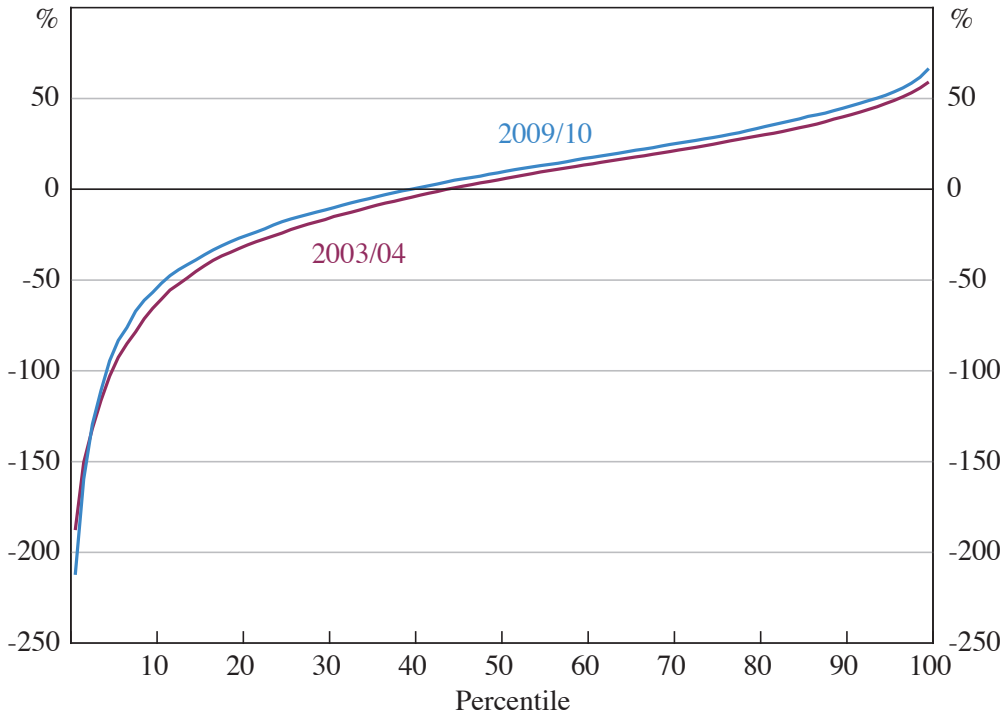
Note: Gross of depreciation

Sources: ABS; authors' calculations

2.3 Descriptive Analysis

Looking at the distribution of the saving ratio across households, the median saving ratio in 2003/04 was 5 per cent, while in 2009/10 it was 9 per cent. The shift up in the saving ratio evident across most of the distribution is consistent with the rise in the aggregate saving ratio over this period (Figure 3). The distribution of the saving ratio displays a long tail of negative saving ratios (negative skew). This is unsurprising as consumption is always positive, but income, which is the denominator of the saving ratio, can sometimes be close to zero, which leads to large negative saving ratios for some households.

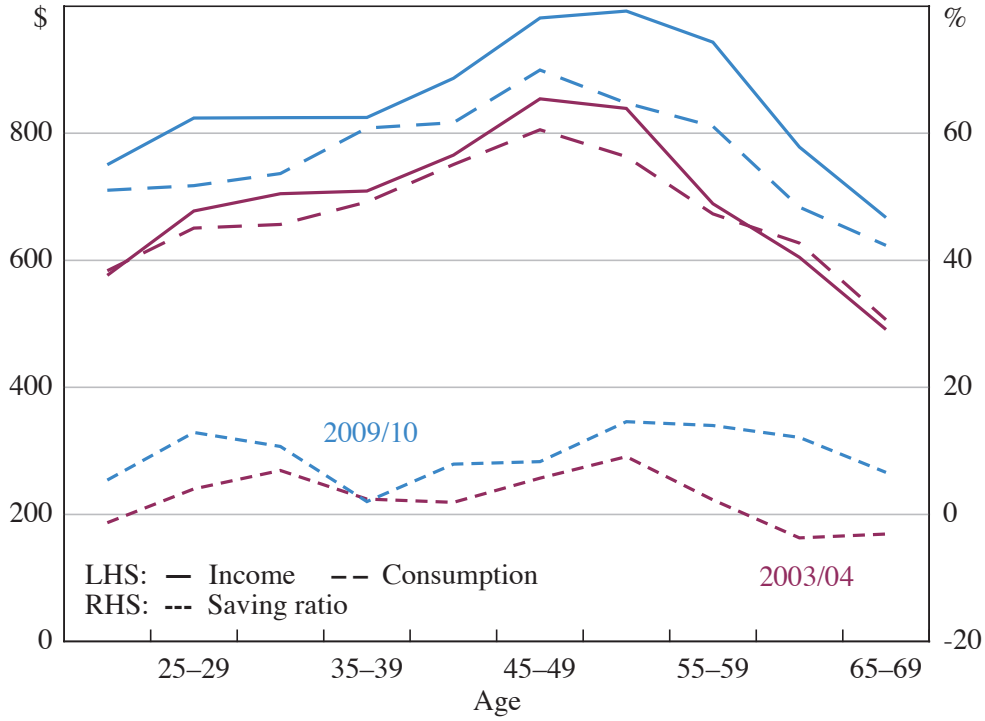
Figure 3: Distribution of Saving Ratio



Sources: ABS; authors' calculations

Figure 4 shows how income, consumption and saving vary by household age in the 2003/04 and 2009/10 Surveys. Household consumption tends to track income closely, with both varying significantly over the life cycle, suggesting that households do not fully smooth their consumption, although Attanasio (1999) points out that the hump-shaped consumption profile is less pronounced after controlling for family size and composition. Between the 2003/04 and 2009/10 Surveys, saving increased especially for younger and older households, with income rising more than consumption for these groups.

Figure 4: Household Income, Consumption and Saving
By age of household head



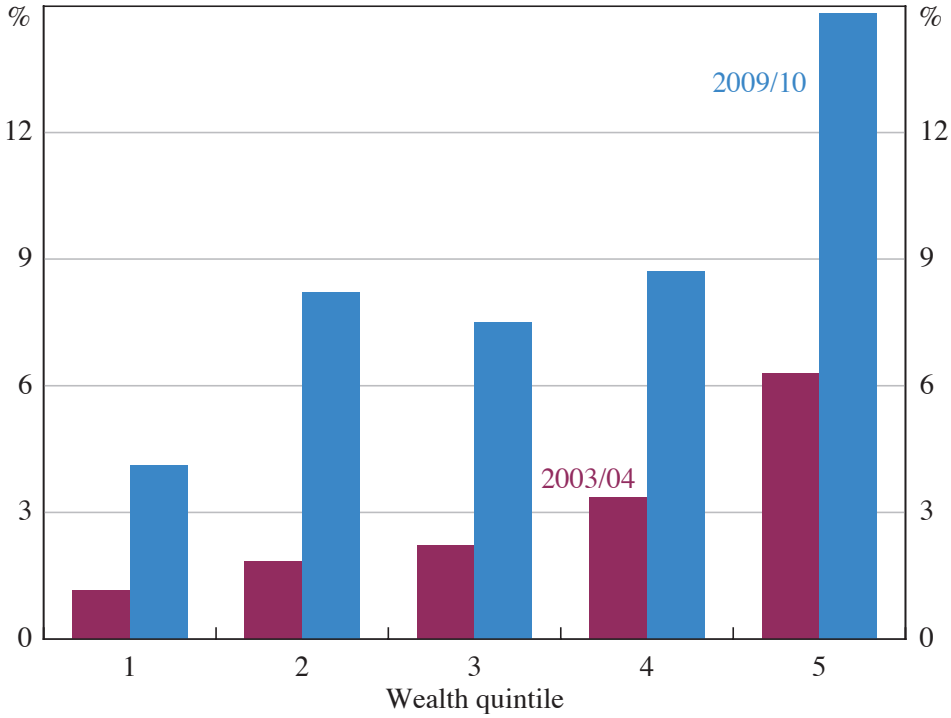
Notes: Saving is gross of depreciation; income and consumption are weekly and in 2009/10 dollars; weighted averages across age groups

Sources: ABS; authors' calculations

Changes in household saving behaviour do not appear to be specific to certain levels of household wealth, with the saving ratio increasing across all wealth quintiles between 2003/04 and 2009/10 (Figure 5). Most (age-matched) income quintiles also saw a rise in saving between 2003/04 and 2009/10, with only the lowest income group recording a fall in saving (Figure 6).[4]

4 Age-matching involves splitting the households in each age group into separate income quintiles. The corresponding income quintiles from each age group are then combined, so that, for example, the lowest age-matched income quintile consists of those households that make up the lowest income quintile within each age group. Income quintiles are age-matched in order to separate age and income effects; for example, since post-retirement households are typically in the lower income quintiles, the saving behaviour of older households will govern the saving behaviour of the lower (non age-matched) income quintiles.

