Final Report

Peer Reviewed

Housing wealth and consumer spending

authored by

Judith Yates and Stephen Whelan

for the

Australian Housing and Urban Research Institute

Sydney Research Centre

June 2009

AHURI Final Report No. 132

ISSN: 1834-7223

ISBN: 978-1-921610-12-7

AHURI

Australian Housing and Urban Research Institute

ACKNOWLEDGEMENTS

This material was produced with funding from the Australian Government and the Australian States and Territories. AHURI Ltd gratefully acknowledges the financial and other support it has received from the Australian, State and Territory governments, without which this work would not have been possible.

AHURI comprises a network of fourteen universities clustered into seven Research Centres across Australia. Research Centre contributions, both financial and in-kind, have made the completion of this report possible.

AHURI FINAL REPORT SERIES

AHURI Final Reports is a refereed series presenting the results of original research to a diverse readership of policy makers, researchers and practitioners.

PEER REVIEW STATEMENT

An objective assessment of all reports published in the AHURI Final Report Series by carefully selected experts in the field ensures that material of the highest quality is published. The AHURI Final Report Series employs a double-blind peer review of the full Final Report – where anonymity is strictly observed between authors and referees.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ABS	Australian Bureau of Statistics
AHURI	Australian Housing and Urban Research Institute Ltd.
ASNA	Australian System of National Accounts
AW	Attanasio and Weber
BIS	Bank for International Settlements
CBO	Congressional Budget Office
CPI	Consumer Price Index
CURF	Confidentialised Unit Record File
ECB	European Central Bank
FES	Family Expenditure Survey
GDP	Gross Domestic Product
HES	Household Expenditure Survey
HILDA	Household, Income and Labour Dynamics in Australia
IMF	International Monetary Fund
LTV	Loan to value (ratio)
MEW	Mortgage equity withdrawal
MM	Muellbauer and Murphy
MPC	Marginal propensity to consume
OECD	Organisation for Economic Cooperation and Development
RBA	Reserve Bank of Australia
SIH	Survey of Income and Housing
SIHC	Survey of Income and Housing Costs

EXECUTIVE SUMMARY

Dramatic increases in asset prices in Australia in the mid-1990s to early 2000s contributed to a significant increase in the real value of household wealth. As in many other countries, this increase coincided with an increase in aggregate household consumption. These trends stimulated a resurgence of literature on household consumption and wealth and there is now extensive international evidence that provides broad support for the basic theoretical claim that an increase in both housing and financial wealth leads to an increase in consumption. However, there is less agreement about the relative importance of these effects. This lack of agreement in the evidence is consistent with disagreement over the channels through which an unanticipated increase (or decrease) in housing wealth influences consumption.

The focus of this study is on the possible channels or transmission mechanisms through which a housing wealth effect occurs in Australia and on the way in which these might be identified. Household level data are used to determine the size of the housing wealth effect and to distinguish between the alternative explanations provided for the observed correlation between housing wealth and consumption.

The theoretical underpinnings for presuming a relationship between household consumption and wealth lie in the life-cycle hypothesis. In the simplest version of this framework, households smooth out fluctuations in current income by borrowing against future earnings early in life; by accumulating wealth (through saving) when income is relatively high; and by drawing on that wealth (through dis-saving) when income is relatively low. Anticipated changes in wealth are built into consumption plans; unanticipated changes lead to a revision of those plans. The possibility of wealth effects arises when there are unanticipated changes in household wealth. However, life-cycle theories do not distinguish between different forms of wealth and some of the debate over transmission mechanisms arises because there is some dispute as to whether changes in housing wealth have the same effect as changes in financial wealth. While recognising the role of the latter, this paper is concerned primarily with the ways in which increases in housing wealth might increase household consumption.

Three key transmission mechanisms have been identified in the literature: a direct wealth effect whereby there is an identifiable causal relationship between an increase in wealth and an increase in consumption; a credit constraint effect whereby an increase in wealth provides households with increased collateral and increased borrowing capacity which, in turn, lead to an increase in consumption; and a common cause effect whereby the increases in household wealth and consumption are stimulated by the same common factor such as an increase in income expectations. These possible explanations for the observed correlation between household consumption and household wealth are presented in Chapter 1.

The rationale for these mechanisms can be summarised briefly as follows. If, for example, the impact of an unanticipated increase in wealth operates through a direct wealth effect, then older households would be expected to increase their household consumption by more than younger households as a result of the shorter life-span they have left in which to enjoy the benefits of the equivalent of a windfall gain. Also, home owners would be affected but renters would not. If, instead, wealth effects are transmitted indirectly by changes in credit constraints, then only credit-constrained owners will be affected by the increased collateral provided by the general increase in house prices and housing wealth. Finally, if wealth effects are driven by a common factor, such as higher income expectations from a productivity shock, then the household consumption of renters should be affected as much as that of home-

owners and young households are more likely to be affected than old because they have a longer period over which expectations of higher incomes have an impact.

Unlike studies that have relied upon aggregate consumption and wealth data to determine whether or not there was a wealth effect, use of data at an individual household level provides an opportunity to distinguish between the alternative transmission mechanisms through which wealth effects occur. The two key international studies that have used household data and a similar approach to that used in this report reached conflicting conclusions about these mechanisms. Attanasio et al. (2008) showed that the consumption response to an increase in wealth was highest and significant for the youngest group and lowest and insignificant for the older group. Attanasio et al. conclude their results do not offer support for the wealth hypothesis but are consistent with a common cause effect. They are in marked contrast with the results obtained by Campbell and Cocco (2007) who use the same data source and a similar pseudo-panel technique but who find the wealth effect is greatest for older home owners and smallest for younger renters. Campbell and Cocco conclude their results provide support for the existence of a direct wealth effect but are also consistent with this effect operating through a collateral effect arising from increased house prices relaxing borrowing constraints. These studies are described briefly in Chapter 2 and in detail in Appendix B.

These transmission mechanisms, and the ways in which they might be identified, form the focus of this report. The socio-demographic and economic data available in the six Household Expenditure Surveys undertaken in Australia from 1975 to 2003–04 are used to create a pseudo-panel data set from which life-time consumption profiles for Australian households are estimated. The wealth data available in the 1998–99 and 2003–04 surveys are then used to examine the impact of unanticipated increases in housing wealth. The data used are described in Chapter 3.

In distinguishing between these transmission mechanisms, the methodology employed in this report initially closely follows that used in work undertaken for the Bank of England by Attanasio and his colleagues. This is outlined in Chapter 4. In the first instance, only a time dummy variable is used to identify whether or not there is a wealth effect in the 2003–04 time period. Wealth variables are then introduced in a number of different ways, using data that vary over time and at an individual household level (in contrast to relying on regional price data as a crude approximation of the extent to which households have experienced an increase in housing wealth). Results are presented for housing wealth, other (= financial) wealth and total wealth. In all cases, the focus is on the similarities or differences in the behaviour in 2003–04 of three distinct age cohorts: the young (aged less than 40 years in 2003–04), the middle-aged (aged between 40 and 60 years in 2003–04) and an older age cohorts and on the differences between those who are owners and those who are renters. This chapter can be skipped by non-technical readers.

The results, presented in Chapter 5 and in Appendix C, are robust to a range of specifications and to varying definitions of key variables. They provide considerable support for the existence of a wealth effect.

The increase in consumption expenditure implied by the preferred estimate is consistent with an annual marginal propensity to consume (mpc) out of housing wealth of approximately 0.01 to 0.015. That is, a $100 increase in housing wealth is associated with an increase in consumption expenditure of approximately $1.00 to $1.50 per annum. This is somewhat lower than the estimates derived from aggregate studies such as those reported in Appendix A (and, in particular, lower than the equivalent $3 estimate generated by Dvornak and Kohler (2007) for Australia), but it falls within the range of mpc estimates reported in the micro-econometric studies

reported in Appendix A. These results can be put into context by considering the implications using simple 'back of the envelope' calculations based on a relatively modest fall of 5 per cent in real house prices from their 2007 (pre-housing crisis) values. This is consistent with an Australia-wide average loss of the order of at least $20,000 per dwelling. If the response to this decrease in housing wealth was the same as a response to an increase in housing wealth, the above estimates would represent a reduction in total average household consumption of 0.3 to 0.45 per cent or a reduction in GDP of 0.2 to 0.3 per cent. However, this conclusion should be treated with some considerable caution in the absence of robust evidence about the symmetry of wealth effects.

The results presented in Chapter 5 provide clear evidence from which conclusions about the various transmission mechanisms can be drawn. They do not support the conclusion drawn by Attanasio et al.: namely, that the observed relationship between consumption and housing wealth can be attributed to a common cause effect. Such support would require a change in consumption expenditure in response to the unanticipated increase in wealth between 1998–99 and 2003–04 to be greatest for young households. Neither do they support the main conclusion drawn by Campbell and Cocco (2007): namely, that the relationship can be attributed to a direct wealth effect. Such support would require the consumption response to be greatest for older home owners.

The results from this study, instead, show that the consumption response to the housing wealth observed in 2003–04 was greatest for the middle-age group of home-owners and that the responses for households in the young cohorts (both for all households and for owners only) were generally insignificantly different from the responses for the equivalent older cohorts. The results suggest that the baby boomer cohort, many of whom benefited from rapid reductions in the real value of their mortgage debt as a result of the high inflation of the 1970s and 1980s, has been much more prepared to use the increased value of their gross housing wealth to fund current consumption than other cohorts. The results also suggest that the cohort that was 60+ years old in 2003–04 is less willing than mid-age cohorts to extract equity from the increased value of their owner-occupied dwellings to fund increases in household consumption. These results are inconsistent with the hypotheses that the observed wealth effects are transmitted directly or that increases in consumption and wealth are the result of a common cause.

However, the results are not inconsistent with the claim that the wealth effect operates through a credit constraint transmission mechanism. Only owners are affected by the increased collateral provided by the increase in housing wealth and those who respond most are those who are not income constrained (as are the young) and who are still actively adding to their wealth (unlike the old). The greatest response to their 2003–04 level of housing wealth comes from the baby-boomer cohort who, in 2003–04, were mid-life households aged between 40 and 60. The consumption responses by this cohort were significantly greater than the responses either by the younger cohort (who, on average, had considerably less equity in their owner-occupied housing) or by the older cohort (who, on average, had more gross and more net housing wealth in 2003–04 and very little housing debt compared with the baby-boomer cohort).

This finding has potentially important macroeconomic implications, particularly in light of the current slowdown in the economy in general and in house prices in particular. It shows that the impact of an unanticipated increase in housing wealth on household consumption is not insignificant, particularly for the cohort that is now middle-aged. It raises concerns that any subsequent slowdown in house price growth may reduce

both the capacity and the willingness of the baby-boomer generation to maintain their current levels of consumption. If housing wealth effects are symmetric, so that the size of the impact of a decrease in wealth is the same as that for an increase in wealth, then the finding reinforces concerns that a financial accelerator will exacerbate the economic downturn. However, further research on the symmetry of wealth effects is needed before such a conclusion can be drawn with certainty. Further research is also needed to determine whether the responses observed by the current mid-age cohort will be replicated by the current young cohort as they age.

To summarise: this project has examined the effects of increases in housing wealth brought about by increases in house prices on general consumption spending in Australia. In doing so, it has addressed the following questions.

- What are the possible links between increased house prices and increased consumption?
- What is the evidence in existing literature that there is a causal link between house prices and consumer spending?
- What has been the consumption response of households in different population groups (young, old, owner, renter) to an increase in housing wealth?
- What evidence is there in Australia that there is a causal link between house prices and consumer spending?
- What are the implications, if any, of demographic ageing for these relationships and the economic performance of Australia?

The study, the first of its kind in Australia, complements a growing body of international research in this field. The results presented question the accuracy of the assertion that the relationship between house prices and general consumption spending in the economy is at its strongest among older home owners.

1 INTRODUCTION

Dramatic increases in real house prices in a number of countries in the mid-1990s to early 2000s contributed to a significant increase in the real value of household wealth.[1] In many cases, this coincided with an increase in aggregate consumption (and a corresponding decrease in the aggregate saving ratio).[2] These trends stimulated a resurgence of literature on wealth effects and household consumption, with an emerging consensus that there was a clear link between consumption and wealth. From macroeconomic analyses, estimates of the marginal propensity to consume from housing wealth generally range from 0.02 and 0.10 and, from microeconomic analyses, tend to be at the lower end of this range. However, there is less agreement about the relative importance of the impact of changes in housing wealth vis-à-vis changes in financial wealth. This lack of agreement is consistent with disagreement over the channels through which an unanticipated increase (or decrease) in housing wealth influences consumption. A brief review of the relevant literature is covered below.

The focus of this study is on the possible channels or transmission mechanisms through which a housing wealth effect occurs in Australia, and on the way in which these might be identified. Household level data are used to determine the size of the housing wealth effect and to distinguish between the alternative explanations provided for the observed correlation between housing wealth and consumption.

By the mid-2000s, house price growth had begun to slow. This slowdown, which varied by country from a softening to a dramatic decline, was exacerbated by the onset of the global financial crisis in 2007. The possibility that this could have a significant negative effect on the real economy highlights the importance of better understanding the ways in which housing wealth affects consumption. The question of whether declines in house prices will magnify an economic downturn is critical when the threat of global recession looms. An improved understanding of the transmission mechanisms through which wealth effects occur assists in answering this question.

1.1 Household consumption and household wealth

The underpinnings for presuming a relationship between household consumption and wealth lie in the life-cycle hypothesis or permanent income hypothesis. In the simplest version of this framework, household consumption is assumed to depend on expected life-time income. Households smooth out fluctuations in current income by: borrowing against future earnings early in life; by accumulating wealth (through saving) when income is relatively high; and by drawing on that wealth (through dis-saving) when income is relatively low. Anticipated changes in wealth are built into consumption plans; unanticipated changes lead to a revision of those plans.[3]

[1] Borio and McGuire (2004) illustrate the increases in housing and equity prices that contributed to the growth in household wealth in a number of OECD countries from 1970 to 2005.

[2] Hiebert (2006) illustrates the close correlation between asset price inflation and declines in the saving rates for Australia, Canada, the US and the UK for the period from 1972 to 2002. These countries were selected because of the work of Bertaut (2002) and Barrell and Davis (2004), which shows a bigger wealth effect on consumption in these four countries than in other OECD countries.

[3] This simplified representation ignores a number of important and relevant extensions to the basic model such as the role of liquidity constraints and bequest motives and it abstracts from uncertainty about future income and expenses. Browning and Lusardi (1996) give a detailed overview of the basic model and its extensions. Altissimo et al. (2005) provide a more recent update with a focus specifically on the role of asset price effects.

A well-established literature has investigated the impact of wealth on consumption and a number of papers provide a synthesis of the extensive international evidence that provides broad support for the basic theoretical claim that an increase in wealth leads to an increase in consumption. An overview of these syntheses and of the relatively limited Australian literature on wealth effects is provided in Appendix A. A summary of the estimates obtained in a selection of recent empirical studies, including those for Australia, is provided in Table A1.

These estimates provide support for the claim that there is broad agreement about the existence of wealth effects emanating both from housing and financial wealth. They also illustrate the extent to which the evidence on the absolute and relative importance of these effects varies. This divergence in the evidence is consistent with disagreement in the literature over the explanations for whether changes in housing and financial wealth should be expected to have the same effect and over the ways in which their respective effects are manifest. Some of the sources of these disagreements are considered below.

1.1.1 Direct wealth effects

The prediction of the life-cycle hypothesis (that unanticipated increases in wealth will lead to an increase in consumption) provides the basis for what is called the direct wealth effect, the first of the possible transmission mechanisms to be considered here. However, the foundation for this hypothesis makes no distinction between different types of wealth and there are a number of reasons why an increase in housing wealth might have a different impact on consumption from an increase in financial wealth. Dvornak and Kohler (2007) and Sierminska and Takhtamanova (2007) summarise those given in the literature. Some suggest housing wealth will have a greater impact than financial wealth; others that it will have a smaller impact.

Housing's illiquidity means transaction costs are high and it is more difficult to trade than stocks. This suggests there might be a lower marginal propensity to consume from housing wealth than stock market or financial wealth. This argument is weakened by financial innovation that has increased housing liquidity by making it easier for households to withdraw housing equity and by the fact that much stock holding is concentrated in superannuation assets that are inaccessible prior to retirement. The distribution of housing wealth tends to be spread across the income distribution, whereas financial wealth (primarily stocks) tends to be more concentrated with high income groups who generally tend to have a lower marginal propensity to consume. This would tend to increase the wealth effect of housing compared with financial wealth (for example, Mishkin, 2007). Changes in wealth arising from increases in house prices means housing wealth might be expected to be more permanent than changes arising from increases in share prices, similarly suggesting a greater impact on consumption. Conversely, psychological factors may lead to households employing 'mental accounts' (Shefrin and Thaler, 1988, Thaler, 1990) earmarking housing for long-term savings and bequest, suggesting a lesser impact on consumption. The ambiguity of all of these explanations reinforces the suggestion that it is an empirical question as to which of the factors dominates.

An extreme view, on the other hand, suggests that, unlike an increase in financial wealth, an increase in house prices does not make a household better off. In effect, 'housing wealth isn't wealth' at all (Buiter, 2007, 2008).[4] This view is based on the argument that any increase in housing wealth will increase the opportunity cost of the

[4] King (1990) presents a similar argument in his critique of Muellbauer and Murphy (1990), one of the earliest papers to examine the relationship between house prices and household consumption. Buiter acknowledges King as the source of his argument.

services provided by housing. Because most households with housing wealth are owner-occupiers who also consume the services provided by their housing, any positive effect associated with higher house prices is thus offset by an increase in the cost of housing consumption. The capital gain earned by a trading down or last-time seller is paid for by a trade-up or first-time buyer. Carroll (2004) expresses this argument slightly differently, arguing that increases in house prices do not increase wealth only if home owners intend to live in their dwellings indefinitely. For every current home owner made better off, a future home owner or a renter is made worse off. Renters, in fact, may reduce their spending in order to save for the larger deposit required to access home ownership. The reverse applies for decreases in house prices. House price changes redistribute wealth but do not increase it in aggregate. In other words,

> "the fundamental value of a house is the present discounted value of its current and future rental values. Anyone who is 'long' [in] housing, that is, anyone for whom the value of their home exceeds the present discounted value of the housing services they plan to consume over their remaining lifetime, will be made worse off by a decline in house prices. Anyone 'short' [in] housing will be better off. So the young and all those planning to trade up in the housing market are made better off by a decline in house prices." (Buiter, 2008, p.1)

Important qualifications to this proposition provide possible alternative channels to a direct wealth effect for the ways in which changes in housing wealth might affect consumption. These are discussed in the following sub-section.

The redistribution effects of changes in aggregate housing wealth effect can generate a direct wealth effect if there are different marginal propensities to spend out of wealth by households who are long in housing (for example, the old or those whose asset portfolios include investment as well as owner-occupied housing) and those who are short in housing (for example, the young, or renters) and, as Goodhart and Hoffman (2008, p.182) argue, those who are yet to be born or who are too young to be earning for themselves. In Goodhart and Hoffman's view, there is an asymmetry between gainers and losers which works in favour of a positive wealth effect of house prices on consumption.

Poterba (2000) employs the same argument, recognising that for households who do not plan to live in their current home for very long, “the present discounted value of the increase in the cost of living in the house will be small relative to the positive wealth effect of the increase in the home's value" (p.104). For such households, an increase in housing wealth might be expected to induce an increase in non-housing consumption.

An amplification of this argument was presented in a background paper recently prepared by the US Congressional Budget Office (CBO):

> "greater housing wealth raises spending on non-housing goods and services only if it causes households to hold fewer non housing assets than they otherwise would have or if they extract equity from homes either by increased borrowing or moving to a cheaper residence. Otherwise there is no wealth effect." (CBO, 2007, p.5)

The latter proviso in this claim highlights mortgage equity withdrawal (MEW) as a key mechanism through which wealth effects can occur. However, the first proviso suggests wealth effects can arise without mortgage equity withdrawal. An increase in housing wealth can create an asset rebalancing effect which allows householders to reduce their holding of financial assets while still maintaining a desired level of total

wealth for precautionary or bequest motives (thus reducing the amount of saving for a deposit by their heirs).

Many of these arguments suggest that changes in housing wealth not only might have a different impact from changes in financial wealth, but that they may have an effect that is more observable among particular households than it is overall: the aggregate impact on the economy will depend, for example, on the age distribution of the population and on the proportion of households who are owners or renters. They highlight the desirability in any attempt to analyse wealth effects on consumption both of allowing for the possibility that different components of wealth might have different effects and for the possibility that these effects might differ according to different household characteristics.

1.1.2 Indirect effects

The previous sub-section described the ways in which increases in housing wealth might have a direct wealth effect on household consumption. This sub-section considers alternative, indirect channels.

Credit constraint channel

The first of these arises from a qualification to the 'housing wealth isn't wealth' proposition. It is based on the role of borrowing constraints that limit current household consumption for households unable to borrow against expected future income and depends on the role housing plays in providing collateral.[5] Increases in housing wealth allow otherwise constrained households to borrow against the increased equity in their homes. Thus, through facilitating MEW (or home equity extraction), increases in housing wealth can increase household consumption. If improvements in household balance sheets result in access to cheaper finance than would otherwise have been possible, this can give rise to a financial accelerator effect whereby

> "changes in home values may affect household borrowing and spending by somewhat more than suggested by the conventional wealth effect because changes in homeowners' net worth also affect their external finance premiums and thus their costs of credit. If true, this hypothesis has various interesting implications. For example, unlike the standard view based on the wealth effect, this approach would suggest that the distribution of housing wealth across the population matters because the effect on aggregate consumption of a given decline in house prices is greater, the greater the fraction of consumers who begin with relatively low home equity." (Bernanke, 2007)[6].

Aoki et al. (2004) provide a formal analysis of the proposition that housing is used as collateral to reduce agency costs associated with borrowing to finance (consumption or investment) expenditure, and hence, that fluctuations in house prices influence borrowing conditions for households. However, only borrowing constrained households will increase consumption through this channel when their collateral is

[5] Poterba and Samwick (1995) initially raised this possibility in terms of their discussion of financial wealth effects. Buiter (2008, p.2–3) questions the assumption made by Bernanke and a number of other authors (for example, Mishkin, 2007) that the credit or collateral effect supplements the direct wealth effect implied by a life-cycle view of consumption. In his view, it provides an alternative, not a supplementary, channel to the conventionally hypothesised wealth effect.

[6] Imeida et al. (2006) review evidence on the financial accelerator effect through which financial constraints amplify fluctuations in asset prices and credit demand.

increased (and vice versa if their collateral is decreased). As argued above, these are likely to be households with relatively low levels of equity in their homes.[7]

For unconstrained borrowers, a home-equity loan may be the most convenient way of financing intended household consumption regardless of whether the house prices increased. In other words, housing equity withdrawal may simply be an alternative to acquiring additional financial debts (Bridges et al., 2004; Klyuev and Mills, 2007). Of itself, an increase in equity withdrawal does not necessarily imply a wealth effect.

These arguments reinforce the importance of distinguishing between households who are credit constrained (for example, those with low equity in housing) and those who are not (for example, older households drawing down accumulated equity) when attempting to identify the existence or otherwise of a housing wealth effect on consumption. However, identifying the size of an indirect wealth effect transmitted through this channel can be problematic.

Common cause channel

Concerns raised by Muellbauer and Murphy (1997), Aron and Muellbauer and Murphy (2007) and Muellbauer (2007) highlight a second indirect channel through which wealth effects might be transmitted: namely what has been called a common cause channel. Muellbauer and his colleagues argue that estimates of wealth effects operating through a credit constraint or collateral channel are liable to bias if they ignore the possibility that increases in house prices were stimulated by the financial or credit market liberalisation that took place in the 1990s and 2000s. This improved access is not only to secured credit (which is affected by collateral constraints) but also to unsecured credit (which is not affected by collateral constraints). As a result, consumption increased because borrowing constraints were relaxed for all households, not just for those with housing wealth. Failure to control for the direct effect of credit liberalisation on consumption and on house prices, therefore, can over-estimate the effect of housing wealth on consumption.

In his critique of the earlier Muellbauer and Murphy analysis, King (1990) suggested other factors also can provide a similar common cause effect. Factors such as changes in real interest rates or income expectations arising from productivity shocks that can affect both household consumption and house prices also may explain the observed correlation between increases in house prices and increases in household consumption. Relaxation of credit constraints increases the potential for such factors to become more significant.

1.2 Overview and structure of report

In summary, the extensive empirical literature on wealth effects suggests that there is a strong case for arguing that housing wealth and household consumption are closely linked. However, there is less agreement about the size of this effect and little agreement on the explanation of why it occurs as 'abstract economic theorizing does not produce unambiguous conclusions.' (Carroll, 2004, p.4).

[7] This suggests that the wealth effect is greater, the greater the fraction of consumers who are credit constrained. Roubini (2007) claims "this suggests the (US) Fed might be relatively relaxed about declines in segments of the housing market where wealth homeowners have a large stock of home equity, but more concerned about price falls in areas where people have little home equity. This is typically the segment with a high proportion of sub-prime loans."

1.2.1 Overview

Attanasio et al. (2008) provide a summary of the three main hypotheses for the co-movement between house prices and consumption proposed in the literature (and outlined in Section 1.1). First, an increase in house prices raises household wealth and thereby facilitates consumption (particularly for those who wish to trade down). Second, house price growth increases the collateral available to home-owners which reduces credit constraints and facilitates higher consumption. Third, house prices and consumption have been influenced by common factors, with the key common factor suggested being income expectations. Only the first of these explanations can be described as a direct wealth effect where there is a causal relationship between changes in housing wealth and changes in household consumption. The second two explanations rely on the existence of an indirect effect: either via a reduction in collateral constraints or attributable to a common factor that explains changes in both wealth and consumption. However,

> "Existing studies do not provide a definitive link between house prices and spending. Nonetheless, analysis of the behaviour of individual households appears to be the key to gauging the relative importance of the various links between house prices and consumer spending." Benito et al. (2006, p.145)[8]

Many of the aggregate (time series) studies summarised in Table A1 in Appendix A claim to provide strong support for the existence of a direct wealth effect. However, the possibility that wealth and consumption are affected by common factors has led to a concern that aggregate data may reflect spurious relationships (see, for example, Sierminska and Takhtamanova, 2007).[9] This concern lies behind attempts to introduce panel effects into aggregate time series analyses, for example, by disaggregating to a regional level as done by Case et al. (2005) for the US and Dvornak and Kohler (2007) for Australia, or by undertaking cross-country analyses, as done, for example, by Labhard et al. (2005) and Ludwig and Sløk (2004). However, disaggregation of aggregate data within a single country is limited by the availability of reliable data at a sub-national level and cross-country studies are limited by the same institutional differences that make cross-country comparisons unreliable.

Increasingly, therefore, studies have turned to panel studies based on household level data in an attempt to determine the existence and size of a wealth effect, and more importantly, to identify the key transmission mechanisms involved. The key benefit of micro-econometric analysis of individual household data is that it provides an opportunity to identify the source of the observed relationship between consumption and housing wealth. For example, if the impact of an unanticipated increase in wealth operates through a direct wealth effect, then older households would be expected to increase their household consumption by more than younger households as a result of the shorter life-span they have left in which to enjoy the benefits of the equivalent of a windfall gain (for example, Grant and Peltonen, 2005). Also, home owners would be affected but renters would not. If, instead, wealth effects are transmitted indirectly by changes in credit constraints, then only credit-constrained owners will be affected by the increased collateral provided by the general increase in house prices and housing wealth (for example, Aoki et al., 2004; Campbell and Cocco, 2007; Disney et al., 2006). Finally, if wealth effects are driven by a common factor, such as higher income expectations, then the household consumption of renters should be affected as much

[8] Benito et al. (2006) also suggest that changes in the strength of some of these different channels could explain why the linkages between house prices and consumption are less stable than is sometimes supposed and why they may have weakened in recent years.

[9] Dolmas (2003) gives a theoretical example to illustrate the problems that arise with aggregate analyses.

as that of home-owners and young households are more likely to be affected than old because they have a longer period over which expectations of higher incomes have an impact (for example, Attanasio et al., 2008; Benito et al., 2006).

Early examples of studies that relied upon household level data are Attanasio and Weber (1994) for the UK, and for analysing financial rather than housing wealth effects, Maki and Palumbo (2001) for the US. More recent studies analysing housing wealth effects are: using UK data, Attanasio et al. (2008), Campbell and Cocco (2007), Bridges et al. (2004), Disney et al. (2003) and Disney et al. (2006); using US data, Bostic et al. (2006), Cooper (2008), Juster et al. (2006), Lehnert (2004); using Spanish data, Bover (2005); using Dutch data, Berben et al. (2006); using Italian data, Grant and Peltonen (2005) and Paiella (2007); using NZ data, Smith (2007); and using Danish data, Browning et al. (2008) . The key features of the most relevant of these studies for this paper will be returned to in the following chapter.

Of these recent studies, all but the papers by Disney, Bostic and Browning (and their co-authors) and that by Cooper had authors with central bank or central government connections, highlighting a central agency perception of the importance of such analyses. Identification of the channels by which such effects take place enhances an understanding of the role that housing plays in the macro economy. As suggested by Benito and Mumtaz (2006), a collateral channel which relaxes a liquidly constraint directly or provides equity that can be extracted could amplify the effects of monetary policy on the economy. Such a concern has motivated the RBA to undertake a survey of housing equity withdrawal in Australia (Schwartz et al., 2006, 2008). However, the results of this RBA research suggest that equity withdrawal is unlikely to raise concern as more of the equity withdrawn has been used to fund investment than to fund consumption. A similar result has been obtained for the UK (Benito and Power, 2004).

1.2.2 Report structure

The following chapter provides an overview of a number of studies that have employed a methodology and household survey data similar to that used in this paper. This is followed in Chapter 3 by an overview of relevant aggregate Australian data on house prices, housing wealth and consumption, to put the survey data employed into context. It provides summary results from the confidentialised unit record files from the Australian Bureau of Statistics Household Expenditure Surveys (HES) from 1975 through to 2003–04 which are the surveys to be used in this study. Chapter 3 also describes how the HES data are used to generate the pseudo-cohorts used in the microeconometric analysis of the impact of housing wealth on consumption undertaken in this study

Chapter 4 provides an overview of the methodology employed and describes the identification strategy used to distinguish between the competing hypotheses put forward to explain the observed correlation between housing wealth and consumption behaviour. This methodology is compared with that employed by the key papers that have motivated this study. Descriptive statistics of the data used in the analysis presented in this report are also set out.

The key results are presented in Chapter 5 and are followed by the conclusions in Chapter 6.

Four appendices provide additional detail to the material provided in the text. Appendix A supplements Chapter 1 with an overview of the international and Australian evidence on wealth effects. Appendix B supplements Chapter 2 and Chapter 4 by providing a detailed description of the pseudo-panel household studies that foreshadowed the methodological approach employed in this paper. Appendix C provides additional disaggregated descriptive data to add to the summary data in

Chapter 3. Appendix D provides additional empirical results (and tests) to highlight the robustness of the results presented in Chapter 5 to an alternative definition of the key consumption variable.

2 RELEVANT HOUSEHOLD STUDIES

As indicated in the previous chapter, few studies have used household level data to determine the effect of housing wealth on household consumption and to distinguish the alternative explanations for observed correlations. One of the key reasons for this is the need for survey data that both has a panel dimension and has data on household consumption and wealth.

Recent household level studies by Berben et al. (2006), Bostic et al. (2006), Bridges et al. (2004), Browing et al. (2008), Disney et al. (2003), Disney et al. (2006), Juster et al. (2004), Lehnert (2004), Grant and Peltonen (2005) and Paiella (2007) all based their analyses on true panel data (although in some cases the data were available only for a relatively limited time period and in other cases, estimates or proxies had to be employed for some of the key variables in the analysis or several panel data sets had to be merged to obtain the data required). Bover (2005) relied on just a single cross-section survey from which a panel was created and Bridges et al. (2004) effectively used only one wave of their panel data. Only Attanasio et al. (2005, 2008), and Campbell and Cocco (2005, 2007) employed synthetic or pseudo-panel data similar to that employed here.[10] Both of these build on an earlier study by Attanasio and Weber (1994). This pseudo-panel approach is adopted here because there is no longitudinal household data in Australia with information both on household characteristics and on household consumption.[11]

Pseudo-cohorts are employed when panel data are too limited to track individual households over time but when a series of independent cross-section data exists. This methodology was initially developed by Deaton (1985) and Browning et al. (1985) and is now well established.[12] Deaton defines a 'cohort' as a group with fixed membership. Attanasio and Weber (1994) and Attanasio et al. (2008) use age cohorts based on year of birth but alternative approaches to defining cohorts can be employed. Maki and Palumbo (2001), for example, use income and education cohorts. However, these characteristics provide problems in defining a cohort because they change over time. A household can switch income cohorts over time and a gradual increase in education standards means that older cohorts tend to be less well educated than younger ones, with the result that the age structure of the population has a confounding influence on education cohorts. Similar issues are likely to arise with Campbell and Cocco's (2007) use of regional and tenure characteristics to supplement age cohorts based on year of birth. These issues are discussed in Section 2.2 below.

