Housing prices, household debt and household consumption

Inquiry into housing policies, labour force participation and economic growth

AUTHORED BY

Kadir Atalay
The University of Sydney

Stephen Whelan
The University of Sydney

Judith Yates
The University of Sydney

Recommended citation

Related reports and documents

Housing policies, labour force participation and economic growth

http://www.ahuri.edu.au/research/research-in-progress/inquiry-81070

Inquiry panel members

Each AHURI Inquiry is supported by a panel of experts drawn from the research, policy and practice communities. Panel members for this Inquiry:

Mary Cavar	Productivity Commission
Marilyn Chilvers	Department of Family and Community Services, NSW Government
Michael Fusarelli	Department of Family and Community Services, NSW Government
Shane Garrett	Housing Industry Association Ltd
Michael Lennon	Housing Choices Australia
Paul McBride	Department of Social Services, Australian Government
Marty Robinson	Treasury, Australian Government
Iain Scott	Department of Social Services, Australian Government

AHURI

AHURI is a national independent research network with an expert not-for-profit research management company, AHURI Limited, at its centre.

AHURI's mission is to deliver high quality research that influences policy development and practice change to improve the housing and urban environments of all Australians.

Using high quality, independent evidence and through active, managed engagement, AHURI works to inform the policies and practices of governments and the housing and urban development industries, and stimulate debate in the broader Australian community.

AHURI undertakes evidence-based policy development on a range of priority policy topics that are of interest to our audience groups, including housing and labour markets, urban growth and renewal, planning and infrastructure development, housing supply and affordability, homelessness, economic productivity, and social cohesion and wellbeing.

Acknowledgements

HILDA Survey

The Household, Income and Labour Dynamics in Australia (HILDA) Survey was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this report, however, are those of the authors and should not be attributed to either DSS or the Melbourne Institute.

Disclaimer

HILDA disclaimer

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either DSS or the Melbourne Institute.

AHURI journal

AHURI Final Report journal series 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 reports published in the AHURI journal series by carefully selected experts in the field ensures that material published is of the highest quality. The AHURI journal series employs a double-blind peer review of the full report, where anonymity is strictly observed between authors and referees.

Copyright

Contents

List of tables

List of figures

Acronyms and abbreviations used in this report

ABS	Australian Bureau of Statistics
APRA	Australian Prudential Regulatory Authority
BIS	Bank for International Settlements
CPI	Consumer Price Index
DSS	Department of Social Services
ECB	European Central Bank
GFC	Global Financial Crisis
GDP	Gross Domestic Product
HDI	Household Disposable Income
HES	Household Expenditure Survey
HEW	Housing Equity Withdrawal
HILDA	Household, Income and Labour Dynamics in Australia
IMF	International Monetary Fund
LCM	Life-cycle Hypothesis
LTV	Loan to Value Ratio
MEW	Mortgage Equity Withdrawal
MPC	Marginal Propensity to Consume
OECD	Organisation for Economic Cooperation and Development
PIH	Permanent Income Hypothesis
RBA	Reserve Bank of Australia

Executive summary

Key points

- This research finds a positive relationship between changes in house values or housing wealth, and, consumption expenditure. The increase in consumption is more pronounced for middle aged home owners compared to households that belong to younger or older cohorts.

- Prior to the Global Financial Crisis (GFC), an increase in house values of $100,000 was associated within an average increase in consumption between $1,000 (for old aged households) to $1,700 per annum (middle aged households).

- The relationship between housing prices or house values and consumption was moderated by the GFC: after the GFC, house price rises were associated with increased consumption for old and middle-aged households of approximately $600 to $1,600 per annum respectively.

- Prior to the GFC, house price changes were associated with large increases in consumption for home owners who initially borrowed a larger fraction of the property price (or have a higher 'loan to value' (LTV) ratio). By 2009 (after the GFC), this effect did not hold, suggesting that households with higher LTV ratios have become more conservative in their response to a change in house prices.

- This change in behaviour is not apparent for rental investors. In 2003, home owners with a rental investment property had a larger consumption response to an increase in house prices ($2,400 average annual consumption increase for a $100,000 increase in house prices) relative to home owners who do not have an investment property ($1,700). This differential was larger again in 2009 ($2,800 compared to $1,500). Since the GFC, the evidence suggests that home owners who are not investors have moderated their consumption behaviour while home owning investors have increased their consumption.

Key findings

The analysis in this report was motivated by the observed relationship between housing prices or housing wealth, and the consumption expenditure of households. Previous studies for Australia and other countries had identified a strong positive correlation at the aggregate level between housing wealth and household consumption. Analysis of household level microdata confirmed this pattern, while highlighting important differences in behaviour across young, middle-aged and older households. While differences in the magnitude of consumption changes across households provide important insights into the underlying causal relationships driving the behavioural outcomes, it was not clear if and how such relationships had been affected by the economic events beginning in 2007. The analysis in this paper compares the behaviour of household's pre-and post-GFC.

Key findings from the analysis can be summarised as follows:

There is a strong relationship between house price changes and household consumption for old and middle-aged households.

The empirical analysis indicates that the relationship between housing prices and therefore housing wealth, and household consumption, was weaker following the GFC. Moreover it remained the case that there were important differences in the behaviour of households of different ages:

- *Pre-GFC*: a $100,000 AUD (2002 AUD) increase in house value is associated with a $34 increase in total household consumption for middle-aged households (aged between 40 and 60 years) and $18 increase for old-aged households (aged over 60 years) per week. This corresponds to an increase in consumption expenditure of approximately $1,000 to $1,700 per annum for old and middle-aged households.

- *Post-GFC*: the effect of changes in house prices has a statistically significant but slightly lower impact on the consumption of old and middle-aged households of approximately $600 to $1,600 per annum. For older households the estimate is no longer statistically significant.