Figure 5: Household Saving Ratio
By wealth quintile



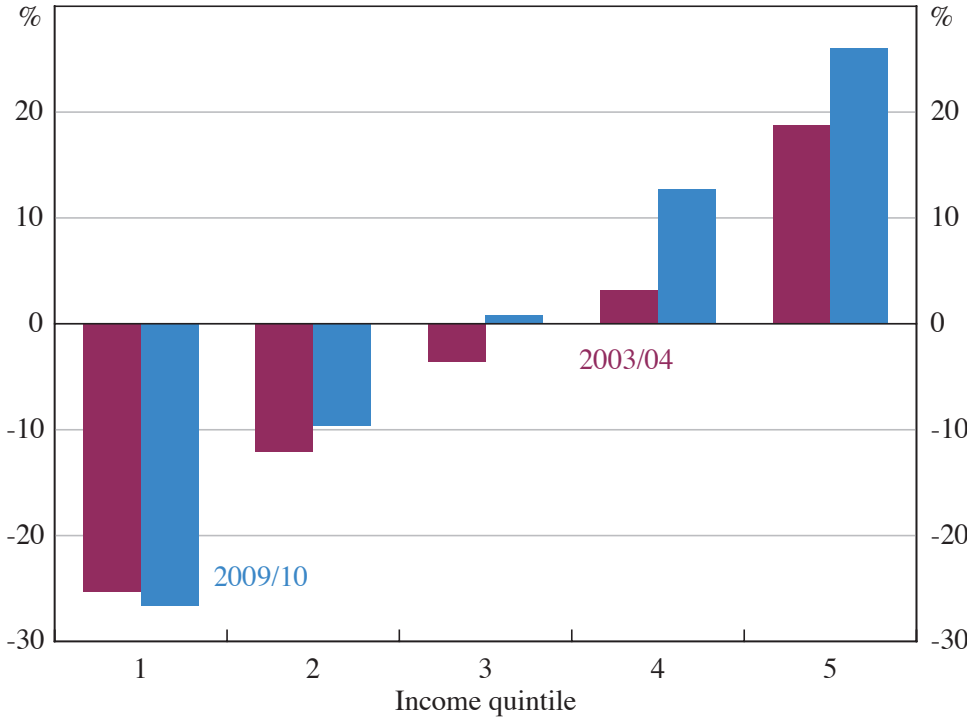
Notes: Gross of depreciation; weighted average

Sources: ABS; authors' calculations

This simple descriptive analysis suggests that relatively young and old households, but not middle-aged households, considerably increased their saving between 2003/04 and 2009/10, while a change in saving behaviour was evident across most wealth and income groups. While this could in part reflect the ageing of the population, we find that this ageing effect is not large enough to explain the large increase in the saving ratio over the 2000s. (Appendix A describes a simple decomposition model based on age and birth cohorts, and shows that the increase in saving cannot be attributed to these factors).[5] Given this, we need to consider other explanations for the rise in the saving ratio.

5 This is not surprising given that most of the rise in the saving ratio occurred over a relatively short period, whereas the ageing of the population is a slow-moving process. Chamon and Prasad (2010) find a similar result in their study, while Browning and Lusardi (1996) argue that ageing is too slow to provide a sufficient explanation for the large decline in the US aggregate household saving ratio.

Figure 6: Household Saving Ratio
By income quintile



Notes: Gross of depreciation; weighted average; age-matched

Sources: ABS; authors' calculations

3. Cross-sectional Analysis

In this section we estimate a model of the median saving ratio that takes into account a range of household characteristics. The median saving ratio gives a better indication of how much a 'typical' household saves than the mean saving ratio, which can be heavily influenced by a small number of extreme values. The mean saving ratio is nonetheless important since it determines economy-wide household saving, and we return to it in Section 4.

Income is a particularly important determinant of household saving, although there is some debate as to how it effects saving. Economic orthodoxy would suggest that a household's permanent or long-run level of income should *not* affect their saving ratio, since households with relatively high levels of permanent income would also have relatively high levels of consumption. Aggregate time series data on national saving supports this proposition: as countries grow richer, household incomes trend higher but saving ratios do not. Conversely, the evidence from cross-sectional, household-level studies is less clear; for example, Dynan *et al* (2004)

find that individual households' saving ratios *are* affected by their level of permanent income.

Our main results are estimated under the assumption that households' permanent income levels do not affect saving ratios, although our results are robust to relaxing this assumption (see Models (1) and (3) in Table B3). In particular, we assume that a household's saving ratio is a function of the deviation of their current level of income from their permanent level of income:

$$saving\,ratio_i = \beta\left(y_i - y_i^*\right) + X_i + \varepsilon_i.$$

Here y_i is the natural logarithm of household i's current income, y_i^* is the logarithm of their permanent income, and X_i represents other household characteristics pertinent to the saving decision such as age, employment status and household composition. This model implies that a household will increase their saving ratio if their current level of income rises but their permanent level of income does not, for example due to a one-off bequest. Conversely, a household will reduce their saving ratio if their current level of income falls but their permanent level of income does not, for example due to a temporary spell of unemployment.

In practice we cannot observe the permanent income of a household, and so must estimate it. We do this by regressing current income on proxies for permanent income, including households' education level, occupation, marital status and age, and taking the fitted values as measuring permanent income (see Table B1 for model results). We then use the percentage deviation of current income from the modelled estimate of permanent income as our income variable, $\left(y_i - y_i^*\right)$.

Some authors have argued that including a measure of income in models such as ours may introduce measurement error and endogeneity issues, resulting in biased estimates. For example, Sabelhaus and Groen (2000), Brzozowski and Crossley (2011) and Meyer and Sullivan (2011) argue that large dissaving at the bottom of the income distribution in household surveys is more likely to be due to households under-reporting their income than genuine dissaving, although Browning and Lusardi (1996) argue that reporting bias in household income is unlikely to be a serious issue for most households. There is growing recognition,

however, that income is too important as a driver of household saving to be excluded – see, for example, Dynan *et al* (2004) and Muellbauer (2007) – and so we choose to include it in the form discussed above in our main model. As a robustness check we also estimate a model excluding any measure of income – Model (3) in Table B3.

In addition to income, we explore other possible drivers of saving. These drivers and the main variables used in our modelling are outlined below.[6]

- **Life-cycle motives**. Although an ageing population cannot explain the rise in the aggregate saving ratio, age is an important determinant of household saving in the cross-section, and so we include it in our median regression model. Age dummy variables are used to capture the saving behaviour of different age groups: young (less than 30 years old), pre-retirement (50–64 years) and old (65 years and over). The reference household is middle-aged (30–49 years).

- **Credit constraints**. An increase in the incidence of credit constraints would be expected to lift household saving, since some households that may wish to borrow to fund consumption would be precluded from doing so. Credit constrained households are identified from households' answers to questions regarding financial stress; households are assumed to be credit constrained if they answer in the affirmative to at least two out of seven financial stress questions. The reference household is not financially constrained.

  Note that our credit constraint variable will only capture households that are currently credit constrained. In an overlapping generations framework, Kent, Ossolinski and Willard (2007) show that the adjustment to a new equilibrium following a change in credit constraints can take many years to complete. As such, the lowering of credit constraints that occurred in the late 1980s and early 1990s may still have been impacting household behaviour during our sample period. In particular, with a decline in the number of households who purchased housing during the earlier period of elevated credit constraints and relatively low house prices, the share of households likely to experience very large capital gains on selling their homes (and therefore needing to save less than otherwise similar households would) falls.

6 See Table C1 for a full list of definitions of variables used in the modelling.

- **Precautionary motives**. We seek to capture precautionary motives in a number of ways. Similar to Chamon and Prasad (2010), we construct a variable that seeks to measure a household's risk of unemployment, a risk that is likely to influence a household's saving behaviour. (Chamon and Prasad, in their study of Chinese households, estimate the risk of incurring a large health expense). One might expect that employed households that face a relatively high risk of becoming unemployed in the future save more than other households (see, for example, the models outlined in Zeldes (1989), Deaton (1991), Carroll (1992) and Carroll and Samwick (1997)). Each household's risk of unemployment is estimated using a logit model of the probability of a household containing one or more unemployed people. If a household's fitted probability of unemployment is greater than 10 per cent, the risk of unemployment variable is set equal to 1. (The logit model is based on a number of independent variables including geographical location, wealth, age, migrant status and personal debt status; see Appendix B for more detail).

  Precautionary motives may also be captured in other variables that describe households with less secure incomes or those who are more vulnerable to income shocks, such as migrant households, single-parent households, those with a worse standard of living compared with a year ago and those who rely on government payments for a large share their income. We also control for households likely to be vulnerable to an asset price shock: self-funded retirees and households that draw more than 20 per cent of their income from investments. The reference household is born in an English-speaking country (possibly Australia) and has the same or a better standard of living compared with a year ago.