Pseudo-panels from pooled cross-section surveys combine group or cohort averages at different times. Deaton (1985) shows sample cohort means are consistent (but error-ridden) estimates of the true cohort means.[13] Deaton also argues that pseudo-panel data are not necessarily inferior to panel data because the attrition problem that effectively curtails the length of panel data does not apply to pseudo-panels.

[10] In both these cases, the 2005 papers are earlier but more or less identical discussion paper versions of the later published papers. All page references given here relate to the published versions.

[11] The most widely used household panel data set in Australia, the Household, Income and Labour Dynamics in Australia (HILDA) survey, has been available only from 2001, has extremely limited information on household consumption expenditure, and has wealth information only for 2002 and 2007, a period in which wealth increased and then decreased.

[12] To the extent that the UK Office for National Statistics now produces an official pseudo-cohort panel data set from their General Household Surveys (Uren, 2006).

[13] If cohort sample sizes are not large, then errors in variables techniques should be used. With cohort sample sizes of around 100 to 300, Browning, Deaton and Irish (1985) treat the sample cohort means as if they were population means.

2.1 Previous pseudo-panel studies

The three key studies which are precursors to this particular study are by Attanasio and Weber (1994), Attanasio et al. (2008) and Campbell and Cocco (2007).[14] Each of these used pseudo-panel data to examine the nature of the relationship between housing wealth and household consumption. All relied on the UK Family Expenditure Survey (FES), which is an annual cross-section survey similar to the Australian Household Expenditure Surveys (HES) to be used in this study. The latter two were written, apparently independently, at more or less the same time. Their key characteristics and results are summarised here. A more detailed overview of all three is provided in Appendix B.

Attanasio et al. (2008) base their study on FES data from 1978 to 2001. They explain household consumption expenditure in terms of age and cohort dummies, observable household characteristics (such as family size and composition), tenure, and regional house price growth rates. They find that house price growth has the greatest effect on the consumption of their youngest cohort and the least effect on that of the oldest cohort. They also find that renters have a similar consumption response to changes in house prices, as do home owners. They conclude their results are consistent with a common cause (attributed to income expectations) explanation of increases in both house prices and consumption.

Their results and conclusions are in marked contrast with those of Campbell and Cocco (2005, 2007) who based their study on FES data from 1988 to 2000. Their baseline specification differs from that of Attanasio et al. (2008) by their inclusion of interest rates and income as explanatory variables, in the way in which they define their cohorts and in their use of variables expressed in changes rather than levels. They find that house price increases have the greatest effect on consumption for older home owners and the lowest effect on the consumption for young renters. This leads them to conclude their results are consistent with the collateral channel or credit constraint effect.

2.2 Reasons for divergent results and associated issues

Attanasio et al. (2008) attribute the differences in results to differences in the sample period and in the baseline specification for estimating consumption but do not explain why these differences should be so significant.[15]

Aron et al. (2006) and Muellbauer (2007) do provide some explanations. A first is that Campbell and Cocco's (2007) choice of post-1988 data means they potentially remove the confounding effect of the mid-1980s financial liberalisation that was ignored by Attanasio et al. (but taken into account by Attanasio and Weber). A second is that Attanasio et al. fail to take into account the independent role played by current income, financial asset ownership and other variables that affect access to credit. Because consumption of young households is likely to be strongly influenced by current income, failure to control for this and other economic variables is likely to affect results.

[14] In January 2009, Attanasio, Leicester and Wakefield (2009) presented a complementary paper to the Attanasio et al. (2008) paper. Because this paper was presented after the main text of this report was completed, its contribution is only briefly summarised in Appendix B. However, its conclusions are consistent with those reported for Attanasio et al. (2008) and it serves to provide an explicit theoretical basis for those conclusions.

[15] They also attribute them to the use of self-reported house prices in the Campbell and Cocco analysis but this is incorrect. Campbell and Cocco use virtually the same house price data as Attanasio et al.

These explanations, along with the Campbell and Cocco discussion of the endogeneity issues that arise when cohorts are defined on a self-selecting basis, suggest that the possibility that outcomes for owners and renters may differ needs to be taken into account, as does the extent to which individual households do, in fact, face borrowing constraints.

Disney et al. (2006) use data from the British Household Panel Survey from 1995 and 2000 to show that only a small proportion of households face collateral constraints. Those who do face such constraints tend to use changes in wealth to switch from unsecured to secured debt with little impact on consumption. They directly measure the evolution over time of household-specific loan-to-value ratios (and remove potential endogeneity by estimating the current value of mortgage outstanding from information on the original mortgage) rather than using an instrument for the collateral constraint. While this approach is not possible with pseudo-panel data it does suggest that it might be possible to derive a measure of the extent to which households are, in fact, constrained as a means of addressing the issues raised by Aron et al. Disney et al. (2003) interact capital gains with a dummy variable for whether or not a household had been in negative equity as an indicator of what they call balance sheet distress.[16]

A third explanation for the difference in results arises from the length of panel used by each set of authors. Attanasio et al. used fifteen panels; Campbell and Cocco used just seven. Part of this is attributable to the longer time period employed by Attanasio et al. but part of it is attributable to Campbell and Cocco's truncation of cohorts who were already relatively old at the start of the sample period. With too early a choice of birth year for the oldest cohorts, mortality may result in sample sizes being too small for these cohorts at the end of the sample period. Campbell and Cocco explicitly address this by reporting relevant sample sizes. This points to the need to ensure sample sizes are large enough to ensure results are reliable when determining how many cohorts to consider.

More obvious explanations lie in the specific variables employed in these studies. Attanasio et al. and Campbell and Cocco both use changes in regionally defined house price indices as a proxy for changes in housing wealth, but employ these at different levels of aggregation (respectively six and three regions for the whole of the UK) and use different price deflators to define real house prices. While such indices do reflect broad trends in dwelling prices, they are likely to be too aggregated to reflect the specific changes experienced by individual households at a local level. Self-reported values are more able to do this, although they are more likely to suffer from measurement error and will embody changes arising from household consumption decisions (such as on maintenance expenditure). However, self-reported values have the advantage that they reflect the household's perception of the current value of their dwelling, and if the asset is a non-traded asset, it is the perception of value that is possibly more relevant to decision-making than actual market value.

Cristini and Sevilla (2008) undertake a comparison exercise on Attanasio et al. and Campbell and Cocco to determine the key factor that leads them to reach opposite conclusions. They do this by examining the extent to which the results in each paper are robust to the methodological differences between them, focusing specifically on the treatment of control variables relating to age and tenure but covering a number of the points raised above as well. Their tests tend to be more favourable to the Attanasio et al. conclusion in favour of a common cause effect.

[16] Their results suggest an asymmetric response with the marginal propensity to consume from real housing gains being significantly higher for initial negative equity but no significant difference in consumption outcomes for households facing capital losses.

> "The wealth hypothesis continues to be challenged when age is the testing dimension: the consumption of the young and old do not react in a significantly different way to a house price increase" (Cristini and Sevilla, 2008, p.2).

This result for different age groups appears to be robust to changes in the specification. However, their analysis also shows that comparisons that take tenure into account are not robust to the specification used. In their view this suggests the need for a more rigorous discussion of the correct empirical specification to test the wealth versus the common cause effect.[17]

Irrespective of specification differences, the Attanasio et al. and Campbell and Cocco results clearly showed the life-cycle effects of changing family size on household consumption. Both papers allow for this by including demographic variables in their baseline specifications, a procedure that effectively implicitly generates equivalence scales. In a paper published after these two studies were completed, Fernandez-Villaverde and Krueger (2007) proposed direct use of equivalence scales.[18] Use of equivalence scales has a significant effect in reducing the hump observed in household consumption, but does not reduce it entirely. This leads Fernandez-Villaverde and Krueger to conclude that demographics only partly explain the hump observed in a household's life-cycle consumption, a finding which they argue is consistent with related evidence in the literature, suggesting that households cannot perfectly smooth their consumption of services from durables. One of the possible explanations as to why this hump remains is "liquidity constraints that prevent young households from borrowing against future (higher) labour income to finance higher current consumption". (Fernandez-Villaverde and Krueger, 2007, p.560).

In what follows, equivalence scales are used only for the descriptive data presented in the next chapter as a means of controlling for variations in household size for the various cohorts over time. Household size and composition are controlled for directly in the baseline estimates of household consumption are used in Chapters 4 and 5.

[17] The conclusion is qualified by their inability to replicate Campbell and Cocco results, despite having access to the same data. They speculate that differences in the two studies might arise from the price deflators used and also from the ways in which cohorts are specified.

[18] They identified a number of different scales employed in what they describe as the 'rich previous work' that has used detailed information on expenditure shares to derive equivalence scales and took as their preferred measure the mean of those in the relevant literature they identified. This mean was very similar to the modified OECD scale (although the modified OECD scale was not one they reported). The modified OECD equivalence scale has become the norm in Australia to adjust household income to a common metric. It assigns a weight of 1 to the first adult in the households, 0.5 to each additional person aged 15 years or more and 0.3 to any children aged less than 15 years. Equivalised household consumption is derived by dividing total household consumption by the sum of the equivalence points allocated to the household members. This adjustment has the effect of using a single adult as the standard benchmark.

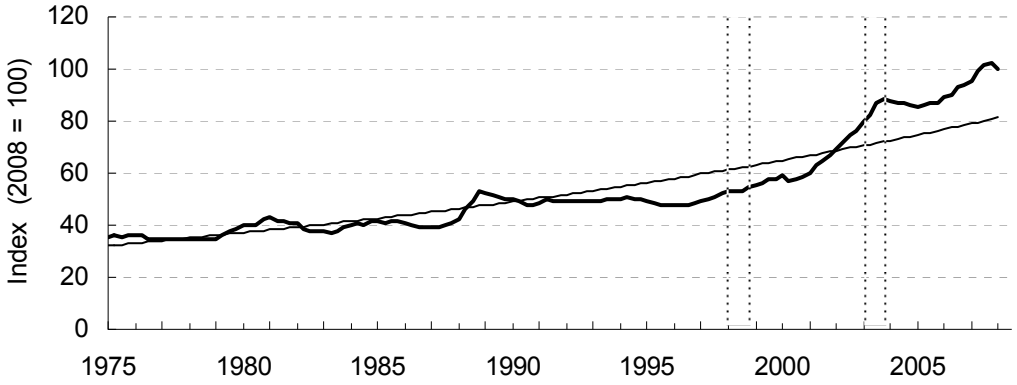
3 DATA

The data used in this study is household level data from Household Expenditure Surveys (HES) from 1975–76 to 2003–04. The HES data has been collected approximately every five years by the Australian Bureau of Statistics (ABS) and is described in Section 3.2. Section 3.1 provides a broad overview of relevant aggregate data over this period in order to put the survey data and the empirical analysis in this report into context.

3.1 Aggregate overview

In the period covered by the Household Expenditure Surveys, real house prices grew by an average of more than three per cent per annum over the period. An indication of the pattern of growth in real dwelling prices is illustrated in Figure 1. These data apply to Australia-wide median house prices. Disaggregate data by capital cities and rest of state for houses and units are illustrated in Appendix B.[19]

Figure 1: Real house prices: 1975–2008



Source: House prices from Productivity Commission (2004), updated to 2008 from ABS Cat. No. 6416.0, Table 10. CPI adjusted.

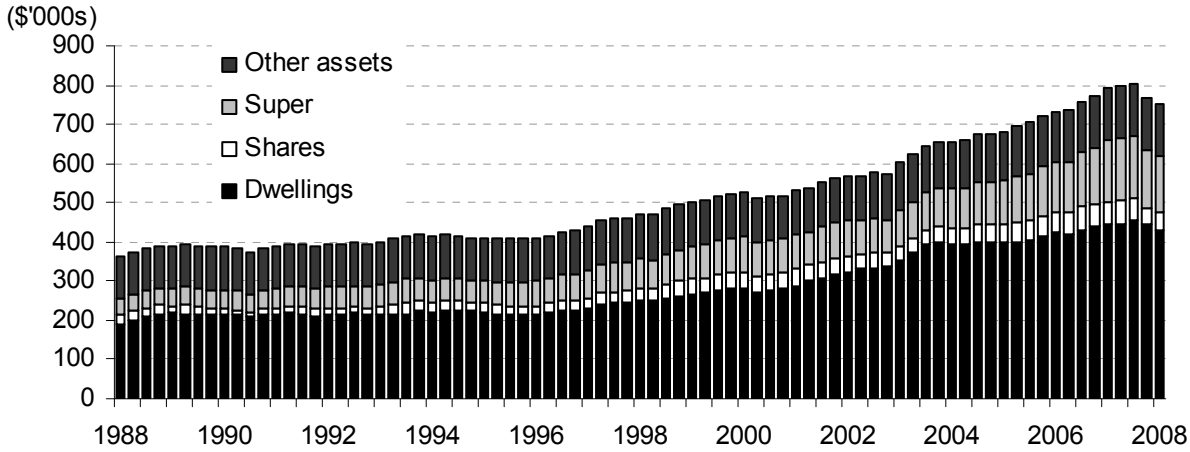
The bars on the chart indicate the period over which the two most recent 1998–99 and 2003–04 HES surveys were undertaken. The standout and critical feature of the graph is the large surge in house prices during the period bounded by the penultimate and final HES. During this period median real house prices increased by around seventy per cent or an annual growth rate of 10.5 per cent per annum between 1998–99 and 2003–04. While the question of whether this house price increase reflects a speculative bubble or can be attributed to economic fundamentals is still being debated; the consensus for similar rises in other countries is that a high proportion of the rise to 2004 can be regarded as a permanent rather than transitory increase in housing wealth (see, for example, Girourard et al., 2006; Himmelberg et al., 2005). Himmelberg et al. (2005) caution against drawing conclusions solely on the basis of trend data (because such data do not give an indication of the underlying economic variables that drive house prices) but Otto (2007) estimates that economic factors explain around 40–60 per cent of the growth in house prices in Australia from 1986 to 2005. Thus, it seems not unreasonable to assert that these increases were

[19] These show the same broad trends as illustrated here but they also show considerable difference in dwelling values by dwelling type and region.

unanticipated given the extent to which the average increases in real house prices between 1998–99 and 2003–04 were significantly in excess of past trends.[20]

This increase in real house prices contributed to a significant increase in household housing wealth from the late 1990s, with average gross dwelling assets per household increasing by twenty-five per cent in a decade from around $200,000 in 1988 (52 per cent of total gross wealth) to $255,000 per household in 1998–99 (53 per cent of total gross wealth). However, in just five years from 1998–99 average household wealth surged by more than fifty per cent to $391,000 in 2003–04 (62 per cent of total gross wealth).[21] This increase in real gross household wealth is illustrated in Figure 2.

Figure 2: Real gross wealth per household ($2008): 1988–2008



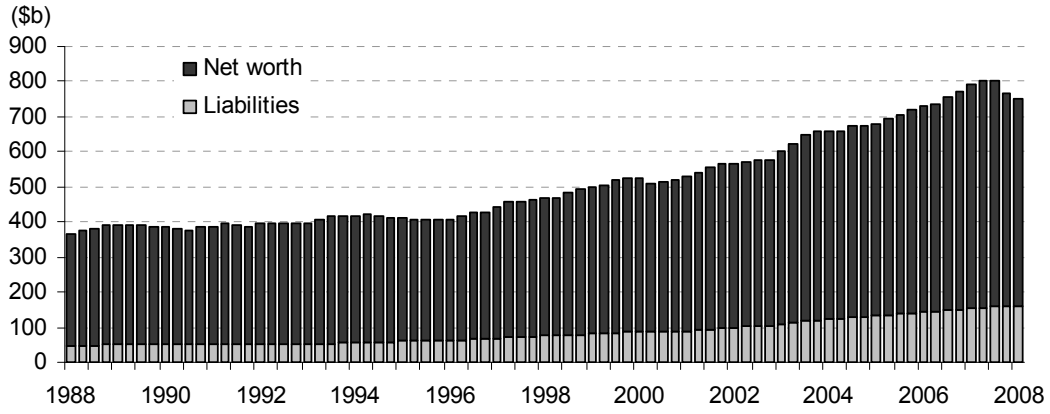
Source: Aggregate data on selected assets and liabilities from RBA Statistics, Table B20 (CPI adjusted to $2008); household numbers derived from interpolation and extrapolation of census data from 1991 to 2006.

The period between 1998–99 and 2003–04 was also associated with a substantial increase in the level of household liabilities. Over the two decades to 2008, liabilities increased to the point that net wealth, which was eighty-eight per cent of gross wealth in 1988 declined to seventy-nine per cent of gross wealth by 2008. Real net wealth increased by twenty-three per cent in the decade to 1998 and by thirty-one per cent in the five years to 2003 (that is, in the 5 years between the 1998–99 and 2003–04 Household Expenditure Surveys). It increased by a further fifteen per cent in the five years to 2008. These increases are illustrated in Figure 3.

[20] Much of the increase in house prices between 2000 and 2003 has been attributed to a boom in investor demand stimulated both by the interaction of taxation and house price inflation making investment in housing tax effective and by supply-side developments that have made investor finance both cheaper and more readily available (RBA, 2002). It was exacerbated by the introduction in 2001 of a direct grant to first home buyers provided through the First Home Owners Scheme. Both of these stimuli are likely to represent unanticipated shocks by owner-occupiers.

[21] By 2008, real gross dwelling wealth (in $2008) had fallen from a peak of $454,000 per household in 2007 to $432,000 in 2008, still higher than its 2003–04 value. These data include financial assets for unincorporated businesses as well as for households and so will be marginally higher than equivalent HES data.

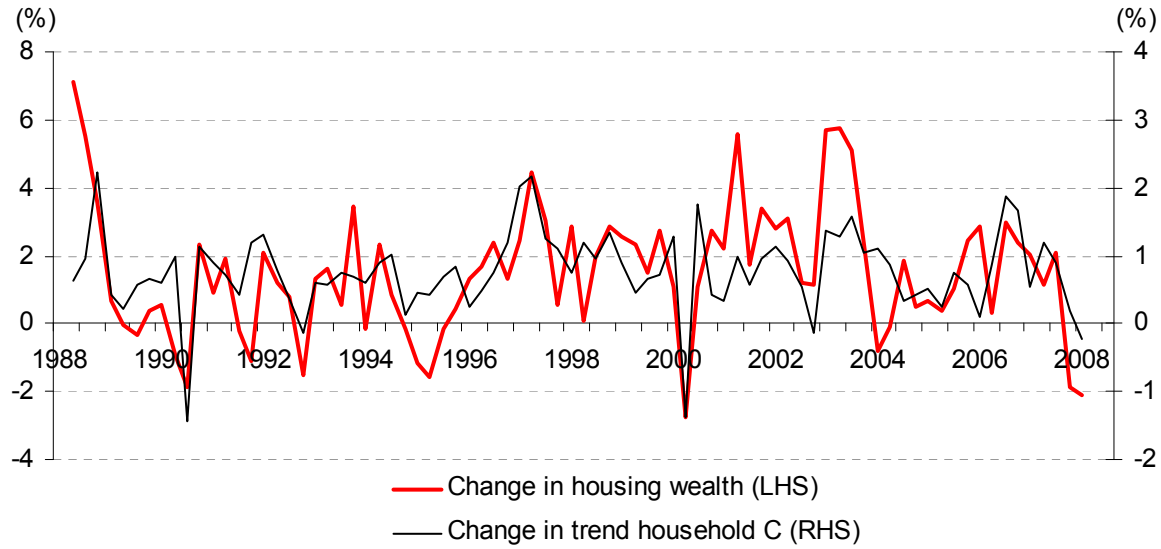
Figure 3: Real net wealth per household ($2008): 1988–2008



Source: RBA Statistics, Table B20 (CPI adjusted to $2008); household numbers derived from interpolation and extrapolation of census data from 1991 to 2006

As noted in Chapter 1, a pattern identified in a number of overseas studies is the positive correlation between household wealth, much of which is tied up in dwelling assets, and household consumption. A similar pattern emerges from an examination of the Australian experience over the past two decades. While clearly there are a number of factors that affect household consumption, the data in Figure 4 highlights the extent to which changes in real household consumption and real housing wealth have been correlated over the past two decades.[22]

Figure 4: Changes in housing wealth and household consumption ($2008): 1988–2008



Source: Wealth data as for Figure 2 (changes in gross housing wealth charted as RBA data do not distinguish housing liabilities from total liabilities); household final consumption data from ABS Cat. No 5206008 (trend data CPI adjusted to $2008)

[22] The contemporaneous correlation between housing wealth and household consumption is 0.5 for the whole period from 1988 to 2008 and 0.68 for the five years from 1998 to 2003. When the consumption response is assumed to pre-empt changes in wealth, the correlation coefficient reduces to 0.0.

As indicated in Chapter 1, the primary aim of this study is to shed light on the transmission mechanisms through which wealth and consumption might be linked, not to repeat the many studies that have estimated the strength of this relationship (although an estimate of the size of the wealth effect is a by-product of the approach taken). The approach and underlying methodology to be used to identify potential transmission mechanisms is outlined in the following chapter. The remaining part of this chapter is used to describe the data to be employed.

3.2 HES data

The data to be used in this study are household level data from Household Expenditure Surveys (HES) from 1975–76 to 2003–04. From 1988–89 these surveys were undertaken every five years; prior to 1988–89, surveys were undertaken in 1974–75 (capital cities only), 1975–76 and 1984. From 2003–04 it is to move to a 6-yearly cycle. The HES collects detailed information about the expenditure, income and household characteristics of a sample of between 7,000 and 10,000 households resident in private dwellings throughout Australia. Each household is interviewed only once.

HES output includes, inter alia, detailed expenditure on over 600 items combined into thirteen broad groups (including current housing costs). Expenditure in the HES is primarily recorded using an acquisitions approach so that expenditure on durables is treated in the same way as expenditure on non-durables and no attempt is made to estimate the imputed rental services from owner-occupied dwellings. For owners, current housing costs include rates payment and mortgage or unsecured loan payments if the initial purpose of the loan was primarily to buy, build, add to or alter the dwelling.

Current weekly household cash income is reported from the following sources: wages and salaries; own unincorporated business; superannuation; investments; other private income; government pensions and allowances. Income from rent is collected net of the expenses incurred in deriving income but income from other investment is collected on a gross basis.[23] Data on current household disposable income are also reported.[24]

For households data have been collected on tenure type, dwelling type and size, household/family composition and size and location at a broad spatial level in each of the six surveys to date.[25] For persons socio-demographic data are collected on age, sex, marital status, country of birth, year of arrival in Australia, participation in school

[23] From 2003–04, the amount of interest paid on money borrowed to purchase shares was also collected. Other changes made to capture reported current income (and particularly unincorporated business income and investment income) have reduced significantly the number of households with extremely low gross household incomes. These changes and their effects are outlined in the 2003–04 User Guide (ABS, 2006a).

[24] Income tax is as reported by the respondents from 1984 to 1998–99 with non-response (and data for all other years) imputed by the ABS on the basis of income and characteristics of household members as reported in the survey and according to the taxation criteria for each year.

[25] Prior to 1998–99, nature of occupancy was used in place of tenure type, with those with a mortgage or loan secured against the property being defined as purchasers and those without as owners. From the 1998–99 HES, owner occupiers are classified as owners with a mortgage and owners without a mortgage (with the former covering households with a loan secured against their dwelling regardless of whether this was used for housing or non-housing purposes). With the release of a second edition of the 1998–99 HES CURF in 2008, all HES CURFs have consistent spatial data at a state/territory level.

and tertiary education, education qualifications, labour force and employment status, and occupation.[26]

Where possible, comparability in conceptions, classifications and methodology employed was maintained between 1984 and 1998–99. Changes made in 1998–99 affect the detailed expenditure classifications but there were only minor changes at the major group level of classification and none affected the housing data relevant for this study.[27] In all surveys, age data are available at least in 5-year categories for those aged from 25 to 65 years at the time of the survey with varying degrees of detail available in the different surveys and for those outside this age range at the time of the survey.

From 1993–94, information is available on the estimated value of owner-occupied dwellings and on outstanding mortgage debt. Prior to 1993–94, debt but not asset information is available. For 2003–04 a comprehensive range of information about the assets and liabilities of each household is available. The inclusion of detailed wealth data at an individual household level in the 2003–04 HES data set and of housing wealth data at an individual household level in the earlier HES data sets means that the data used for the analysis in this report are richer than those used in the studies which serve as a starting-point for the analysis undertaken in the following chapters. Importantly, the existence of individual wealth data obviates the need to use aggregate or disaggregate data on house prices as proxies for the wealth effect that forms the focus of the analysis.

In all surveys, sample weights are calibrated to an independent set of demographic benchmarks.

3.3 Defining cohorts

This section provides information on the process by which the demographic data in the HES was used to construct a series of pseudo-panels for estimation purposes and provides information on the sample sizes involved. As indicated in Section 3.2, the analysis is undertaken at a household level, with data for the 'reference person' in each survey being used to generate the panel data.

3.3.1 Year of birth cohorts

Reference persons within each panel (survey) are identified as belonging to a cohort where the cohort is defined by the year of birth. Cohort 1 is the set of individuals who were born between 1980 and 1984 inclusive. Individuals born between 1975 and 1979 belong to cohort 2, and so on. In total, sixteen cohorts are defined. Definition of the

[26] From 1984, the reference person for each household is chosen by applying, to all household members aged 15 years and over, the selection criteria below, in the order listed, until a single appropriate reference person is identified:

- one of the partners in a registered or de facto marriage, with dependent children;
- one of the partners in a registered or de facto marriage, without dependent children;
- a lone parent with dependent children;
- the person with the highest income;
- the eldest person.

Earlier surveys used 'head of household' or 'any responsible adult' as nominated by the household as someone able to answer questions that relate to the household as a whole. The head was usually taken to be the male 'bread-winner' but otherwise was selected as the person holding the ownership or lease of the dwelling, by gender (males chosen before females) or by seniority.

[27] Summaries of changes from 1998–99 and precise sample sizes from 1984 can be found in ABS (2006a) Household Expenditure Survey and Survey of Income and Housing User Guide, 2003–04, Cat. No. 6503.0. A summary of comparability between 1998–99 HES and previous surveys can be found in ABS (2000) Household Expenditure Survey User Guide, 1998–99, Cat. No. 6527.0.

cohorts and identification of which cohort an individual belongs to reflected the nature of, and constraints imposed by, the HES data. First, the HES were undertaken approximately every five years excluding 1980. Hence, there is a gap of nine years between the first and second HES datasets. Second, within each survey the age of individuals is presented in bands of five years. When defining cohort membership, individuals are assumed to be the median age of the band to which they belong. For example, an individual who is identified as being aged between 25 and 29 years of age is identified as being 27 years of age. The year of birth for the individual, and hence the cohort to which they individual belong, is then identified by taking the age of the individual from the year the HES survey was conducted. For example, for an individual 'aged 27 years' in the 2003–04 HES, the year of birth is 1976. Hence, they will be a member of the cohort of individuals born between 1975 and 1979 (cohort 2). Applying this procedure to all individuals in the successive HES datasets defines the cohorts described in Table 1.

Table 1: Cohort definitions

Cohort	*Year of birth*
1	1980–1985
2	1975–1980
3	1970–1975
4	1965–1970
5	1960–1965
6	1955–1960
7	1950–1955
8	1945–1950
9	1940–1945
10	1935–1940
11	1930–1935
12	1925–1930
13	1920–1925
14	1915–1920
15	1910–1915
16	yob<1910

3.3.2 Age and cohort counts

Table 2 indicates the number of individual reference persons (and hence households) in these various cohorts. Table 3 reclassifies this data by age of reference persons across the various 'waves' of the HES. The numbers in the cells in Tables 2 and 3 capture the sample sizes in each cohort year cell. In total, there are approximately 39,000 observations across the six 'waves' of the HES. In each year-cohort cell, the number of observations varies according to the age of individuals in question and the year in which the HES was conducted. For example, there is only one set of observations for individuals who belong to cohort one (giving a total of 268 observations as shown in Table 2). This reflects the fact that individuals in cohort one were too young to appear in any HES prior to the 2003–04 survey. Similarly, for cohort seven there are six sets of observations corresponding to each of the available HES used in this study. However, this cohort is not observed when their median age was twenty-seven years due to the nine-year gap between the first and second HES.

The figures in Table 3 make clear which cohorts are observed for any given HES. Hence, by the final HES, only individuals who belong to cohorts 1– 12 are observed.[28]

Table 2: Observation count by age and cohort

Cohort	*Median age (years)*											
	22	27	32	37	42	47	52	57	62	67	72	77
1	268	·	·	·	·	·	·	·	·	·	·	·
2	323	514	·	·	·	·	·	·	·	·	·	·
3	460	616	665	·	·	·	·	·	·	·	·	·
4	370	744	758	787	·	·	·	·	·	·	·	·
5	269	753	994	869	828	·	·	·	·	·	·	·
6	·	488	828	1,002	800	715	·	·	·	·	·	·
7	432	·	572	856	990	765	705	·	·	·	·	·
8	·	715	·	523	895	885	670	623	·	·	·	·
9	·	·	624	·	454	614	679	460	493	·	·	·
10	·	·	·	589	·	343	548	531	405	389	·	·
11	·	·	·	·	471	·	319	476	531	372	353	·
12	·	·	·	·	·	537	·	329	551	473	339	580
13	·	·	·	·	·	·	441	·	353	457	466	453
14	·	·	·	·	·	·	·	392	·	277	389	557
15	·	·	·	·	·	·	·	·	404	·	244	430
16	·	·	·	·	·	·	·	·	·	345	276	546

Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

Table 3: Observation count by year and cohort

Cohort	*Year of HES*					
	1975	1984	1988	1993	1998	2003
1	·	·	·	·	·	268
2	·	·	·	·	323	514
3	·	·	·	460	616	665
4	·	·	370	744	758	787
5	·	269	753	994	869	828
6	·	488	828	1,002	800	715
7	432	572	856	990	765	705
8	715	523	895	885	670	623
9	624	454	614	679	460	493
10	589	343	548	531	405	389
11	471	319	476	531	372	353
12	537	329	551	473	339	580
13	441	353	457	466	453	·
14	392	277	389	557	·	·

[28] Data limitations mean that all reference persons older than 75 at the time of the survey are classified in the '75 and over age group' which can result in them incorrectly being placed in a lower cohort than is appropriate

Cohort			*Year of HES*			
15	404	244	430	·	·	·
16	884	283	·	·	·	·

Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

3.4 Life-cycle expenditure

These pseudo-panel data described in Table 1 are used to derive the life-cycle pattern of consumption for different cohorts. This forms the baseline estimate from which to assess the impact of a change in housing wealth. Thus, the paper begins with the same starting point as employed by Attanasio et al. (2008) and Campbell and Cocco (2007) based, in turn, on Attanasio and Weber (1994) and refined by Fernandez-Villaverde and Krueger (2007).

In the descriptive data illustrated below, thirteen cohorts are defined on the basis of the year of birth of the household reference person, with the oldest (cohort 13) having a reference person seventy-five years old or more in 2003–04 and the youngest (cohort 1) having a reference person aged less than twenty years old in 2003–04.

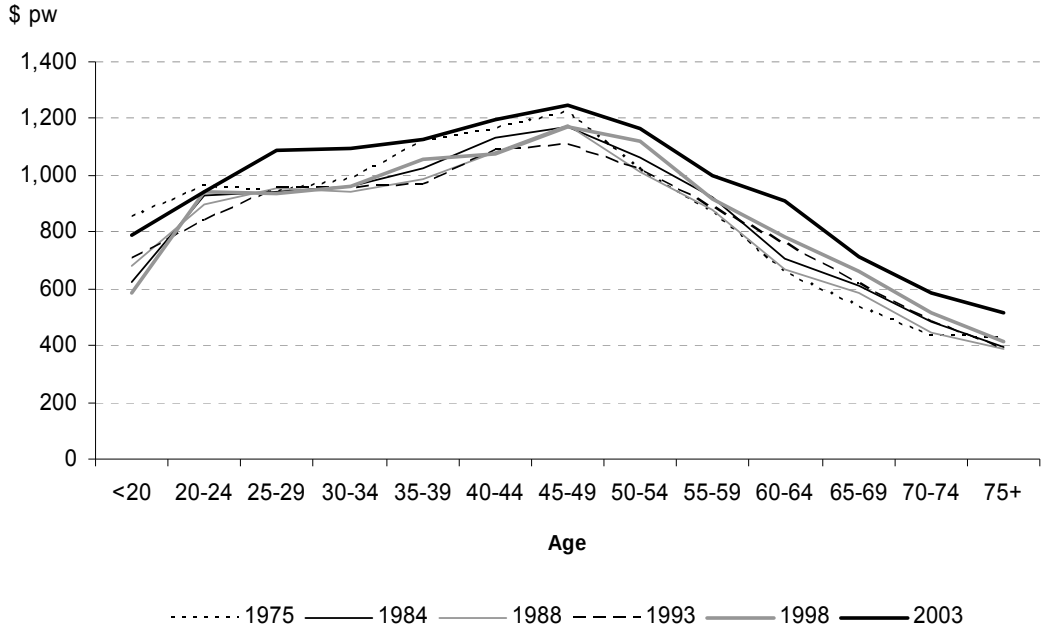
3.4.1 Life-cycle expenditure by age

Figure 5 illustrates real household expenditure on goods and services for each age-group over time where household expenditure is based on total expenditure on goods and services inflated by the consumer price index to $2007. This measure of expenditure is used in the analytical results presented in Chapter 5 but results for an alternative measure of household expenditure based on excluding housing expenditures are presented in Appendix C.[29] Household expenditure by year of birth cohort is presented in Figure 7.