- The estimated consumption response to the increases in housing wealth was greatest for middle-aged home owners compared with those in other age cohorts.

The orders of magnitude of these results are robust to the different house price and housing wealth measures used in the analysis.

The findings from the analysis are consistent with the hypothesis that the increases in housing prices affect household consumption through the relaxation of a credit or collateral constraint that enables households to increase their borrowing in order to finance consumption.

The analysis of microdata or household level data allows inferences to be drawn about the underlying causal mechanism that links housing wealth and household consumption. By comparing younger and older households, and those households that are owner-occupiers with those that rent, it is possible to identify the mechanism via which a change in house prices affects household consumption. The empirical analysis indicates that:

- *Pre-GFC*: House price changes are associated with larger increases in consumption for home owners who initially borrow a larger fraction of the property price or have a higher 'Loan to Value' (LTV) ratio.

- *Post-GFC*: In 2009, the pre-GFC relationship no longer holds and the empirical evidence suggests that the consumption response is unaffected by the household LTV ratio.

- Overall the results suggest that, since the GFC, households with high LTVs have become more conservative and they may no longer be increasing their debt to increase consumption in response to an increase in house prices.

House price movements have had little impact on the pre- and post-GFC consumption responses of owner-occupiers who are not rental investors. They have, however, had clear impacts on the consumption responses of owner-occupiers who are rental investors. Pre- and post-GFC responses for rental investors vary significantly depending on whether or not these investors had mortgage debt on their rental property.

In general, existing analysis of household responses to changes in house prices has not considered the behaviour of rental property investors. The rich microdata analysed in this study allows those households with rental investment properties to be identified separately and their behaviours to be analysed. The empirical analysis indicates that:

- In 2003, owner-occupiers with rental investment properties had a more pronounced consumption response to an increase in house prices relative to other households. On average, investors increased their consumption by approximately $2,500 per annum for each $100,000 increase in house prices compared with $1,700 for owner-occupiers who did not own an investment property.

- The difference between investor and not-investor home owners in 2009 was larger than that in 2003, having increased to approximately $2,800 for investors compared with a marginally lower $1,600 per annum for non-investors.

- Following the GFC, however, investors with no debt became more conservative, reducing their consumption response from around $3,000 to approximately $2,600 per annum. Investors with mortgage debt, however, became far more responsive. Their consumption response to a $100,000 increase in housing wealth rose from $1,700 per annum to almost $2,900 per annum.

- The results for investors with and without debt prior to and following the GFC suggest an amplified role of the collateral channel for investors. That is, the relaxation of credit constraints for investors appears to be an important determinant of how responsive such households are to a change in house prices.

Policy development options

Increases in house prices can have material impacts on the perception of wealth of a home owning household, and this can have downstream effects on consumption and therefore economic growth. The evidence from this report suggests that a key factor in explaining the links between house price movements and consumption is that of household credit constraints. House price increases serve to increase the amount of equity a household perceives they have in their house and this reduces the constraint on borrowing more to finance consumption. The research also showed that the GFC had an impact on moderating this relationship: it shows that the GFC reduced the impact of credit constraint as households became more conservative in their willingness to borrow more to finance consumption. This impact differs considerably across different household types. This suggests that policy needs to be sensitive to the overall housing portfolio of would-be-borrowers. Since the GFC, households borrowing to finance a home solely to meet their own housing needs are less likely to withdraw their equity to finance consumption. On the other hand, the consumption behaviour of households borrowing to expand their housing portfolios beyond their own home have the potential to have a greater impact on the macroeconomy in response to wealth shocks because of their greater responsiveness to these shocks.

The implications for policy can be separated into two broad areas. The first concerns monetary policy while the second focuses on prudential regulation of the financial system. Traditionally, monetary policy and in particular the setting of interest rates has been seen as a key mechanism via which macroeconomic outcomes can be achieved. Over the past two decades the primary focus of monetary policy has been the targeting of inflation as this is seen as conducive to sustained economic growth over the long term. While the GFC has refocussed attention on the role of monetary policy in achieving a target rate of inflation, it is unlikely that monetary policy per se could be expected to be focussed on the relationships considered in this report. Rather, monetary policy settings have responded to a range of economic considerations of which house prices and their impact on the macroeconomy is simply one factor.

Our findings are relevant for policy-makers considering macro-economic stability in Australia and the important role played by prudential regulation of the financial system. The take-up of further mortgage debt among highly leveraged households through the 'collateralisation effect' exposes those households to the risk of significant losses if house prices fall or if interest rates

increase. This, in turn, may pose a systemic risk for the macroeconomy. This is in contrast to the relatively sanguine view among macroeconomic policy-makers around high levels of debt and the rising household debt to income ratio in Australia because of a broad consensus that debt has been held primarily by those most able to service it: namely higher income and higher wealth households. Macroeconomic policy-makers should acknowledge the potential risks associated with high levels of household debt and rising household income-to-debt ratios. Despite the large benefits of having a flexible mortgage system that allows households to borrow against their housing equity, this highlights a potential cost of such a system. In a number of countries with similar situations, regulations have been implemented to limit the growth of household indebtedness and the need to ensure robust prudential regulation remains an important policy priority.

The study

This project examines the contemporary effects of house prices and house-price-induced increases in debt on general consumption spending in Australia, focusing specifically on how their links may have been affected by the GFC. As a result, this project provides some insight into whether or not more nuanced monetary policies that focus on different households and lending practices might be warranted.

There is broad agreement in the literature on the existence of a positive correlation between housing prices and household consumption (see Yates and Whelan 2009). Nonetheless, empirical estimates of its magnitude vary and generally the analysis has been restricted to periods where housing prices have increased steadily. The relationship between household debt and consumption has had less attention paid to it and the question of how house prices, mortgage debt and household consumption are linked remains unresolved. Past research has shown that understanding this link requires consideration of disaggregated data to supplement results obtained from aggregate data. This project provides such consideration.