- **Wealth effects**. Higher wealth has been found to have a significantly positive effect on household consumption in Australia, and therefore a negative effect on saving, all else equal (Dvornak and Kohler 2003; Yates and Whelan 2009; Windsor, Jääskelä and Finlay 2013). We include the ratio of household wealth relative to income and the gearing ratio (debt relative to assets), as well as home ownership dummies, to capture wealth effects in our model. We interact all of these variables with age because there are theoretical reasons to believe that the saving response to shocks in these variables may differ by age. The reference household is a renter.

Other controls include household size; the number of children in the household (relative to household size); state or territory of usual residence; region of state (rural/urban); education status; skill level of occupation; marital status; gender of the household head; and dummy variables that identify if a household obtains more than 20 per cent of their income from wages and salaries, business income, government payments, and other income.[7] The reference household is a single male with high school as their highest level of education who lives in urban NSW and works in a high-skilled occupation.

3.1 Regression Output

Table 1 shows results from the median regressions for 2003/04 and 2009/10, where the dependent variable is the saving ratio and the independent variables are as described above. The differences in coefficients across the two time periods are also presented. Full regression outputs are presented in Table B3 where, for robustness, we also show results from a regression where the logarithm of current income is used instead of the deviation of current income from permanent income (Model (1)), and where no measure of income is included (Model (3)).

7 Other income includes private pensions, superannuation, child support, scholarships, other regular sources and income from family members not living in the household.

Table 1: Median Regression Model

Coefficients

Variable	2003/04	2009/10	Difference over time
Income	0.6***	0.6***	0.0
Education			
– TAFE/certificate	–2.6	3.2*	5.8**
– University	–4.3**	4.3**	8.6***
Single-parent household	–3.1	8.4***	11.5***
Government income (>20%)	8.6***	14.5***	5.8*
Financially constrained	4.0*	3.7	–0.4
Risk of unemployment	1.9	0.1	–1.8
Non-English-speaking migrant	6.2***	7.4***	1.2
Self-funded retiree	–13.6***	–1.5	12.1**
Wealth-to-income ratio			
– Young	–0.4	–0.5	–0.1
– Middle-aged	–0.3**	–0.5***	–0.2
– Pre-retired	–0.4***	–0.1	0.4**
– Old	–0.2**	–0.2***	–0.1
Own home outright			
– Young	8.3	9.0	0.8
– Middle-aged	3.3	5.9	2.6
– Pre-retirement	–6.8*	–4.2	2.6
– Old	–12.7**	–3.5	9.2
Gearing ratio			
– Young	–9.0**	0.9	9.9*
– Middle-aged	–10.1	–7.7	2.3
– Pre-retired	–17.0	–1.7	15.3
– Old	–19.6	–11.6	8.0
Young	–5.1	–2.4	2.7
Pre-retired	9.6***	7.8**	–1.8
Old	6.7	4.6	–2.1

Notes: ***, ** and * represent significance at the 1, 5 and 10 per cent level, respectively; HES household weights used; 500 repetitions of bootstrapped weights are used to obtain the standard errors; coefficients on other variables and the constant are reported in Table B3; reference household is a single middle-aged male, born in an English-speaking country, not financially constrained, same or better standard of living compared with a year ago, working in a high-skilled occupation, with high school as highest level of education and lives in urban NSW

Sources: ABS; authors' calculations

3.2 Results

Income

As expected we find that the coefficients on the deviation of current income from permanent income are significant and positive, meaning that households whose current level of income is above their permanent level of income save more, all else equal. The value of the coefficient on income suggests that in the cross-section, a 1 percentage point increase in current income relative to permanent income is associated with a 0.6 percentage point increase in the saving ratio, all else equal; this is within, but at the upper end, of the range of estimates presented in Dynan *et al* (2004) using US data.[8]

Education, which is often used as a proxy for permanent income, is found to have a significant impact on saving.[9] This suggests that our estimate of permanent income used to derive the income variable may not be perfect, that the permanent income hypothesis does not hold, and/or that education is capturing other factors. For example, precautionary motives may be lower for highly educated households because they may face less employment risk.

Financial constraints

Households that are financially constrained according to our criterion tend to have higher saving ratios, holding all else equal, although this effect is only statistically significant in 2003/04. As discussed earlier, this accords with intuition.

Variables related to precautionary motives

Single-parent households and those who rely on government payments for a large share of their income tend to save more than other households, all else equal.

8 Note that if we drop all other controls from our model, the coefficient on income falls to around 0.2, which is more typical of that found in other studies. This highlights the importance of controlling for a range of household characteristics.

9 Education is widely used as a proxy for permanent income; Attanasio and Weber (2010), for instance, document that more highly educated households tend to have steeper income profiles than those headed by less-educated individuals.

Being at risk of unemployment is also associated with higher saving, although the effect is not statistically significant.

Households where the household head was not born in an English-speaking country tend to save more than households where the household head was born in an English-speaking country. This is consistent with the results of Islam *et al* (2013), who find that migrants have a higher propensity to save compared with Australian-born households with similar characteristics. While this effect could reflect the differing priorities of newly arrived migrants compared with existing residents, it could also be evidence of precautionary saving if being born in a non-English-speaking country is associated with less certainty regarding employment.

Variables related to wealth

Turning to the effect of household wealth on saving behaviour, we find that, overall, higher wealth-to-income ratios are associated with lower saving ratios (and therefore more consumption). In general, the wealth effect is smaller for the oldest households, which is consistent with Windsor *et al* (2013), who interpret this as evidence against a traditional wealth effect on consumption. Rather, they suggest that rising household wealth increases consumption by reducing liquidity constraints, which are more likely to be binding on the young.

Owning a dwelling outright tends to be associated with higher saving for younger households and lower saving for older households. For the young, this effect may be capturing personality traits rather than wealth *per se*, with those who own their home outright by the age of 30 being inherently diligent savers. For the older age groups, owning a home is likely to be associated with a higher degree of financial security, obviating the need to save in case of emergency.

Turning to the effect of debt on saving behaviour, our results suggest that the more debt a household has relative to their assets, the less the household saves; for households aged under 30 years this effect is statistically significant in 2003/04.

Life cycle

Perhaps unsurprisingly, we find that pre-retirement households save more than middle-aged households (the control group), who in turn save the same or more than the young. Older households, all else equal, tend to save more than middle-aged or younger households would, were they to face similar living circumstances, suggesting that the low level of saving by older households is predominantly due to their circumstances rather than their age *per se*.

4. Time Series Analysis

In the previous section we considered how household characteristics relate to median saving behaviour in the cross-section. We now focus on the drivers of the rise in the saving ratio between 2003/04 and 2009/10. To do this, we look at changes in households' propensity to save using the median regression model from Section 3; we also decompose the total change in the mean saving ratio (the concept of saving reported in the national accounts) into changes in households' propensity to save and changes in household characteristics.

4.1 Changes in the Median Saving Ratio

The last column of Table 1 in Section 3 shows the change in model coefficients between the 2003/04 Survey and the 2009/10 Survey. We interpret changes in these coefficients, where they are statistically significant, as indicating changing preferences regarding saving for those households with the corresponding characteristics. As noted in Section 1, however, since we cannot directly measure household preferences, other interpretations of the data are possible.

Income

There is no change in the coefficient on deviations of current relative to permanent income between the two surveys. There is a significant change in the coefficients on education, however. Relative to high school educated households, more highly educated households significantly increased their propensity to save between 2003/04 and 2009/10. If we interpret education as a proxy for future income expectations, this suggests that higher-educated households downgraded their income expectations between 2003/04 and 2009/10; this implies current income

being high relative to permanent income, which would lead households to spend less and save more.

Financial constraints

The propensity to save for financially constrained households did not increase between 2003/04 and 2009/10. As such, our results do not support the hypothesis that tighter credit constraints played a significant part in the rise in household saving.

Variables related to precautionary motives

Single-parent households and households who received more than 20 per cent of their income from government payments increased their propensity to save between 2003/04 and 2009/10 compared with reference households, suggesting that these households were less resilient than other households to changes in financial circumstances.

Self-funded retirees and those earning at least 20 per cent of their income from investments – that is, those households most exposed to movements in asset prices – also increased their propensity to save between 2003/04 and 2009/10, suggesting a reaction to the large fall in asset prices that occurred during the financial crisis.[10]

Variables related to wealth

The wealth effect for households aged 50 to 64 years fell significantly between 2003/04 and 2009/10, while the negative effect on saving of owning a home outright also fell for households aged 65 and over. Lowe (2011) suggests that weakening wealth effects for older households could be due to the slower growth in the value of dwelling assets in the period leading up to 2009/10 and/or wealthy households losing liquid assets in the financial crisis and saving more to rebuild their wealth.