The results in Figure 5 show a conventional pattern, with consumption increasing from the age of twenty to reach a peak in mid-age (late-40s) and declining steadily from then on as households age. This result reflects that which was obtained in the UK studies (Attanasio and Weber, 1994; Attanasio et al., 2008; Campbell and Cocco, 2007). A similar pattern for US households can be seen in Fernandez-Villaverde and Krueger (2007). The “hump” of consumption expenditures that occurs in the mid-age years is often associated with family size but is also explained by liquidity constraints imposed by relatively low current incomes during early stages in the life-cycle and imperfect capital markets (Browning and Lusardi, 1996). Declining consumption for older households can be explained by precautionary saving on their part (Browning and Lusardi, 1996). Fernandez-Villaverde and Krueger suggest the decline in consumption for older households also might be associated with a decline in work-related expenditure.

[29] Selected other payments include income tax payments, repayments of mortgage principal and payments for superannuation and life insurance.

Figure 5: Consumption expenditure by age and year of survey ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

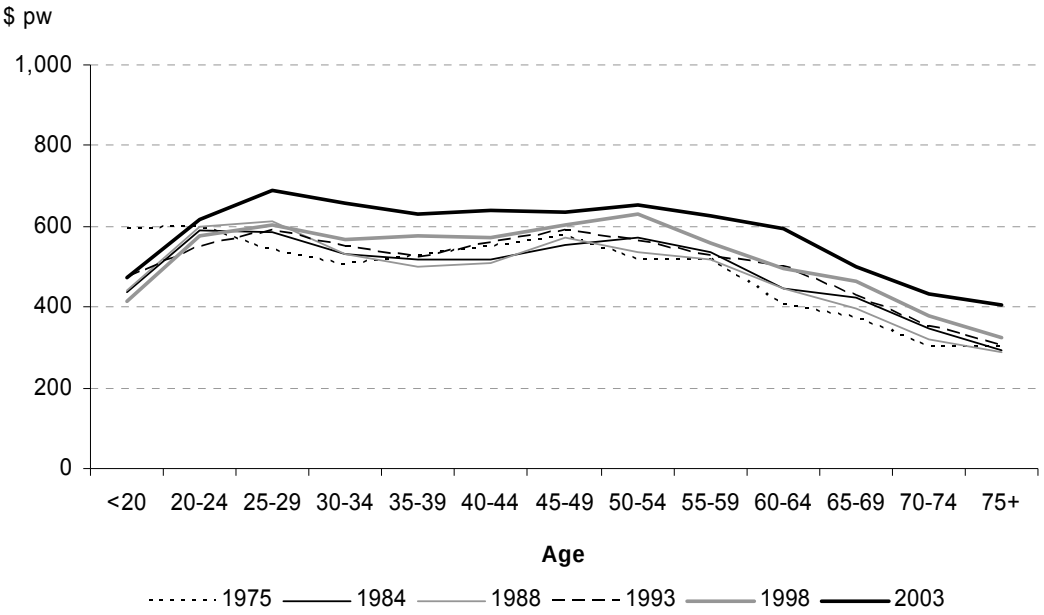
Figure 6 illustrates the effect of using the modified OECD equivalence scale. While use of an equivalence scale means that summary data that control for household size and/or composition can be illustrated, it has the disadvantage of assuming the same equivalence scale applies for consumption as for income. It is used here only to simplify presentation of results. In the multivariate analysis reported later in this report, household size and composition are controlled for directly, rather than indirectly using an equivalence scale.

The results in Figure 6 clearly show the effect that equivalisation has in flattening the hump in consumption during the child-rearing years but also show that the same general pattern of rising consumption through to mid-age and falling consumption thereafter even after controlling for household size.

Both Figure 5 and Figure 6 suggest that age-related consumption on goods and services increased gradually from 1975 until the mid-1990s but that real consumption expenditure increased significantly for all age-groups between 1998–09 and 2003–04.[30]

[30] Tables B.2 and B.3 in Appendix B illustrate comparable results for household disposable income.

Figure 6: Equivalised consumption expenditure by age and year of survey ($2007)



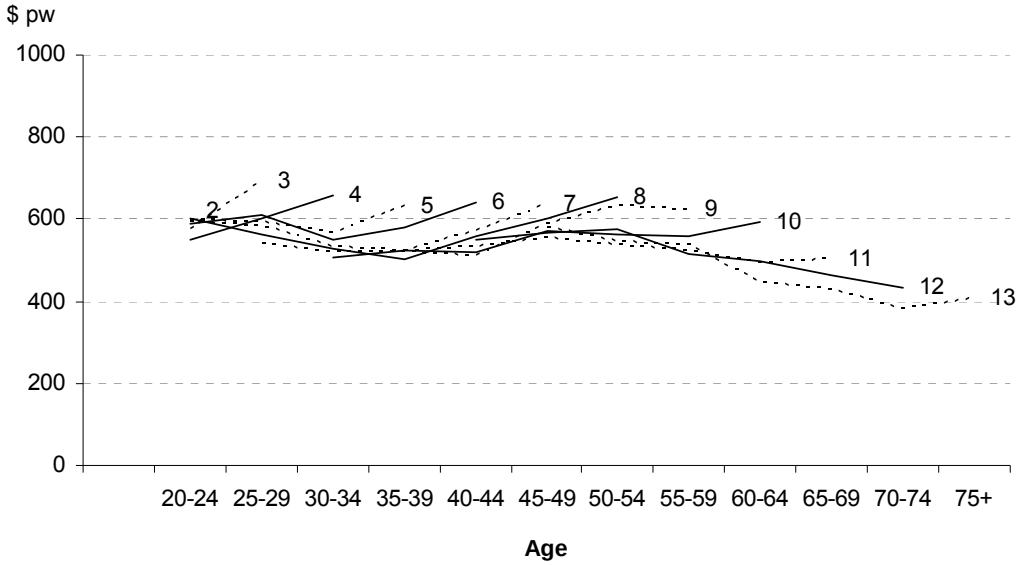
Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

This pattern can be seen in Figure 7 which shows real equivalised consumption profiles for each of the thirteen cohorts described above.[31] Importantly, these paths point to an increase in age-related (equivalised) household consumption in the last survey compared with the norm established earlier.[32] The time spanned by penultimate and the final HES corresponds to the period when housing prices, and consequently the wealth of home owning households, increased significantly.

[31] Cohort labels are located at the 2003–04 age of each of these cohorts.

[32] Consumption for the mid-point between the 1975–76 and 1984 surveys has been linearly interpolated for presentation purposes.

Figure 7: Equivalised consumption expenditure by age and cohort ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

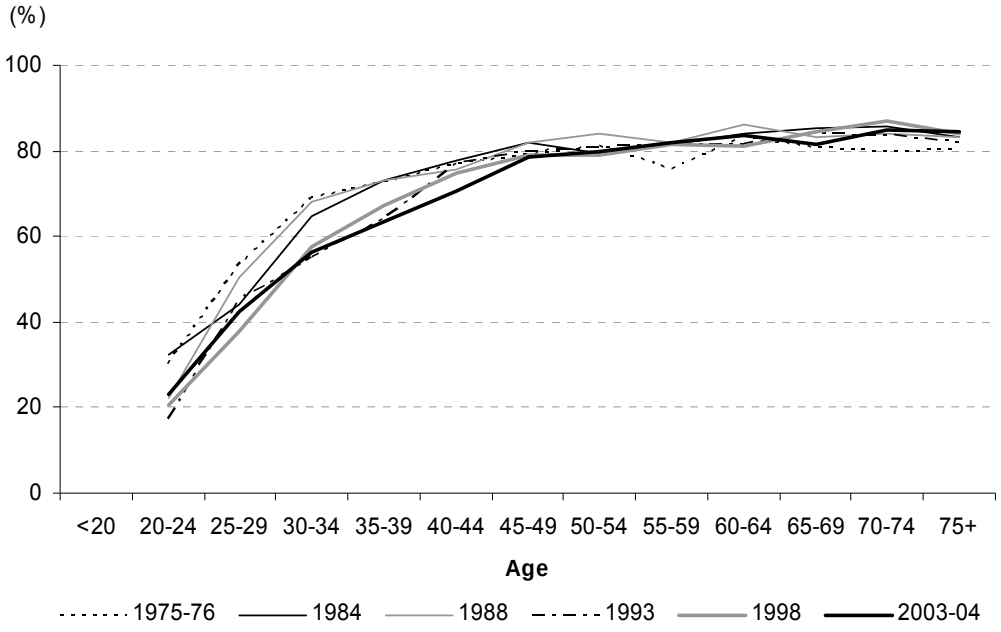
3.4.2 Life-cycle expenditure by age and tenure

The final descriptive life-cycle expenditure data to be presented here disaggregate the above results by tenure to illustrate the extent to which there are differences in outcomes between owners and renters. As argued by Campbell and Cocco, the results illustrated may be compromised by the use of pseudo- rather than true-cohort data as tenure status potentially is an endogenous variable.[33]

Figure 8 shows age-specific home-ownership rates as generated from the HESs used in this study. This shows two key points relevant for this study. The first is that home ownership rates increase rapidly for households up to the age of 35 or 40 but the incremental increases thereafter are relatively small. Endogeneity between income and tenure status, therefore, is more likely to be a problem for younger households rather than older age-groups in pseudo-cohort data. The second key point is that home-ownership rates for young households have declined significantly over the period. Similar results from Census data, which are not subject to sampling error, can be seen in Yates et al. (2008). This may reflect either an affordability constraint or a life-stage choice on the part of the young. The likely impact on their consumption patterns is likely to be ambiguous as an aspiration to home ownership might encourage them to increase saving, whereas an inability or unwillingness might encourage them to reduce their saving.

[33] Household structure, embedded in the results presented in both sets of results illustrated in this section, also potentially is an endogenous variable.

Figure 8: Age-specific home ownership rates, HES data

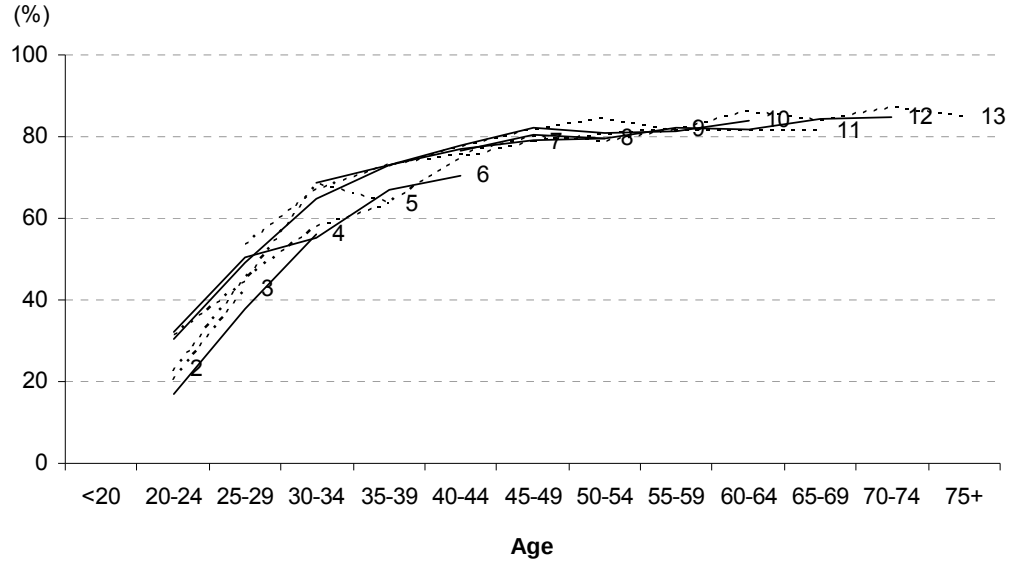


Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

Figure 9 shows the transition to home ownership for twelve of the thirteen cohorts defined in this study and as estimated from the pseudo-panel survey data.[34] It suggests that home-ownership rates peaked at around 80–85 per cent for older cohorts (up to cohort 7, which covers those born before 1958 and, hence, older than 45 years in 2003–04) but suggests that younger cohorts (from cohort 8 and younger than 45 years in 2003–04) may not achieve the same high rate of home ownership. Together these results suggest the need to allow for the changing proportion of households in each tenure for different age groups or for different cohorts.

[34] Sample sizes are too small to be reliable at a disaggregate level for the youngest cohort.

Figure 9: Transition to home ownership by cohort, HES data

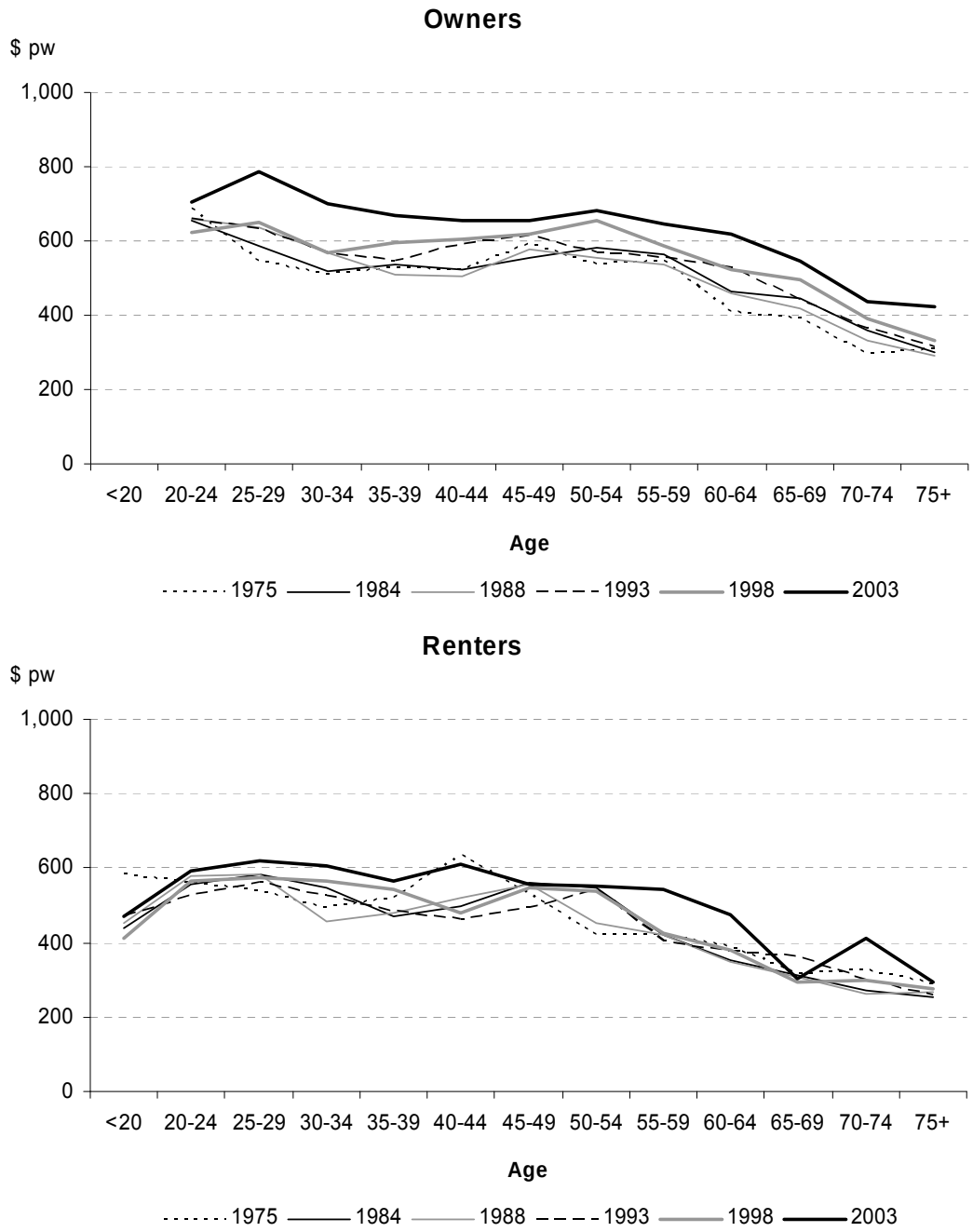


Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 and 2003–04. Results derived from ABS Basic CURF data. As with the consumption data, tenure outcomes for the mid point between the 1975–76 and 1984 surveys have been linearly interpolated for presentation purposes

Age-specific equivalised consumption expenditures by owners and renters are illustrated in Figure 10 (which therefore disaggregates by tenure the results illustrated in Figure 6). Again, a number of observations can be made about these results. In the first place, for each age group they show generally higher average consumption expenditure for owners compared with renters (reflecting, presumably, significantly higher life-cycle income for owners). Second, when disaggregated by tenure, the results do not show the clear hump-shaped pattern of life-cycle consumption evident in Figure 6. With the exception of data for younger owners in 2003–04, they suggest a relatively flat (equivalised) consumption expenditure for households in both tenures until the middle-age years.[35] They also suggest that, for younger households at least, the increase in consumption in 2003–04 generally has been greater for owners rather than renters. The analysis presented in Chapter 5 examines this possibility explicitly.

[35] Yang (2008) also presents life-cycle profiles of equivalised consumption expenditure disaggregated by tenure but separates out housing and non-housing consumption expenditure. The results are similar to those illustrated above for renters but Yang's non-housing consumption expenditure results for owners retain a conventional hump-shaped pattern. Housing consumption expenditure for both renters and owners tends to increase over the life-cycle.

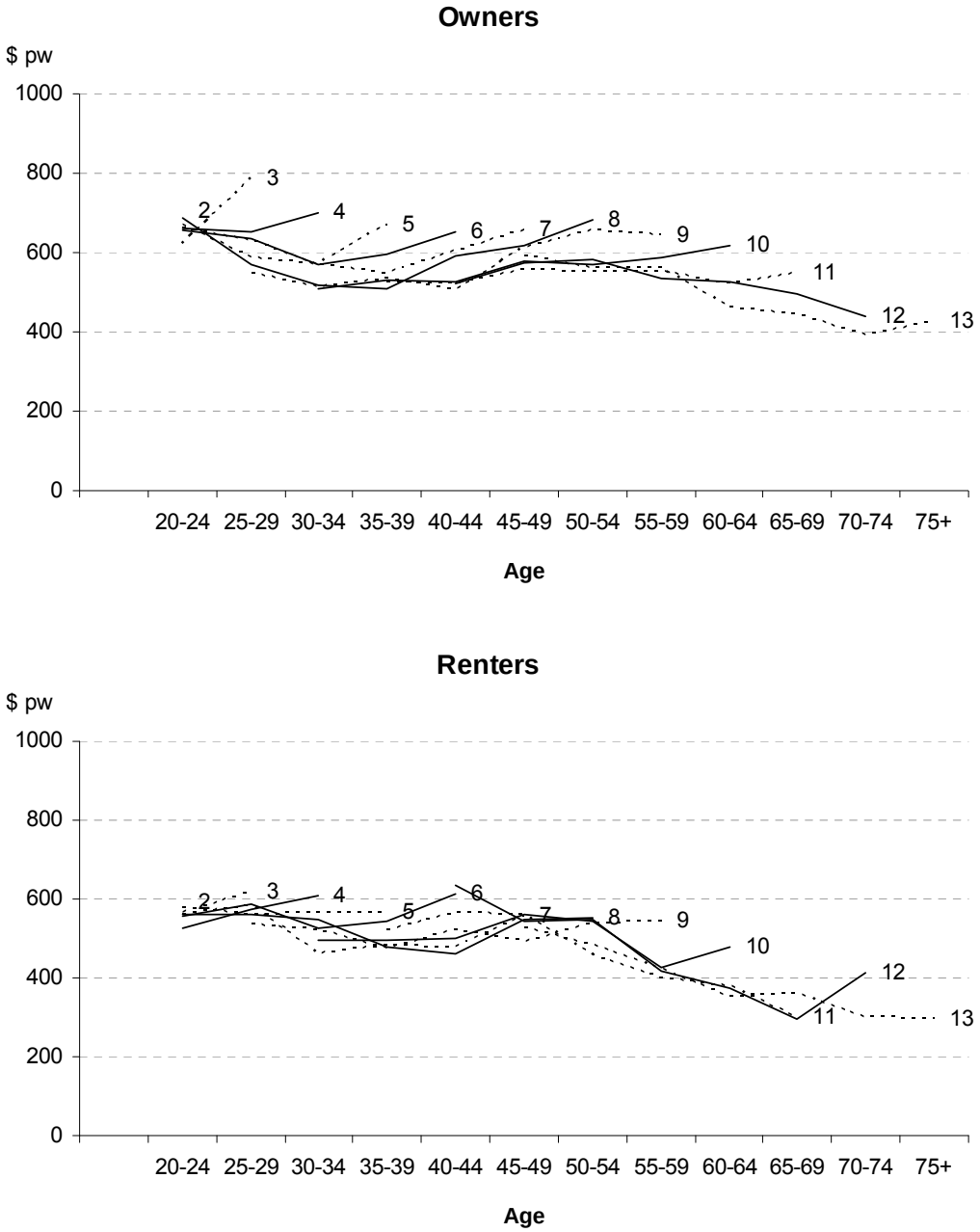
Figure 10: Equivalised consumption expenditure by age, tenure and year of survey ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

The final set of charts illustrating the descriptive life-cycle expenditure data are given in Figure 11 which presents equivalised consumption expenditure data by cohort (and disaggregates by tenure the results presented in Figure 7). These charts reinforce the suggestion from the results illustrated in Figure 10. They suggest that increases in (equivalised) consumption expenditure are more pronounced and more systematic for owners rather than renters but suggests that there have been increases for older renters.

Figure 11: Equivalised consumption expenditure by age, tenure and cohort ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

Further disaggregation suggests that it is the behaviour of outright owners (that is, of those without a mortgage) rather than owner purchasers (with a mortgage) that is the driving force behind this result. This is consistent with the Reserve Bank of Australia's analysis of equity withdrawal from which they concluded that the bulk of funds generated from equity withdrawn from owner-occupied housing were used for asset accumulation rather than consumption-type expenditure (RBA, 2005, Table 4; Schwartz et al., 2008; Ellis et al., 2003). Illustrative charts are presented in Figure C4 in Appendix C.

Supplementary results presented in Appendix C also illustrate the effect of excluding expenditure on housing from the measure of consumption expenditure (in Figure C5 and Figure C6).

The data illustrated in this section form the basis for the baseline estimate of consumption expenditure to be presented in Chapter 5.

3.5 Wealth data

Information on the estimated value of owner-occupied dwellings along with information on household loans have been collected in the HES since 1993, but detailed information on a comprehensive range of household assets and liabilities was collected for the first time in 2003–04. The HES data relevant for this study are described here. Data are available on both gross and net housing and other forms of wealth. Total net wealth or net worth is defined as the difference between the value of the stock of household assets and the value of the stock of household liabilities. Assets include financial assets (such as bank deposits, shares, superannuation account balances and the outstanding value of loans made to other households or businesses) and non-financial assets (including produced fixed assets such as dwellings and their contents, vehicles and machinery and equipment used in businesses owned by households, intangible fixed assets, business inventories and non-produced assets such as land). Liabilities are primarily the value of loans outstanding.

3.5.1 Net household wealth

Figure 12 illustrates household net wealth broken down by the age of the household reference person and disaggregated by tenure.

On average, Australian households reported a net household worth of $475,000 in 2003–04.[36] Of this, forty-four per cent was held in the form of equity in owner-occupied property and an additional ten per cent in the form of equity in other property (including rental property). Results not illustrated show that superannuation accounts for a further fourteen per cent of household net worth and less than five per cent of net worth is liquid in the sense of being held in the form of accounts with financial institutions. The ratio of average net wealth to average gross wealth was eighty-seven per cent (or, conversely, in 2003–04, the ratio of liabilities to assets was a relatively low 13 per cent).

Most net wealth is held by owner-occupier households who have an average net wealth of $628,000 (of which $297,000 is in the form of equity in owner-occupied property and $61,000 is in the form of equity in other property). This is in marked contrast with non-owner-occupier households who have an average net wealth of only $114,000 (of which only $21,000 is in the form of equity in property).

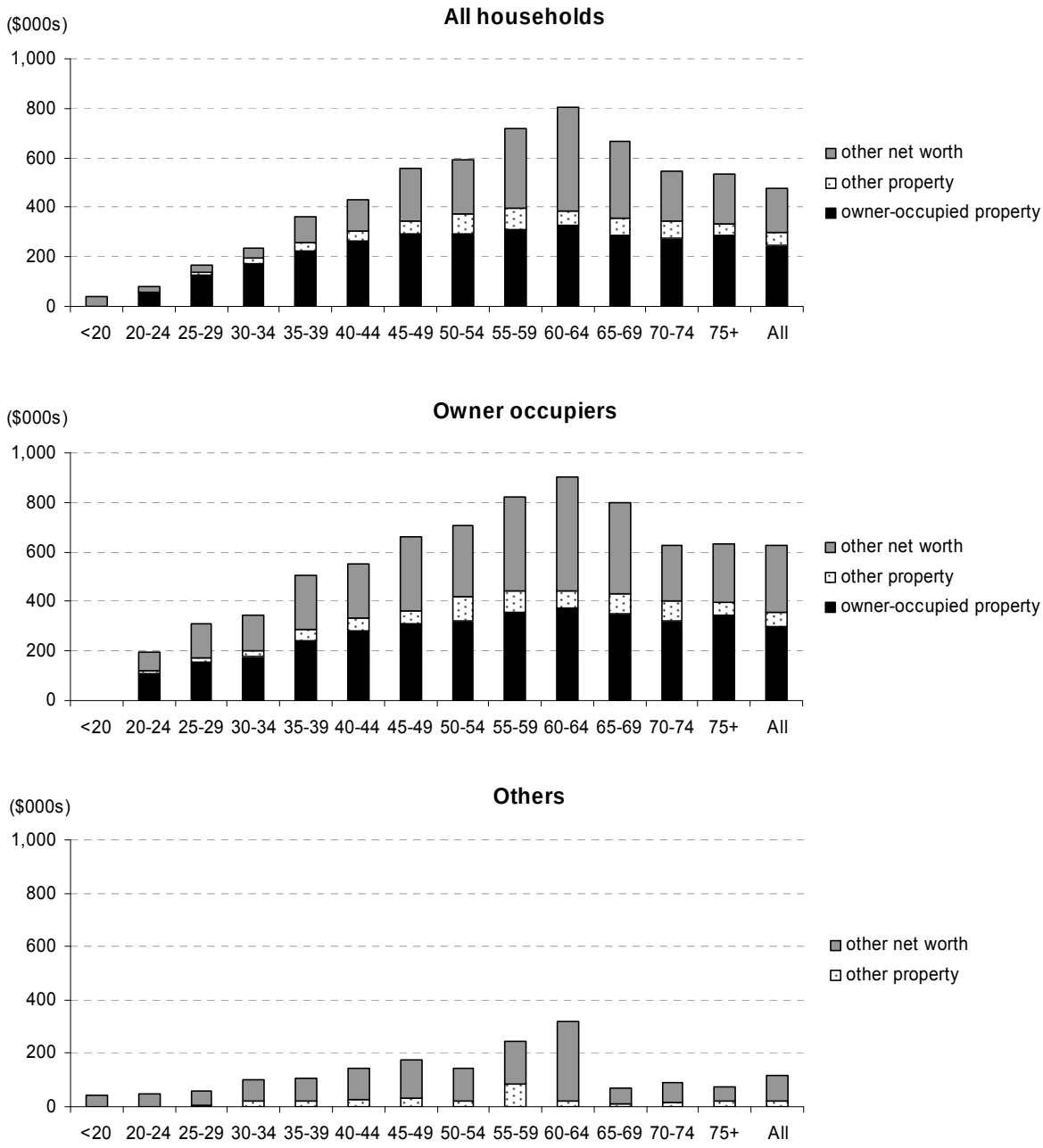
Household net wealth increases markedly with age, up to 65 years old and then declines relatively rapidly in the post-retirement years with the changes being more marked for financial rather than non-financial wealth (reflecting, presumably, the transformation of superannuation wealth into an income stream). The results published by the ABS (2006b) show that wealth is unequally distributed with the twenty per cent of households in the top net wealth quintile holding fifty-nine per cent

[36] This compares with an average of $468,000 reported by the ABS (2006b, Table 1) and based on the 2003–04 Survey of Income and Housing (SIH). The wealth results from the confidentialised unit record file (CURF) of the HES and differs marginally from those given in the official ABS publication both because the HES is a sub-sample of the SIH and because of the steps taken to confidentialise the data on the CURF. More details of the ABS survey can be found in the relevant ABS publication which compares the wealth data in the Australian System of National Accounts (ASNA) and the 2003–04 SIH (in Appendix 3). Once appropriate adjustments are made for differences in scope the aggregate SIH data are approximately ten per cent higher than the national accounts data. However, as argued in chapter 1, it is the household's own assessment of its net wealth that is the more appropriate for this study.

of total net wealth in Australia. Median net wealth is slightly less than $300,000 per household.

As can be seen in Figure 12, both owners and renters have positive equity in net housing wealth: the former in both owner-occupied and other property and the latter, by definition, only in the form of other property (for example as rented property or holiday homes). However, the net value of housing wealth is dominated by that held in the form of owner-occupied housing.

Figure 12: Net worth by age and tenure, 2003–04



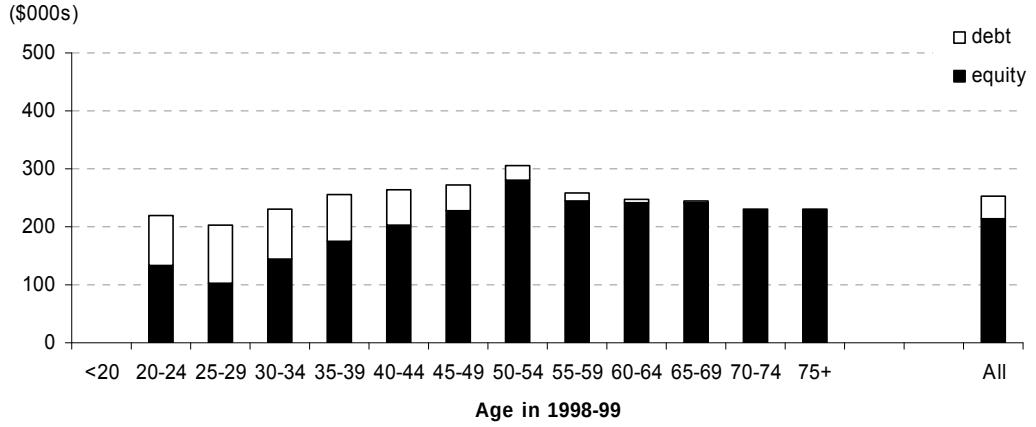
Source: Australian Bureau of Statistics Household Expenditure Survey, 2003–04. Results derived from Basic CURF data.

3.5.2 Owner-occupied housing wealth

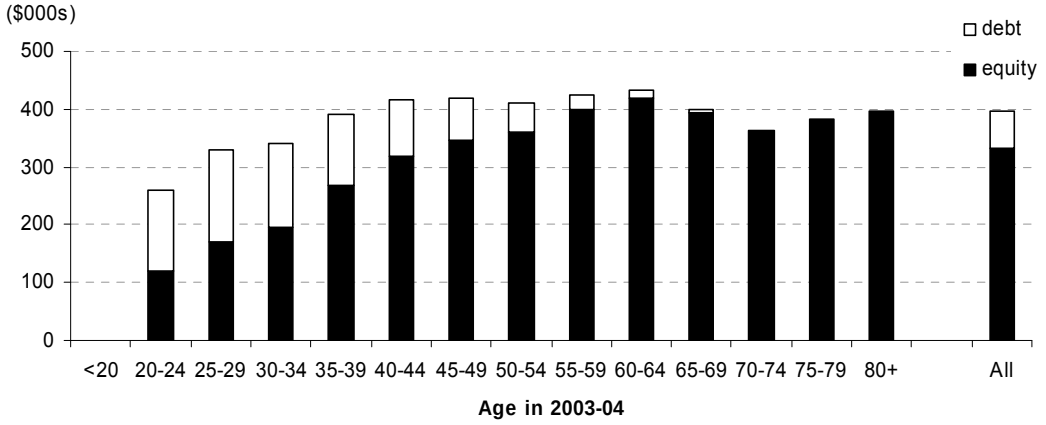
In 1998–99, the average value of owner-occupied housing for each owner was assessed at $254,000 (in $2007) and varied from $203,000 (in $2007) for those in the 25–29-year age group to $305,000 (in $2007) for those in the 50–54-year age group. These results are shown in the top chart in Figure 13. The average loan-to-valuation ratio across all households was sixteen per cent, with a decline from around fifty per cent for the youngest households to zero per cent for those at retirement age.