The Australian experience is an important one to consider. After several years of strong growth, house prices and new housing finance commitments fell following the GFC. They have since both recovered to the point that house prices and outstanding housing debt are now in excess of their pre-GFC peaks. The consequences of these changes, particularly for consumer spending, are unresolved. The Australian experience, like that for other countries, poses a number of questions.

- Has consumption behaviour been affected by the GFC, and if so, to what extent?

- What has been the consumption response of households across population groups to house prices movements following the GFC?

- Do the responses by households differ from their pre-GFC behaviours, and if so, why?

For each of these questions, a better understanding of the factors that drive household consumption, and especially of the role of housing and housing debt, is required. Such analysis is important as an input into Australian macroeconomic policy-making, and is a useful complement to AHURI project 60360 (Yates and Whelan 2009). This report extends the analysis in Yates and Whelan (2009) to cover the period in which the Australian (and world) economy experienced a significant macroeconomic shock in the form of the GFC. Significantly, this period is in contrast to those used by studies for the United Kingdom (Attanasio, Blow et al. 2009; Campbell and Cocco 2007) and Yates and Whelan (2009) in which the observation periods were dominated by prolonged increases in house prices.

To provide some insights into these issues, this project addresses the following inquiry research question:

- *How have house prices and house-price-induced increases in debt affected consumption spending in Australia since the GFC, and what are the implications for economic and financial stability?*

Five supporting research questions are considered in this report:

1 *What is the existing evidence of a causal link between house prices and consumer spending?*

2 *Have previously established links between house prices and consumer spending in Australia been affected by the GFC?*

3 *What is the role of debt in the house price and consumption relation?*

4 *How has the consumption response of households in different population groups to changes in housing prices and housing debt been affected by the GFC?*

5 *What are the implications of these relationships for the economic performance of Australia?*

1   Overview

The goal of this project is to examine the contemporary effects of house prices and house price induced increases in debt on consumption spending in Australia, focusing specifically on how their links may have been affected by the GFC.

The analysis is motivated in part by recent changes in house prices, household consumption and debt in Australia. After several years of strong growth, house prices and new housing finance commitments fell following the GFC. They have since recovered to the point where both house prices and outstanding housing debt are now in excess of their pre-GFC peaks. The consequences of these changes, particularly for consumer spending, are unresolved.

Monetary authorities and policy-makers more generally have recognised that our understanding of the relationships between these aggregates is incomplete. It is clear that a comprehensive understanding of these relationships is critical for identifying appropriate policy settings to ensure macroeconomic and financial stability. An evaluation of the links between household consumption and wealth in the post-GFC era where rising household debt has assumed an increasingly dominant role will provide important insights into factors affecting macro-economic policies designed to protect economic growth and stability, to supplement those designed to protect financial stability. In particular, it will provide important insights into whether there have been changes in the way in which monetary policy impacts on macroeconomic outcomes.

The findings will provide insights into the extent to which the combination of post-GFC uncertainty and increased household indebtedness have affected the impact of rising house prices on household consumption. Any reduction in this impact as a result of increased uncertainty arising from increased debt is likely to have significant ramifications on future GDP growth, particularly at a time when growth rates are slowing as a result of the post-mining boom readjustment. Insights into the impact that monetary policy is likely to have and the mechanism by which this policy is transmitted will help in identifying the appropriate policy instruments and the nature of policy settings.

1.1   Why this research was conducted

This project examines the effects of housing prices and house price induced increases in debt on consumption spending in Australia, focusing specifically on how these links may have been affected by the GFC. Of particular interest is how these associations may be affected by the distribution of debt between owners and investors. The analysis complements recent Reserve Bank of Australia (RBA) research on changes in household savings behaviour in the post-GFC environment (Finlay and Price 2014).

There is a broad consensus in the literature on the existence of a positive correlation between housing prices and household consumption (see Yates and Whelan 2009 for an overview of this). However, while many economists have analysed the role of increasing housing wealth in

fuelling consumption and economic growth (Case, Quigley et al. 2011), less attention has been paid to the potential impact on consumption and growth of the rise in household indebtedness associated with this rise in housing wealth. The importance of doing so became clear when housing price rises came to a dramatic halt in many countries in the latter part of the 2000s. The aftermath of the GFC highlighted the potential for significant negative spillovers between housing markets and the broader economy when household indebtedness is high.

In Australia, the steady increase in household net worth that contributed to increased consumption in the decade or so prior to the mid-2000s temporarily ceased in 2007. At this point, household debt continued to grow even though housing prices fell significantly (Figure 1).

Figure 1: Ratio of household net worth and components to net Household Disposable Income: 1985–2015
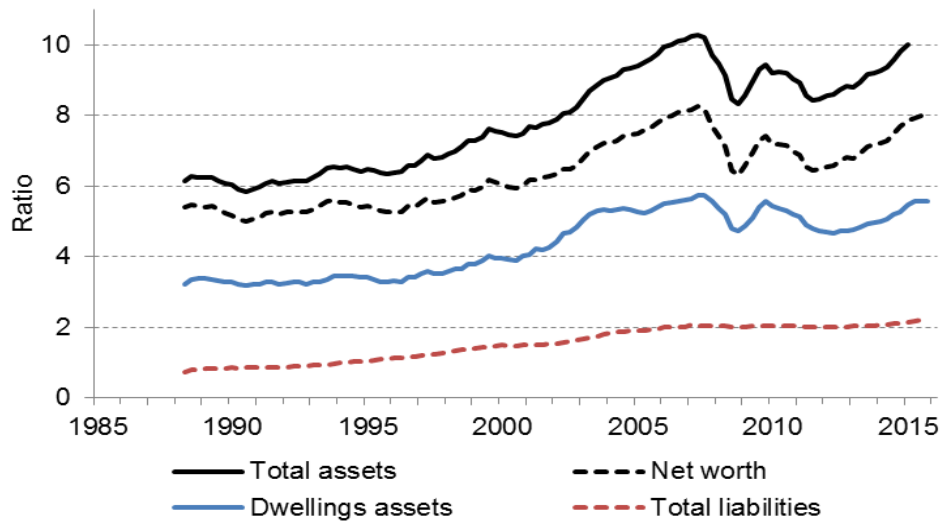
Source: RBA Statistics, Table E01, net HDI derived from ABS Cat. No. 5206.0, Table 20.