10 Note that self-funded retirees are likely to dissave more than suggested by our results. As discussed in Section 2.1, in our dataset we cannot separately identify capital draw-downs from investment earnings for self-funded retirees. As such, some of the income attributed to self-funded retirees is actually dissaving from their accumulated assets.

The negative effect on saving of a high gearing ratio also fell between 2003/04 and 2009/10, with the fall for young households being statistically significant. This suggests that households may have adopted a more prudent attitude to debt between 2003/04 and 2009/10, and accords with other data sources that suggest households have increased their voluntary mortgage repayments over the past few years, aided by lower interest rates (RBA 2012).

4.2 Changes in the Mean Saving Ratio

Using the same model, but applied to the mean, the model-implied mean saving ratio in year *i* can be expressed as

$$\overline{saving\,ratio_i} = \bar{X}_i'\hat{\beta}_i$$

where $\bar{X}_i$ is a vector of the averages of variables used in the saving model in year *i*, including the constant term, and β_i is a vector of the coefficient terms associated with the variables in $\bar{X}_i$ in year *i*. Given this, we can express the change in the mean saving ratio as

$$\begin{aligned}
\Delta saving\,ratio_{21} &= \bar{X}_2'\hat{\beta}_2 - \bar{X}_1'\hat{\beta}_1 \\
&= \left(\bar{X}_1'\hat{\beta}_2 - \bar{X}_1'\hat{\beta}_1\right) + \left(\bar{X}_2'\hat{\beta}_2 - \bar{X}_1'\hat{\beta}_2\right) \\
&= \bar{X}_1'\left(\hat{\beta}_2 - \hat{\beta}_1\right) + \left(\bar{X}_2' - \bar{X}_1'\right)\hat{\beta}_2 \\
&= parameter\,effect + characteristic\,effect,
\end{aligned}$$

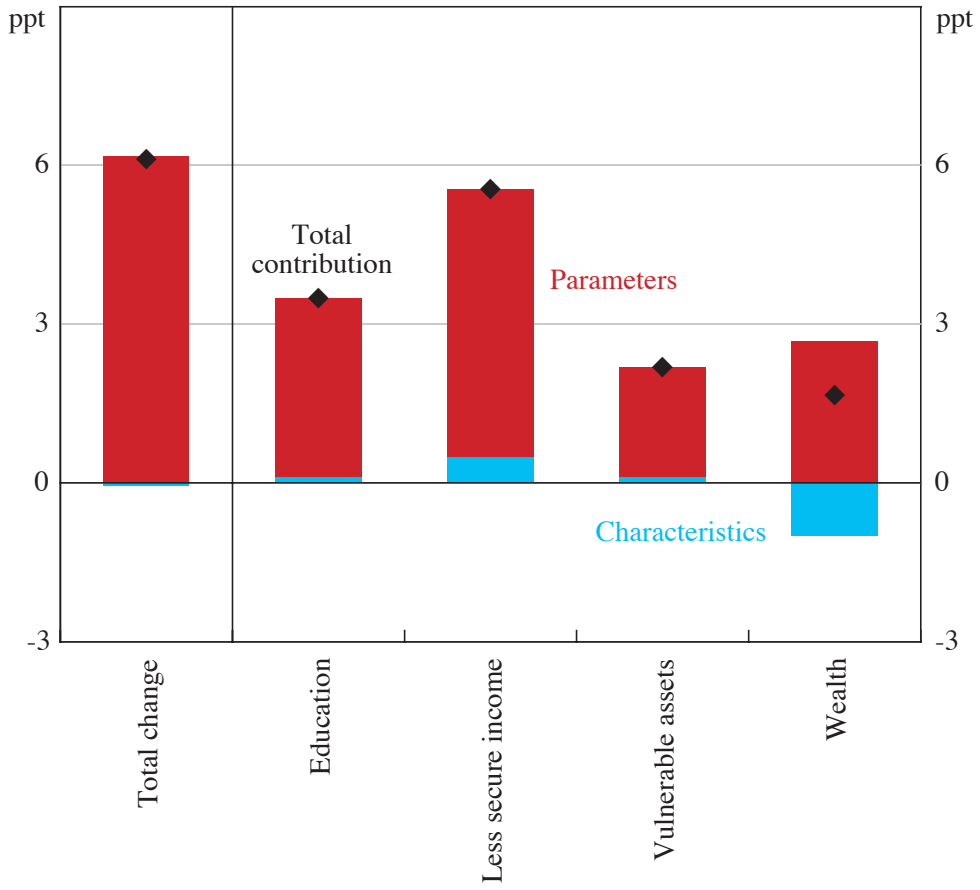
where year 1 represents 2003/04 and year 2 represents 2009/10. That is, the change in the model-implied mean saving ratio can be decomposed into changes in model parameters and changes in population characteristics. This follows the method introduced by Blinder (1973) and Oaxaca (1973).[11,12]

11 As noted, the model used here is very similar to the model for the median saving ratio in Section 3, except that it is estimated by least squares. As such, the model is of conditional mean saving ratios rather than conditional median saving ratios. We also drop the interaction terms between age and the wealth-related variables. See Table B4 for output from the least squares regression.

12 Appendix D presents a quantile decomposition of the change in the saving ratio for each percentile of the saving ratio distribution.

This decomposition enables us to estimate the roles that population characteristics and model parameters have played in the rise of the household saving ratio separately. The results suggest that changes in population characteristics played virtually no role in the increase in the saving ratio between 2003/04 and 2009/10, with changes in model parameters dominating (Figure 7).

Figure 7: Contributions to Change in Saving Ratio
Between 2003/04 and 2009/10



Sources: ABS; authors' calculations

Figure 7 shows the total contribution of changes in model parameters to the change in the model-implied mean saving ratio (the red bar on the left), as well as the

contribution from variables related to: education, precautionary motives (split into those related to incomes and those related to assets), and wealth.[13] With the exception of wealth, all subgroupings are statistically significant at the 5 per cent level; the wealth subgrouping is statistically significant at the 10 per cent level. Not shown are the constant (negative although not statistically significant), other variables from Section 3 that were not statistically significant, and the combined effect of other variables and controls not otherwise discussed (again not statistically significant). The combined effect of all these together is, however, statistically significantly negative.

The results presented in Figure 7 are consistent with the results from the median analysis in Section 4.1.

- Higher-educated households increased their propensity to save between 2003/04 and 2009/10, with this increase largest for the most highly educated households. Given our interpretation of education as a proxy for permanent income, or equivalently for expectations regarding future increases in income, the rise in saving for higher-educated households suggests a downward reassessment by these households of their future income prospects.

- The propensity to save rose for those households with attributes suggestive of less secure income or vulnerability to asset price shocks, which suggests a greater degree of risk aversion, or a greater degree of risk, for households with these characteristics.

- Finally, wealthy households and those with high debt levels (included in the wealth grouping) tended to increase their propensity to save between 2003/04 and 2009/10, suggesting an effort to rebuild wealth after the effects of the financial crisis and changed attitudes to debt.

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13 The education category includes dummy variables for households with TAFE/certificate and university education; the less secure income category includes dummy variables for unemployed, pensioner, single-parent, lower-skilled, non-English-speaking migrant households and households that rely on the government for income; the vulnerable to asset price shocks category includes dummy variables for self-funded retirees and pre-retirement-aged households; and the wealth category includes the wealth-to-income ratio, home ownership dummies and the gearing ratio.

Saving ratios associated with a number of other variables discussed in the median analysis were not found to statistically significantly change between 2003/04 and 2009/10, including the risk of being unemployed and the credit constraint variables. Regarding other variables:

- By construction, the deviation of current income from permanent income plays no role in the modelled change in the saving ratio, since the average deviation of temporary income from permanent income is zero in both survey years.

- With the exception of pre-retirement-aged households (included in the vulnerable to asset price shocks subgrouping), the change in the age effects are not statistically significant.

Overall, the results from the median and mean time series analysis are consistent with a number of factors driving the increase in household saving between 2003/04 and 2009/10. The rise in saving for those groups judged to be vulnerable to income or asset price shocks suggests that precautionary motives played a role, with households observing events overseas, as well as rising unemployment and declines in asset prices domestically, and judging the world to be a more risky place than previously thought. Related to this, the rise in saving for those with high debt levels suggests that households adopted a more prudent attitude towards debt over this period, while the rise in saving for higher-educated households suggests a downward reassessment of expected future income prospects for these households. Finally, the rise in saving for wealthy households suggests a reassessment of expected future capital gains and a desire to rebuild wealth, with declines in asset prices following the global financial crisis both reducing wealth immediately and reminding households that asset prices can fall as well as rise.