Figure 13: Equity and debt held in owner-occupied property

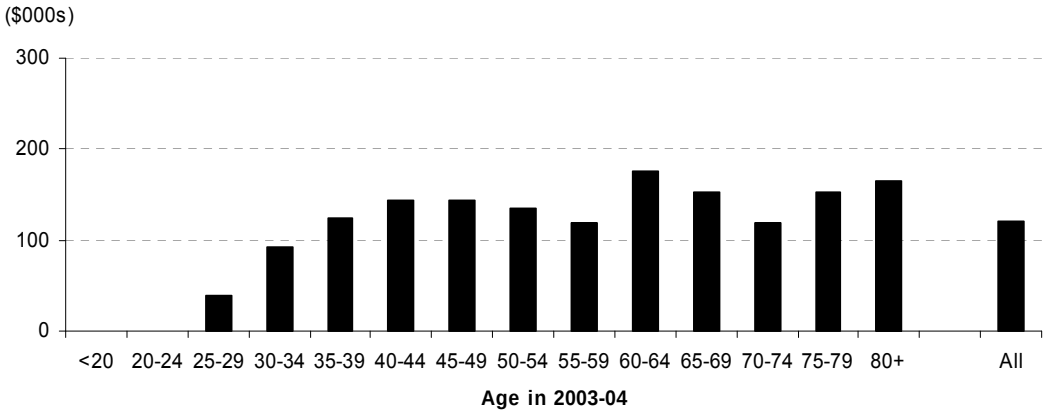
1998–99 ($2007)



2003–04 ($2007)



Cohort change in equity in owner-occupied housing: 1998–99 to 2003–04 ($2007)



Source: Australian Bureau of Statistics Household Expenditure Survey, 2003–04. Results derived from Basic CURF data.

By 2003–04 the average value of owner-occupied housing was assessed at $396,000 (in $2007) and varied from $259,000 (in $2007) for the small number of the youngest owner-occupiers to $434,000 (in $2007) for those in the 60–64-year age group (the middle chart in Figure 13). In 2003–04 the average loan to value ratio across all households remained at sixteen per cent but it had increased marginally for the youngest households.

The top two-thirds of Figure 13 illustrates the way in which equity in owner-occupied wealth builds up over the life-cycle as housing debt is repaid (and as inflation reduces the real value of housing debt at the same time as house price inflation increases the gross value of housing assets).

The final third of Figure 13 shows the average gain in equity in owner-occupied housing enjoyed by each age cohort (measured by the difference in average equity for a given age group in 1998–99 and that for the age group five years older in 2003–04.

Between 1998–99 and 2003–04, average household equity in owner-occupied housing increased by fifty per cent from $213,000 to $333,000, reflecting the significant increase in dwelling prices that occurred over the same period. The average change in the value of equity in owner-occupied housing in the five years to 2003–04 was $120,000 (measured in $2007) which represents a real increase of forty-seven per cent on the value of equity in 1998.[37]

[37] The reported increase in the average gross value of owner-occupied housing was fifty-seven per cent. The slightly lower growth in equity arises from relatively greater increase in the average value of outstanding debt. Over the same period, the ABS index for house prices (which is limited to capital cities only) increased by sixty-two per cent in real terms.

4 METHODOLOGY

As noted in Chapter 1, the principal aim of the analysis in this paper is to use household level data to distinguish between the alternative explanations that have been provided for any observed correlation between housing wealth and consumption: viz. a direct wealth channel, a credit constraint channel and a common cause channel. A secondary aim is to determine the extent of a housing wealth effect on household consumption in Australia. This chapter describes the methodology employed to distinguish between the alternative explanations that have been provided for any observed correlation and to identify how, if at all, housing wealth affects consumption expenditure. The approach is similar to that adopted in studies discussed in Chapter 2 and Appendix B, namely Attanasio and Weber (1994), Attanasio et al. (2008) and Campbell and Cocco (2007). Section 4.1 provides an outline of the basic framework for the approach employed here. Sections 4.2 and 4.3 set out the detailed empirical specifications employed in this study to gain insight into the ways in which housing wealth might affect household consumption. Section 4.4 summarises some of the key statistics from the HES data used in the results reported in Chapter 5.

4.1 Consumption over the life-cycle

Following Attanasio et al. (2008), the starting point and underlying theoretical basis for the empirical analysis in this report is the life-cycle model of consumption in which household consumption is proportional to lifetime wealth. The basic prediction of this model is that consumption is smoothed over time with households borrowing when young, saving in middle age and dis-saving in retirement. This behaviour generates an age-wealth profile that has the familiar 'hump shape'.

4.1.1 Baseline specification

The starting point for the empirical specification is the determination of the life-cycle consumption profile for each individual household. These, in turn, are based on the underlying (anticipated) life-time wealth profiles. These profiles can then be used to determine whether the impact of unanticipated changes in wealth on consumption patterns differ for different age groups.

However, estimation of consumption profiles over the life-cycle is not possible with use of a single cross-section data set. Cross-sectional data represents a snapshot of a population at a given point in time and captures well the factors that vary over the life-cycle. However, when observing differences in consumption between households of different ages, age-consumption profiles will reflect both genuine age (life-cycle) effects but also differences across cohorts (Attanasio et al., 1999, p.33). For example, differences in the consumption patterns of young households (such as those currently aged less than 40 years) and older households reflect more than the disparity in the age of those households. Effectively, the older households belong to 'a different generation' and the consumption behaviour exhibited by these (older) households will reflect the unique set of experiences and events faced by households of that generation. With a single cross-section of data it is not possible to distinguish the separate effects associated with age and the specific experiences of a particular generation (or cohort) of households: hence the use of panel data which enables these differences to be isolated. Cohort effects, for example, can be controlled for by taking averages over households of a particular age which belong to different cohorts (that is, have different birth dates). In addition, at different points of time, each cohort may be affected by factors that are common to all households but which vary over

time and which may affect different households differently. Macroeconomic shocks are a clear example.

The baseline specification in (4.1) expresses household consumption as a function of a number of observable variables that capture the broad factors that affect household consumption over the life-cycle as well as time and cohort effects.

$$X_t^h = f\left(age^h\right) + \gamma' z_t^h + \beta' T_t + \alpha^c + e_t^h \quad (4.1)$$

Here X_t^h is the consumption expenditure of household h at time t; $f\left(age^h\right)$ is the age of the reference person in the household entered as both linear and quadratic terms; z_t^h is a set of observable characteristics of the household including current income, size, composition, occupational status of the household head; T_t is a series of time dummy variables; α^c is a cohort-specific intercept; and e_t^h is a residual term.

The coefficients γ', β' and α^c are sets of parameters to be estimated.

4.1.2 Justification of functional form

Use of a quadratic function characterises consumption as following an 'inverted U-shape' over the life-cycle. As indicated in Chapter 3, in the HES data employed in this study, consumption generally increases from the age of around 20 to reach a peak in mid-age (late 40s) and declines steadily from then on as households age. The set of observable characteristics is constrained by those available in each of the various HESs and is defined on a consistent basis over the six surveys. These include information on family size and composition, labour market participation and household income, as well as limited spatial data.[38]

The baseline specification also includes a series of time and cohort dummy variables. The time dummies allow for structural changes (such as changes in the financial system) and key macroeconomic variables (such as changes in interest rates or macroeconomic shocks) that may vary for each survey and affect all cohorts at that time. The cohort dummies allow for differences in the behaviour of successive cohorts (arising, for example, from differences in time preference or attitudes to risk). The descriptive analysis of the data in Chapter 3 suggests that, for various reasons, the average consumption profile of successive cohorts may have shifted up or down. Heterogeneity effects are absorbed into the error term. Assuming that any residuals average out to zero over the estimation period and are uncorrelated with any deterministic trends enables separate estimates for age, cohort and time effects to be generated (Attanasio et al. 2008, p.10).

The specification in (4.1) provides base consumption profiles but does not explicitly include measures of household wealth, nor does it incorporate variables that enable the alternative transmission mechanisms by which household wealth affects consumption to be determined. The latter are introduced in the following section following a well-trodden path. The specific contributions made by this paper are covered in Section 4.3 where alternatives to the wealth proxies employed in other studies are introduced.

[38] Age and all other household characteristics are based on the reference person in the household, where the reference person is usually the person with the highest income or the oldest in the household.

4.2 Identifying transmission mechanisms

As outlined in Chapter 1, identification of the underlying transmission mechanism between household wealth and consumption assumes that the groups within the population are affected differently by the change in housing wealth observed during the period 1998–99 – 2003–04.

The approach employed in this section is motivated by that of Attanasio and Weber (1994) and of Attanasio et al. (2008) but differs in a number of key respects. The first set of extensions to the baseline specification, covered in this section, are designed simply to determine whether consumption responses of households in the three age groups in 2003–04 differ significantly from their baseline consumption profiles without the complication of explicit wealth terms, however defined. This approach is similar to that employed by Attanasio and Weber (1994) and Attanasio et al. (2008). It is equivalent to assuming that the significant increase in house prices and housing wealth that occurred in Australia between 1998–99 and 2003–04 was similar for all households (and therefore, equivalent to including a national rather than regional house price term). As in both of the earlier studies, differences or similarities in the coefficients of the three age-group dummies provide evidence of the transmission mechanism through which house prices affect consumption.

4.2.1 Year and cohort interaction

In equation (4.2), differences in the behaviours of different groups are tested for by incorporating age-group dummy variables into equation (4.1) and interacting these with a time dummy for 2003–04. The age-group dummies define households as belonging to young, middle-aged, or older cohorts, with a young household having a reference person aged less than 40 years of age $\left(DY_t^{ch}=1\right)$ in 2003–04, a middle-aged household having a reference person aged between 40 and 60 years of age $\left(DM_t^{ch}=1\right)$and an older household having a reference person aged 60 years of age or more $\left(DO_t^{ch}=1\right)$.[39]

Equation (4.2) sets out the first of the extensions to the baseline specification in (4.1) by including an implicit or indirect measure of housing wealth based on use of a time dummy for the period when housing wealth increased. .

$$X_t^h = f\left(age^h\right)+\gamma' z_t^h+\beta' T_t \ +\alpha^c+\theta_Y\cdot T_{2004}\cdot DY_t^{ch} +\theta_M\cdot T_{2004}\cdot DM_t^{ch}+\theta_O\cdot T_{2004}\cdot DO_t^{ch}+e_t^h \tag{4.2}$$

Here T_{2004} is time dummy variable representing the final HES and all other variables are as described above. In equation (4.2), the effect of housing wealth is captured

[39] Age 40 was chosen as a break for defining households as 'young' because the data reported in Chapter 3 shows that, by 40, most households have made their life-time housing choices. Age 60 was chosen as a break for 'older' households because it defines the age at which, historically, the greatest proportion of workers have begun to move out of full-time employment and the age at which they have been eligible for mature age benefits. The use of three age-defined groups or cohorts (young, middle and older) reflects the behavioural responses that are likely to be observed under the alternative transmission mechanisms discussed previously. As a group, individuals aged less than 40 are likely to have accumulated only limited wealth in the form of housing. Middle-aged households will have made their lifetime housing choice and accumulated some wealth in the form of housing by accumulating housing equity. Older households will generally have paid off mortgage debt and are likely to have moved into semi- or full retirement. Although the age groups could have been defined more closely, for example using 10-year age groups, identification of their behavioural responses becomes more difficult from an econometric point of view. As specified, the coefficients on the age-defined cohorts capture the average effect of all individuals in each of the young, middle and older cohorts.

only indirectly by inclusion of a time dummy variable for 2003–04 interacted with the age-defined cohort variables $\left(DY_t^{ch}, DM_t^{ch} \text{ and } DO_t^{ch}\right)$.

The interest in this specification lies in the outcomes for θ_Y, θ_M and θ_O, the coefficients on the interaction terms of the age-cohort dummies with the time dummy for the final HES. These show how consumption changed for these cohorts in the period associated with the large increase in housing prices between 1998–99 and 2003–04. In particular, they indicate how consumption patterns among these cohorts deviated from the underlying life-cycle pattern as captured by the baseline specification in equation (4.1). In each case, these coefficients should not be interpreted as indicating a direct causal relationship between housing wealth and consumption, as they may reflect one of a number of possible explanations. The question of causality is addressed by determining whether the various age-defined cohort groups (young, middle-aged and older) exhibit different consumption patterns. Similarities (or differences) in those patterns are consistent with alternative hypotheses advanced to explain the observed correlation between housing wealth and consumption. If older households experience larger increases in housing wealth than do younger households (for example because more of them are home owners), a direct wealth effect may be observed if θ_O exceeds θ_Y.

4.2.2 Year-cohort-tenure interaction

The use of equation (4.2) to identify the transmission mechanism depends on the presumption that such an effect will be greater for older households because the increase in their housing wealth is greater than it is for younger households. This presumption can be tested for explicitly by controlling for tenure status. Direct wealth effects arising from increases in housing wealth should show up only for households who are home owners. The possibility that consumption responses to the increase in housing wealth in the 2003–04 HES might vary by tenure status as well, as age is taken into account with the following specification:

$$\begin{aligned} X_t^h = f\left(age^h\right) + \gamma' z_t^h + \beta' T_t + \alpha^c + \theta_Y \cdot T_{2004} \cdot DY_t^{ch} \cdot O_{2004}^h \\ + \theta_M \cdot T_{2004} \cdot DM_t^{ch} \cdot O_{2004}^h + \theta_O \cdot T_{2004} \cdot DO_t^{ch} \cdot O_{2004}^h + e_t^h \end{aligned} \tag{4.3}$$

Here O_{2004}^h is a dummy variable capturing the tenure status ($O_{2004}^h = 1$ for homeowners) of household h in 2003–04 and all other variables are as defined in equation (4.2). This specification allows the consumption response of homeowners in 2003–04 to differ according to the age-group cohort to which they belong. As argued in Chapter 1, a direct wealth effect implies larger effects on consumption for older home-owners compared with younger home-owners who are more likely to be short in housing and who have a greater time span over which any increase in wealth may be consumed. This specification also allows a test of whether the consumption behaviour of home-owners as a group differed from that of renters in 2004 by considering the joint significance of $\theta_Y, \theta_M \text{ and } \theta_O$.

4.3 Incorporating household wealth into the specification

Both specifications in the previous section implicitly presumed that all home owner households experienced an identical unanticipated increase in their housing wealth. They did not allow for any individual variation in the size of these wealth effects within each age-defined cohort. This section relaxes that assumption and does so in a more precise way than that used by Attanasio and Webber (1994) and Attanasio et al. (2008). Both of these earlier studies employed regional house price measures in an

attempt to allow changes in wealth to vary across households according to the region to which they belonged.

The extensions to the baseline specification in this section exploit a characteristic of the HES described not available in the data employed by Attanasio and Weber (1994) or Attanasio et al. (2008). In clear contrast to the survey data relied upon in these UK-based studies, an important advantage of the Australian survey data used here is that the penultimate and final HES included detailed information on the wealth holdings of households. These data are relatively limited for the 1998–99 survey but are comprehensive for the 2003–04 survey. They mean that information is available on wealth at an individual household level, and hence, obviate the need for use of either national or regional price data as a proxy for changes in wealth. The observed heterogeneity in changes in house prices by location and market segment (such as dwelling type and size) means that aggregate house price data (even when disaggregated to a regional level) are likely to average out much of the differences in actual changes experienced at an individual household level. The capacity to explicitly control for the (self-assessed) value of wealth for each household means that attempts to determine how different households respond to a given (and presumed unanticipated) change in their housing wealth are not confounded by assumptions about the extent to which they have experienced an increase in this wealth.

In general, differences in the responses of these age-defined cohort groups are captured in the specifications in this section by interacting the relevant dummy variables with a term representing housing wealth. In the estimates reported in Chapter 5, this wealth term is specified in a number of different ways designed to exploit the information available in the HES. In each case, tests for statistical differences in the size of the coefficient on the interaction terms between the various age-groups are used to distinguish between the competing hypotheses outlined above. As in the specifications above, evidence that the three age groups of home owners responded to the increase in housing wealth in a similar fashion, as measured by equality of the coefficients on the interaction terms would be consistent with a direct wealth effect. Conversely, evidence that the response of the younger age group was larger, would be consistent with the 'common cause' hypothesis.

4.3.1 Direct measures of housing wealth

A benefit of the HESs is that the final two surveys (1998–99 and 2003–04) contain data on a variety of household assets and liabilities. The availability of these wealth data allows any housing wealth-related impact on consumption to reflect both the cross-sectional and time-series variation in the data. In each of the surveys where information is available on housing wealth, the specification allows the response to self-evaluated housing wealth to differ across age-defined cohorts. This allows the 2003–04 wealth data to reflect the response to the (presumed unanticipated) increase in housing wealth between 1998–99 and 2003–04.

The specification described in (4.4) incorporates the direct measures of housing wealth available in the final two HESs by interacting year dummy variables ($T_{1999}=1$ and $T_{2004}=1$) and age-defined cohort dummy variables with measures of housing wealth $\left(HW_t\right)$ as follows:

$$
\begin{aligned}
X_t^h = {} & f\left(age^h\right) + \gamma' z_t^h + \beta' T_t + \alpha^c + \theta_Y^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} \\
& + \theta_M^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} + \theta_O^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} \\
& + \theta_Y^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} + \theta_M^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} \\
& + \theta_O^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} + e_t^h
\end{aligned}
\qquad (4.4a)
$$

Here the term HW_t is a measure of the individual household's self-reported housing wealth and all the remaining variables are as defined above. Again, the statistical tests will examine whether there are any differences in the behaviours of age-group cohorts as reflected in the magnitude of the coefficients θ_Y^{2004}, θ_M^{2004} and θ_O^{2004}.

The approach in this study has some significant advantages over that used in other studies. For example, Attanasio and Weber (1994) and Attanasio et al. (2008) incorporated measures of regional variation in house prices and therefore housing wealth when distinguishing between the various transmission mechanisms discussed above. The measure available in the HES contains substantially more variation through the use of the households' own assessments of their housing wealth. One problem of using such a measure is that a household's own assessment of their housing wealth may be subject to measurement error.[40] While this may be so, it can be argued that an owner's own assessment or perception of their housing wealth is likely to provide a better indicator of the impact that housing wealth has on household consumption than a possibly more accurate but externally imposed assessment about which the household has inaccurate information.

Specification (4.4b) provides a simple extension to this specification by incorporating a number of loan-to-value ratio dummies to control for the extent to which households might face a collateral constraint. Specification (4.4c) constrains the coefficients on the wealth-cohort interaction terms for 1998–99 and 2003–04 to be equal. The exact specification and results are reported in Chapter 5.[41]

4.3.2 Controlling for other forms of wealth

The final HES includes detailed information on the assets and liabilities of households other than that related to housing. The empirical analysis undertaken controls for the possibility that wealth holdings other than an owner-occupied dwelling may have contributed to any observed consumption behaviour by use of the following specification:

$$
\begin{aligned}
X_t^h = {} & f\left(age^h\right) + \gamma' z_t^h + \beta' T_t + \alpha^c + \theta_Y^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} \\
& + \theta_M^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} + \theta_O^{1999} \cdot T_{1999} \cdot DY_{1999}^{ch} \cdot HW_{1999} \\
& + \theta_Y^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} + \theta_M^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} \\
& + \theta_O^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot HW_{2004} + \tilde{\theta}_Y^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot OW_{2004} \\
& + \tilde{\theta}_M^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot OW_{2004} + \tilde{\theta}_O^{2004} \cdot T_{2004} \cdot DY_{2004}^{ch} \cdot OW_{2004} + e_t^h
\end{aligned}
\qquad (4.5a)
$$

[40] For US household survey data, Kiel and Zabel (1999) find that the average owner over-estimates the value of their house by five per cent but that differences between sales prices and owner valuations are not related to household or housing characteristics. This suggests there is unlikely to be any bias introduced by their use in equations such as those specified here.

[41] Each of the specifications described by (4.4a) to (4.4c) is equivalent to including a housing wealth variable that is not interacted with the age-defined cohort dummies and dropping one of the interaction terms because of multi-collinearity. The same point can be made for specifications (4.5a) and (4.5b) and inclusion of the relevant wealth variables in those equations.

where the term OW_{2004} is a measure of the household's self-reported other wealth in the final HES. Other wealth includes financial wealth such as shares and property wealth which includes the value of any investment properties. The specification allows the consumption behaviour of households to vary across different types of wealth holdings. The coefficients $\tilde{\theta}_Y^{2004}$, θ_M^{2004} and $\tilde{\theta}_O^{2004}$ capture how consumption varies according to 'other wealth' holdings for young, middle-aged and old cohorts respectively. Similarly, the coefficients θ_Y^{2004}, θ_M^{2004} and θ_M^{2004} indicate how consumption varies according to housing wealth of young, middle-aged and old cohorts in 2003–04. Again, the statistical tests will examine whether there are any differences in the behaviours of age-group cohorts as reflected in the magnitude of the coefficients θ_Y^{2004}, θ_M^{2004} and θ_O^{2004}.

The final specification of the model, (4.5b), constrains the coefficients of dwelling and other wealth to be identical by replacing the separate terms for these two components of total wealth in 2003–04 by a single total wealth variable. As with (4.4b), the exact specification and results are reported in Chapter 5.

4.3.3 Other empirical issues

In the results reported in Chapter 5 the dependent variable used is expenditure on goods and services only and the discussion in that chapter focuses primarily on these results. Results from models that use a more narrowly defined measure of expenditure, namely expenditure on goods and services less expenditure on housing are presented in Appendix C.[42] These results, that are reported upon but not presented in the text in Chapter 5, provide a robustness check for the conclusions drawn. Alternative specifications (such as including tenure dummies in the baseline equation) and definitions of variables (such as changing the definition of older households from 60+ years to 65+ years) are not reported upon because the results are not substantively different from those presented here. However, as with the results in Appendix C, they do provide a robustness check for the conclusions drawn.[43]

4.4 Data exclusions and summary statistics

The empirical analysis uses virtually all of the 39,000 observations available from the HES where full information is available on a consistent basis across the six surveys. The only observations excluded were those where the reference person for the household was aged less than 20 years of age and those where consumption expenditure was negative. The first exclusion was applied because sample sizes in each of the surveys for households where the reference person was less than 20 years old, this age group was too small to generate reliable results. Negative expenditure is possible because expenditure is collected on an acquisition basis: it will be negative if receipts from refunds, trade-ins, sales or successful insurance claims over the period covered by the survey exceed the cost of goods and services acquired in the survey period.

Summary statistics from the full dataset used in the analysis are presented in Table 4. The median age of reference persons in the observations used is approximately 47 years, where the definition of median age is as described in Chapter 3. The geographical distribution of households reflects the dispersion of households across

[42] This narrower measure is that employed by Attanasio *et al.* (2008). Campbell and Cocco (2007) employ the broader measure but exclude expenditure on durables. The data in the HES used in this report do not allow expenditure on durables and non-durables to be identified separately.

[43] Results available from authors on request.

Australia. The majority of households identify themselves as owners with thirty-nine per cent owning the dwelling outright and thirty-one per cent having a mortgage over the occupied property at the time of the survey. Of the remaining thirty per cent, twenty-seven per cent rent and a small proportion (which includes those who rent free) are classified neither as owners or renters.

Various measures of expenditure also are reported in Table 4. The HES collects data on total expenditure on goods and services by broad expenditure group (including housing) and provides supplementary data on selected other payments (including income tax, mortgage principal payments for any owner-occupied dwelling and superannuation and life-insurance payments. The preferred measure employed in this study consists of the total of expenditure on goods and services. The broadest measure adds expenditure on selected other payments to the preferred measure. The narrowest measure subtracts expenditure on current housing costs from expenditure on goods and services.

All measures have been CPI-adjusted to $2007. The preferred definition for this study indicates an average weekly household expenditure on goods and services over the six surveys of $918, measured in 2007 dollars.

Table 4: Summary statistics from HES data

Characteristic[a]	*Mean*
State of residence dummies	
New South Wales	0.34
Victoria	0.25
Queensland	0.18
South Australia	0.09
Western Australia	0.09
Tasmania	0.03
ACT and Northern Territory	0.02
Household characteristic dummies	
Couple with no children	0.26
Couple with children	0.39
Single with no children	0.22
Single with children	0.09
Other variables	0.04
Average equivalised household size (no. persons)	1.72
Age of reference person (years)	47
Household disposable income ($2007 pw)	945
Occupation dummies	
Professional occupations	0.27
All other occupations	0.40
Not in workforce	0.33
Expenditure measures	
Total expenditure (incl. income tax, mortgage principal, super) ($2007 pw)	1241
Expenditure on goods and services only ($2007 pw)	918
Expenditure on goods and services less expenditure on housing ($2007 pw)	788
Net wealth measures	
Net dwelling wealth in 1998–99 ($2007) b	151,614
Net total wealth in 2003–04 ($2007) c	533,221
Net dwelling wealth in 2003–04 ($2007) c	234,545
Net other wealth in 2003–04 ($2007) c	298,675
Loan-to-value ratio dummies	
LTV1 (0–<50%)	0.60
LTV2 (50–<80%	0.09
LTV3 (80+%	0.02
Cohort dummies	
Cohort 1	0.01
Cohort 2	0.03
Cohort 3	0.05
Cohort 4	0.07
Cohort 5	0.09
Cohort 6	0.10
Cohort 7	0.11

Characteristic[a]	*Mean*
Cohort 8	0.10
Cohort 9	0.08
Cohort 10	0.07
Cohort 11	0.06
Cohort 12	0.08
Cohort 13	0.06
Cohort 14	0.04
Cohort 15	0.03
Cohort 16	0.03
Time dummies	
1975	0.12
1984	0.14
1988–89	0.15
1993–94	0.18
1998–99	0.20
2003–04	0.21
Number of observations	39,326

a. Averaged over all six HES surveys. All dummy variables are specified on a 0/1 basis.

b. Averaged only over 1998–99 HES survey.

c. Averaged only over 2003–04 HES survey.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

5 EMPIRICAL RESULTS

In this chapter, Section 5.1 sets out the key results derived from the specifications described in Chapter 4. The results presented and discussed here have total household expenditure on goods and services as the dependent variable. Results for total expenditure less expenditure on housing are presented in Appendix C. Section 5.2 discusses how the results from these specifications relate to the various hypotheses that link housing wealth and household consumption. Section 5.3 suggests what further research might be undertaken.

5.1 Key results

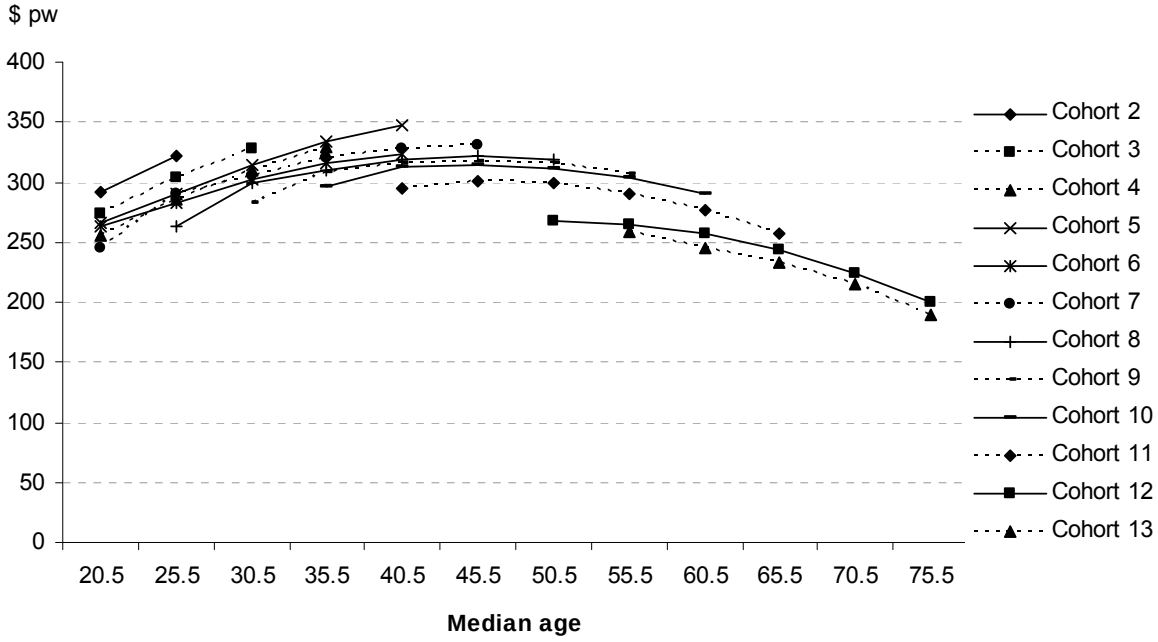
The results for specifications (4.1) to (4.5) in Chapter 4 are presented in Table 5. Table 6 summarises the results for the coefficients of the key interaction terms and Table 7 summarises the implications of these results for the three transmission mechanisms being considered.

5.1.1 Baseline consumption profiles

The key results of interest in Table 5 relate to the coefficients on the variables designed to capture the effect of the increase in housing wealth on household consumption behaviour. These are presented in columns (4.2) to (4.5b). Column (4.1) reflects the baseline specification. This specification models expenditure as a function of time and cohort effects as well as a number of observable variables that capture the broad factors that affect household consumption over the life-cycle. It does not explicitly include measures of household wealth and hence it does not allow the alternative transmission mechanisms by which household wealth affects consumption to be distinguished. Figure 14 charts the age-consumption profiles implied by the estimates presented in column (4.1) of Table 5.

The profiles in Figure 14 represent the fitted age-consumption profiles for cohorts 2–13 described in Chapter 3. These profiles highlight the underlying life-cycle behaviour of each of the cohorts in the data and the 'inverted U' pattern of consumption over the life-cycle. In addition, the consumption profiles of successive cohorts are higher, consistent with the descriptive statistics (presented in Chapter 3 and in Table 5) and a general increase in expenditure over time. Although the year of birth cohort variables are, in general, individually statistically insignificant, they are retained in the baseline and subsequent specifications because they are jointly significant. From a methodological perspective, inclusion of the year of birth cohort variables allows the 'baseline' life-cycle age profile for different cohorts (defined by year of birth) to be identified.

Figure 14: Estimated age-consumption profiles ($2007)[a]



a. These are derived by setting all variables other than age and cohort variables in specification (4.1) to zero.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

5.1.2 Interaction effects with implicit wealth variables

In Table 5 (and in Table C1 in Appendix C) each column corresponds to the specifications described in Chapter 4.[44] Two general comments can be made about the results in columns (4.2)–(4.5b) prior to considering their implications for the various alternative hypotheses associated with the relationship between housing wealth and consumption. First, the results reported for the various control variables that proxy for household life-cycle, preferences and other considerations are generally consistent with a priori expectations.[45] The coefficients on the time dummies indicate an increase in household consumption expenditure over time and the coefficients on the cohort dummies indicate successively higher expenditures by younger cohorts.

[44] The results presented in the text are based on total consumption expenditure on goods and services and so include housing interest as a component of housing expenditures. There is, therefore, a potential problem of endogeneity between the dependent variable and the loan-to-value ratio dummies in so far as a high loan-to-value ratio is correlated with a high housing loan (and high interest payments). This problem is not a problem in the results which deduct housing expenditures from expenditure on goods and services and which are presented in Table C1 in Appendix C. The relevant estimates in Table C1 differ in magnitude and levels of significance from their equivalents in Table 7 but follow the same broad pattern. The key coefficient commented upon in the text (the impact of an LTV ratio between fifty and eighty per cent) remains positive and significant at the one per cent level but is reduced from a value of 167 to 75.

[45] In the baseline specification, the omitted category for the time dummies is 2003–04; for the cohort dummies it is cohorts 1 and 2 and for the location dummies it is New South Wales. For the household dummy variables the omitted category is "other households". This includes group and multiple family households. The occupation dummies cover all households with a reference person in employment. The omitted category is households not in the workforce.

The coefficients on the geographic variables (state dummy variables) indicate that in general households in all states have lower levels of consumption expenditure than those in NSW, ceteris paribus. The exception is households in the ACT and NT which have higher consumption than those of households in New South Wales. This is consistent with the higher incomes reported by households in New South Wales and the Territories. The coefficient on household size indicates that household expenditure increases with household size consistently across the various specifications reported in Table 5 and, after adjusting for household size, household expenditure is higher for couples than for singles. The coefficients on the age and age-squared terms are statistically significant and give rise to the familiar 'inverted U' shape patterns of household expenditure over the life-cycle (as illustrated in Figure 14). Holding household size and type constant, household expenditure increases with household income, is higher for those in higher status occupations and is higher for those in the workforce. A second comment is that the coefficients are robust across the various specifications reported.

Specifications (4.2) and (4.3) incorporate indirect measures of the housing wealth effect. Specification (4.2) includes interaction terms between age-defined cohorts and the time period corresponding to the final HES; the term in specification (4.3) interacts this term with tenure status. In specification (4.2) (4.3), the coefficients on the interaction terms capture the deviation in consumption in the 2003–04 HES from the average life-cycle pattern for each age-defined (age and tenure) cohort. In effect, the specifications in (4.2) and (4.3) capture household consumption behaviour by estimating the age-consumption profiles presented in **Figure 14**, and then allowing consumption in 2003–04 for households in each age-defined cohort (young, middle and old) to be totally unconstrained by the estimated life-cycle profiles.

5.1.3 Interaction effects with explicit wealth variables

Specifications (4.4a) to (4.5b) include direct measures of household wealth. The preferred specifications are those in (4.4a) and (4.4b) because these explicitly control for the household's level of net housing wealth. The regression results indicate that, in general, higher net housing wealth is associated with higher household consumption. For example, the coefficients on the interaction terms in (4.4a) indicate that, when all other variables are held constant, every $100,000 increase in housing net wealth in 2003–04 is associated with an increase in weekly household expenditure of approximately $19 per week for a household that belongs to the young cohort. This is equivalent to an annual increase in consumption of approximately $1,000. Similarly, the increase in weekly (annual) consumption for households that belong to the middle-aged and older cohorts is $30 ($1,560) and $16 ($832) respectively. In all cases, the coefficients on the dwelling wealth variable in 2003–04 are statistically significant at the one per cent level.