Housing price inflation had begun to slow in the mid-2000s, initially as monetary policy was tightened in response to concerns of an unprecedented increase in borrowing for investment housing and higher rates of inflation. Slow and sometimes negative housing price growth continued through to 2014 as a result of the economic and financial shocks associated with the GFC from 2007 onwards. Despite this, housing debt for both owner-occupied and investment dwellings continued to grow. By 2015, total housing debt had risen to close to 150 per cent of annual household disposable income (HDI), up from less than 30 per cent at the start of the 1990s. In 1990, investor debt represented around 10 per cent of total outstanding housing debt. By 2015 new finance commitments for investment housing had exceeded those for owner-occupied housing and investor debt had increased to 30 per cent of total outstanding housing debt (Figure 2).

Figure 2: Ratio of household debt and its components to net HDI: 1985–2015
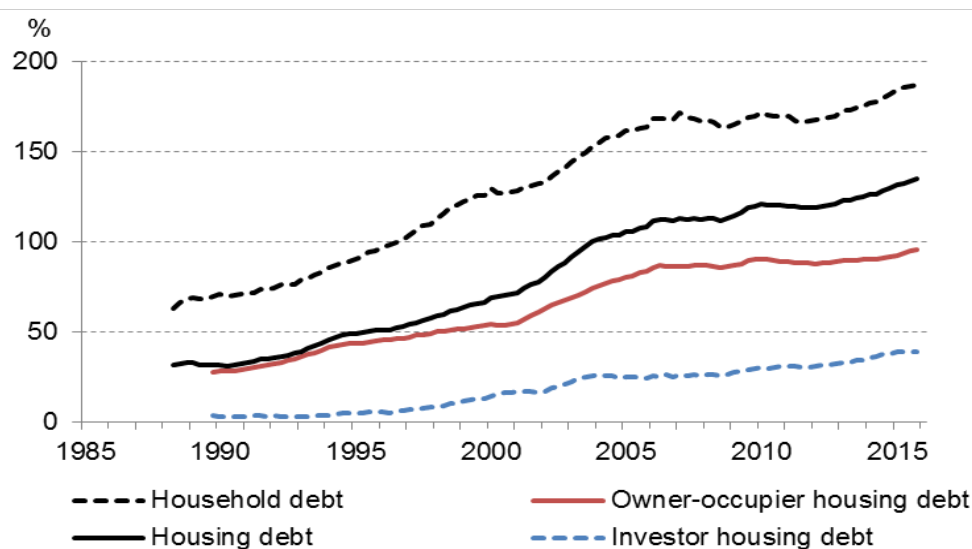
Source: RBA Statistics, Table E02.

Since the GFC, increasing attention been paid to the relationship between household debt and household consumption. Nonetheless, the question of how housing prices, mortgage debt and household consumption are linked remains largely unresolved. For example, it is unclear if the consumption behaviour of households has been affected by the GFC and, if so, the extent of the impact. Similarly, there are unresolved questions around the consumption response of households in different population groups to housing price movements following the GFC. Finally, it is unclear how the post-GFC experience differs from the pre-GFC relationships, and if so, why? A better understanding of the factors that drive household consumption and especially of the role of housing and housing debt is needed to answer these questions.

To provide some insights into these issues, this project addresses the following inquiry research question:

- *How have house prices and house-price induced increases in debt affected consumption spending in Australia since the GFC, and what are the implications for economic and financial stability?*

Five supporting research questions (SRQs) are addressed in this report:

- SRQ1: *What is the existing evidence of a causal link between house prices and consumer spending?*

- SRQ2: *Have previously established links between house prices and consumer spending in Australia been affected by the GFC?*

- SRQ3: *What is the role of debt in the house price and consumption relation?*

- SRQ4: *How has the consumption response of households in different population groups to changes in housing prices and housing debt been affected by the GFC?*

- SRQ5: *What are the implications of these relationships for the economic performance of Australia?*

1.2 Policy context

Globally, concerns have been expressed about rising household indebtedness in relation to the potential threat this poses for macro-economic stability. High debt levels are seen as creating vulnerabilities that can transmit macroeconomic and asset price shocks throughout the economy (OECD 2012), and in turn limit economic growth (Cecchetti 2012). Households in particular are seen as being more vulnerable to asset price shocks and as being more likely to reduce consumption if house prices fall while the level of debt remains unchanged (Jannson 2013). Excessive debt is seen as undermining economic stability, with the size of debt service ratios being related to the size of subsequent output losses (Drehmann and Jueselius 2012). More generally, empirical evidence suggests that when household debt rises above trend levels, the likelihood of recession increases (Sutherland, Hoeller et al. 2012).

Concerns about the sustainability of rising household debt and the possibility that greater household indebtedness can amplify the effect of economic and financial shocks are long standing (Debelle 2004). Nonetheless, to date macro-economic policy-makers in Australia have been relatively sanguine about high levels of debt and the rising household debt to income ratio because debt has been seen as being held primarily by those most able to service it: namely higher income and higher wealth households (e.g. Bilston, Johnson et al. 2015: 26; Edey and Ellis 2014: 14). Nonetheless, policy-makers and regulators remain cautious about those with lower net wealth and high loan to valuation ratios (RBA 2016: 24). This caution has contributed to recent pronouncements around loan standards. For example, the Australian Prudential Regulatory Authority (APRA) has suggested that loan serviceability standards should be reassessed (APRA 2014: 11–15). Similarly, measures to stem the growth of lending to investors and reinforce responsible lending practices were introduced from late 2014 (RBA 2016: 22). It is noteworthy that these policy responses have focused primarily on financial stability and on the risks that poor lending practices impose on the lending institutions, rather than the risks that responses to high household debt by households might have on macro-economic stability. A slowing down of demand by households with high debt may have an impact on economic stability even if these households are not at risk of defaulting on their loans.