However, as discussed earlier, since we cannot directly measure household preferences, we can only draw inferences based on which household groups changed their propensity to save, and other interpretations of the data are possible.

5. Conclusion

This paper investigates household saving behaviour in Australia, as well as the drivers behind the recent rise in the aggregate household saving ratio. Our results explaining household saving behaviour in the cross-section are consistent with theory and previous findings. As might be expected, households' saving ratios tend to increase with income, while saving is found to decrease with wealth and gearing. Financially constrained and migrant households tend to save more than other households, all else equal. While saving differs substantially across age groups we find that, at least in part, this reflects differing circumstances.

Our results suggest that the rise in household saving was driven by changing saving behaviour associated with certain household characteristics, rather than changing characteristics. In particular, households with less secure income and those vulnerable to asset price shocks, younger households with debt and older households with wealth increased their propensity to save between 2003/04 and 2009/10. While our results can inform which households changed their saving behaviour, we are unable to definitively say what caused this change in behaviour. Our interpretation of these results is that precautionary saving motives, a more prudent attitude towards debt and an effort to rebuild wealth after the financial crisis contributed to the rise in the household saving ratio, although other interpretations of the data are possible. An increase in the propensity to save by more highly educated households, relative to lower-educated households, also suggests a reduction in future income expectations.

Appendix A: A Simple Model of Age, Cohort and Time Effects

This model follows the approach of Deaton and Paxson (1994) and Chamon and Prasad (2010), and provides a simple way to disentangle age and birth cohort effects to find their 'pure' effect on saving.[14]

With no shocks to income and a constant real interest rate, the life-cycle hypothesis suggests household consumption can be expressed as:

$$C_{ab;h} = f(a) \times W_b \times e^{\varepsilon_{ab;h}}.$$

Here $C_{ab;h}$ denotes consumption for household h where the household head is aged a and belongs to birth cohort b, $f(a)$ describes how consumption varies with age, W_b denotes the average lifetime resources of households from birth cohort b, and $e^{\varepsilon_{ab;h}}$ is a (multiplicative) household-specific idiosyncratic shock.

Taking logs and averaging consumption over households in the same age (a) and birth cohort (b) gives

$$\overline{\ln(C_{ab})} = \overline{\ln f(a)} + \overline{\ln W_b},$$

where the age effect – $f(a)$ – is assumed to depend on age but not birth cohort, while lifetime resources – W_b – are assumed to depend on birth cohort but not age. We then use dummy variables to decompose the age, birth cohort and time (i.e. unexplained) components of consumption

$$\overline{\ln(C_{ab})} = D^a \alpha_c + D^b \beta_c + D^t \gamma_c,$$

Where D^a, D^b and D^t correspond to age, birth cohort and time dummy variables, and α_c, β_c and γ_c correspond to the coefficients capturing age, birth cohort and time effects on consumption.

14 In this exercise we use the 1988/89, 1993/94, 1998/99, 2003/04 and 2009/10 HES, because a longer time period is needed to determine birth cohort effects precisely. While there were some major methodological changes to pre-1998/99 surveys which make it difficult to compare surveys across time, we assume that the cohort and age effects on consumption and income remain comparable.

Since a household's birth cohort is simply a function of the survey year and their age, we need to place some restrictions on the coefficients in this model to enable identification. Following Chamon and Prasad (2010), the birth cohort effects are constrained to sum to zero and be orthogonal to a linear trend:[15]

$$\Sigma_{i=1}^{n}\beta_c(i)=0 \text{ and } \Sigma_{i=1}^{n}\left(\beta_c(i)\times i\right)=0.$$

Household income (Y) can be modelled in a similar way as

$$\overline{\ln\left(Y_{ab}\right)}=D^a\alpha_y+D^b\beta_y+D^t\gamma_y,$$

Where α_y, β_y and γ_y correspond to the coefficients capturing age, birth cohort and time effects on income. Similar constraints apply: $\Sigma_i\beta_y(i)=0$ and $\Sigma_i\left(\beta_y(i)\times i\right)=0.$

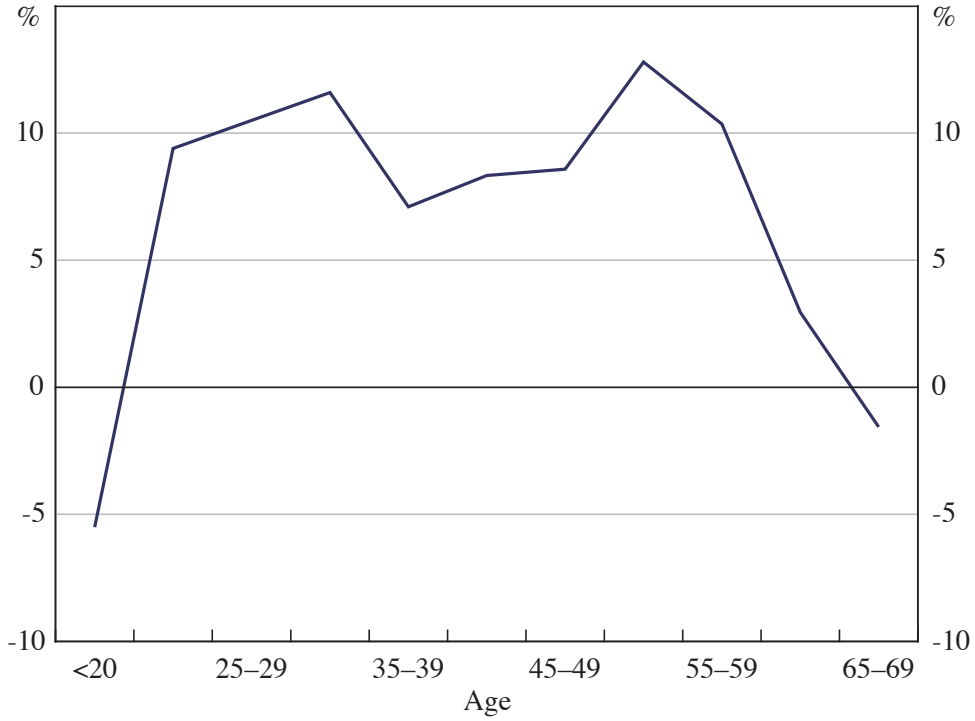
Combining the results of the income and consumption models gives the effect that age, birth cohort and time have on household saving, where household saving ratios are calculated as the difference between the fitted values of the dependent income and consumption variables. Figures A1 to A3 show the estimated effect of age, birth cohort and time respectively, assuming the other effects are held constant. Our reference household for this analysis is a household head aged 30 to 34 surveyed in 2009/10. Note that the level of saving shown in the figures depends on the reference household chosen, but the profile of saving does not, so one should focus on how saving changes for different age, birth cohort or time groups, rather than the level of saving *per se*.

Focusing on the age effect, Figure A1 shows how the average household's saving ratio varies with age, holding the survey year and birth cohort constant. The distribution of the age effect partially exhibits the concave relationship predicted by the standard life-cycle model; saving is low early and late in life, and high during a household's working years. One anomaly stands out from the standard life-cycle prediction, however: the dip around middle-age (30 to 50 years), when

15 As argued in Chamon and Prasad, constraining the time effects would force the decomposition to attribute rising consumption and income to age and/or birth cohort effects, rather than an economy-wide rise in productive capacity. Likewise, restraining the age effects would prevent us from examining the life-cycle hypothesis, which makes predictions about how consumption and income should vary with age.

households reduce their saving before building it back up when they enter the pre-retirement age group.[16]

Figure A1: Effect of Age on Saving
Holding survey year and birth cohort constant



Notes: Gross of depreciation; average by group; survey year = 2009/10, birth cohort = 1975–1980