The increase in consumption expenditure implied by these estimates is consistent with an annual marginal propensity to consume out of housing wealth of approximately 0.01 to 0.015. That is, a $100 increase in housing wealth is associated with an increase in consumption expenditure of approximately $1.00 to $1.50 per annum. This is somewhat lower than most of the estimates derived from aggregate studies reported in Appendix A (and, in particular, is lower than the equivalent $3 estimate generated by Dvornak and Kohler (2007) for Australia), but it falls within the range of MPC estimates reported in the micro-econometric studies reported in Appendix A.[46] The marginal propensity to consume estimates in the majority of

[46] It is higher than the Tan and Voss (2003) aggregate time series estimate of 0.00 for Australia but lower than other Australian time series estimates which range from 0.05 to 0.07 (as shown in Table A1).

household panel studies reported in Table A1 range from 0.01 to 0.03. Only one has an estimate higher than this.

Specification (4.4b) includes an additional set of covariates to control for the effect of the loan-to-value (LTV) ratio on the household's mortgage. The LTV ratio is included to control directly for potential credit constraints faced by households.[47] As outlined in Chapter 1, one explanation for the relationship between housing wealth and consumption is that the increase in housing prices relaxed a binding credit constraint on households, thereby facilitating an increase in borrowing which could be used to finance higher consumption expenditure. The results for the wealth-cohort interaction terms in specification (4.4b) in Table 5 are similar to those for (4.4a), although the values of the coefficients are slightly higher (with the implication that the estimated marginal propensity to consume is also slightly higher than the preferred estimated from specification (4.4a). Further, the coefficients on the LTV variables indicate that, when all other variables are held constant, those households most likely to have faced a binding credit constraint, namely those with a high LTV, had significantly higher consumption in 2003–04. Households with a LTV of between 50–80 per cent have a weekly consumption expenditure that is estimated to be $167 higher than renters. Specification (4.4c), which constrains the coefficients on the wealth-cohort interaction terms for 1998–99 and 2003–04 to be equal show a similar pattern to those for (4.4a) and (4.4b).

The final specifications reported in Table 5, (4.5a) and (4.5b), use alternative measures of wealth in the cohort-wealth interaction terms. Specification (4.5a) includes separate measures of housing wealth and 'other wealth', while (4.5b) includes a measure of total wealth. That is, specification (4.5a) effectively constrains the coefficients on housing wealth and other wealth to be equal. The results for (4.5a) and (4.5b) are generally consistent with those reported in (4.4a)–(4.4c) in terms of the relative value for each cohort, although the magnitudes of some of the variables do differ.

[47] Three dummy variables (covering LTVs, respectively of 0 to < 50 percent, 50 to < 80 per cent and ≥ 80 per cent) were used to distinguish differences in the severity of this constraint. The highest cut-off point was set at ≥ 80 per cent because of a requirement by most lenders that mortgage insurance be undertaken for such LTV ratios.

Table 5: Regression results based on total consumption expenditure on goods and services[a]

	(4.1)		(4.2)		(4.3)		(4.4a)		(4.4b)		(4.4c)		(4.5a)		(4.5b)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
Constant	109.96	1.31	135.08	1.59	121.16	1.70	87.98	1.05 *	108.47	1.29	88.56	1.05	90.05	1.07	99.44	1.19
1975	-97.34	-1.08	-98.81	-1.09	-76.87	-1.02	-36.16	-0.40	-50.08	-0.56	-35.99	-0.40	-32.20	-0.36	-44.35	-0.49
1984	-51.15	-0.83	-50.58	-0.81	-22.06	-0.47	9.89	0.16	0.88	0.01	12.62	0.20	14.41	0.23	0.39	0.01
1988-89	-65.20	-1.42	-63.58	-1.34	-31.48	-1.00	-5.78	-0.13	-11.39	-0.24	-1.54	-0.03	-1.15	-0.02	-16.12	-0.35
1993-94	-52.82	-1.70	-50.23	-1.51	-14.51	-0.85	4.25	0.14	2.97	0.09	9.83	0.31	9.15	0.29	-6.61	-0.21
1998-99	-42.84	-2.52 **	-39.12	-1.92 *			-41.54	-2.30	-36.17	-1.85 *	-20.49	-1.20	-36.70	-2.03 **	-52.08	-2.91 **
cohort 3	-18.75	-0.71	-16.90	-0.64	-22.43	-0.85	-33.91	-1.29 *	-20.56	-0.78	-35.01	-1.34	-34.75	-1.33	-30.24	-1.16
cohort 4	-36.67	-0.96	-32.91	-0.85	-35.73	-0.93	-62.22	-1.63 **	-37.32	-0.97	-62.01	-1.62	-63.47	-1.66 *	-57.63	-1.51
cohort 5	-32.37	-0.62	-32.30	-0.61	-28.55	-0.54	-69.71	-1.33 *	-37.71	-0.72	-72.64	-1.39	-70.71	-1.35	-64.91	-1.24
cohort 6	-64.17	-0.96	-61.45	-0.91	-54.82	-0.81	-117.17	-1.75	-77.50	-1.16	-113.58	-1.70 *	-118.51	-1.77 *	-112.96	-1.69 *
cohort 7	-60.24	-0.74	-55.85	-0.68	-45.55	-0.56	-114.41	-1.40	-69.73	-0.86	-109.28	-1.34	-115.70	-1.42	-110.75	-1.36
cohort 8	-69.87	-0.73	-63.87	-0.66	-50.16	-0.52	-126.94	-1.32	-77.89	-0.81	-120.17	-1.25	-128.06	-1.33	-123.96	-1.29
cohort 9	-73.03	-0.66	-59.29	-0.53	-41.37	-0.37	-121.75	-1.09	-68.66	-0.62	-113.84	-1.02	-121.81	-1.10	-119.48	-1.07
cohort 10	-76.46	-0.61	-62.51	-0.49	-40.94	-0.32	-120.31	-0.95	-64.02	-0.51	-110.67	-0.88	-119.72	-0.95	-118.48	-0.94
cohort 11	-89.42	-0.63	-75.63	-0.53	-51.05	-0.36	-131.97	-0.94	-74.09	-0.53	-121.21	-0.86	-130.60	-0.93	-130.58	-0.93
cohort 12	-122.45	-0.79	-108.11	-0.69	-79.32	-0.51	-162.42	-1.04	-103.23	-0.66	-151.58	-0.97	-160.11	-1.03	-161.23	-1.04
cohort 13	-132.37	-0.77	-123.32	-0.72	-91.13	-0.53	-174.95	-1.03	-118.28	-0.69	-161.20	-0.94	-173.88	-1.02	-176.73	-1.04
cohort 14	-147.13	-0.79	-138.42	-0.74	-102.72	-0.55	-186.63	-1.01	-129.23	-0.70	-174.94	-0.94	-185.52	-1.00	-189.68	-1.02
cohort 15	-174.37	-0.87	-165.07	-0.82	-125.66	-0.62	-214.54	-1.07	-154.27	-0.77	-201.62	-1.00	-213.20	-1.06	-218.38	-1.09
cohort 16	-173.95	-0.77	-164.32	-0.73	-119.11	-0.53	-213.75	-0.95	-150.44	-0.67	-198.87	-0.88	-212.19	-0.94	-219.34	-0.97
Victoria	-18.33	-2.61 **	-18.34	-2.61 **	-19.01	-2.71 **	-10.05	-1.43 *	-9.61	-1.37	-10.61	-1.51	-10.68	-1.52	-12.29	-1.75 *
Queensland	-56.75	-7.25 **	-56.79	-7.26 **	-56.74	-7.26 **	-46.27	-5.91 **	-45.96	-5.88 **	-47.09	-6.02 **	-47.03	-6.01 **	-49.06	-6.28 **
South Australia	-59.29	-6.67 **	-59.49	-6.70 **	-59.93	-6.75 **	-46.36	-5.21 **	-45.39	-5.10 **	-47.03	-5.29 **	-47.35	-5.33 **	-50.34	-5.67 **
Western Australia	-31.13	-3.46 **	-31.21	-3.46 **	-31.57	-3.51 **	-21.11	-2.35 **	-21.75	-2.42 **	-21.66	-2.41 **	-22.01	-2.45 **	-24.44	-2.72 **
Tasmania	-58.51	-6.13 **	-58.61	-6.14 **	-59.16	-6.20 **	-46.63	-4.89 **	-44.58	-4.67 **	-47.44	-4.97 **	-47.56	-4.99 **	-50.11	-5.26 **
ACT and Northern territory	33.84	3.66 **	34.02	3.68 **	34.65	3.75 **	46.99	5.08 **	45.98	4.98 **	46.13	4.99 **	46.55	5.03 **	43.93	4.76 **
Couple with no children	-61.39	-4.54 **	-60.84	-4.49 **	-63.48	-4.69 **	-63.80	-4.73 **	-67.68	-5.02 **	-63.28	-4.69 **	-65.38	-4.85 **	-65.30	-4.84 **
Couple with children	-74.99	-5.74 **	-73.87	-5.64 **	-76.62	-5.84 **	-77.01	-5.91 **	-81.82	-6.29 **	-76.46	-5.87 **	-77.17	-5.93 **	-76.69	-5.89 **
Single with no children	-148.58	-9.68 **	-148.49	-9.66 **	-147.88	-9.62 **	-143.71	-9.39 **	-148.08	-9.68 **	-143.33	-9.36 **	-144.07	-9.42 **	-145.25	-9.49 **
Single with children	-152.84	-10.53 **	-152.63	-10.50 **	-151.83	-10.44 **	-148.58	-10.27 **	-151.70	-10.49 **	-148.46	-10.26 **	-148.73	-10.28 **	-149.70	-10.34 **
Adjusted household size	204.51	24.21 **	204.40	24.19 **	204.73	24.24 **	205.75	24.44 **	206.44	24.55 **	206.01	24.46 **	206.71	24.56 **	206.57	24.53 **
age	11.13	3.36 **	9.73	2.88 **	9.13	2.70 **	11.84	3.54 **	9.79	2.93 **	11.49	3.44 **	11.69	3.50 **	11.61	3.48 **
age squared	-0.11	-8.48 **	-0.10	-6.70 **	-0.10	-6.81 **	-0.12	-8.77 **	-0.11	-7.58 **	-0.12	-8.67 **	-0.12	-8.71 **	-0.12	-8.61 **
household disposable income	0.40	87.20 **	0.40	87.08 **	0.40	86.80 **	0.39	84.80 **	0.39	84.33 **	0.39	84.77 **	0.39	83.60 **	0.39	83.78 **
Professional occupations	146.48	17.16 **	146.02	17.10 **	144.30	16.88 **	141.57	16.62 **	140.16	16.46 **	142.19	16.69 **	141.50	16.62 **	142.25	16.70 **
Other occupations	40.42	5.31 **	39.86	5.23 **	38.74	5.09 **	40.29	5.31 **	39.94	5.26 **	40.56	5.34 **	41.41	5.46 **	41.45	5.46 **

	(4.1)		(4.2)		(4.3)		(4.4a)		(4.4b)		(4.4c)		(4.5a)		(4.5b)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
T2003*young			(dropped)													
T2003*middle			**24.27**	**1.43**												
T2003*older			**-21.59**	**-1.04**												
T2003*young*owner					**79.67**	**3.49 ****										
T2003*middle*owner					**79.90**	**4.10 ****										
T2003*older*owner					**38.56**	**1.79 ***										
T2003*young*renter					8.86	0.38										
T2003*middle*renter					14.88	0.57										
T2003*older*renter					-70.89	-2.03 **										
T2003*young*other tenure					-176.87	-2.89 **										
T2003*middle*other tenure					126.85	1.78 *										
T2003*older*other tenure					-29.32	-0.43										
T1998*young*net dwelling wealth							11.01	1.59	12.95	1.88 *			11.20	1.62	11.03	1.60
T1998*middle*net dwelling wealth							47.78	12.08 **	47.18	11.94 **			48.35	12.23 **	47.63	12.05 **
T1998*older*net dwelling wealth							33.90	6.42 **	30.76	5.81 **			33.88	6.42 **	33.02	6.28 **
T2003*young*net dwelling wealth							**18.67**	**3.37 ****	**23.70**	**3.97 ****	**15.55**	**3.54 ****	**11.98**	**1.57**	**5.36**	**2.72 ****
T2003*middle*net dwelling wealth							**29.58**	**10.87 ****	**36.67**	**11.94 ****	**35.13**	**15.16 ****	**13.00**	**3.31 ****	**10.61**	**10.62 ****
T2003*older*net dwelling wealth							**16.08**	**5.75 ****	**21.18**	**7.10 ****	**19.51**	**7.55 ****	**9.70**	**2.49 ****	**4.99**	**5.24 ****
T2003*young*net other wealth													3.64	1.49		
T2003*middle*net other wealth													7.68	5.94 **		
T2003*older*net other wealth													3.17	2.60 **		
T2003*young*net total wealth																
T2003*middle*net total wealth																
T2003*older*net total wealth																
T2003*LTV1 (0 to <50%)									**-41.18**	**-2.50 ****						
T2003*LTV2 (50 to <80%)									**167.06**	**7.52 ****						
T2003*LTV3 (80% +)									**180.82**	**4.56 ****						
Number of observations	39,326		39,326		39,326		39,326		39,326		39,326		39,326		39,326	
adj R squared	0.428		0.428		0.429		0.432		0.434		0.432		0.433		0.432	

a. Key coefficients of interest are highlighted. ** indicates significance at the five per cent level; * indicates significance at the ten per cent level

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

5.2 Interpretation of results

As indicated in Chapter 1, the principal objective of this study is to distinguish between the alternative transmission mechanisms that may explain the observed relationship between housing wealth and consumption. A secondary aim is to determine the extent of a housing wealth effect on household consumption in Australia. The results of this secondary aim were reported in Section 5.1.3.

5.2.1 Tests for various transmission mechanisms

As discussed in Chapter 4, distinguishing between the various transmission mechanisms requires that the relationship between the estimated coefficients be examined to determine if they are consistent (or inconsistent) with the presence of a particular transmission mechanism. If the relationship between housing wealth and consumption reflects a direct wealth effect, for example, the data should reveal a pattern in which the increase in expenditure by older home-owning households is largest after the unanticipated increase in housing wealth that occurred between 1998–99 and 2003–04. Conversely, a pattern whereby the observed consumption expenditure of younger cohorts (both home-owners and renters) is largest would be consistent with a common causal factor such as a productivity shock in which the increase in lifetime income was greatest for younger cohorts.

To distinguish among the various transmission mechanisms, Table 6 summarises the results of a number of statistical tests on the coefficients of the key interaction terms in the lower half of Table 5. These test for the individual and joint significance of the interaction terms in specifications (4.2)–(4.5b) and for a number of pair-wise tests between specific coefficients. They can be illustrated by considering column (4.4a) in Table 6. Specification (4.4a), the preferred specification, includes interaction terms between age-defined cohort dummies and net housing wealth (NDW) for the household. The coefficients on those interaction terms are positive and individually significantly different from zero at least at the five per cent level of significance.[48] The pair-wise tests indicate that the coefficient on the young interaction term is smaller in magnitude than the coefficient on the middle interaction term. Moreover, this difference is significant at the ten per cent level of significance. In contrast, it is not possible to reject the hypothesis that the coefficients on the young and old interaction terms are different from one another. The joint tests of significance indicate that it is possible to reject the hypothesis that the coefficients on the interaction terms are jointly equal to zero.

The implications of these tests for the various transmission mechanisms is summarised in Table 7 for each of the specifications reported in Table 5. In each case, existence of support for the various transmission mechanisms is based on applying the tests summarised under Table 7 to the results of the statistical tests reported in Table 6. This approach can be illustrated by considering, for example, the conclusions drawn for the preferred specification in column (4.4a). The basis for these and all of the remaining conclusions presented in Table 7 is set out in Table C4 in Appendix C.

Testing for a direct wealth effect

The first of the conditions set out under Table 7 for identifying the transmission mechanism as a direct wealth effect is a requirement that the coefficients on the wealth variables/proxies for owners in all age cohorts are positive and significant. As

[48] Many of the results in the paper are significant at a one per cent level of significance but, for simplicity of presentation, only the less stringent test has been reported.

can be seen from the individual tests on the coefficients in the top half of the results in Table 6, this condition holds in the case of specification (4.4a). The second of the conditions is that the coefficients on the wealth variables for owners have the following pattern: older cohort significantly greater than middle cohort and middle cohort significantly greater than young cohort. The pair-wise tests summarised in Table 6 indicate that the coefficient on the middle cohort wealth interaction term is greater in magnitude than that for the young cohort. However, it is also greater than the coefficient for the older cohort interaction term. Further, it is not possible to reject the hypothesis that the coefficients on the young and the older cohort interaction terms are equal to each other. Thus, the results of these pair-wise tests are inconsistent with this second condition and are therefore not compatible with a direct wealth effect transmission mechanism. For this reason, the hypothesis that the observed increase in consumption that is associated with an increase in housing wealth can be attributed to a direct wealth effect is rejected.[49]

Testing for a common cause effect

A similar process can be followed for the conclusion that the results are not consistent with the hypothesis that the increase in consumption that accompanied the increase in housing wealth was driven by a common causal factor such as an unanticipated productivity shock. The first condition is similar to that outlined above. The coefficients on the wealth variable should be positive for all households. As above, the results in Table 6 suggest this condition is met. However, one of the consequences of such a shock is that lifetime incomes are increased. Moreover, the increase in lifetime incomes, and hence consumption, would be expected to be largest for younger households and to decrease as the time span over which such an increase can be anticipated decreases. This suggests that the coefficients on the wealth-cohort interaction terms should decrease in magnitude as the cohorts get older. That is, the interaction term for the younger cohort should be larger than that for the middle cohort. Similarly, the interaction term for the middle cohort should be larger than that for the older cohort. This pattern is captured by the second condition for the common cause effect described under Table 7. As can be seen from the results in Table 6, the regression results for specification (4.4a) are not consistent with this pattern as the coefficient for the wealth interaction term is largest in magnitude for the middle cohort, and again, it is not possible to reject the hypothesis that the coefficients on the young and the older cohort interaction terms are equal to each other. On this test alone, the common cause effect hypothesis can be rejected. However, further cause for rejection arises from the third test which suggests that the response to a common causal factor should be the same for households regardless of their tenure (or housing wealth). The tests presented in Table 6 clearly show that this is not the case: the response for owners is significantly greater than that for renters. Thus the hypothesis that the observed increase in consumption that is associated with an increase in housing wealth can be attributed to a common cause effect is rejected.

Testing for a credit constraint effect

Finally, Table 7 also states that the results for specification (4.4a) provide support for the presence of a credit constraint effect. Again, the basis of this conclusion can be illustrated by applying the results of the tests in Table 6 to the conditions described under Table 7 that are consistent with the presence of a credit constraint effect. The first condition, that the coefficients on wealth variable/proxy for owners in all age

[49] The third test for a direct wealth effect (that the coefficients on the wealth variable for renters is non-negative could not be tested with this particular specification, since consumption patterns for renters in 2003–04 were not identified.

cohorts are non-negative, is met (as can be seen from the individual test results in the top half of Table 6). The second condition is that the coefficients on the wealth variable or proxy for credit-constrained cohorts should be positive and significant. An a priori expectation is that the coefficient for those cohorts which are credit-constrained should be larger than those not credit-constrained.

The hypothesis regarding the collateral or credit-constraint effect suggests that, when housing wealth increases, households previously constrained from increasing their consumption by a high LTV mortgage ratio are now less constrained because they can withdraw equity from their housing assets. Because they tend to have lower LTV ratios, older cohorts are less likely to be credit-constrained than younger cohorts. Thus, if a wealth effect is transmitted through the credit or collateral constraint transmission mechanisms, the smallest increases in consumption would be observed for these older cohorts. For borrowers with a binding income constraint as well as a collateral constraint, an increase in housing wealth is also less likely to result in an increase in consumption by way of the collateral constraint mechanism. Since the youngest cohorts are most likely to be affected by income constraints, they are also less likely to increase consumption when housing wealth increases. Only owners are affected by the increased collateral provided by the increase in housing wealth and those who respond most are those who are not income-constrained (as are the young) and who are still actively adding to their wealth (unlike the old).

For specification (4.4a) the cohort-wealth interaction terms are both individually and jointly significant and non-negative. In addition, the coefficient on the middle cohort-wealth interaction term is larger than that for the older cohort-wealth interaction term. This pattern is to be expected if the middle cohort is more likely to be credit-constrained than the older cohort. At the same time, the coefficient on the young cohort-wealth interaction term is smaller in magnitude than that of the middle cohort and not significantly different from that of the older cohort. These results provide some support for the credit-constraint hypothesis. Young and middle-aged cohorts are more likely to be credit-constrained and take the opportunity to borrow against any increase in house prices to finance higher consumption. However, at the same time, the young are more likely to face a binding income constraint so that any response to an increase is house prices (as a result of relaxation of a collateral constraint) is likely to be more muted.

Table 6: Summary results for key interaction coefficients based on total consumption expenditure on goods and services[a]

(4.2) age		(4.3) age*own		(4.4a) age*NDW		(4.4b) age*NDW/LTV		(4.4c) age*NDW/1998=2003		(4.5a) age*NDW/NOW		(4.5b) age*NTW	
Individual/pairwise tests													
individ.	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*
Y ?	Y≈M	Y>0**	Y≈M	Y>0**	Y<M*	Y>0**	Y<M**	Y>0**	Y<M**	Y>0	Y≈M	Y>0**	Y<M*
M>0	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M≈O	M>0**	M>O**
O<0	O≈Y	O>0*	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y
Joint tests													
Wealth ne 0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**	
		Own>Rent**		Own>Rent**		Own>Rent**		Own>Rent**		Own>Rent**			

a. Y refers to the 'young' cohort, aged younger than 40 years in 2003–04; M refers to the 'middle' cohort, aged between 40 and 60 years in 2003–04 and O refers to the 'older' cohort, aged 60 years or more in 2003–04. ** indicates significance at the five per cent level; * indicates significance at the ten per cent level; a query indicates no estimate is available because the relevant variable was dropped during the estimation process.

The tests in the second set of columns for each specification are based on F tests of pair-wise comparisons of the relevant variables.

The tests in the penultimate row are based on a test of whether coefficients of the key interaction terms are jointly equal to 0; where this test is rejected, the sign of effect is inferred (where possible) from signs of relevant coefficients. "Wealth" refers both to the various wealth variables employed and to the proxies embodied in the different specifications.

The tests in the final row are inferred from the 'wealth' tests where the relevant wealth variable/proxy is defined explicitly for owners. In equation (4.3) it is based on pair-wise tests on the coefficients for owners and renters in each of the age-specific cohorts.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Table 7: Consistency of results with alternative transmission mechanisms[a]

	(4.2) age	*(4.3) age*own*	*(4.4a) age*NDW*	*(4.4b) age*NDW/LTV*	*(4.4c) age*NDW/1998=2003*	*(4.5a) age*NDW/NOW*	*(4.5b) age*NTW*
Direct wealth effect	?	×	×	×	×	×	×
Credit constraint effect	?	✓?	✓?	✓?	✓?	✓?	✓?
Common cause effect	×	×	×	×	×	×	×

The following tests have been applied in determining whether the results in Tables 5 and 6 are consistent with the respective transmission mechanisms. The rationales for the decisions made are presented in Table C4 in Appendix C.

Direct wealth effect:

(i) Coefficients on wealth variables/proxies for owners in all age cohorts are positive and significant.

(ii) Coefficients on wealth variables/proxies for owners have the following pattern: older cohort significantly greater than middle cohort and middle cohort significantly greater than young cohort.

(iii) Coefficients on wealth variables/proxies for renters in any age cohort are not significantly different from zero.

Credit constraint effect:

(i) Coefficients on wealth variables/proxies for credit-constrained cohorts are positive and significant.

(ii) Coefficients on wealth variables/proxies for owners in all age cohorts are non-negative.

(iii) Coefficients on wealth variables/proxies for renters in any age cohort are not significantly different from zero.

Common cause effect:

(i) Coefficients on wealth variables/proxies for all households are positive and significant.

(ii) Coefficients on wealth variables/proxies for all households (owners or renters) in the young cohort are significantly greater than responses by middle cohort and middle cohort significantly greater than older cohort.

(iii) Coefficients on wealth variables/proxies for owners are not significantly different from those by renters.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

5.2.2 Implications of regression results

The preceding discussion has focused on specification (4.4a) as the preferred specification because it includes explicit information about housing wealth at the individual household level. However, the results for the remaining specifications in Table 5 are consistent with the results that have been focused upon in this section.

The clear pattern that emerges from an examination of the regression results in Table 5 is that, in general, the econometric evidence is not consistent with the presence of either a direct wealth or a common causal factor as being the source of the transmission mechanism that explains the observed relationship between housing wealth and consumption behaviour. However, it is consistent with the argument that it is the relaxation of credit constraints arising from the increased housing wealth that is the most likely explanation of the observed consumption patterns.

The results from the empirical analysis are supported by existing research into patterns of equity withdrawal in Australia which suggests that households in the middle cohort were more likely to withdraw equity from their housing wealth by increasing the debt on an existing mortgage (for example, Schwartz et al., 2008). Nonetheless, evidence that the majority of the equity withdrawn was used to fund asset accumulation or to reduce other debts, rather than simply increase consumption, explains the relatively small wealth effect identified.

The results described above can be put into context by considering their possible implications. One way to do this is to consider the implications of the estimates using some simple 'back of the envelope' calculations based on a relatively modest fall of five per cent in real house prices from their 2007 (pre-housing crisis) values. This is consistent with an Australia-wide average loss of the order of at least $20,000 per dwelling. If such a reversal of the decade-long surge in house prices from the late 1990s were seen as a permanent loss of housing wealth it could lead to a reversal of the consumption surge associated with the earlier increase in house prices.[50]

If the response to a decrease in housing wealth was the same as a response to an increase in housing wealth, the estimates presented in column (4.4a) in Table 5 would suggest a permanent decline in average household consumption per owner-occupier household of at least $200 per year based on the response to this change by older cohorts who have the lowest estimated marginal propensity to consume out of housing wealth. The response for middle-age cohorts would be close to twice this amount. This represents a fall of at least 0.4 to 0.6 per cent of the average household consumption for all households. Given that owner-occupiers represent seventy per cent of all households, this amounts to a reduction in total average household consumption of 0.3 to 0.45 per cent or a reduction in GDP of 0.2 to 0.3 per cent. However, this conclusion should be treated with some considerable caution in the absence of robust evidence about the symmetry of wealth effects.

Even though these calculations are crude estimates based on simply 'grossing-up' estimates derived from the micro-econometric results, and despite the above qualifications about assuming symmetric effects for a downturn, they highlight the potential impact of changes in housing wealth. They point to the possibility that a downward shock to house prices could result in a wealth effect operating through a credit or collateral constraint. That this could lead to an additional downward shock to

[50] In his recent overview of housing wealth effects, Belsky (2008) suggests there is little work to date on their symmetry. In one of only two studies identified to date, Case *et al.* (2005, p.25) report a large and significant wealth effect for increases in housing wealth but small and insignificant effects for decreases in housing wealth. On the other hand, based on work in progress, Van Nieuwerburgh (2008) suggests the impact of a downturn in housing wealth will be severe.

the macroeconomic system at a time when global recession looms, reinforces the importance of the role of assets on the real economy and highlights the importance of understanding the transmission mechanisms by which housing wealth affects consumer behaviour.

5.3 Further research

The results of the analysis presented in this report provide insights into the nature of the relationship between housing wealth and household consumption behaviour. The finding that the observed increase in consumption was consistent with the collateral or credit-constraint transmission mechanism should be interpreted in light of the econometric results and the interpretation placed on the various estimates reported. The analysis reported in this chapter may be construed as part of a broader research agenda that seeks to understand the relationship between wealth and expenditure. Validation of the results is desirable so as to gain a full understanding of the underlying processes at work and the implications of those for individuals and the macro-economy in general. In this context, it is possible to identify at least three ways in which the analysis presented in this report may be extended.

The first is to determine whether results based on a pseudo-panel data set derived from a series of HES data can be replicated using true panel data. A potential data source is the Household, Income and Labour Dynamics in Australia (HILDA) dataset. The HILDA dataset is a longitudinal dataset that contains information on households and their members collected on an annual basis since 2001. A key advantage of HILDA is that information is available on the value of various forms of wealth held by the household.[51] Additionally, as a true panel dataset it is possible to observe behaviour of the same households over time as their wealth and other economic environment characteristics change. This obviates the need to rely on the construction of synthetic cohorts and provides useful information on the response of households to shocks to wealth holdings.

However, there are two potential limitations in using the HILDA data to examine the questions considered in this report. The first relates to the limited amount of information available on consumption expenditures. All waves of HILDA contain some information on household expenditure patterns but it is considerably less detailed than that available in the HESs. The second limitation relates to the limited time period covered by the HILDA dataset and to the two periods for which wealth data are available. The most recent rapid increase in house price inflation in Australia began in the late 1990s and reached a peak around 2003–04. Currently, the HILDA wealth data are available for 2002, well after the initial increases in housing wealth associated with the most recent house price boom, and for 2006, well after the peak and at a time when there were likely to be doubts about the sustainability of the earlier increases. The HILDA dataset also covers a relatively short time period over which the relationships of interest may be identified.

A second way in which the analysis in this report might be extended relates to the intergenerational implications of the results as the population ages. The evidence described in this report points to the role of credit constraint effects as being the important mechanism by which increases in house prices have affected consumption behaviour. Moreover, it is the middle-aged cohorts, those aged between 40 and 60 years of age in 2003–04, that have exhibited the strongest consumption responses to

[51] Detailed information on the wealth holdings of households is available in waves two and six of HILDA (collected in 2002 and 2006 respectively). In other years, less detailed information is available on the wealth of households. This survey was not considered for this study because the wave six data were not available when the study commenced and because of the limitations discussed in the text.

increases in housing wealth. This age group roughly corresponds to the baby-boomer generation born after the Second World War. It is this generation that has faced a number of institutional changes during their lifetime that are likely to have had a significant impact on their savings and consumption behaviour. An obvious example is the introduction of forced saving in the form of the Superannuation Guarantee levy in 1992. The question of whether younger cohorts will follow the same behavioural patterns and same institutional constraints as they age as the current baby-boomer generation, is worthy of further consideration.

The results discussed in this chapter highlighted the significance of the response of a particular generation to circumstances that most probably have benefited them more than any other generation. The question of who will benefit from future increases in housing wealth (or vice versa) and how they will respond to any changes in that wealth is one which remains unanswered. Further research is needed to determine whether the responses observed by the current mid-age cohort will be replicated by the current young cohort as they age. Further research also is needed to determine whether the responses observed by the current mid-age cohort will be sustained as they age.

Finally, a critical question that has not been addressed adequately with the data employed in this study is that raised in the previous sub-section: namely the question of the symmetry of a consumption response to decreases as well as increases in wealth. Underpinning this is the need to better understand what can be regarded as an anticipated, and what can be regarded as an unanticipated, change in housing wealth. Thus, a third way in which the analysis in this report can be extended relates to the importance of determining whether behaviour during an upswing in asset prices is the same as behaviour during a downturn in asset prices.

Overall, understanding the relationship between housing wealth, asset portfolio allocation decisions and consumption behaviour is likely to require an analysis of the behaviour of individuals and households over a longer time frame and over a period where both increases and decreases in wealth are observed. Supplementing analysis of the HES used in this report, with new HES data as they become available and with the HILDA data will add to this understanding. Data from other surveys, such as the Surveys of Income and Housing Costs (SIHC), that have been undertaken periodically since the early 1990s and contain information on income and housing-related issues such as mortgages, also may provide additional insight into the issues identified in this report.

6 CONCLUSIONS

This report has examined the relationship between housing wealth and consumption behaviour in Australia. The analysis was motivated, at least in part, by the significant increase in asset prices, especially house prices, observed in Australia between the late 1990s and early 2000s. This phenomenon led to a significant increase in the wealth of Australian households. While there is broad agreement in the international literature that such changes are generally accompanied by an increase in household consumption, there is less agreement about the transmission mechanism that underpins the relationship between household wealth and consumption. Three possible causal mechanisms have been identified in the literature, namely the direct wealth, the credit-constraint effect and the common causal hypothesis. While an examination of aggregate data may provide insight into the presence of a correlation between household wealth and consumption, it does not provide a means with which to distinguish among the various transmission mechanisms.

The objective of this study was to use household level data to determine the extent of a housing wealth effect on household consumption in Australia and to distinguish alternative explanations that have been provided for any observed correlation between housing wealth and consumption. The empirical analysis used a series of household-level surveys conducted by the Australian Bureau of Statistics over a period of almost 30 years, from 1975 to 2003–04, to explore the nature of the link between household wealth and consumption. Following a well-developed literature that has been applied to international data, synthetic or pseudo-cohorts were constructed across successive Household Expenditure Surveys. Through this process it was possible to estimate how the large unanticipated increase in house prices that occurred between the penultimate and final HESs impacted on the consumption behaviour of households after controlling for life-cycle, time and cohort-related affects that may have impacted on observed behaviour.