Policy-makers generally, and the RBA specifically, need to keep abreast of any changes in the response of different types of consumers to the various drivers of household consumption, the largest component of aggregate demand. Increasingly, housing debt is being seen as an important determinant of consumption and it is critical that policy-makers are cognisant of any changes in the behaviour of households in this regard. Potential transmission mechanisms from household debt to consumption spending have been identified in a number of official RBA statements. In these, concern has been expressed, or implied, about a range of issues including: the impact on macro-economic stability if stronger consumption were associated with an increase in leverage (RBA 2014c: 65; 2014d: 74); or a weakness in demand if home owners become more reluctant to borrow against increases in net wealth, possibly because labour income has slowed (RBA 2015a: 36); about the possibility that 'strong investor lending may contribute to a build-up in risk in banks' mortgage portfolios by funding additional speculative demand that increases the chance of a sharp housing market downturn in the future' (RBA 2014a: 22); and about the additional risks investors face because the tax deductibility of interest expenses reduces their incentive to amortise their housing debt (RBA 2014a: 37–38).

An example of concern with the potential impact of property markets in general, and high leverage in particular, on macro-economic instability is given in the RBA evidence to the Senate Economics References Committee Inquiry into Affordable Housing. Edey, an Assistant RBA Governor, expressed 'concerns with the macro-economic risks associated with excessive speculative activity, since this activity can amplify the property price cycle and increase risks to households' (Edey and Ellis 2014: 2). Ellis pointed to the likelihood that macro-prudential

measures will induce different responses from owner-occupiers and investors because of the different incentives they face (Edey and Ellis 2014: 14).

Ellis argued that even though existing residential housing or its associated mortgage book is particularly risky, housing can pose a systemic risk for economic and financial stability simply because of its size. Household equity in housing assets accounts for almost half of total net household wealth and expenditure on housing services accounts for more than 20 per cent of total household consumption. One implication is that, 'a large enough downturn in housing prices would harm output through its effect on household spending, even if it did not spark a financial crisis through loan losses' (Ellis 2015: 7). A second source of systemic risk arises from the correlation that exists in property markets. Although each individual property is unique, and although the majority of residential property is held by owner-occupiers for the services it provides, property markets nonetheless are correlated because changes in property prices are driven by common factors—interest rates, incomes, lending standards and supply responses. An additional source of systemic risk arises from the pro-cyclicality of property markets and the possibility of positive feedback generating a self-reinforcing dynamic. An example of such positive feedback would occur if investors sold their investment property in response to asset price falls and this, in turn, induced further sales and price falls. Such pro-cyclicality is more likely to occur with leveraged assets.

Ellis concluded by pointing out that we know a lot about how highly leveraged property 'can sometimes be dangerous for economic and financial stability', and there is a lot of evidence 'that property has something to with the boom-bust episodes that so often engender financial instability and crisis' (Ellis 2015: 11) Nonetheless, it is also clear that we do not yet know is what the mechanism is behind these connections and that knowledge of the causal link is critical before a policy response is warranted. While seeking more information, it is also important to avoid 'jumping to strong policy conclusions on the basis of data that might not be the most relevant.' (Ellis 2015: 11)

The concerns expressed above have been echoed by other senior policy-makers. In a speech in late 2015, Lowe, the current Governor of the RBA, pointed to the 'inextricable' link between the growth in the assets side of household balance sheets and the growth in the liabilities side. This, it was suggested, has meant that household balance sheets are more risky than they once were which, in turn, has been 'reflected in the decision by many Australians to take a more prudent approach to their spending over recent years'. Lowe suggests that the response to housing prices 'looks to be smaller than it was previously' and that 'this smaller response is affecting overall spending in the economy'. Nonetheless, the RBA is 'still trying to fully understand the implications of all of this' (Lowe 2015: 15–16).

The increases in housing debt prior to the GFC and the dramatic decline in house prices immediately following the GFC highlighted the self-reinforcing link between housing and the broader economy. Subsequent increases in both house prices and housing debt have raised concerns about the concentration of lending for housing in bank portfolios and about future economic and financial instability, particularly when interest rates increase from their current historically low levels. Lending to investors is seen as particularly problematic because the attributes of investor lending differ from those of owner-occupier loans and this affects its risk profile. For one, investors have greater incentives to take out interest only loans given that interest expenses are deductible against other income. The implication is that they are less likely to pay down their loans and are more likely to face difficulties in servicing repayments both when the interest only period ends and if interest rates rise (RBA 2014b: 49)

A re-examination of the links between household consumption and wealth in the post-GFC era where rising household debt has assumed an increasingly dominant role will provide important insights into factors affecting macro-economic policies designed to protect economic growth and stability. In particular, it will provide important insights into whether there have been changes in

the way in which monetary policy is transmitted. As Boivin, Kiley et al. (2011) have argued, it is important to understand this transmission mechanism because the impact of low interest rates on the economy can be limited. Separate identification of the responses of households who are investors and those who are not will enhance our understanding of this transmission mechanism.