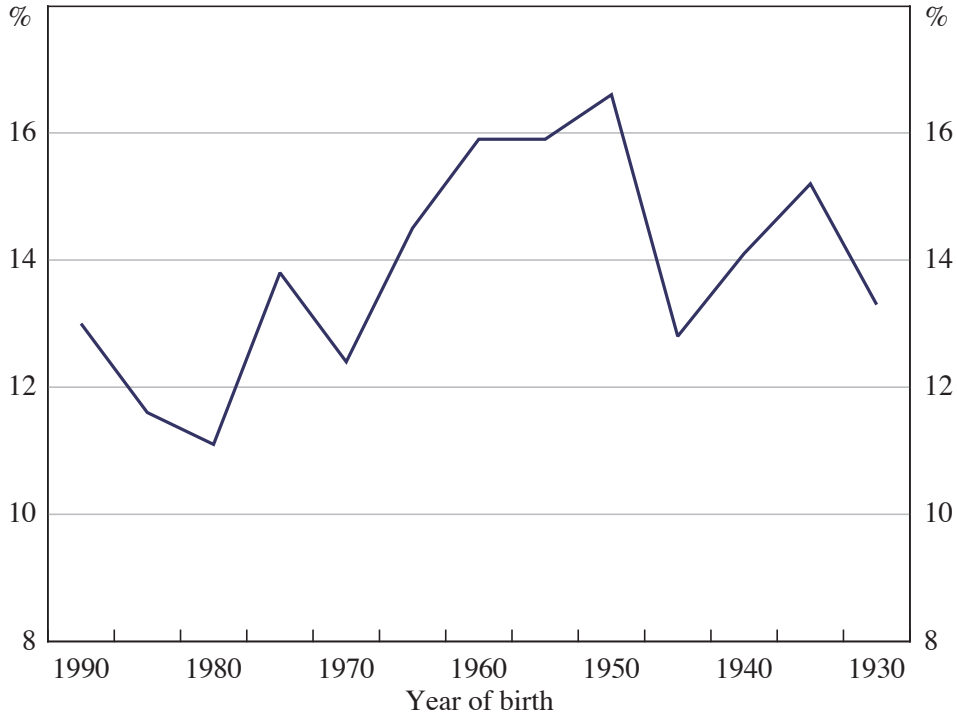
Sources: ABS; authors' calculations

A possible explanation for this that accords with a slightly amended life-cycle model is simply that costs increase around middle age. Younger households have relatively few living costs and so are able to save for a down-payment on a house, while middle-aged households have children and must pay mortgage interest. The behaviour is also consistent with a myopic model of household behaviour. For example, Thaler and Shefrin (1981) argue that hyperbolic discounting can explain why younger households tend not to save enough for retirement, while Carroll and Samwick (1997) argue that younger households place more weight on saving for large purchases and emergencies to smooth near-term consumption rather than saving for longer-term (retirement) consumption.

16 As noted in Section 2.1, the saving of self-funded retirees, and so the older age groups, is likely to be overstated.

Figure A2 shows how the average household saving ratio varies with birth cohort, holding the survey year and age of the household head constant; the effects are less clear than those for age, although they suggest that the baby boomer cohort (born between 1946 and 1964) saves more than other birth cohorts throughout their lives.

Figure A2: Effect of Birth Cohort on Saving
Holding survey year and age constant

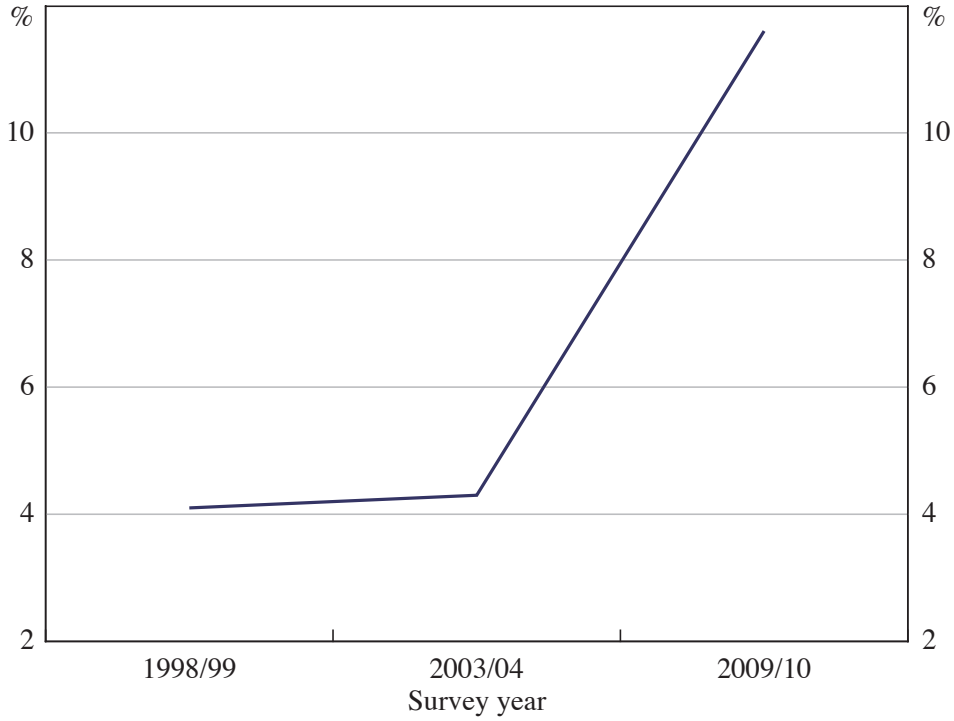


Notes: Gross of depreciation; average by group; survey year = 2009/10, age = 30–34

Sources: ABS; authors' calculations

Time effects in this model represent all determinants of saving not relating to age or birth cohort. Between the 1998/99 and 2003/04 Surveys, the time effect on saving is found to be negligible; on the other hand, the time effect between the 2003/04 and 2009/10 Surveys is large and positive (Figure A3).

Figure A3: Effect of Survey Year on Saving
Holding age and birth cohort constant



Notes: Gross of depreciation; average by group; birth cohort = 1975–1980, age = 30–34

Sources: ABS; authors' calculations

Appendix B: Auxiliary Regressions

B.1 Permanent Income Model

Since we cannot observe a household's permanent level of income, we estimate it by regressing current income on proxies for permanent income, including households' education level, occupation, marital status and age, and taking the fitted values as measuring permanent income (Table B1).

Table B1: Permanent Income Model

Coefficients

Variable	2003/04	2009/10
Education		
– TAFE/certificate	0.0	0.1***
– University	0.1***	0.2***
Middle-skilled occupation	–0.1***	–0.1***
Low-skilled occupation	–0.2***	–0.2***
Unemployed	–0.9***	–0.7***
Self-funded retiree	–0.7***	–0.5***
Pensioner	–0.6***	–0.5***
Not in the labour force	–0.1***	0.1***
Single-parent household	0.2***	0.3***
Married	0.5***	0.5***
Young	–0.1***	0.0*
Pre-retired	0.0	0.1***
Old	–0.1***	0.0**
Constant	6.3***	6.3***
R^2	0.49	0.39

Note: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

Sources: ABS; authors' calculations

B.2 Risk of Unemployment Model

For households with a household head aged less than 65 years that had no persons unemployed at the time of the survey, the risk of unemployment variable is set equal to one if the fitted value of a logit regression of unemployment status on a range of household characteristics is greater than 10 per cent. In particular, for $unemployed_{it}$ representing a dummy variable that equals one if household i has at least one unemployed person in survey t, and zero otherwise, we model $unemployed_{it}$ using a number of independent variables including geographical location, wealth, age, migrant status, personal debt status and other relevant household characteristics, as detailed in Table B2.

Table B2: Risk of Unemployment Model

Coefficients

Variable	2003/04	2009/10
Better off than a year ago	–0.16	–0.67***
Worse off than a year ago	0.26	0.11
Financially constrained	0.44**	0.87***
Number of credit cards	–0.23***	–0.05
Personal credit status	0.49**	0.58**
Wealth-to-income ratio	0.00	0.01
No of spare rooms	–0.25**	–0.15
Mortgage	–0.30	–0.46**
Own home outright	–0.40	–0.77**
Education – TAFE/certificate	0.26	0.26
Education – university	–0.01	0.40*
Single-parent household	0.70**	1.06***
Married	–0.16	0.84***
English-speaking migrant	0.46	–0.16
Non-English-speaking migrant	0.40	–0.02
Young	0.04	–0.12
Pre-retired	0.16	0.73***
Old	0.75	–0.40
Vic	0.09	0.37
Qld	–0.12	0.19
SA	0.24	0.23
WA	0.08	0.14
TAS	0.18	0.02
ACT and NT	0.15	–0.81**
Non-urban	0.25	0.11
Household size	0.67***	0.57***
Female	0.34**	0.30
Share of children	–2.97***	–1.79***
Share of old	–2.46***	–3.08***
Constant	–4.17***	–5.18***
R^2	0.13	0.15

Note: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

Sources: ABS; authors' calculations

B.3 Median and Mean Regression Models

Tables B3 and B4 present full median and mean regression outputs. Each table shows outputs from three different models: Models (1), (2) and (3). The only difference between the three models is the measure of income used: the logarithm of current income is used in Model (1); the deviation of current income from permanent is used in Model (2) (this is the model used in the main text); and no measure of income is used in Model (3). Note that all variables used in the permanent income model are also included in the main saving model, so that Models (1) and (2) will have the same explanatory power and the same coefficients on variables not included in the permanent income model.

Although model outputs are generally similar, some differences are worth highlighting. The effect of education on saving is more pronounced in Model (1) compared with Models (2) and (3), which do not control for the level of current income. This result accords with the intuition that households spend in line with their permanent income, which is correlated with education attainment, and save any deviations between their current and permanent income.