The results of the empirical analysis, presented in Chapter 5 and in Appendix D, are robust to a range of specifications and to varying definitions of key variables. They showed that only owners are affected by the increased collateral provided by the increase in housing wealth and those who respond most are those who are not income-constrained (as are the young) and those who are still actively adding to their wealth (unlike the old). The greatest response to their 2003–04 housing wealth comes from the baby-boomer cohort who, in 2003–04, were mid-age households aged between 40 and 60. The consumption responses by this cohort were significantly greater than the responses by either the younger cohort (who, on average, had considerably less equity in their owner-occupied housing) or by the older cohort (who, on average, had more gross and more net housing wealth in 2003–04 and very little housing debt) compared with the baby-boomer cohort. The responses for households in the young cohorts were not significantly different from the responses for the older cohorts. Both are more likely than the mid-age cohort to face an income credit-constraint.

In other words, the results are not inconsistent with the claim that the wealth effect operates through a credit-constraint mechanism. They provide support for the argument that the increase in house prices during the late 1990s and early 2000s relaxed a binding credit-constraint for mid-life households and facilitated an increase in their consumption. The conclusions drawn from the results of the analysis presented in this report are consistent with, but extend, the analysis of mortgage equity withdrawal conducted by the Reserve Bank (Schwartz et al., 2008).

This finding has potentially important macroeconomic implications, particularly in light of the current slowdown in the economy in general and in house prices in particular. It shows that the impact of an unanticipated increase in housing wealth on household consumption is not insignificant, particularly for the cohort that is now middle-aged. It raises concerns that, any subsequent slowdown in house price growth may reduce both the capacity and the willingness of the baby-boomer generation to maintain their current levels of consumption. It reinforces concerns that a financial accelerator may exacerbate the economic downturn.[52]

The results are inconsistent with the hypotheses that the observed wealth effects are transmitted directly or that increases in consumption and wealth are the result of a common cause. The conclusions set out in this report do not correspond with those reported in studies in the UK undertaken either by Attanasio et al. (2008) or by Campbell and Cocco (2007). In the former study, the observed relationship between consumption and housing wealth was attributed to a common cause effect. In the latter study, it was attributed to a direct wealth effect. Although both of these studies used more or less the same data, they arrived at substantially different conclusions about the relationship between housing wealth and consumption. The differences between these two earlier UK studies were examined in Chapter 2 and in Appendix B.

The divergence in the results in this report and those in the UK literature may have a number of sources. They may arise from differences in institutional arrangements (particularly in relation to mortgage markets) or from differences in the underlying behaviour of households. They may arise from differences in the data employed. The wealth data used in this report have important advantages over the wealth data used in the UK studies. In particular, the availability of self-reported information on the value of housing and other forms of wealth in the penultimate and final HES made it possible to examine the impact of variations in wealth holdings at an individual household level. However, the data available meant that the analysis still had to rely on pseudo-panel data rather than true panel data and hence meant that difficulties associated with this choice of technique could not be addressed. The differences in the results derived from all three studies highlight the need for continued analysis of the relationship considered in this report.

[52] See Almeida *et al.* (2006) for an analysis of the financial accelerator mechanism that arises because of the pro-cyclical debt capacity of collateral constrained households.

REFERENCES

Almeida, H., Campello, M. and Liu, C. (2006). "The Financial Accelerator: Evidence from International Housing Markets," *Review of Finance*, 10(3): 321–352

Altissimo, F., Georgiou, E., Sastre, T., Valderrama, M., Sterne, G., Stocker, M., Weth, M., Whelan, K. and Willman, A. (2005) "Wealth and asset price effects on economic activity", *European Central Bank Occasional Paper* No, 29, June 2005, http://www.ecb.int/pub/pdf/scpops/ecbocp29.pdf

Aoki, K., Proudman, J. and Vlieghe, G. (2004) "House prices, consumption, and monetary policy: a financial accelerator approach", *Journal of Financial Intermediation*, 13(4):414–435

Aron, J., Muellbauer, J. and Murphy, J. (2006) "Housing Wealth and UK Consumption", mimeo, http://www.abdn.ac.uk/business/uploads/files/Housing%20Wealth%20and%20UK%20Consumption.pdf

Attanasio, O., Banks, J., Meghir, C. Weber, G. (1999) "Humps and bumps in lifetime consumption", *Journal of Business & Economic Statistics, 17* (1):22–35

Attanasio, O., Blow, L., Hamilton, R and Leicester, A. (2008) "Booms and Busts: Consumption, House Prices and Expectations", *Economica*, Published Online: 15 Jul 2008

Attanasio, O., Blow, L., Hamilton, R and Leicester, A. (2005), "Consumption, house prices and expectations", *Bank of England Working Paper* No 271, http://www.bankofengland.co.uk/publications/workingpapers/wpabst05.htm#wp05

Attanasio, O. and Browning, M. (1995) "Consumption over the Life Cycle and over the Business Cycle" *American Economic Review*, 85(5): 1118–1137

Attanasio, O., Leicester, A. and Wakefield, M. (2009) "The Coincident Cycles of House Prices and Consumption in the U.K.: Do House Prices Drive Consumption Growth?" presented at American Economic Association and Allied Social Science Associations annual meeting, January 3–5, 2009, San Francisco, http://www.aeaweb.org/assa/2009/retrieve.php?pdfid=42

Attanasio, O. and Weber, G. (1994) "The UK consumption boom of the late 1980s: Aggregate implications of microeconomic evidence", *Economic Journal*, 104(427): 1269–1302

Australian Bureau of Statistics (2006a) Household Expenditure Survey and Survey of Income and Housing User Guide, 2003–04, ABS Cat No 6503.0

Australian Bureau of Statistics (2006b) *Household Wealth and Wealth Distribution*, 2003–04, ABS Cat No 6554.0.

Bank for International Settlements (BIS) (2007) "Understanding asset prices: an overview", BIS Papers No 34, March 2007, http://www.bis.org/publ/bppdf/bispap34.htm

Barrell, R. and Davis, E., (2004) "Consumption, Financial and Real Wealth in the G-5", National Institute Economic and Social Research Discussion Paper no. 232, (revised December 2004), http://www.niesr.ac.uk/pubs/dps/dp232.pdf

Belsky, E. (2008) "Housing Wealth Effects and the Course of the US Economy: Theory, Evidence, and Policy Implications', Joint Center for Housing Studies Working Paper W08–7
http://www.jchs.harvard.edu/publications/finance/w08–7_belsky.pdf

Belsky, E. and Prakken, J. (2004) "Housing Wealth Effects: Housing's Impact on Wealth Accumulation, Wealth Distribution and Consumer Spending", Joint Center for Housing Studies Working Paper W04–13
http://www.jchs.harvard.edu/publications/finance/w04–13.pdf

Benito, A. and Mumtaz, H. (2006) "Consumption excess sensitivity, liquidity constraints and the collateral role of housing", Bank of England Working Paper No. 306,
http://www.bankofengland.co.uk/publications/workingpapers/wp306.pdf

Benito, A. and Power, J. (2004) "Housing equity and consumption: insights from the Survey of English Housing", *Bank of England Quarterly Bulletin*, Autumn 2004: 302–309,
http://www.bankofengland.co.uk/publications/quarterlybulletin/qb040303.pdf

Benito, A., Thompson, J., Waldron, M. and Wood, R. (2006) House Prices and Consumer Spending, *Bank of England Quarterly Bulletin*, Summer 2006: 142–154
http://www.bankofengland.co.uk/publications/quarterlybulletin/qb060201.pdf

Benjamin, J. and Chinloy, P. (2008), "Home Equity, Household Savings and Consumption", *Journal of Real Estate Finance and Economics*, 37(1): 21–32

Benjamin, J., Chinloy, P. and Jud, G. (2004) "Real estate versus financial wealth in consumption" *Journal of Real Estate Finance and Economics,* 29(3), 341–354

Berben, R., Bernoth, K. and Mastrogiacomo, M. (2006) "Households' Response to Wealth Changes: Do Gains or Losses make a Difference?," DNB Working Papers 090, Netherlands Central Bank, Research Department

Bernanke, B. (2007) "The Financial Accelerator and the Credit Channel", speech to The Credit Channel of Monetary Policy in the Twenty-first Century Conference, Federal Reserve Bank of Atlanta, Atlanta, Georgia, June 15, 2007 , http://www.federalreserve.gov/newsevents/speech/bernanke20070615a.htm

Bertaut, C. (2002) "Equity Prices, Household Wealth, and Consumption Growth" Board of Governors of the Federal Reserve System, International Finance Discussion Papers, Number 724.
http://www.federalreserve.gov/pubs/ifdp/2002/724/ifdp724.pdf

Boone, L. and Girouard, N. (2002) "The stock market, the housing market and consumer behaviour" *OECD Economic Studies* No. 35, 2002/25

Borio, C. and McGuire, P. (2004) "Twin Peaks in Equity and Housing Prices?", *BIS Quarterly Review*, March: 79–93, http://www.bis.org/publ/qtrpdf/r_qt0403g.pdf

Bostic, R., Gabriel, S. and Painter, G. (2006) "Housing Wealth, Financial Wealth and Consumption: New Evidence from Micro Data", mimeo
http://www.economics.uci.edu/docs/colloqpapers/s06/Gabriel.pdf

Bover, O. (2005) "Wealth Effects on Consumption: Microeconometric Estimates from the Spanish Survey of Household Finances", *Banco de España Working Paper* 05–22
http://www.bde.es/informes/be/docs/dt0522e.pdf

Bridges, S., Disney, R., and Henley, A. (2004) "Household Wealth and the Accumulation of Financial Debt: Evidence from UK Households", mimeo, also in G. Bertola, R. Disney and C. Grant (eds) (2006) *The Economics of Consumer Credit*, Cambridge, MA, MIT Press http://www.nottingham.ac.uk/economics/staff/details/papers/Bridges-Disney-Henley.pdf

Browning, M., Deaton, A. and Irish, M. (1985) "A Profitable Approach to Labor Supply and Commodity Demands over the Life-Cycle", *Econometrica*, 53(3): 503–544

Browning, M., Gørtz, M. and Leth-Petersen, S. (2008) "House Prices and Consumption: A Micro Study", paper presented at ECB/CFS-conference, Goethe University, Frankfurt, Tyskland, September 2008 http://www.ecb.int/events/pdf/conferences/ecb_cfs_conf/Goertz_Browning_Leth.pdf

Browning, M. and Lusardi, A. (1996) "Household Saving: Micro Theories and Micro Facts", *Journal of Economic Literature*, 34(4): 1797–1855

Buiter, W. (2008) "Housing wealth isn't wealth", NBER Working Paper 14204, 20 July 2008, revised 9 Nov 2008, http://www.nber.org/~wbuiter/wealth.pdf

Buiter, W. (2007) "Housing wealth isn't wealth", Financial Times, October 30, 2007. http://blogs.ft.com/maverecon/2007/10/housing-wealth-.html/

Campbell, J. and Cocco, J. (2007) "How Do House Prices Affect Consumption? Evidence From Micro Data", *Journal of Monetary Economics*, 54(3): 591–621

Campbell, J. and Cocco, J. (2005) "How Do House Prices Affect Consumption? Evidence From Micro Data", Harvard Institute of Economic Research Discussion Paper No. 2083, July 2005 http://econweb.fas.harvard.edu/hier/2005papers/HIER2083.pdf

Carroll, C. (2004), "Housing Wealth and Consumption Expenditure", unpublished manuscript, Johns Hopkins University http://econ.jhu.edu/people/ccarroll/papers/FedHouseWealthv2.pdf

Carroll, C., Otsuka, M. and Slacalek, J. (2006) "How large is the housing wealth effect? A new Approach", NBER Working Paper 12746 http://www.nber.org/papers/w12746

Case, K., Quigley, J. and Shiller, R. (2005) "Comparing Wealth Effects: The Stock Market versus the Housing Market," *Advances in Macroeconomics,* 5(1): Article 1. http://www.bepress.com/bejm/advances/vol5/iss1/art1

Case, K., Quigley. J. and Shiller, R. (2001) "Comparing Wealth Effects: The Stock Market versus the Housing Market", NBER Working Paper No. 8606, November 2001 (also Cowles Foundation Discussion Paper No. 1335, October 2001) http://papers.ssrn.com/paper.taf?abstract_id=289644

Catte, P., Girouard, N. Price, R. and André, C. (2004) "Housing markets, wealth and the business cycle", *OECD Working Paper* No. 394

Congressional Budget Office (CBO) (2007) "Housing Wealth and Consumer Spending", Background Paper prepared for the Congress of the United States, http://www.cbo.gov/ftpdocs/77xx/doc7719/01–05-Housing.pdf

Cooper, D. (2008) Impending Spending Bust? The Role of Housing Wealth as Borrowing Collateral, University of Michigan Job Market Paper, November http://www-personal.umich.edu/~dhcooper/hequity_psid_paper_d2.pdf

Cristini, A. and Sevilla, A. (2007) "Do house prices affect consumption and why? A replication and comparison exercise", mimeo, Oxford University, http://www.eea-esem.com/files/papers/EEA-ESEM/2008/2656/comparison_ccabhl_140208.pdf

Davis, M. and Palumbo, M. (2001) "A Primer on the Economics and Time Series Econometrics of Wealth Effects", Federal Reserve Board Finance and Economics Discussion Series 2001–09 https://www.federalreserve.gov/pubs/feds/2001/200109/200109pap.pdf

Deaton, A. (1985) "Panel data from time series of cross sections", *Journal of Econometrics*, 30(1):109–126

De Veirman, E. and Dunstan, A. (2008) "How do Housing Wealth, Financial Wealth and Consumption Interact? Evidence from New Zealand", *Reserve Bank of New Zealand Discussion Paper*, DP2008/05, February 2008, http://www.rbnz.govt.nz/research/discusspapers/dp08_05.pdf

Disney, R., Bridges, S. and Gathergood, J. (2006) "Housing Wealth and Household Indebtedness: Is there a Household 'Financial Accelerator'?", mimeo, http://www.bde.es/doctrab/confere/confe_12/01_Disney_Bridges_Gathergood.pdf

Disney, R., Henley, A. and Jevons, D. (2003) “House price shocks, negative equity and household consumption in the UK in the 1990s”, mimeo http://www.iue.it/FinConsEU/ResearchActivities/EconomicsOfConsumerCreditMay2003/Papers/Disney.pdf

Dolmas, J. (2003) "A note on the potential pitfalls in estimating a ‘wealth effect’ on consumption from aggregate data", *Economics Letters*, 78(3): 437–441

Dvornak, N. and Kohler, M. (2007) "Housing Wealth, Stock Market Wealth and Consumption: A Panel Analysis for Australia" *Economic Record*, 83(261): 117–130

Dynan, K. and Maki, D. (2001) "Does Stock Market Wealth Matter for Consumption?", Federal Reserve Board Finance and Economics Discussion Series 2001–23, https://www.federalreserve.gov/pubs/feds/2001/200123/200123pap.pdf

Ellis, L., Lawson, J. Roberts-Thomson, L. (2003) Housing Leverage in Australia, *Reserve Bank Discussion Paper,* RDP2003–09 http://www.rba.gov.au/PublicationsAndResearch/RDP/RDP2003–09.html

Fernández-Villaverde, J. and Krueger, D. (2007) "Consumption over the life cycle: facts from consumer expenditure survey data" *Review of Economics and Statistics*, v 89(3): 552–565

Fisher, L., Otto, G. and Voss, G. (2006) “Housing booms, non-financial wealth and consumption: Lessons from the Australian experience”, Proceedings of the 35th Australian Conference of Economists, 25–27 September 2006, Curtin University of Technology, Perth http://www.cbs.curtin.edu.au/files/Fisher_Otto_Voss.pdf

Fisher, L. and Voss, G. (2004) “Consumption, Wealth and Expected Stock Returns in Australia”, *Economic Record,* 80:251, 359–372

Girourard, N. and Blondal, S. (2001) "House prices and economic activity ", OECD Working Papers No 279, http://www.oecd.org/dataoecd/38/42/1888662.pdf

Girouard, N., Kennedy, M. and André, C. (2006) “Has the Rise in Debt made Households more Vulnerable?” OECD Economics Department Working Paper 535

Goodhardt, C. and Hofmann, B. (2008) "House Prices, money, credit and the macroeconomy", *Oxford Review of Economic Policy*, 24(1):180–205, also European Central Bank Working Paper Series No. 888 http://www.ecb.int/pub/pdf/scpwps/ecbwp888.pdf

Gramlich, E. (2002) "Consumption and the wealth effect: The United States and the United Kingdom", speech by Mr Edward M. Gramlich, Member of the Board of Governors of the US Federal Reserve System, before the International Bond Congress, London, U.K., 20 February 2002. http://www.bis.org/review/r020222c.pdf

Grant, C. and Peltonen, T. (2005) “Housing and Equity Wealth Effects of Italian Households”, *DNB Working Paper* No. 43 / May 2005, http://www.dnb.nl/dnb/home/file/Working%20Paper%20No.%2043–2005_tcm47–146700.pdf

Groenewold, N. (2003) “Consumption and Stock Prices: Can We Distinguish Signalling from Wealth Effects”, University of Western Australia Discussion Paper 03.22 http://www.ecom.uwa.edu.au/__data/page/37148/03_22_Groewold.pdf

Guiso, L., Paiella, M. and Visco, I. (2005) "Do capital gains affect consumption? Estimates of wealth effects from Italian households’ behaviour", Bank of Italy Working Paper No. 555, Final version published in 2006 in: E. Santarelli (ed.), *Entrepreneurship, Growth, and Innovation: the Dynamics of Firms and Industries*, New York, Springer http://www.bancaditalia.it/pubblicazioni/econo/temidi/td05/td555_05/td555en/tema_555.pdf

Headey, B. Warren, D. and Wooden, M. (2008) "The structure and distribution of household wealth in Australia: cohort differences and retirement issues", *Social Policy Research Paper* no. 33, http://www.fahcsia.gov.au/internet/facsinternet.nsf/research/prps-prps_33.htm

Hiebert, P. (2006) “Household saving and asset valuations in selected industrialised countries”, Research Discussion Paper RDP 2006–07, Reserve Bank of Australia, http://www.rba.gov.au/PublicationsAndResearch/RDP/RDP2006–07.pdf

Himmelberg, C., Mayer, C. and Sinai, T. (2005) "Assessing High House Prices: Bubbles, Fundamentals and Misperceptions" *Journal of Economic Perspectives*, 19(4): 67–92

HM Treasury (2003) Housing Consumption and EMU: EMU Study, HM Treasury, London, http://www.hm-treasury.gov.uk/media/3/1/ACF1951.pdf

Juster, F., Lupton, J., Smith, J and Stafford, F. (2006) "The Decline in Household Saving and the Wealth Effect," *Review of Economics and Statistics*, 88(1): 20–27

Kiel, K. and Zabel, J. (1999) "The accuracy of owner provided house values: the 1978–1991 American housing survey" *Real Estate Economics* 27(2): 263–298

King (1990) “Discussion*”, Economic Policy,* 5(2): 383–387

Kishor, N. (2007) "Does Consumption Respond More to Housing Wealth than to Financial Market Wealth? If So, Why?", *Journal of Real Estate Finance and Economics*, 35(4): 427–448

Klyuev, V. and Mills, P. (2007) “Is Housing Wealth an ‘‘ATM’’? The Relationship Between Household Wealth, Home Equity Withdrawal, and Saving Rates”, *IMF Staff Papers*, 54 (3): 539–561 http://www.imf.org/External/Pubs/FT/staffp/2007/03/pdf/klyuev.pdf

Labhard, V., Sterne, G. and Young, C. (2005) "Wealth and consumption: an assessment of the international evidence", Bank of England Working Paper No 275, http://www.bankofengland.co.uk/publications/workingpapers/wp275.pdf

Lehnert, A. (2004) “Housing, Consumption, and Credit Constraints”, Divisions of Research & Statistics and Monetary Affairs. Federal Reserve Board, Washington, D.C., http://www.federalreserve.gov/Pubs/feds/2004/200463/200463pap.pdf

Lettau, M. and Ludvigson, S. (2004) "Understanding Trend and Cycle in Asset Values: Reevaluating the Wealth Effect on Consumption", *American Economic Review*, 94(1): 276–299

Ludvigson, S. and Steindel, C. (1999) “How Important Is the Stock Market Effect on Consumption?” *Federal Reserve Bank of New York Economic Policy Review*, 5(2): 29–51, http://www.ny.frb.org/research/epr/99v05n2/9907ludv.pdf

Ludwig, A. and Sløk, T. (2004) "The Relationship between Stock Prices, House Prices and Consumption in OECD Countries", *Topics in Macroeconomics*, 4(1): Article 4, http://www.bepress.com/bejm/topics/vol4/iss1/art4/

Maki, D. and Palumbo, M. (2001) "Disentangling the Wealth Effect: A Cohort Analysis of Household Saving in the 1990s,", Federal Reserve Board Finance and Economics Discussion Series 2001–21 https://www.federalreserve.gov/pubs/feds/2001/200121/200121pap.pdf

Mehra, Y. (2001) "The Wealth Effect in Empirical Life-Cycle Aggregate Consumption Equations", *Federal Reserve Bank of Richmond Economic Quarterly*, 87(2): 45–68, http://www.richmondfed.org/publications/economic_research/economic_quarterly/pdfs/spring2001/mehra.pdf

Mishkin, F. (2007) "Housing and the Monetary Transmission Mechanism", NBER Working Paper No. 13518, Issued in October 2007 http://www.nber.org/papers/w13518

Muellbauer, J. (2007) “Housing, Credit and Consumer Expenditure", paper prepared for the *Federal Reserve Bank of Kansas City's symposium on "Housing Finance and Monetary Policy"* at Jackson Hole, Wyoming, August 30-September http://www.frbkc.org/publicat/sympos/2007/PDF/Muellbauer_0415.pdf

Muellbauer, J. and Murphy, A. (1997) "Booms and busts in the UK housing market", *Economic Journal*, 107(445): 1701–1727

Muellbauer, J. and Murphy, A. (1990) "Is the UK balance of payments sustainable?", *Economic Policy*, 5(2): 347–395

Otto, G. (2007) "The Growth of House Prices in Australian Capital Cities: What Do Economic Fundamentals Explain?" *Australian Economic Review,* 40(3): 225–238

Paiella, M. (2007) "Does wealth affect consumption? Evidence for Italy", *Journal of Macroeconomics*, 29: 189–205

Palumbo, M. Rudd, J. and Whelan, K. (2002) "On the Relationships between Real Consumption, Income, and Wealth", Federal Reserve Board Finance and Economics Discussion Series 2002–38 https://www.federalreserve.gov/pubs/feds/2002/200238/200238pap.pdf

Pichette, L. and Tremblay, D. (2003) "Are Wealth Effects Important for Canada?", Bank of Canada Working Paper 2003–30, http://www.bank-banque-canada.ca/en/res/wp/2003/wp03–30.pdf

Poterba, J. (2000) "Stock Market Wealth and Consumption", *Journal of Economic Perspectives*, 14(1): 99–118

Poterba, J. and Samwick, A. (1995) "Stock ownership patterns, stock market fluctuations, and consumption", *Brookings Papers on Economic Activity*, 2: 295–372

Productivity Commission (2004) *First Home Ownership*, Report no. 28, Melbourne: Productivity Commission, http://www.pc.gov.au

Ramakrishnan, U (2003) "Housing, Consumption and Output", part II of *Australia: selected Issues, IMF Country Report*, International Monetary Fund, Washington, DC. http://www.imf.org/external/pubs/cat/longres.cfm?sk=16972.0

Reserve Bank of Australia (RBA) (2005) "Survey on Housing Equity Withdrawal and Injection" *Reserve Bank Bulletin*, October 2005 http://www.rba.gov.au/PublicationsAndResearch/Bulletin/bu_oct05/survey_housing.html

Reserve Bank of Australia (RBA) (2002) "Recent Developments in Housing: Prices, Finance and Investor Attitudes", *Reserve Bank Bulletin*, July 2002 http://www.rba.gov.au/PublicationsAndResearch/Bulletin/bu_jul02/bu_0702_1.pdf

Roubini, N. (2007) "Bernanke: Wealth effect of housing on consumption higher than previously estimated", http://www.rgemonitor.com/blog/roubini/200281, downloaded 5 January 2008

Schwartz, C., Hampton, T., Lewis, C. and Norman, D. (2006) "A Survey of Equity Withdrawal and Injection in Australia", *Reserve Bank of Australia Discussion Paper* RDP 2006–08 http://www.rba.gov.au/PublicationsAndResearch/RDP/RDP2006–08.html

Schwartz, C., Lewis, C., Norman, D. and Hampton, T. (2008) "Factors Influencing Housing Equity Withdrawal: Evidence from a Microeconomic Survey", *Economic Record,* 84(267): 421–433

Shefrin, H. and Thaler, R. (1988) "The Behavioral Life-Cycle Hypothesis", *Economic Inquiry,* 26(4): 609–643

Sierminska, E. and Takhtamanova, Y. (2007) "Wealth Effects out of Financial and Housing Wealth: Cross-Country and Age Group Comparisons", FRB San Franciso, Working Paper 2007–01 http://www.frbsf.org/publications/economics/papers/2007/wp07–01bk.pdf

Smith, M (2007), "Microeconomic analysis of household expenditures and their relationship with house prices", *Reserve Bank of New Zealand Bulletin*, 70(4): 39–45 http://www.rbnz.govt.nz/research/bulletin/2007_2011/2007dec70_4smith.pdf

Tan, A. and Voss, G. (2003) "Consumption and Wealth in Australia", *Economic Record,* 79(244): 39–56

Tang, K-K. (2006) "The wealth effect of housing on aggregate consumption", *Applied Economics Letters*, 13(3/20): 189–193

Thaler, Richard H. (1990) "Anomalies", *Journal of Economic Perspectives*, 4(1): 193–205

Uren, Z. (2006) "The GHS Pseudo Cohort Dataset (GHSPCD)" http://www.statistics.gov.uk/cci/article.asp?id=1637

Van Nieuwerburgh, S. (2008) "The Housing Crisis and its Effects on Aggregate Consumption", Stern finance blogspot, Oct 20, 2008 http://sternfinance.blogspot.com/2008/10/housing-crisis-and-its-effects-on.html. Accessed 8th January 2009

Yang, F. (2008), "Consumption over the life cycle: How different is housing*?", Review of Economic Dynamics* In press, corrected proof available online 20 June 2008

Yates, J., Kendig, H. and Phillips, B. with Milligan, V and Tanton, R. (2008) *Sustaining fair shares: the Australian housing system and intergenerational sustainability*, Australian Housing and Urban Research Institute, Final Report No. 111, http://www.ahuri.edu.au

APPENDIX A:
EMPIRICAL RESULTS FROM LITERATURE

International evidence

There is considerable international evidence on the existence of a wealth effect. Based on US experience, for example Gramlich (2002, p.1) claims that, "at the aggregate level, the effect of wealth on consumption has been a mainstay of large-scale econometric models for at least thirty years". In the model of the US economy employed by the Federal Reserve, an additional dollar of household wealth leads to a permanent rise in consumption of about three to five cents. However, he also suggests that "a basic question is whether households' net worth summarises all the information about their balance sheets that is useful in predicting their spending" and reports that attempts by the US Federal Reserve to decompose net worth into two categories of wealth (housing and financial assets) have resulted in estimated marginal propensities to consume that vary substantially for non-stock market (or housing) wealth relative to stock market (or financial) wealth.

In its broader overview of central bank research on the impact of changes in asset wealth on the real economy, a recent Bank for International Settlements paper (BIS 2007) similarly notes that estimates of the propensity to consume from net worth tend to be relatively unstable. Altissimo *et al.* (2005), in a paper prepared for the European Central Bank (ECB), review theoretical and empirical evidence regarding asset and wealth effects. They suggest there is broad agreement about the appropriate framework for examining such effects, with most studies reviewed relying on a common life-cycle model of consumption for their analysis. However, empirical work differs according to whether household survey data, time series data or a panel data are employed and to the specific wealth effects examined. The results reviewed yield no strong consensus regarding the propensity to consume out of wealth or its components, with results varying over time and both within and between countries.[53] Some of the differences in results between countries are attributed to differences in wealth composition and demographics but Altissimo *et al.* suggest that the range of estimates across countries or even within the same country is wider than theory would suggest on the basis of cross-country differences in these variables. They argue that results are affected by differences in ways in which key variables are measured or in institutional differences affecting, for example, liquidity of wealth or volatility of asset prices and conclude that cross-country comparisons may be unreliable because of data mismeasurement and structural shocks that vary across time and across countries.

Labhard, Sterne and Young (2005), in a Bank of England working paper, provide a similar review of international evidence that focuses on empirical estimates of the long-run marginal propensity to consume from financial wealth derived from time series analyses. They also suggest there is little theoretical rationale for the wide diversion in estimates across countries and offer similar explanations of cross-country differences, suggesting that country differences can be explained by a "cocktail of data problems and a failure to account for the underlying structural changes in both consumption and wealth" (p.8). On the basis of a set of simplifying assumptions and by eliminating differences in the way in which wealth is measured, they conclude that the hypothesis of a common long-run marginal propensity to consume across countries of a little over six per cent cannot be rejected.

[53] However, there is some consensus for the claim that estimates are typically smaller for continental European Union (EU) countries than for English-speaking countries.

Along with other recent overviews (see, for example, Altissimo *et al.*, 2005; BIS, 2007; Congressional Budget Office (CBO), 2007; Girourard and Blöndal, 2001; Hiebert, 2006; HM Treasury, 2003; Sierminska and Takhtamanova, 2007), the Labhard, Sterne and Young review indicates that, in many studies, estimates of the propensity to consume from housing wealth differ from those of the propensity to consume from financial wealth. As with estimates for total wealth or financial wealth, estimates of the propensity to consume from housing wealth differ across studies and are not the same within studies over time.

However, in broad terms, from aggregate analyses there is a general consensus that the marginal propensity to consume from housing wealth lies somewhere between 0.02 and 0.10 and from disaggregate analyses that it is at the lower end of this range. There is less agreement in either aggregate and disaggregate analyses whether it is greater than the marginal propensity to consume from financial wealth.

A similar conclusion can be drawn from the limited studies that have been undertaken in Australia. Table A1 provides a summary of estimates that have been obtained in a selection of relatively recent empirical studies, including those for Australia.

DeVeirman and Dunstan (2008) suggest that the international empirical literature on the wealth effect is split between two views that essentially differ in their assessment of whether changes in wealth are due to exogenous shocks that are permanent or whether they are endogenous with changes in consumption anticipating changes in wealth. This point is returned to at the end of the following sub-section.

Australian evidence

There have been relatively few recent studies in Australia that have examined some aspect of the relationship between wealth and consumption. The studies that have been undertaken are based on aggregate time series and aggregate panel data. One closely related study has employed household level data from a single survey. No studies have employed a household panel approach.

Aggregate time series data have been used in a number of over-lapping papers by Fisher *et al.* (2006), Fisher and Voss (2004) and Tan and Voss (2003), and more recently in a paper by Tang (2006).

Tan and Voss (2003) focus on the relationship between (non-durables) consumption and household wealth for the period 1980–1999 (and for two sub-samples split at 1988) with the aim of determining whether there has been a stable relationship between them in Australia over their survey period in light of the considerable changes that have taken place in the latter period as a result of financial deregulation. Their results provide evidence of instability in the relationship between wealth and consumption over the full sample period (but relative stability for the second period sub-sample). This is attributed to the impact of deregulation of financial markets that provided households with greater access to credit markets in the second half of the sample period. They claim their result provides circumstantial evidence that household behaviour changed between the 1980s and 1990s.

In general, their results are relatively sensitive to model specification, but their preferred models (for the second sub-sample) suggest that changes in both non-financial and financial assets have significant but different short-run and long-run effects with more rapid short-run responses to changes in financial wealth but with changes in non-financial wealth being larger in the long-run than those for financial wealth.

Fisher and Voss (2004) extend the work of Tan and Voss by extending their sample period to cover 1976 to 2003. As did Tan and Voss, they find no evidence of a stable

relationship over the period. Their work follows that of Lettau and Ludvigson (2004) who focus specifically on the empirical foundation of the relationship between consumption and wealth by taking into account possible endogeneity of wealth. Contrary to conventional wisdom that the relationship between wealth and consumption is a *fait accompli* with the only question one of timing (Poterba, 2000, p103), Lettau and Ludvigson find that most changes in asset values are transitory and unrelated to consumer spending. Using the same methodology, Fisher and Voss reach the same conclusion. Estimates of error terms for their extended data from 2000 suggest that consumption did not respond strongly to the significant increase in wealth that occurred from that time (which, they argue, is consistent with the post-2000 wealth shock being seen as temporary rather than permanent). As they point out, their results (along with those of Lettau and Ludvigson) highlight the difficulty in separating out permanent and transitory shocks to net wealth. They conclude that further work is required to get an adequate model of the long-run relationship between consumption and wealth in Australia (p.366).

The most recent paper from this stable, Fisher *et al.* (2006) continues with this methodology but highlights the role of fluctuations in house prices in affecting changes to total household wealth. It attributes observed changes in housing wealth to what they identify as a large and persistent transitory component in household wealth. Again, they conclude there is little evidence that private consumption expenditure responds to transitory fluctuations in either total or non-financial wealth and that Australian households have ignored the effect of cyclical fluctuations in house prices when choosing their consumption path.