The findings from the questions outlined in Section 1.1 will give insights into the extent to which the combination of post-GFC uncertainty and increased household indebtedness have affected the previously identified impact of rising housing prices on household consumption. Any reduction in this impact as a result of increased uncertainty arising or from the increased debt is likely to have significant ramifications on future Gross Domestic Product (GDP) growth, particularly at a time when growth rates are slowing in Australia as a result of the post-mining boom readjustment. Any further insights into the impact that monetary policy is likely to have and into the mechanism by which this policy is transmitted will help in identifying the appropriate instruments to use and the extent of adjustment needed.

1.3   Existing research

Much of the international literature relevant to this study has been conducted prior to the GFC and focused on the mechanisms that linked consumption and house prices. An emerging literature examines the debt and consumption relation in response to the deleveraging that took place in a number of countries following the GFC. In many ways, the concerns expressed in Australia about the impact of high debt reflect a concern that Australia could follow a similar trajectory should housing prices turn around after their long upward trend interrupted only for short periods between 2008 and 2012.

1.3.1 Establishing a correlation between house prices and consumption

There is a broad consensus in the literature on the existence of a positive association between housing prices and household consumption though there is less agreement about the underlying causal mechanism driving this relationship. Further, empirical estimates attempting to identify the magnitude of the relationship between house prices and household consumption vary widely. Importantly, much of the existing analysis is restricted to periods where housing price booms are observed.

Three key transmission mechanisms have been identified to explain the observed correlation between house prices and household consumption: viz. a common cause effect; a direct wealth effect, and a credit constraint or collateral effect. These are described briefly below. Yates and Whelan (2009) provide a more detailed overview of these mechanisms and of the empirical evidence supporting each. In general, inferences about the underlying causal mechanism linking house prices and household consumption is based on an examination of the behaviour of different types of households.

A common cause transmission mechanism (King 1994; Attanasio and Weber 1994; Attanasio, Blow et al. 2009; Browning, Gortz et al. 2013) is used to describe any effect where consumption and house prices response in similar ways to an (unspecified) common factor. Obvious common drivers are expectations of ongoing increases in real income due, for example, to increased productivity. If a 'common cause' mechanism drives the relationship between household consumption and house prices, this has implications for the behaviour of different types of households. For example, the consumption of renters should be affected as much as that of home owners as both types of households will experience the benefits of positive shocks to productivity. Moreover, in the case of positive productivity shocks the consumption of 'young

households' is more likely to be affected than that of 'older households' because of the longer period over which the impact has an effect.[1]

Changes in house prices may also have a direct or indirect wealth effect. A direct wealth transmission mechanism is generally associated with an unanticipated increase in dwelling prices and should affect only households who own dwellings. Housing generally represents the largest single component of a household's asset portfolio so that an increase in house prices increases the wealth of a home-owning household. Conversely, those households that do not own dwellings should not be impacted and in general their consumption would not be expected to respond to a change in house prices if a direct wealth effect is the underlying mechanism that links house prices and consumption (Grant and Peltonen 2005). Moreover, it would be expected to have a greater impact on the consumption of older home-owning households because of the relatively shorter life-span they have left to benefit from or consume the increase in their wealth.

Finally, household consumption and house prices may be linked via a credit constraint mechanism or collateral effect that is associated with an indirect wealth effect (Campbell and Cocco 2007). That is, an increase in house prices may provide an opportunity for home-owning households to borrow against the increased value of their assets and thereby increase consumption. Such a mechanism would only affect the consumption behaviour of home owners for whom increased dwelling values provide an increase in collateral and thereby facilitate increased consumption through an increase in borrowing capacity. Older households who are more likely to own their dwellings outright are less likely to have faced a credit constraint as a result of insufficient collateral. Younger households are likely to have much lower equity but are also more likely to face an income constraint that limits their capacity to borrow even as their housing equity increases. Thus, the transmission of a wealth effect though relaxation of a credit constraint operating through a wealth rather than an income constraint is most likely to operate on middle age households.

In Yates and Whelan (2009), a description of the use of data at an individual household level to examine behavioural differences according to age and tenure so as to distinguish between alternative transmission mechanisms is set out. In that study, empirical analysis for Australia provides support for the collateral channel. That is, the weight of empirical evidence in that report pointed to increases in house prices having the largest impact on the consumption of middle-aged home-owning households. The findings in Yates and Whelan (2009) are reinforced by work reported in Windsor, Jaaskela et al. (2015) using a different data set. Both studies show that it is middle-aged home-owning households for whom consumption is most responsive to increased household wealth associated with increased dwelling prices. Such a pattern is consistent with higher house price relaxing credit constraints and thereby facilitating higher consumption among this group.

Evidence of a housing collateral effect is also consistent with patterns of equity withdrawal observed in Australia. The withdrawal of equity provides one means by which households that experience an increase in their housing-related wealth can finance higher consumption expenditures. A series of Australian studies have found that home owners are increasingly using flexible mortgage products to unlock housing equity at all stages of the life cycle, including pre-retirement years (Schwartz, Lewis et al. 2008; Parkinson, Searle et al. 2009; Ong 2015). The increase in housing equity withdrawal (HEW) among home owners aged 45 years and above increased from 13 per cent in 2001–02 to 18 per cent by 2009–10. Notably, this

---

[1] In this context a 'young household' should be interpreted as one that contains members that are young on average. This is generally determined by focusing on the age of the household head, so that a household headed by an individual aged less than 40 years of age is considered to be 'young'. Similarly, a household headed by an individual aged more than 60 years of age is considered 'older'.

behaviour was considerably greater for those in the pre-retirement age groups (45–54 and 55–64) than in the post-retirement age groups (65–74 and 75+) (Ong, Haffner et al. 2015). By far the most common approach to equity release among those in the pre-retirement age groups has been through mortgage equity withdrawal (MEW)—that is, in situ additions to outstanding mortgage debt. One consequence of this is that MEW has been associated with raised levels of indebtedness among some home owners.