Further, the coefficients on lower-skilled and middle-skilled occupations are positive in Model (1) but negative in Models (2) and (3), which do not control for the level of current income. Although a little puzzling, the difference is likely to reflect the fact that the variables in Models (2) and (3) that are associated with lower levels of current income will also tend to be associated with lower saving, resulting in a negative bias. This issue also applies to other variables correlated with lower current income, for example households containing unemployed people or pensioners.[17]

17 Note that the income variable used in Model (2) – the deviation of current income from permanent income – will not show low-skilled or middle-skilled workers on average as having a negative deviation of current from permanent income, since skill level is included in the permanent income model.

Table B3: Median Regression Model

Coefficients (*continued next page*)

Variable	2003/04			2009/10		
	(1)	(2)	(3)	(1)	(2)	(3)
Worse off than a year ago	–2.2	–2.2	–6.3***	0.4	0.4	–3.5**
Income	0.6***	0.6***	na	0.6***	0.6***	na
Income (>20%)						
– Business	–0.2	–0.2	2.6	–3.5	–3.5	–1.7
– Salary	3.4	3.4	16.6***	3.3	3.3	12.6***
– Government	8.6***	8.6***	–2.2	14.5***	14.5***	–0.4
– Other	0.6	0.6	–4.4*	–5.4**	–5.4**	–7.5***
Financially constrained	4.0	4.0*	1.9	3.7	3.7	1.9
No of credit cards	–4.3***	–4.3***	–1.4**	–4.1***	–4.1***	–0.8
Personal debt	–7.0***	–7.0**	–15.9***	–6.0**	–6.0**	–17.2***
Wealth-to-income ratio						
– Young	–0.4	–0.4	0.3	–0.5	–0.5	0.2
– Middle-aged	–0.3**	–0.3**	0.0	–0.5***	–0.5***	0.0
– Pre-retired	–0.4***	–0.4***	0.0	–0.1	–0.1	0.0
– Old	–0.2**	–0.2**	0.0	–0.2***	–0.2***	0.1
Mortgage						
– Young	1.3	1.3	3.6	2.4	2.4	0.3
– Middle-aged	–1.0	–1.0	2.6	5.7*	5.7*	4.7
– Pre-retired	–8.5*	–8.5**	0.5	–8.9***	–8.9***	–1.3
– Old	–17.4*	–17.4	–0.1	–4.4	–4.4	–8.1
Own home outright						
– Young	8.3	8.3	8.3	9.0	9.0	11.3
– Middle-aged	3.3	3.3	10.2***	5.9	5.9	11.9**
– Pre-retired	–6.8*	–6.8*	3.1	–4.2	–4.2	1.9
– Old	–12.7**	–12.7**	–5.7	–3.5	–3.5	–0.7
Gearing ratio						
– Young	–9.0**	–9.0**	–13.8**	0.9	0.9	7.4*
– Middle-aged	–10.1	–10.1	–6.4	–7.7	–7.7	–6.0
– Pre-retired	–17.0	–17.0	–7.2	–1.7	–1.7	–10.9*
– Old	–19.6	–19.6	–21.3	–11.6	–11.6	–5.5
Education						
– TAFE/certificate	–3.7**	–2.6	–3.5**	–0.1	3.2*	2.2
– University	–11.0***	–4.3**	–5.4***	–5.3***	4.3**	0.6

Table B3: Median Regression Model
Coefficients (*continued*)

Variable	2003/04			2009/10		
	(1)	(2)	(3)	(1)	(2)	(3)
Risk of unemployment	1.9	1.9	4.5*	0.1	0.1	–1.7
Middle-skilled occupation	0.2	–7.1***	–7.2***	4.8***	–3.2	–2.3
Low-skilled occupation	2.9	–7.8***	–4.8**	6.4***	–3.3	–1.4
Unemployed	0.7	–48.9***	–15.5**	6.9	–33.7***	–8.7
Self-funded retiree	–9.2***	–13.6***	–13.4***	–5.8*	–1.5	–2.1
Pensioner	4.6	–30.5***	–6.1	4.0	–26.2***	–2.9
Not in the labour force	9.7**	–29.8***	–4.0	6.4*	–22.5***	–1.3
Single-parent household	–15.6***	–3.1	9.7**	–10.1***	8.4***	7.9***
Married	–12.2***	15.4***	–1.8	–10.6***	17.9***	–1.7
Non-English-speaking migrant	6.2***	6.2***	2.0	7.4***	7.4***	2.8*
Young	–0.7	–5.1	–0.4	–0.9	–2.4	0.1
Pre-retired	10.0**	9.6***	3.0	4.4	7.8**	9.3***
Old	15.1**	6.7	13.4**	7.3	4.6	12.9**
State						
– Vic	0.9	0.9	–0.7	2.9	2.9*	–0.2
– Qld	1.7	1.7	1.0	2.7	2.7	0.7
– SA	5.1***	5.1**	1.4	9.1***	9.1***	6.5***
– WA	2.0	2.0	1.1	3.9	3.9*	3.8
– TAS	2.7	2.7	–2.1	5.5	5.5**	–2.0
– ACT and NT	–6.4***	–6.4***	–2.8	–3.9*	–3.9*	6.3***
Non-urban	4.3***	4.3***	0.3	4.5***	4.5***	–0.8
Household size	–11.3***	–11.3***	0.8	–10.1***	–10.1***	2.8**
Female	–0.5	–0.5	–4.0**	–0.7	–0.7	–3.3**
Share of children	27.5***	27.5***	–15.9***	9.6*	9.6*	–25.0***
Constant/year effect in 2009/10	–318.9***	35.6***	6.8	–11.1	–14.5**	–8.3
R^2	0.15	0.15	0.05	0.15	0.15	0.05

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; HES household weights used; 500 repetitions of bootstrapped weights are used to obtain the standard errors; reference household is a single middle-aged male, born in an English-speaking country, not financially constrained, same or better standard of living compared with a year ago, working in a high-skilled occupation, with high school as highest level of education and lives in urban NSW

Sources: ABS; authors' calculations

Table B4: Mean Regression Model

Coefficients (*continued next page*)

Variable	2003/04			2009/10		
	(1)	(2)	(3)	(1)	(2)	(3)
Worse off than a year ago	1.0	–2.0*	–5.4***	–2.0*	0.9	–3.2***
Income	0.6***	0.5***	na	0.5***	0.6***	na
Income (>20%)						
– Business	–2.0	4.5**	7.5***	3.0*	–0.8	3.6**
– Salary	5.6***	8.9***	14.9***	6.3***	7.5***	6.8***
– Government	15.5***	5.6***	–8.4***	6.1***	15.2***	–1.2
– Other	–4.2***	–4.5**	–11.0***	–2.0	–5.5***	–13.7***
Financially constrained	1.3	4.4**	0.3	4.7**	1.3	–1.3
No of credit cards	–3.9***	–3.7***	–0.6	–3.8***	–3.8***	0.2
Personal debt	–10.4***	–10.6***	–19.9***	–10.6***	–10.3***	–21.5***
Wealth-to-income ratio	–0.3***	–0.4***	–0.1*	–0.4***	–0.3***	0.1**
Mortgage	0.4	0.2	2.7*	–0.1	0.4	3.4**
Own home outright	3.4**	2.4	6.3***	2.2	3.1**	5.6***
Gearing ratio	–2.6	–10.8***	–14.8***	–10.3***	–2.8	–8.1***
Education						
– TAFE/certificate	–0.4	–0.5	–1.6	–1.2	2.7**	3.3**
– University	–6.8***	–1.8	–3.9***	–9.0***	4.8***	2.3*
Risk of unemployment	3.5***	6.0***	6.7***	5.9***	3.6***	1.6
Middle-skilled occupation	4.1***	–9.0***	–6.5***	0.4	–5.3***	–1.7
Low-skilled occupation	5.7***	–9.3***	–5.9***	2.6	–5.1***	1.3
Unemployed	0.3	–43.7***	–19.1***	–1.3	–26.8***	–15.9***
Self-funded retiree	–4.0**	–13.4***	–8.2***	–8.4***	–7.9***	–0.7
Pensioner	1.3	–27.4***	–1.3	7.9**	–35.2***	–8.1***
Not in the labour force	–1.8	–25.4***	–4.7	9.2***	–17.8***	–4.1
Single-parent household	–6.7***	–2.7	9.1***	–10.2***	4.7**	5.3**
Married	–7.2***	12.5***	–2.3	–11.7***	18.4***	–1.0

Table B4: Mean Regression Model

Coefficients (*continued*)