This result is in direct contradiction to that obtained for the IMF by Ramakrishnan (2003) and by Tang (2006). The IMF study, which excluded financial wealth form its specification because of inadequate data over the period (from 1981), found that housing wealth has a significant impact on consumption, with annual consumption increasing by 5 cents for a dollar increase in net housing wealth. This result is similar to Tang, who found a significant and sizable impact of both financial and housing assets on household consumption, with housing wealth having a long-run impact that is about three times that of financial wealth. Tang attributes this result to the greater volatility in financial compared with housing assets (and hence to greater difficulty in determining whether an increase in the value of financial assets is likely to be permanent), to the greater concentration of financial wealth among the more affluent and, finally, to a greater propensity to leverage housing wealth (and hence to the greater investment return provided by an equal percentage increase in housing wealth over financial wealth).

This Australian work, along with that of Lettau and Ludvigson, suggests that the debate over whether the rise in house prices that has taken place in a number of countries can be attributed to fundamentals or has a strong transitory component (that is, is a speculative bubble) is critical. Whether the increase in house prices observed in Australia (and elsewhere) approximately from 1999 to 2004 is seen by households as contributing to a permanent increase or only transitory increase in their housing wealth is likely to be critical in influencing their consumption response. Most of the recent work on this question (for example Girourard *et al.*, 2006; Himmelberg *et al.*, 2005; and also Otto, 2007) suggests there are strong arguments in favour of the former. However, most of this work pre-dates much of the significant run-up in house prices from 2000 and was completed prior to the 2007 start of the housing meltdown in the US (and the subsequent global financial crisis). While hindsight does provide more substance to the claim that at least some of the pre-2007 rise in house prices was the result of a speculative bubble, the critical question is whether households

interpreted the long rise in house prices as making a permanent or transitory contribution to the net wealth prior to the 2007 downturn.

As discussed in Chapter 1, one of the weaknesses of aggregate time series models is that they do not always adequately capture the effects of a number of structural changes such as changes in demographic structures, changes in institutional arrangements affecting consumption and saving (such as tax changes or introduction of compulsory superannuation) and changes in the distributions of income and wealth. They also are unable to separate out the effects of common causal drivers that affect both consumption and wealth.

To address the problems of multi-collinearity that can arise when attempting to separate out the effects of different components of household wealth on consumption, Dvornak and Kohler (2003, 2007) introduce cross-section data to time series data similar to that used in the papers discussed above but with a sample starting at 1984.

They follow the methodology employed by Case *et al.* (2001) by using quarterly data from 1984 to 2001 for the five largest states in Australia to form their regional panel data set. They suggest that their use of state-based data enables them to distinguish the effects of different components of wealth since state housing markets are seen as geographically distinct, whereas share markets are highly integrated. Their panel data results suggest both housing and stock market wealth have a significant effect on consumption with a permanent $A1 increase in stock market wealth increasing long-run annual consumption by 6–9 cents and the same increase in housing wealth increasing annual consumption by around 3 cents. Because households' housing assets are more than three times their stock market assets, they conclude that a one per cent increase in housing wealth has an effect on consumption at least as large as that of a one per cent increase in stock market wealth. At a broad level, their results are robust to estimation over a rolling window of ten years (within the 1984 to 2001 sample frame). Although there is some variation in the estimated coefficients, the stock market effect is always greater than the housing wealth effect. They suggest the gradually changing value of the coefficients is likely to reflect the ongoing changes in the structure of financial markets and use this result to add a cautionary note to the effect that the past may not always be an indication of the future during periods of rapid financial innovation.

Finally, they also re-estimate their model with aggregate data in order to illustrate the benefits of using state level over aggregate data. Their aggregate results suggest the stock market wealth effect is significant, while the housing effect is insignificant, which, they claim, is a similar result to that obtained by Tan and Voss and which they attribute to problems of multicollinearity between these variables in the aggregate data.[54]

Hiebert (2006) employs aggregate data for four OECD countries (Australia, Canada, the UK and the US) and estimates the response of household saving to equity and housing asset values using a common model both for the four individual countries and for a panel based on these four countries (with and without fixed country effects). His approach follows the methodology employed by Bertaut (2002). His individual country results confirm the existence of a wealth effect but suggest that there is some parameter instability in the estimates toward the end of the estimating period (viz. 2002) for countries other than Australia, and evidence of a structural break in the data in the early 1990s for Australia. His panel results suggest that equity price indices have a larger long-term effect on real saving than those for house prices (with the

[54] This is so only for the case where Tan and Voss use their full sample rather than their preferred sub-sample.

reverse being true in the short-run). He concludes that "over recent years, 'active' saving (through traditional means of setting aside a portion of current income) has been increasingly supplanted by 'passive' saving (that is, using valuation gains, either realised or unrealised) as a means of accumulating wealth.

Because his results are presented as elasticities of savings with respect to changes in wealth, they cannot be compared directly with the magnitude of consumption elasticities.

The final study which is relevant for this review of Australian studies is that by Schwartz *et al.* (2006, 2008). Rather than focusing on the relationship between consumption and wealth, they rely on a specially commissioned survey of 4,500 households undertaken in 2004 to examine the extent of housing equity withdrawal and the uses to which withdrawn funds are put. The results suggest the most common method of withdrawing equity was for a household to increase the level of debt secured against a property they already owned but that most of the value of equity withdrawn was associated with property transactions. They employed a sequential bivariate logit analysis to model first the decision to adjust or maintain housing equity and then, for those who adjusted, whether they injected or withdrew equity. Their results are consistent with strong life-cycle behaviour, with the bulk of equity withdrawal being undertaken by older households, while younger households typically inject primarily through mortgage repayments or deposits for property purchase. Finally, the results suggest that the bulk of the value of withdrawn equity was used to increase non-housing assets. Although a significant proportion of households used the funds for consumption expenditure, only a relatively small portion of overall equity withdrawn was used for consumption. There is no analysis of the characteristics of households who did increase consumption.

There are several potential problems with using the results of this study to examine the impact of changes in housing wealth on consumption. The first arises because the analysis apportions the full value of any equity withdrawn by each household to the main use. A second arises because of the dominance of life-cycle effects in the results. The static nature of the survey means that it is not possible to determine whether the observed changes (with younger households injecting net equity and older households withdrawing it) simply reflect life-cycle behaviour that would have taken place anyway. Despite this, the results in the paper are seen to be consistent with the paper's claim that “it remains likely that the trend rise in equity withdrawal evidence for much of the past 10 to 15 years has been one of the factors supporting strong growth in consumption over that period.”

Table A1: Selected empirical results*

		Wealth				
		Housing	*Financial*	*Total*	*Country*	*Period*
Study	***Aggregate time series studies***					
Ludvigson and Steindal (1999)	mpc	0.04	0.04	0.05	US	1953–1997
Mehra (2001)	mpc	0.05	0.04–0.06	0.04-.06	US	1959–2000
Davis & Palumbo (2001)	mpc	0.08	0.06	0.04–0.06	US	1960–2000
Bertaut (2002)	mpc	0.05–0.10	0.06		US	1960–2000
Bertaut (2002)	mpc	0.04	0.04		UK	1970–2000
Bertaut (2002)	mpc	0.08–0.09	0.09–0.10		Canada	1976–2000

		Wealth				
		Housing	*Financial*	*Total*	*Country*	*Period*
Bertaut (2002)	mpc	0.05	0.05		Aus	1981–1999
Boone and Girouard (2001)	mpc	0.03-.05	0.04–0.08	0.02–0.04	F, UK, US	1975–2000
Boone and Girouard (2001)	mpc	0.19–0.34	0.10–0.12	0.02–0.06	C, J	1975–2000
Palumbo, Rudd and Whelan (2002)	mpc		0.07–0.08		US	1954–2000
Pichette & Tremblay (2003)	mpc	0.06	0.00		C	1964–2000
Carroll (2003)	mpc	0.09–0.14	0.04–0.07	0.05–0.07	US	1960–2003
Tan and Voss (2003)	mpc	0.00	0.04		Aus	1980–1999
Ramakrishnan (2003)	mpc	0.05			Aus	1981–2002
Belsky and Prakken (2004)	mpc	0.06	0.06	0.06	US	1960–2003
Benjamin, Chinloy and Jud (2004)	mpc	0.08	0.02		US	1952–2001
Catte, Girouard, Price and André (2004)	mpc	0.05–0.08	0.03–0.04		AUS, C, NL, UK, US	~10–40 yrs
Catte, Girouard, Price and André (2004)	mpc	0.01–0.02	0.01–0.02		F, D, I, E	~20 yrs
Carroll, Otsuka and Slacalek (2006)	mpc	0.09	0.04	0.06	US	1960–2004
Tang (2006)	mpc	0.06	0.02		Aus	1988–2003
Kishor (2007)	mpc	0.07	0.03		US	1952–2002
DeVierman and Dunstan (2008)	mpc	0.05-.075	0.14–0.18		NZ	1982–2006
Benjamin and Chinloy (2008)	mpc	0.02	0.04		US	1964–2003
Nieuwerbergh (2008)	mpc	0.09–0.15			US	1952–2008
Davis and Palumbo (2001)	elast	0.36	0.07	0.19–0.34	US	1960–2000
Groenewold (2003)	elast		0.06		US	1947–2002
Dvornak & Kohler (2007)	mpc	0.03	0.06–0.09		5 Aus	1986–2001
Labhard, Sterne and Young (2005)	mpc		0.07		11 OECD	1970–2002
Ludwig & Slok (2004)	elast	0.00–0.02	0.01–0.03		16 OECD	1960–1984
Ludwig & Slok (2004)	elast	0.03	0.03		16 OECD	1985–2000
Case, Quigley and Shiller (2005)	elast	0.05–0.09	0.02		51 US	1982–1999
Case, Quigley and Shiller (2005)	elast	0.11–0.17	0.00		14 OECD	1975–1996
		Household cross section studies				
Bover (2005)	mpc	0.02	~0.00	0.02	Spain	2002
Sierminska & Takhtamanova (2007)	elast	0.10–0.13	0.00–0.04		C, F, I	~1999
		Household panel studies				
Dynan and Maki (2001)	mpc		0.05–0.15		US	1993–1999
Maki and Palumbo (2001)	mpc			0.03–0.05	US	1989–1998
Disney, Henley & Jevons (2003)	mpc	0.04–0.08			UK	1991–1999

		Wealth				
		Housing	*Financial*	*Total*	*Country*	*Period*
Guiso, Paiella and Visco (2004)	mpc	0.02	0.02	0.02	Italy	1991–2002
Grant & Pelton (2005)	mpc	0.01	0.01		Italy	1989–2002
Berben, Bernoth & Mastrogiacomo (2006)	mpc	0.03		0.01	NL	1993–2005
Juster, Lupton, Smith & Stafford (2006)	mpc	0.03	0.19	0.03	US	1984–1994
Paiella (2007)	mpc	0.02	0.09	0.04	Italy	1991–2002
Cooper (2008)	mpc	0.03			US	1984–2005
Lehnert (2004)	elast	0.04–0.05			US	1968–1993
Attanasio *et al.* (2008)	elast	0.04–0.21			UK	1978–2002
Bostic, Gabriel & Painter (2006)	elast	0.06	0.02		US	1988–2001
Campbell & Cocco (2007)	elast	1.22			UK	1988–2000

* Results are listed chronologically by type of coefficient estimated. All of the results reported are long-run marginal propensities to consume (mpc) or elasticities (elast) and, where a distinction was made, represent responses to permanent increases in wealth. In a number of studies, the analysis was limited to a particular subset of households and in others the focus was on disaggregated results. The most aggregated and, where stated, preferred estimates reported in the paper have been included in this table. A range has been reported when the paper did not indicate a preferred estimate or when only disaggregated results were presented.

APPENDIX B:
PREVIOUS PSEUDO-PANEL HOUSEHOLD STUDIES

This Appendix provides more detail on three of the key studies that employed a similar methodology to that used in this report. These studies developed and refined the microeconomic approaches needed to identify which of the various transmission mechanisms that might explain the correlation between increases in housing wealth and household consumption is supported by the available evidence. As indicated in the main text, despite employing similar methodologies and the same basic data source, they reached diametrically opposed conclusions. Some of the reasons for this are covered in Chapter 2.

Attanasio and Weber (1994)

Attanasio and Weber's (AW) analysis was undertaken in response to an argument presented by Muellbauer and Murphy (1990) that the 1980s increase in the UK consumption ratio (or decline in the saving ratio) could be explained by the increase in house prices in the mid-1980s coupled with the financial liberalisation of the early 1980s and the related reduction in borrowing constraints for those with increased wealth.

Attanasio and Weber's starting hypothesis (that the increase in house prices could be a consequence rather than a cause of the decline in savings) was consistent with that proposed by King (1990) and Pagano (1990) who suggested that an increase in expected lifetime labour income may be responsible both for the consumption boom and for increased house prices. An unanticipated increase in lifetime income may arise from a number of sources including a permanent but unexpected increase in productivity. They argued that, under the Muellbauer and Murphy (MM) hypothesis, an unanticipated increase in housing wealth would imply that the consumption of home owners would increase by more than the consumption of non-homeowners and consumption would increase more in regions that experienced the highest increase in house prices. However, they also argue that

> "perceived permanent changes in productivity growth will affect different generations in different ways. It is conceivable that, if the increase in life-time income is larger for younger cohorts, their consumption should increase by more than that of older cohorts." (Attanasio and Weber, 1994, p.1285)

Attanasio and Weber's testing of these hypotheses relies on FES data from 1974 to 1988 and use of age-defined cohorts to estimate a base level of consumption from which they can analyse the effect of the structural change, presumed to have contributed to the observed increase in productivity post-1985.

They showed the increase in consumption was greater for younger cohorts. This led them to conclude that

> "while the MM hypothesis can explain part of the increase in aggregate consumption, and in particular that increase accounted for by the behaviour of the older households, it cannot explain a large fraction of it. The results indicate that most of the consumption boom was due to the perception of an increase in permanent income and by an attempt of younger households to transfer resources from the future to the present." (Attanasio and Weber, 1994, p.1295)

Attanasio and Weber set the scene for later studies that were predicated on the assumption that the different hypotheses about the impact of changes in wealth could

be assessed by recognising the differences in impact on different types of households using micro- or household-level data.

Attanasio, Blow, Hamilton and Leicester (2008)[55]

Attanasio, Blow, Hamilton and Leicester updated and extend the AW methodology to consider evidence for a direct wealth effect and indirect (collateral and/or expectations effects) explanations for the relationship between house prices and consumption. They model consumption in any period as a fraction of lifetime wealth that depends only on age but explicitly includes lifetime (total) wealth in their specification. Factors influencing life-time wealth are captured by observable variables (such as family size and composition) and others are proxied with a flexible function of age. Variation between different cohorts' non-housing life-time wealth is captured by cohort dummies and by similar control variables to those used by AW.

The key contribution of the empirical analysis in the Attanasio *et al.* (2008) paper is in the attention they pay to the specification of how house price changes might be taken into account. They consider the extent to which annual regional house price growth improves the explanation of the deviation of a cohort's consumption from its estimated trend life-cycle profile by interacting annual regional house price growth with an age cohort dummy rather than a tenure dummy.[56] Attanasio *et al.* use the differences in the estimated coefficients on the age cohort dummy variables, rather than the coefficients themselves, to test their hypothesis. The reason for this approach is that positive coefficients on the house price variables could reflect either a direct causal effect or the effect of a common factor. They argue that, if house prices capture the direct wealth effect, the coefficient should be larger for older households since they have higher rates of home ownership. On the other hand, if house prices capture differences in expected future income, the effect should be greater for younger households.

Overall, their results are consistent with those obtained by AW. Their baseline specification shows that, where there is a divergence of consumption from that predicted from the estimated consumption age profiles, this divergence is greatest for younger households. Their results replicate the AW result that the consumption boom

[55] A more recent paper by Attanasio, Leicester and Wakefield (2009) constructs a structural model that is consistent with the reduced form model employed in Attanasio *et al.*, numerically solves this and calibrates it with both macro- and micro-data to match the UK data employed by Attanasio *et al.* (2008). The calibrated model is used to simulate individual behaviour under a set of counterfactual scenarios in order to further disentangle the underlying mechanisms that transmit house price shocks to consumption growth. Their results support the Attanasio *et al.* (2008) claim that a direct wealth effects from house price shocks will be most evident in the consumption patterns of older groups and that strong consumption responses from younger groups required a different type of shock (such as a shock to income or expected permanent income), consistent with a common cause explanation of consumption growth. In other words, it is consistent with the claim that a stronger consumption response from younger households provides "powerful evidence against the hypothesis that wealth effects from house price changes have been the main mechanism driving the correlation." (Attanasio, Leicester and Wakefield, 2009, p.29). This paper is not covered in detail as it became available only after the first draft of this report had been submitted and because the results extend, but do not differ substantially from, those covered here.

[56] Their preference for this specification is that, unlike age, tenure is seen as a decision variable for most households which means there is a possible selection bias in analyses based on distinguishing owners from renters. However, it could also be argued that transaction costs and dominant social/psychological preferences for home ownership mean that this is likely to be so only for potential first-home buyers and for marginal owners faced with significant shocks (such as changes in income or household structure) rather than holding for the vast majority of households. Attanasio *et al.* (2008) also point out that the split between homeowners and renters has not been constant in the UK over the sample period (with the former increasing) with the implication that results from pseudo-panel analysis based on these groups could be biased.

of the late 1980s was driven by the youngest cohorts and most likely reflects a change in perceived permanent income. They are also able to show that younger households were the primary drivers of subsequent cyclical changes in consumption during the 1990s.

With the introduction of their house price terms, the pattern of coefficients (highest and significant for the youngest group and lowest and insignificant for the older group) do not offer support for the wealth hypothesis, in marked contrast with the results obtained by Campbell and Cocco (2007), discussed later. However, this result is still consistent with a collateral effect as younger households are more likely than older households to be credit-constrained.

This possibility is dismissed on the basis of results which showed similar coefficients for owners and renters when house price growth was interacted with tenure rather than age dummies. This led them to conclude that the common causality effect dominates any positive wealth or collateral effects (which should benefit home owners).[57] They ignore the possibility that, for mortgaged home owners, the binding credit-constraint may be an income- rather than a wealth-constraint.

Their final test is based on decomposing regional house price trends into an expected and unexpected component where the former is driven by real interest rates and growth in regional incomes and the latter is the residual, or unanticipated, effect. Both components are then interacted with their age cohort dummies. In this case, the coefficients on the age cohort dummies with the predicted house price variable (seen as a proxy for growth in permanent income) are similar for all three age cohorts, which is inconsistent with the prediction under the wealth hypothesis that the effect would be greatest for the oldest households. By contrast, the unanticipated house price variable has a greater effect for the young.

Thus, Attanasio *et al.* (2008) conclude that neither direct wealth nor collateral channels have been the principal cause of the relationship between house prices and consumption. Rather, their empirical evidence is consistent with a common causal factor leading to the observed positive correlation between housing prices and consumption. During consumption cycles, younger cohorts, who are less likely to own a property and who are more affected by revisions to future earnings, had the largest swings in consumption, contrary to what would be expected under a direct wealth hypothesis. Second, the relationship between house price growth and consumption is stronger for younger households and not even significant for older households. This result holds for the unanticipated growth in house prices when house price growth is decomposed into anticipated and unanticipated components. Finally, home owners and renters have similar consumption responses over the house price cycle.

This result is in strong contrast to Campbell and Cocco (2005, 2007) who use the same data source and a similar pseudo-panel technique to distinguish among the same alternative hypotheses about the observed correlation between house prices and consumption but who find the wealth effect is greatest for older home owners and smallest for younger renters and who conclude that the collateral channel dominates.

[57] They dismiss potential concerns about sample selection and endogeneity by arguing that these are likely to bias the coefficient on renters downward because increases in home ownership in the UK have been pro-cyclical and better-off renters are more likely to have moved into homeownership.

Campbell and Cocco (2007)

Campbell and Cocco rely on UK FES data from 1988 to 2000 and define their oldest cohort as consisting of individuals born between 1935 and 1939 and their youngest as those born between 1965 and 1969.[58]

While they recognise the benefits of a pseudo-panel approach, they see one of its key limitations as being "an inability to precisely identify those households for whom the wealth effect of house price changes is largest, or for whom borrowing constraints are relaxed when house prices increase." (Campbell and Cocco, 2007, p.594) A second limitation is the inability to control for endogeneity of cohort membership when cohorts are defined "by variables that households themselves choose, namely location and homeownership."(Campbell and Cocco, 2007, p.295) It is in their treatment of these issues that their methodology differs most significantly from Attanasio *et al.* A third methodological difference is that Campbell and Cocco estimate their equations using average cohort data, rather than individual household data as in the Attanasio papers discussed previously. This has the effect of removing much of the heterogeneity from the data but, as Cristina and Sevilla (2008) show, does not affect their results.

Campbell and Cocco (2007) specify two sets of pseudo-cohorts defined to explore the different ways in which housing wealth might affect household consumption. The first is a set of regional-year cohorts based on year of birth and the region in which the household lives. The second is a set of tenure cohorts based on year of birth and on whether the household is an owner or not. In principle, their approach to defining cohorts means that they allow for the possibility of different responses for each age cohort in each region or type of tenure as in the Attanasio *et al.* study. Attanasio *et al.*, achieve this by interacting their regional or tenure variables with age cohort dummies.

Their results show house price increases are positively correlated with consumption growth, with the highest house price elasticity of consumption for older home owners and the lowest (and close to zero) for young renters. They also show that real mortgage payments are negatively correlated with consumption growth (due to changes in real mortgage payments of the young rather than old homeowners). This first result is consistent with a direct wealth effect although Campbell and Cocco argue the small effect on young renters is puzzling as they might be expected to decrease their consumption. The second result is attributed to the presence of borrowing constraints.

Apart from the obvious difference that variables are expressed in growth terms rather than levels, their baseline equation differs from that used by Attanasio *et al.* to estimate the effects of house price growth in two respects. The first is in the inclusion of interest rates and income in the base specification. The second is in the way in which cohorts are defined.

The first difference allows for the influence of current income on consumption and hence for the existence of liquidity rather than collateral constraints on borrowing capacity.

The second difference raises the question of endogeneity in the way in which Campbell and Cocco have defined their cohorts and, particularly, because the

[58] Compared with Attanasio *et al.*, this reduces their sample period from 24 years to 13 and the number of cohorts considered from 15 to 7. They give no explanation for why they do not use a longer time series although their choice does mean that their data only covers the period after financial liberalisation had occurred. Their analysis is restricted to those aged less than 65 at the time of the 2000 survey because of a belief that consumption patterns of older households are likely to be affected by health considerations which might affect their subjective discount rate.

decision to become a homeowners is correlated with individual characteristics such as income and consumption. As they point out, over time, the cohort of renters for a fixed birth year shrinks and becomes more concentrated in the low-income population. However, these effects can be captured by the fixed effects in the regressions. A more serious problem arises if this endogeneity results in there being a correlation between changes in house prices and consumption; for example, due to renters becoming homeowners. The mean consumption for renters in a given birth cohort in one period may be lower than in the previous period because renters with higher consumption (and higher income) have become home owners.[59]

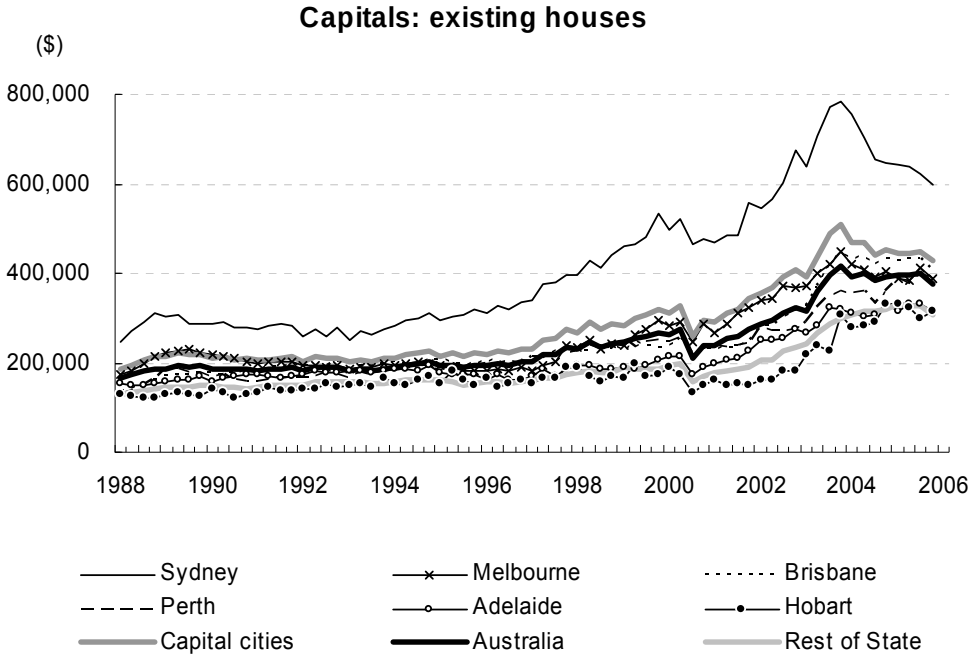
In general, their results provide support for the existence of a wealth effect and are consistent with this effect operating through a collateral effect arising from increased house prices relaxing borrowing constraints. The implication of the Campbell and Cocco findings that older home owners are most responsive to house price increases has an important macroeconomic implication. It suggests that, as the population ages, aggregate consumption may become more responsive to house prices.

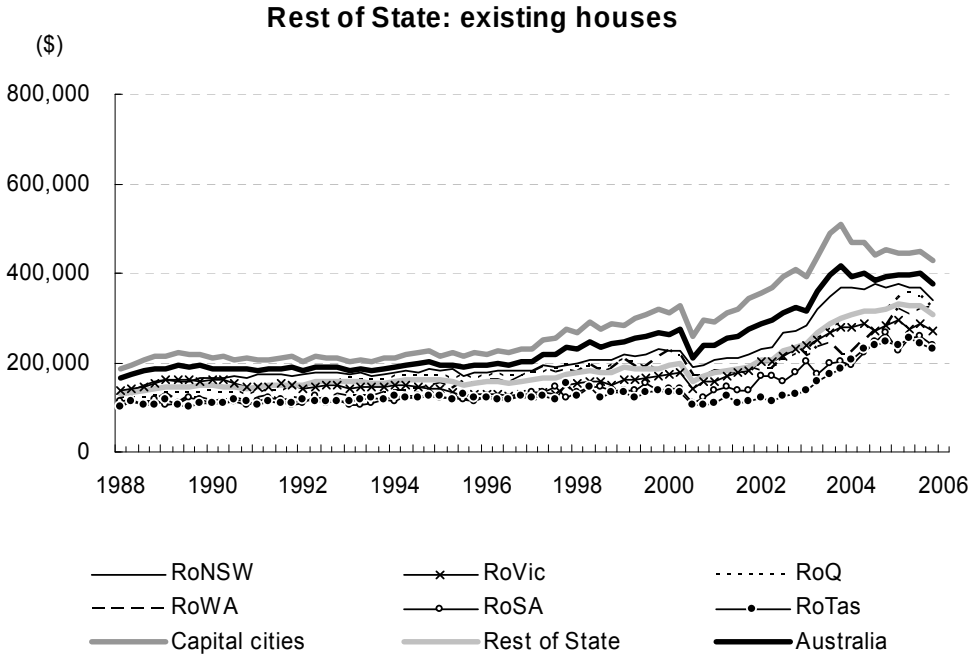
[59] In response to their concern, they develop an alternative approach to the cohort selection problem based on a highly stylised model of consumption and housing choice, calibrated from a range of sources and with discount factors imposed to ensure the simulations match actual data. This is used to generate simulated data which is moderately successful in replicating their FES results except for tenure outcomes for the young (aged less than 40). They estimate regressions on their simulated data similar to those estimated using FES data and supplement these with results based on joint estimation of the tenure and consumption decisions to allow for endogeneity when cohorts are defined along tenure dimensions. They use differences in their simulated and FES results to explain those derived from their pseudo-cohort approach. They conclude that their 'problem' result for young renters might be a result of income measurement error, arguing that, if the income of young renters is subject to more measurement error than that of old homeowners and if it is positively correlated with house prices, the estimated coefficient on house prices may be smaller than that estimated with their pseudo-cohort analysis.

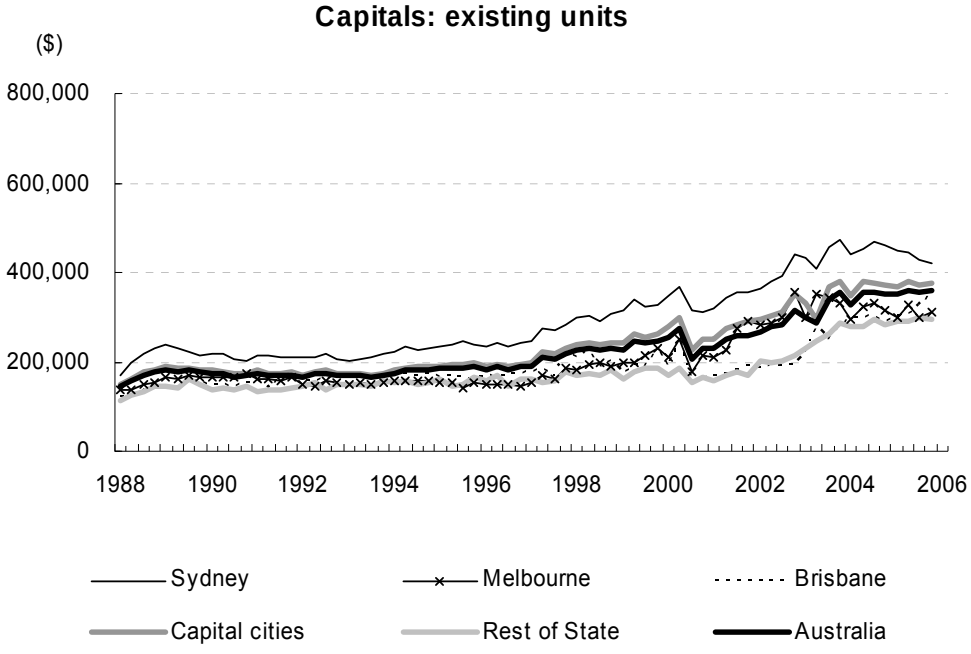
APPENDIX C:
SUPPLEMENTARY DATA

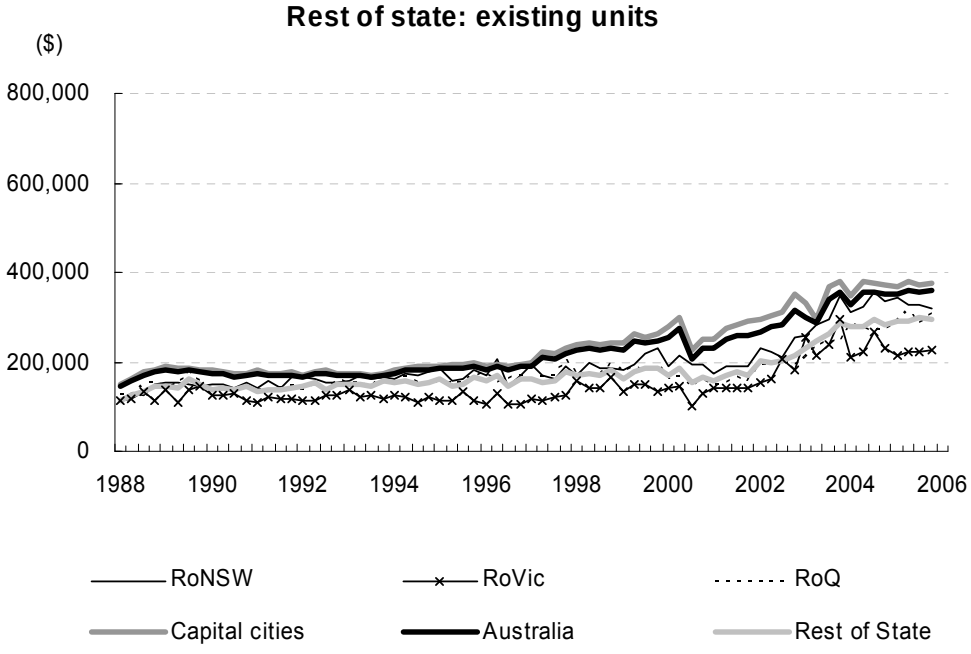
Figure C1 disaggregates the dwelling price data given in Figure 1 by regions and type of dwelling. These charts suggest that, although the actual values differ quite considerably by dwelling type and region, the trends by the disaggregate data below mirror those shown in the Australia-wide data.