1.3.2 Establishing a correlation between debt and consumption

Prior to the 2007 GFC, relatively little attention was paid to the question of whether debt might have an independent effect on consumption and analysis by monetary authorities such as the Bank of England was relatively sanguine about the build-up of household debt (see, e.g. Benito, Waldron et al. 2007). In the years since 2007, however, a number of studies have identified a strong correlation between the growth in housing prices, the associated build-up of household debt and the extent of recessions that followed the collapse of housing booms. Much of this work has been undertaken by central banks and global institutions such as the Organisation for Economic Cooperation and Development (OECD), the International Monetary Fund (IMF) and the Bank of International Settlements (BIS).

This work has attempted to determine whether household debt amplifies recessions and weakens recoveries (IMF 2012: 89) and, in response to concerns that correlation does not imply causation, has attempted to determine the causal mechanisms that underpin the relationship between household debt and household consumption.

A 2012 OECD Working Paper provides a useful overview of much the relevant literature up to the time of this study. It concludes:

> *The empirical evidence shows that high debt levels impair the ability of households and enterprises to smooth consumption and investment and of governments to cushion adverse shocks. The empirical evidence also suggests that when private sector debt levels, particularly for households, rise above trend the likelihood of recession increases. Furthermore, when debt levels are high, recessions tend to be more severe. (Sutherland and Hoeller 2012)*

In their seminal work, Mian and Sufi (2014) make an even stronger claim even though they are agnostic as to the reasons behind it:

> *Taken together, both the international and U.S. evidence reveals a strong pattern: economic disasters are almost always preceded by a large increase in household debt. In fact, the correlation is so robust that it is as close to an empirical law as it gets in macroeconomics. Further, large increases in household debt and economic disasters seem to be linked by collapses in spending.*
>
> *So an initial look at the evidence suggests a link between household debt, spending and severe recessions. But the exact relation between the three is not precisely clear. (Mian and Sufi 2014: 9)*

This raises the broader question of why debt might be important. Indeed, in their 2012 overview, for example, the IMF concluded ' … there is no accepted wisdom about whether and how gross debt may restrain economic activity.' (IMF 2012: 89)

1.3.3 Establishing a causal relation between debt and household consumption

An independent role for debt can be found by relaxing some of the assumptions of traditional theories of consumption which, in their simplest forms, assume no constraints on borrowing (affecting the supply of credit) and no uncertainty about future life-time income (affecting the demand for debt), to identify just two key assumptions. Constraints, however, can create a

transmission mechanism through which debt can affect consumption. Borrowing constraints imposed by lenders, such as limits imposed on leverage through LTVs, can limit access to credit. Possible household responses to debt levels they perceive of as being unsustainable can lead to attempts to reduce debt.[2] The former response contributes to concerns about debt overhang, the latter to concerns about deleveraging. Debt overhang occurs when a household is perceived of as having a level of debt that it would have difficulties in increasing its borrowing, even for an investment that would pay for itself. Deleveraging is commonly used to describe both a reduction in the share of debt in the household's balance sheet and a reduction in the household's debt to income ratio. These potential responses of highly leveraged households to falls in housing prices are discussed in Dynan (2012), one of the more widely cited analyses of the impact of debt on household consumption.

Australia has experienced a prolonged increase in house prices and household debt in the last two decades. The increase in household debt is largely an increase in mortgage debt held by households. Reports by the Organisation for Economic Cooperation and Development (OECD) (2012) show that Australian housing debt ratios are relatively high by international standards (Figure 3). Moreover, unlike the United Kingdom and the United States, post GFC period debt service ratios in Australia have not declined dramatically despite the reductions in interest rates experienced by households.

Figure 3: Size of household liabilities compared with annual income (%)—international comparison
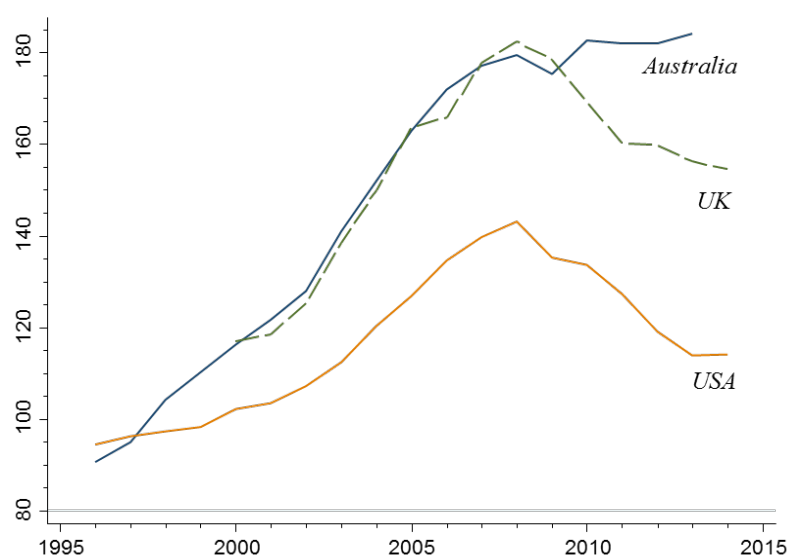
Source: OECD Statistics (http://stats.oecd.org/) OECD Economic Outlook, vol. 2013, issue 2.

In light of rising debt to income (and debt to asset) ratios in Australia, this study focuses specifically on debt overhang, rather than deleveraging as a potential transmission mechanism through which housing debt affects consumption. The way in which this might operate can be identified from household level data in much the same way as described for the wealth effect in Section 1.3.1 above. It might operate through a direct wealth channel by affecting net worth; or it can operate through a credit constraint channel through the debt overhang mechanism outlined above.

---

[2] Bunn and Rostom (2014) give an example from theories expounded as long ago as the 1930s depression. When households who have borrowed in the expectation of higher future income receive an adverse shock to their income expectations, they might decrease consumption and repay their debt.