Variable	2003/04			2009/10		
	(1)	(2)	(3)	(1)	(2)	(3)
English-speaking migrant	–3.7**	–3.8**	–1.3	–4.5***	–4.5***	–0.8
Non-English-speaking migrant	5.2***	5.1***	2.1	7.7***	7.8***	5.4***
Young	0.4	–4.5***	0.0	–0.5	–3.5***	2.7**
Pre-retired	–1.3	0.9	–1.8	0.7	6.6***	3.0**
Old	5.8*	–0.2	0.8	0.7	3.5	4.3
State						
– Vic	0.5	0.4	–0.5	1.9*	2.0*	–2.4**
– Qld	0.8	0.9	–1.0	1.6	1.6	–0.5
– SA	2.4	2.2	–0.4	10.0***	10.1***	5.5***
– WA	2.9	3.0*	0.3	2.1	2.1	1.9
– TAS	1.8	1.6	–1.8	4.6	4.5	–2.6
– ACT and NT	–4.6	–4.5	–1.9	–3.4	–3.3	4.3
Non-urban	4.4***	4.6***	0.4	3.5***	3.4***	–0.1
Household size	–10.4***	–10.5***	0.2	–9.9***	–9.9***	2.2***
Female	–1.3	–1.4	–4.5***	–0.9	–1.1	–3.0***
Share of children	22.1***	23.0***	–14.3***	8.5***	9.4***	–26.1***
Constant	–315.1***	32.9***	8.5**	–339.9***	23.6***	2.6
R^2	0.15	0.15	0.05	0.15	0.15	0.05

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; HES household weights used; 500 repetitions of bootstrapped weights are used to obtain the standard errors; reference household is a single middle-aged male, born in Australia, not financially constrained, same or better standard of living compared with a year ago, working in a high-skilled occupation, with high school as highest level of education and lives in urban NSW

Sources: ABS; authors' calculations

Appendix C: Variable Definitions

Table C1: Definitions of Variables

(*continued next page*)

Variable name	Definition
Current income	Natural logarithm of current household income, dollars
Deviation from permanent income	Percentage deviation of current income from modelled permanent income
Married	Dummy variable equal to 1 if household head married or in a de facto relationship; 0 otherwise
Single-parent household	Dummy variable equal to 1 if household head is a single parent; 0 otherwise
Female	Dummy variable equal to 1 if household head is female; 0 otherwise
Household size	Number of persons regularly residing in household
Share of children	Share of children aged under 15 in household
Share of old	Share of people aged over 65 in household
Non-urban status	Dummy variable equal to 1 if household lives in non-urban area; 0 otherwise
State	A series of dummy variables for NSW, Vic, Qld, SA, WA, TAS, ACT and NT
Education – TAFE/certificate	Dummy variable equal to 1 if highest education of household head is TAFE/certificate; 0 otherwise
Education – university	Dummy variable equal to 1 if highest education of household head is university; 0 otherwise
Low-skilled occupation	Dummy variable equal to 1 if household head is employed in a low-skilled occupation (based on ABS Cat No 1220.0); 0 otherwise
Middle-skilled occupation	Dummy variable equal to 1 if household head is employed in a middle-skilled occupation (based on ABS Cat No 1220.0); 0 otherwise
Unemployed	Dummy variable equal to 1 if household head is unemployed; 0 otherwise
Risk of unemployment	Dummy variable equal to 1 if household at risk of having one or more unemployed individuals; 0 otherwise

Table C1: Definitions of Variables

(*continued next page*)

Variable name	Definition
Self-funded retiree	Dummy variable equal to 1 if household head is a self-funded retiree or receives more than 20 per cent of income from investment income; 0 otherwise
Salary income	Dummy variable equal to 1 if household receives more than 20 per cent of income from wages/salary; 0 otherwise
Business income	Dummy variable equal to 1 if household receives more than 20 per cent of income from business income; 0 otherwise
Government income	Dummy variable equal to 1 if household receives more than 20 per cent of income from government payments; 0 otherwise
Other income	Dummy variable equal to 1 if household receives more than 20 per cent of income from 'other' income; 0 otherwise; other income includes private pensions, superannuation, child support, scholarships, other regular sources and income from family members not living in the household
Pensioner	Dummy variable equal to 1 if household head is a pensioner; 0 otherwise
Not in the labour force	Dummy variable equal to 1 if household head is a not in the labour force and not retired; 0 otherwise
Own home outright	Dummy variable equal to 1 if household owns their place of usual residence outright; 0 otherwise
Mortgage	Dummy variable equal to 1 if household owns their place of usual residence with a mortgage; 0 otherwise
Wealth-to-income ratio	Ratio of household wealth to annual household disposable income
Gearing ratio	Household debt divided by household assets
Young	Dummy variable equal to 1 if household head aged less than 30; 0 otherwise
Middle-aged	Dummy variable equal to 1 if household head aged between 30 and 49; 0 otherwise
Pre-retired	Dummy variable equal to 1 if household head aged between 50 and 64; 0 otherwise
Old	Dummy variable equal to 1 if household head aged over 65; 0 otherwise

Table C1: Definitions of Variables
(*continued*)

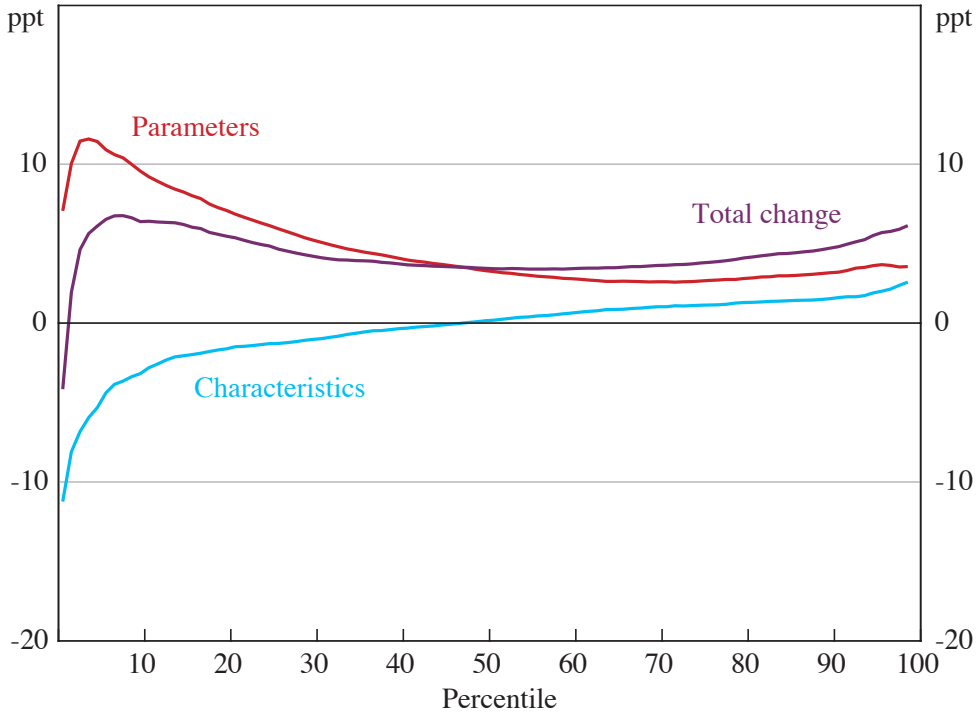
Variable name	Definition
No of credit cards	Number of credit cards in household
Personal debt status	Dummy variable equal to 1 if household has a level of personal debt greater than 10 per cent of its yearly income; 0 otherwise
Better off than a year ago	Dummy variable equal to 1 if household perceives their standard of living to be better than a year ago; 0 otherwise
Worse off than a year ago	Dummy variable equal to 1 if household perceives their standard of living to be worse than a year ago; 0 otherwise
Financially constrained	Dummy variable equal to 1 if household answered yes to two or more of the seven financial stress questions; 0 otherwise
Non-English-speaking migrant	Dummy variable equal to 1 if household head born in a non-English-speaking country; 0 otherwise
English-speaking migrant	Dummy variable equal to 1 if household head born in an English-speaking country other than Australia; 0 otherwise
No of spare rooms	The number of spare rooms in a household's dwelling

Appendix D: Quantile Decomposition

An alternative way to decompose the change in the saving ratio between 2003/04 and 2009/10 is a quantile decomposition based on the method of Machado and Mata (2005). This approach allows us to estimate the contribution of model parameters and population characteristics to the change in saving over the entire saving distribution, rather than just at the mean.

Figure D1 shows this decomposition across the predicted saving distribution. Similar to the results from the Oaxaca-Blinder mean decomposition, the model suggests that parameter effects contributed around 4–12 percentage points to the saving ratios between 2003/04 and 2009/10 across the distribution. Changes in characteristics subtracted from saving at the bottom of the distribution, and contributed to saving at the top of the distribution; that is, the characteristics of high savers shifted to make them even higher savers, all else equal, between 2003/04 and 2009/10.

Figure D1: Decomposition of Change in Saving Ratio
Between 2003/04 and 2009/10



Note: Difference in saving ratio between 2003/04 and 2009/10 Surveys

Sources: ABS; authors' calculations

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