Figure C1: Real dwelling prices by region and dwelling type*: 1988–2006







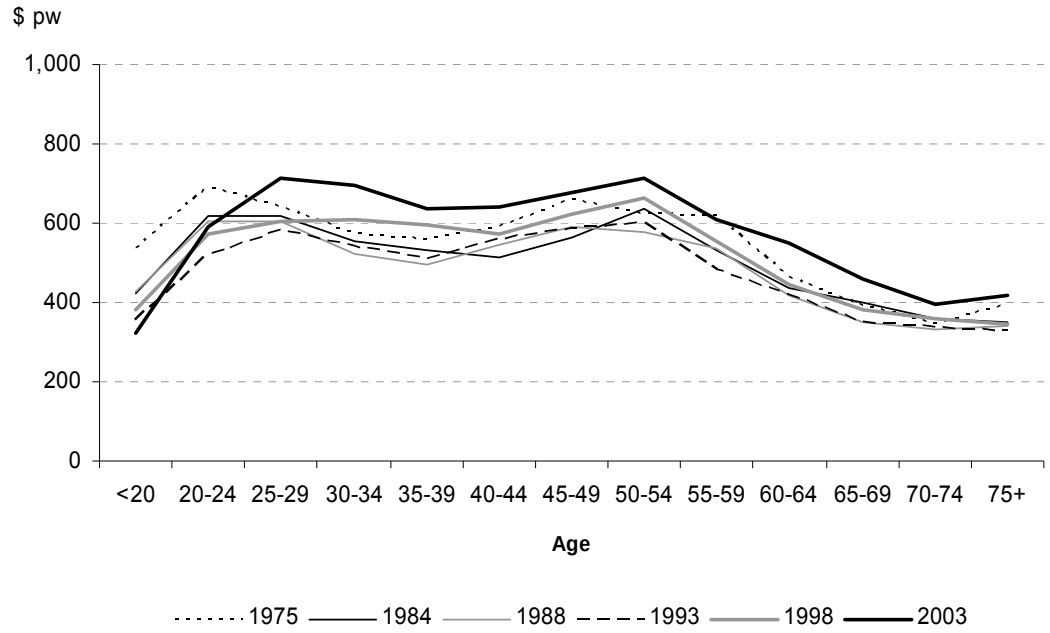


* Data for some regions have not been charted because small sample sizes mean they are unreliable.
Source: HIA Housing Reports

The differences in dwelling values shown in Figure C1 suggest that, although the broad trends are similar, changes in housing wealth vary significantly according to region and dwelling type.

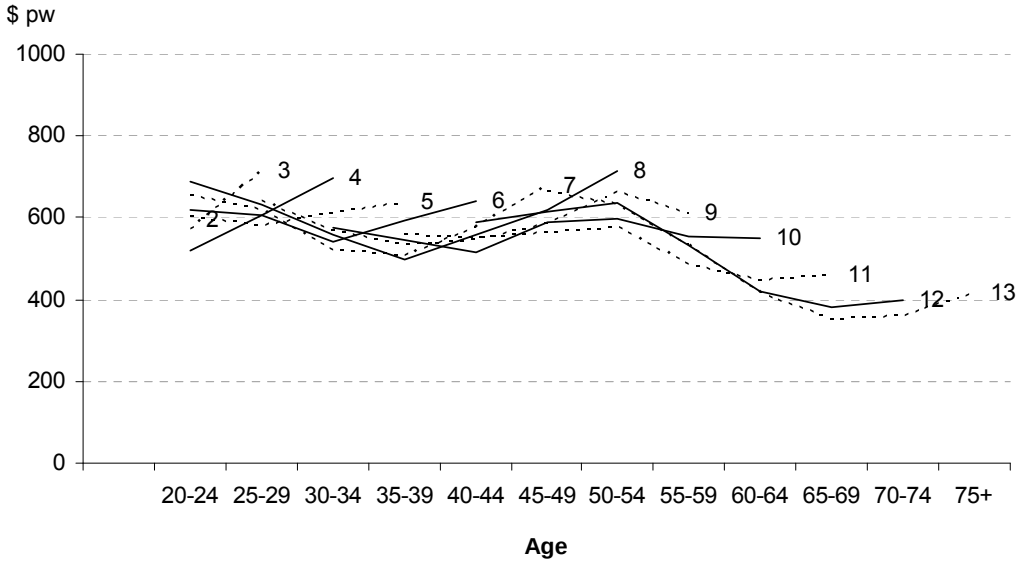
Figure C2 and Figure C3 below show equivalised household disposable income by age and cohort comparable to the consumption data presented in Chapter 4.

Figure C2: Equivalised household disposable income by age and year of survey ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

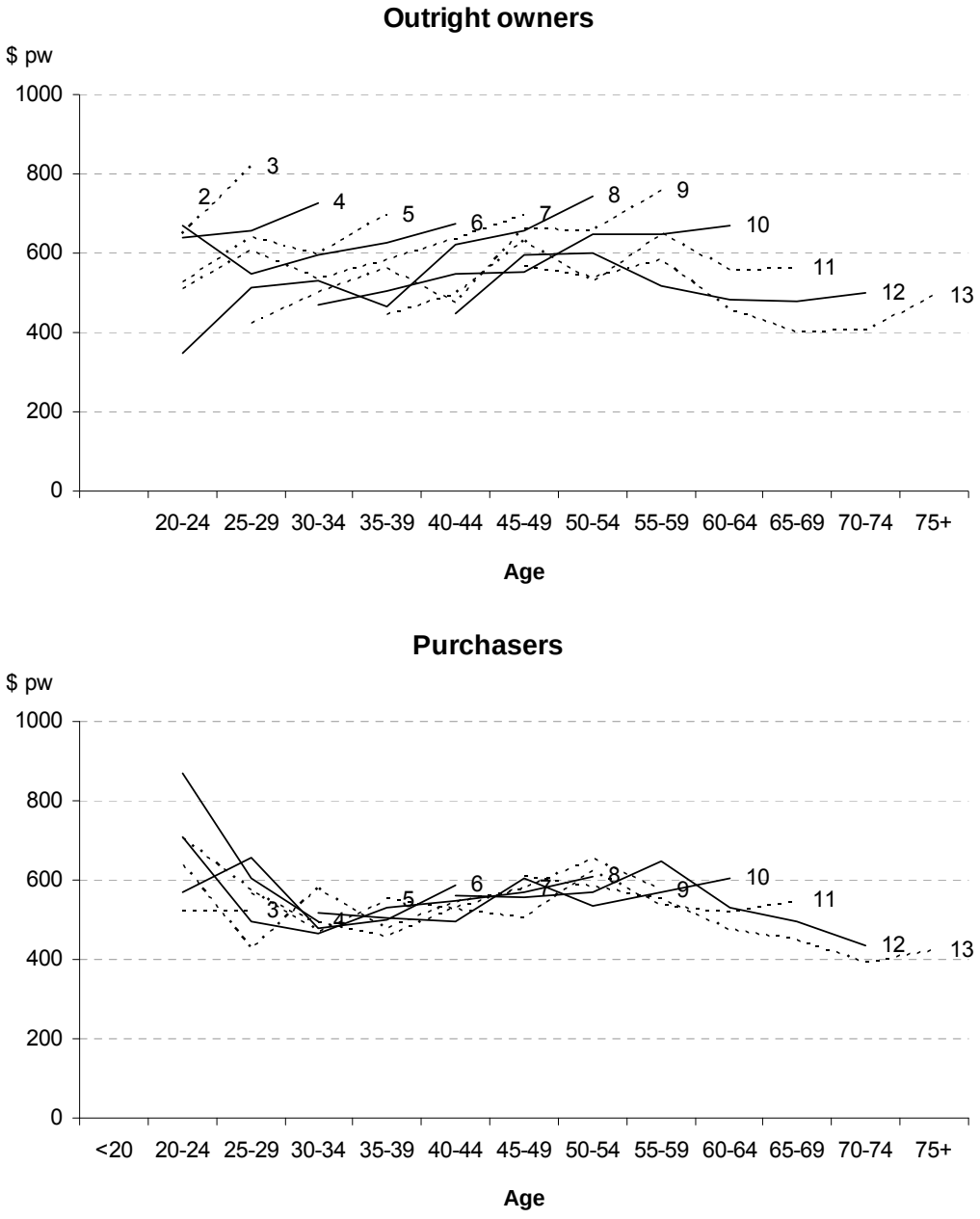
Figure C3: Equivalised household disposable income by cohort ($2007)



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

Figure C further disaggregates the results presented in Figure 11 according to whether owner-occupied property is owned outright or in the process of being purchased. It shows that, for younger households, increases in consumption expenditure occur among outright owners and are not as pronounced or systematically positive for purchasers. [60]

Figure C4: Equivalised consumption expenditure by ownership status and cohort ($2007)

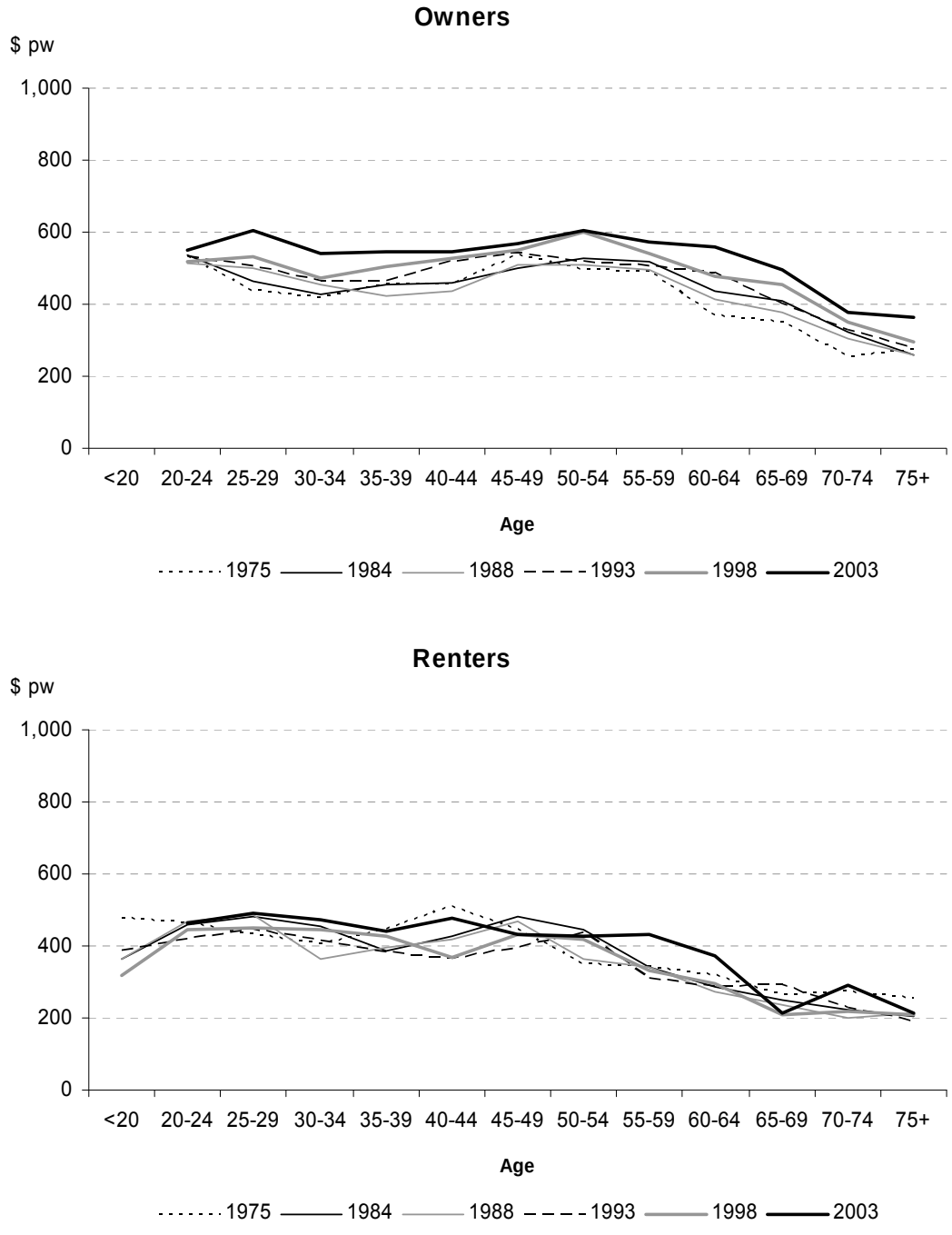


Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975–76 to 2003–04. Results derived from ABS Basic CURF data.

[60] Sample sizes are unreliable for young and old purchasers, young owners. Data are not shown where estimates are derived from less than twenty observations.

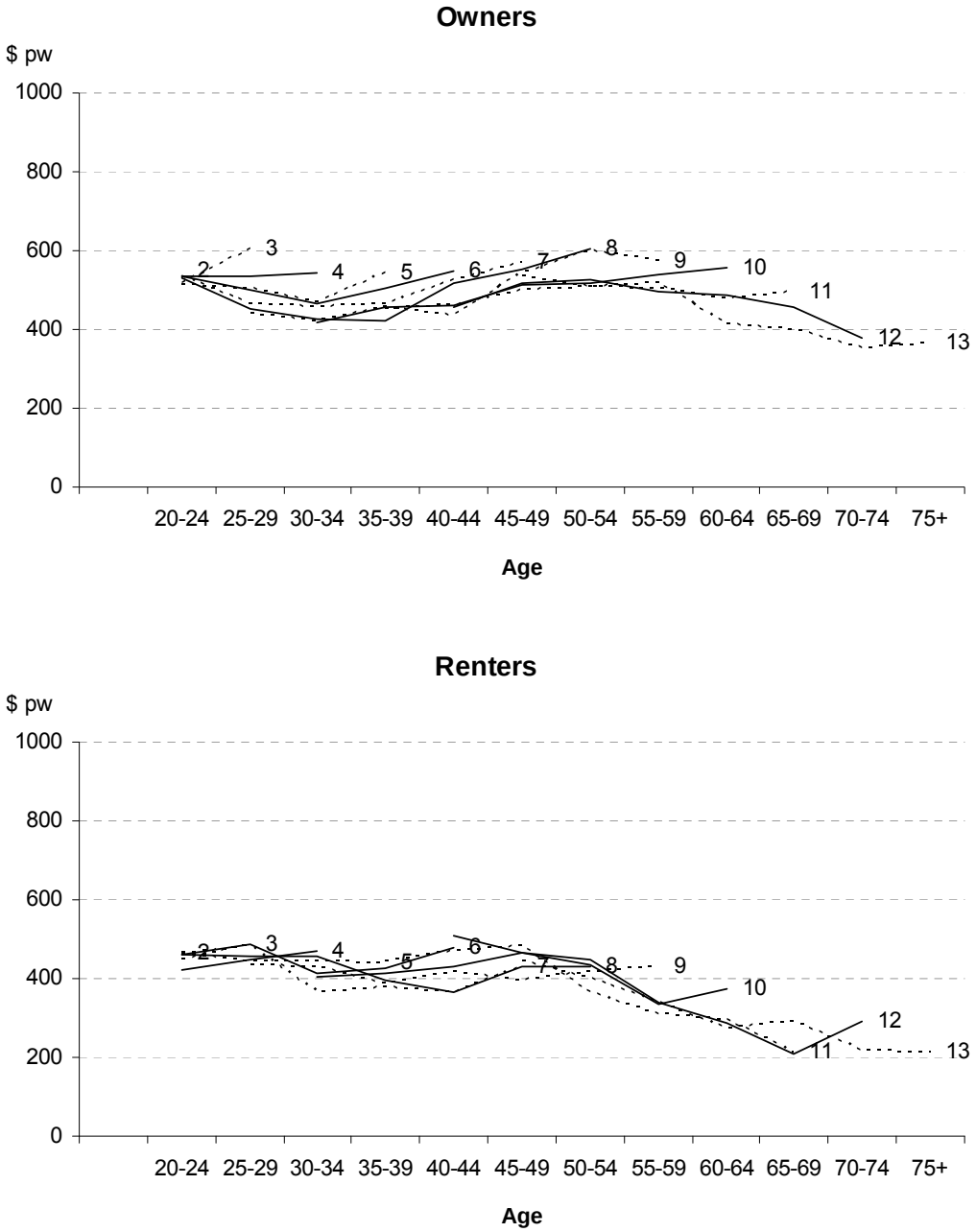
Figure C5 and Figure C6 repeat the key charts presented in Chapter 4 for a definition of consumption expenditure that excludes housing. The results suggest that the general observations are not affected by this change.

Figure C5: Real equivalised consumption expenditure excluding housing by age, tenure and year of survey



Source: Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Figure C6: Real equivalised consumption expenditure excluding housing by cohort, tenure



Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

APPENDIX D:
DETAILED EMPIRICAL RESULTS

Table D1: Regression results for consumption expenditure on goods and services less expenditure on housing[a]

	(4.1)		(4.2)		(4.3)		(4.4a)		(4.4b)		(4.4c)		(4.5a)		(4.5b)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
Constant	-124.64	-1.57	-98.98	-1.24	-90.34	-1.34	-144.53	-1.82 *	-146.15	-1.84 *	-143.88	-1.82 *	-142.27	-1.80 *	-132.11	-1.67 *
1975	-86.81	-1.02	-82.59	-0.96	-86.58	-1.21	-11.43	-0.13	-6.29	-0.07	-11.55	-0.14	-7.46	-0.09	-22.92	-0.27
1984	-33.20	-0.57	-23.91	-0.40	-24.08	-0.54	42.30	0.73	50.66	0.87	45.80	0.79	46.82	0.81	28.79	0.50
1988-89	-54.40	-1.25	-43.15	-0.97	-41.30	-1.39	19.44	0.45	29.59	0.67	25.03	0.58	24.03	0.55	4.68	0.11
1993-94	-33.85	-1.15	-21.54	-0.69	-17.49	-1.08	37.33	1.26	49.39	1.63	44.97	1.53	42.13	1.43	21.71	0.74
1998-99	-19.00	-1.18	-6.18	-0.31			-19.79	-1.16	-5.66	-0.31	8.56	0.53	-15.13	-0.89	-35.17	-2.09 **
cohort 3	-27.02	-1.09	-32.87	-1.31	-36.81	-1.47	-45.88	-1.86 *	-44.67	-1.81 *	-47.07	-1.91	-46.84	-1.90 *	-41.18	-1.67
cohort 4	-40.31	-1.11	-46.58	-1.28	-48.88	-1.34	-72.81	-2.02 *	-67.94	-1.88 *	-71.62	-1.99	-74.14	-2.06 **	-66.97	-1.86
cohort 5	-31.48	-0.64	-52.07	-1.04	-49.07	-0.98	-81.56	-1.66 *	-75.05	-1.52	-79.45	-1.61	-83.06	-1.69 *	-75.57	-1.53
cohort 6	-52.03	-0.82	-69.19	-1.09	-65.48	-1.03	-116.81	-1.85 *	-107.85	-1.71 *	-109.92	-1.74 *	-118.72	-1.88 *	-111.79	-1.77
cohort 7	-32.94	-0.43	-47.25	-0.61	-41.42	-0.54	-98.97	-1.29	-87.67	-1.14	-89.82	-1.17	-100.85	-1.31	-94.90	-1.24
cohort 8	-35.14	-0.39	-46.66	-0.51	-39.18	-0.43	-104.66	-1.15	-91.26	-1.01	-93.14	-1.03	-106.40	-1.17	-101.65	-1.12
cohort 9	-24.90	-0.24	-27.51	-0.26	-16.72	-0.16	-82.97	-0.79	-67.71	-0.65	-69.35	-0.66	-83.77	-0.80	-81.93	-0.78
cohort 10	-21.89	-0.18	-22.69	-0.19	-9.51	-0.08	-72.56	-0.61	-55.50	-0.47	-57.29	-0.48	-72.65	-0.61	-72.28	-0.61
cohort 11	-30.25	-0.23	-29.22	-0.22	-14.80	-0.11	-79.63	-0.60	-61.16	-0.46	-62.63	-0.47	-78.83	-0.59	-80.00	-0.60
cohort 12	-59.25	-0.40	-55.88	-0.38	-38.32	-0.26	-106.33	-0.72	-86.23	-0.59	-88.32	-0.60	-104.46	-0.71	-107.11	-0.73
cohort 13	-65.50	-0.41	-63.68	-0.39	-43.97	-0.27	-115.15	-0.72	-94.17	-0.59	-94.78	-0.59	-114.64	-0.71	-119.16	-0.74
cohort 14	-81.91	-0.47	-78.86	-0.45	-56.95	-0.32	-130.74	-0.75	-108.38	-0.62	-110.72	-0.63	-130.19	-0.75	-136.29	-0.78
cohort 15	-105.72	-0.56	-101.00	-0.53	-76.71	-0.40	-155.27	-0.82	-131.15	-0.69	-133.41	-0.71	-154.52	-0.82	-161.98	-0.86
cohort 16	-102.71	-0.48	-94.74	-0.44	-66.98	-0.31	-151.98	-0.71	-125.28	-0.59	-127.23	-0.60	-151.02	-0.71	-161.04	-0.76
Victoria	1.02	0.15	1.08	0.16	0.05	0.01	11.55	1.75 *	11.07	1.67 *	10.82	1.64 *	10.88	1.65 *	8.63	1.31
Queensland	-41.19	-5.57 **	-41.31	-5.59 **	-41.34	-5.60 **	-27.83	-3.77 **	-28.18	-3.82 **	-28.86	-3.91 **	-28.62	-3.88 **	-31.43	-4.27 **
South Australia	-26.78	-3.19 **	-27.25	-3.25 **	-27.56	-3.29 **	-10.44	-1.25	-10.97	-1.31	-11.20	-1.34	-11.48	-1.37	-15.61	-1.87 *
Western Australia	-3.14	-0.37	-3.39	-0.40	-3.85	-0.45	9.36	1.10	8.51	1.00	8.91	1.05	8.43	0.99	5.07	0.60
Tasmania	-23.78	-2.64 **	-24.15	-2.68 **	-24.72	-2.75 **	-8.71	-0.97	-8.91	-0.99	-9.69	-1.08	-9.69	-1.08	-13.21	-1.47
ACT and Northern territory	31.53	3.61 **	31.49	3.61 **	32.10	3.68 **	48.40	5.55 **	47.79	5.48 **	47.38	5.44 **	48.03	5.51 **	44.38	5.10 **
Couple with no children	-49.93	-3.91 **	-47.78	-3.73 **	-51.07	-3.99 **	-52.90	-4.16 **	-54.36	-4.28 **	-52.42	-4.12 **	-54.53	-4.29 **	-54.70	-4.30 **
Couple with children	-65.18	-5.28 **	-61.45	-4.96 **	-64.68	-5.22 **	-67.98	-5.54 **	-69.57	-5.67 **	-67.48	-5.50 **	-68.08	-5.55 **	-67.47	-5.50 **
Single with no children	-129.50	-8.93 **	-127.69	-8.79 **	-126.31	-8.70 **	-123.46	-8.56 **	-124.31	-8.62 **	-123.10	-8.53 **	-123.74	-8.59 **	-125.43	-8.70 **
Single with children	-129.81	-9.46 **	-127.50	-9.28 **	-126.81	-9.24 **	-124.78	-9.15 **	-125.18	-9.18 **	-124.39	-9.12 **	-124.93	-9.17 **	-126.29	-9.26 **
Adjusted household size	214.26	26.85 **	213.90	26.81 **	214.21	26.87 **	215.83	27.22 **	215.93	27.23 **	216.09	27.24 **	216.84	27.35 **	216.75	27.32 **
age	12.70	4.05 **	11.75	3.69 **	11.56	3.62 **	13.20	4.19 **	12.66	4.01 **	12.68	4.03 **	13.07	4.15 **	13.08	4.16 **
age squared	-0.12	-9.47 **	-0.11	-8.07 **	-0.11	-8.31 **	-0.13	-9.67 **	-0.12	-9.42 **	-0.12	-9.53 **	-0.12	-9.62 **	-0.12	-9.53 **
household disposable income	0.36	82.89 **	0.36	82.76 **	0.36	82.48 **	0.35	80.01 **	0.35	79.82 **	0.35	79.98 **	0.35	78.80 **	0.35	78.96 **
Professional occupations	124.50	15.43 **	124.16	15.39 **	121.53	15.06 **	117.94	14.70 **	117.09	14.58 **	118.75	14.79 **	117.84	14.69 **	118.90	14.81 **
Other occupations	37.94	5.27 **	37.12	5.16 **	35.67	4.96 **	37.70	5.27 **	37.11	5.18 **	38.11	5.33 **	38.79	5.42 **	39.06	5.46 **

	(4.1)		(4.2)		(4.3)		(4.4a)		(4.4b)		(4.4c)		(4.5a)		(4.5b)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
T2003*young			**-17.72**	**-0.90**												
T2003*middle			**46.00**	**2.80** **												
T2003*older			**(dropped)**													
T2003*young*owner					**13.39**	**0.62**										
T2003*middle*owner					**77.97**	**4.24** **										
T2003*older*owner					**34.10**	**1.68** *										
T2003*young*renter					-36.23	-1.65 *										
T2003*middle*renter					-47.58	-1.94 *										
T2003*older*renter					-134.92	-4.09 **										
T2003*young*other tenure					-54.14	-0.94										
T2003*middle*other tenure					207.48	3.08 **										
T2003*older*other tenure					-25.18	-0.39										
T1998*young*net dwelling wealth							29.88	4.59 **	30.23	4.64 **			30.04	4.62 **	29.76	4.57 **
T1998*middle*net dwelling wealth							59.76	16.04 **	59.78	16.04 **			60.37	16.21 **	59.40	15.95 **
T1998*older*net dwelling wealth							37.13	7.46 **	36.74	7.36 **			37.16	7.47 **	36.21	7.30 **
T2003*young*net dwelling wealth							**19.95**	**3.82** **	**17.48**	**3.10** **	**23.67**	**5.71** **	**16.98**	**2.35** **	**4.60**	**2.48** **
T2003*middle*net dwelling wealth							**38.68**	**15.09** **	**38.52**	**13.31** **	**45.11**	**20.66** **	**21.42**	**5.78** **	**13.22**	**14.05** **
T2003*older*net dwelling wealth							**19.71**	**7.49** **	**19.55**	**6.95** **	**23.16**	**9.51** **	**11.93**	**3.25** **	**6.12**	**6.82** **
T2003*young*net other wealth													1.95	0.84		
T2003*middle*net other wealth													7.97	6.55 **		
T2003*older*net other wealth													3.79	3.31 **		
T2003*young*net total wealth																
T2003*middle*net total wealth																
T2003*older*net total wealth																
T2003*LTV1 (0 to <50%)									**15.22**	**0.98**						
T2003*LTV2 (50 to <80%)									**74.91**	**3.58** **						
T2003*LTV3 (80% +)									**48.58**	**1.30**						
Number of observations	39,299		39,299		39,299		39,299		39,299		39,299		39,299		39,299	
adj R squared	0.404		0.404		0.405		0.411		0.411		0.411		0.412		0.411	

a. Key coefficients of interest highlighted. ** indicates significance at the five per cent level; * indicates significance at the ten per cent level

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Table D2: Summary results for key interaction coefficients based on total consumption expenditure on goods and services less consumption expenditure on housing[a]

(4.2) age		(4.3) age*own		(4.4a) age*NDW		(4.4b) age*NDW/LTV		(4.4c) age*NDW/1998=2003		(4.5a) age*NDW/NOW		(4.5b) age*NTW	
Individual/pairwise tests													
individ.	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*	*individ.*	*pairwise*
Y<0	Y<M**	Y>0	Y<M**	Y>0**	Y<M**	Y>0**	Y<M**	Y>0**	Y<M**	Y>0**	Y≈M	Y>0**	Y<M**
M>0	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M>O**	M>0**	M≈O	M>0**	M>O**
O<0	O≈Y	O>0*	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y	O>0**	O≈Y
Joint tests													
Wealth ne 0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**		Wealth>0**	
		Own>Rent**		Own>Rent**		Own>Rent**		Own>Rent**		Own>Rent**			

a. Y refers to the 'young' cohort, aged younger than 40 years in 2003–04; M refers to the 'middle' cohort, aged between 40 and 60 years in 2003–04 and O refers to the 'older' cohort, aged 60 years or more in 2003–04. ** indicates significance at the five per cent level; * indicates significance at the ten per cent level; ? indicates no estimate is available because the relevant variable was dropped during the estimation process.

The tests in the second set of columns for each specification are based on F tests of pair-wise comparisons of the relevant variables.

The tests in the penultimate row are based on a test of whether coefficients of the key interaction terms are jointly equal to 0; where this test is rejected, the sign of effect is inferred (where possible) from signs of relevant coefficients. "Wealth" refers both to the various wealth variables employed and to the proxies embodied in the different specifications.

The tests in the final row are inferred from the 'wealth' tests where the relevant wealth variable/proxy is defined explicitly for owners. In equation (4.3) it is based on pair-wise tests on the coefficients for owners and renters in each of the age-specific cohorts.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Table D3: Consistency of results with alternative transmission mechanisms based on expenditure on goods and services less consumption expenditure on housing[a]

	(4.2) *age*	*(4.3)* *age*own*	*(4.4a)* *age*NDW*	*(4.4b)* *age*NDW/LTV*	*(4.4c)* *age*NDW/1998=2003*	*(4.5a)* *age*NDW/NOW*	*(4.5b)* *age*NTW*
Direct wealth effect	?	×	×	×	×	×	×
Credit constraint effect	?	✓?	✓?	✓?	✓?	✓?	✓?
Common cause effect	×	×	×	×	×	×	×

a. Support is indicated as being provided for the respective transmission mechanisms if all of the following conditions apply. All tests are applied at the five per cent level of significance. × indicates that one or more of the conditions are violated; ✓ indicates that no conditions are violated; a query is used when the conditions are met but are significant at a ten per cent rather than five per cent level, when perverse results are not significant, or when the specification does not allow for testing of all the conditions identified herewith.

The following tests have been applied in determining whether the results in Tables C1 and C2 are consistent with the respective transmission mechanisms. The rationale for the decisions made are presented in Table C5.

Direct wealth effect:

(i) Coefficients on wealth variable/proxy for owners in all age cohorts are positive and significant.

(ii) Coefficients on wealth variable/proxy for owners have the following pattern: older cohort significantly greater than middle cohort and middle cohort significantly greater than young cohort.

(iii) Coefficients on wealth variable/proxy for renters in any age cohort are not significantly different from zero.

Credit constraint effect:

(i) Coefficients on wealth variable/proxy for credit constrained cohorts are positive and significant.

(ii) Coefficients on wealth variable/proxy for owners in all age cohorts are non-negative.

(iii) Coefficients on wealth variable/proxy for renters in any age cohort are not significantly different from zero.

Common cause effect:

(i) Coefficients on wealth variable/proxy for all households are positive and significant.

(ii) Coefficients on wealth variable/proxy for all households (owners or renters) in the young cohort are significantly greater than responses by older households and responses by mid-life households are significantly greater than responses by older households.

(iii) Coefficients on wealth variable/proxy for owners are not significantly different from those by renters.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Table D4: Rationale for decisions made regarding consistency of results with alternative transmission mechanisms based on total expenditure on goods and services

	(4.2) ***age***	***(4.3)*** ***age*own***	***(4.4a)*** ***age*NDW***	***(4.4b)*** ***age*NDW/LTV***	***(4.4c)*** ***age*NDW/1998=2003***	***(4.5a)*** ***age*NDW/NOW***	***(4.5b)*** ***age*NTW***
Direct wealth effect	?	×	×	×	×	×	×
	(i) not tested	(i) yes	(i) yes	(i) yes	(i) yes	(i) yes?	(i) yes
	(ii) not tested	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no
	(iii) not tested	(iii) not tested	(iii) yes	(iii) not tested	(iii) yes	(iii) not tested	(iii) not tested
Credit constraint effect	?	✓?	✓?	✓?	✓?	✓?	✓?
	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested
	(ii) not tested	(ii) yes	(ii) yes	(ii) yes	(ii) yes	(ii) yes	(ii) yes
	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested
Common cause effect	?	×	×	×	×	×	×
	(i) not tested	(i) yes?	(i) yes	(i) yes	(i) yes	(i) yes?	(i) yes
	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no
	(iii) not tested	(iii) no	(iii) no	(iii) no	(iii) no	(iii) no	(iii) no

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

Table D5: Rationale for decisions made regarding consistency of results with alternative transmission mechanisms based on total expenditure on goods and services less consumption expenditure on housing

	(4.2) *age*	*(4.3)* *age*own*	*(4.4a)* *age*NDW*	*(4.4b)* *age*NDW/LTV*	*(4.4c)* *age*NDW/1998=2003*	*(4.5a)* *age*NDW/NOW*	*(4.5b)* *age*NTW*
Direct wealth effect	?	×	×	×	×	×	×
	(i) not tested	(i) yes	(i) yes	(i) yes	(i) yes	(i) yes	(i) yes
	(ii) not tested	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no
	(iii) not tested	(iii) not tested	(iii) yes	(iii) not tested	(iii) yes	(iii) not tested	(iii) not tested
Credit constraint effect	?	✓?	✓?	✓?	✓?	✓?	✓?
	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested	(i) not tested
	(ii) not tested	(ii) yes	(ii) yes	(ii) yes	(ii) yes	(ii) yes	(ii) yes
	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested	(iii) not tested
Common cause effect	?	×	×	×	×	×	×
	(i) not tested	(i) yes?	(i) yes	(i) yes	(i) yes	(i) yes	(i) yes
	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no	(ii) no
	(iii) not tested	(iii) no	(iii) no	(iii) no	(iii) no	(iii) no	(iii) no

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2003–04. Results derived from Basic CURF data.

AHURI Research Centres

Queensland Research Centre
RMIT Research Centre
Southern Research Centre
Swinburne-Monash Research Centre
Sydney Research Centre
UNSW-UWS Research Centre
Western Australia Research Centre

AHURI
Australian Housing
and Urban Research Institute

Australian Housing and Urban Research Institute
Level 1 114 Flinders Street, Melbourne Victoria 3000
Phone +61 3 9660 2300 Fax +61 3 9663 5488
Email information@ahuri.edu.au Web www.ahuri.edu.au