Demand side effects other than those arising from high debt might also contribute to deleveraging and reductions in consumption. Bouis (2015: 2), for example, suggests that the rise in saving rates and hence fall in consumption usually observed during deleveraging episodes may reflect a range of considerations including higher precautionary saving in an environment of heightened economic uncertainty or higher unemployment; or a direct negative wealth effect arising from depressed valuations of real and financial assets, without any direct connection to changes in household debt. This mechanism is analogous to the 'common cause' channel described in Section 1.3.1.

This study builds on the limited existing literature on debt and on the Yates and Whelan (2009) and Atalay, Barrett et al. (2016) analysis of the transmission mechanism. It determines the extent to which different types of households are responding to high levels of debt by reducing their consumption and provides insights into the causal mechanism that might underpin such a relationship.

1.4 Research methods

1.4.1 Methodological framework

This project generates its research findings primarily through quantitative analysis of the eight Household Expenditure Surveys (HESs) undertaken by the Australian Bureau of Statistics (ABS) from 1975–76 to 2009–10. The most recent of these, for 2003–04 and 2009–10, provide a rich source of data on household wealth, debt and consumption as well as on the socio-demographic and economic characteristics of these households and, fortuitously, span the timing of the GFC shock in 2008. The supplementary analyses also utilise Household Income and Labour Dynamics in Australia (HILDA) data wealth modules that span the period from 2002 to 2014.

The empirical methodology used relies on the construction of a pseudo-panel data set from repeated cross sections of the HES. A non-technical description of this approach is provided in the following chapter; a more technical description is provided in Appendix 1. Though each HES consists of a different set of households, it is possible to construct cohorts or sets of households that each share a common fixed characteristic. In the analysis in this report, that common characteristic is the year of birth of the head of the household. This allows us to track the average expenditures of a particular cohort through time, even though no individual or household head is observed more than once. This approach, originally developed by Deaton (1985), has been adopted extensively in the literature to examine the response of household consumption to changes in housing wealth (e.g. Campbell and Cocco 2007; Attanasio, Blow et al. 2009). It replicates the methodology used in Yates and Whelan (2009). Yates and Whelan (2009) also provide a detailed list of studies that have adopted this methodology.

The key advantage of this approach is that it allows the relationship between changes in house prices, household wealth and consumption to be statistically determined and the transmission mechanisms that link housing wealth and household consumption to be identified. The latest HES survey (2009–10), conducted following the GFC, is used to examine the changes in the previously identified links between house prices and consumer spending expenditure patterns of various demographic groups relative to their pre-GFC patterns. As noted above, the econometric methodology has been well established in the literature.

When examining the impact of debt on consumption, the analysis in this report builds on existing analysis by incorporating a more extensive set of debt-related variables into the empirical specifications. In particular, it focuses specifically on behavioural differences between groups likely to be of particular interest such as outright owners and mortgage holders with varying LTV ratios and different levels of household debt. It also examines in more detail the role of the collateral constraint previously identified as the mechanism by which changes in

housing prices affect household consumption. The interaction of key variables with post-GFC dummies is used to determine the impact of the GFC on relevant behavioural responses.

It is important to stress that the analysis in this report represents the first step in understanding the complex nature of the relationship between housing wealth, household consumption and debt. The statistical analysis of these relationships poses some important challenges for the researcher. Ideally, it would be possible to compare the behaviour and outcomes of a 'treatment' and 'control' group where the treatment group were exposed to an exogenous shock such as a decrease in house prices. In the absence of such an experiment it is necessary to rely on shocks such as those associated with the GFC and to apply appropriate statistical techniques to identify the relationships of interest. While the econometric methodology adopted in this report is well developed in the literature, it is important to note that care must be taken before attributing a causal interpretation to the estimated statistical relationships, especially as they relate to household debt. Nonetheless, they provide a means by which the stylised patterns in the data can be identified, and in turn inform more rigorous and nuanced analysis.

1.4.2 Data

The empirical analysis in this report uses two main data sources (i) Household Expenditure Surveys (HESs) and (ii) the Household, Income and Labour Dynamics in Australia (HILDA) dataset. Although the primary data used for analysis is the HES, the robustness of results is assessed using the HILDA.

1.4.2.1 Australian household expenditure data

The data used are household level data from seven Australian Household Expenditure Surveys (HES) undertaken in 1975–76, 1984, 1988–89, 1993–94, 1998–99, 2003–04 and 2009–10. 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. 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 seven 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 HES contain detailed expenditure data on over 600 items combined into thirteen broad groups (including current housing costs). 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 such as income tax, mortgage principal payments for any owner-occupied dwelling and superannuation and life-insurance payments. The preferred measure of consumption employed in this report consists of the total of expenditure on goods and services excluding current housing costs. Nominal values of expenditure are deflated to 2002 AUD using the ABS Consumer Price Index (CPI). Current weekly household cash income is reported from a wide variety of sources including private income, government payments and private pensions. Household data on tenure type, dwelling type and size, household/family composition and size and location at a broad spatial level is available in each of the surveys. For individuals, socio-demographic data are collected on characteristics such as age, sex, marital status, country of birth, year of arrival in Australia, participation in school and tertiary education, education qualifications, labour force and employment status, and occupation. It is important to note that not all information is available in each survey and nor have they always been defined consistently across the seven available HESs. Nonetheless, in all surveys, age data are available in at least 5 year categories for those aged between 20 and 75 years at the time of the survey. This information is critical for facilitating the definition of pseudo-cohorts.

Beginning with the 1993–94 HES, 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 and 2009–10 comprehensive 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 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 that serve as a starting-point for the analysis undertaken in Chapter 2. 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.

The HES data are of unusually high quality and have several unique design features which make them much better suited to the measurement of household consumption than surveys in other countries. Barrett, Levell and Milligan (2013) compare micro and macro measures of expenditure in Australia, UK and the US to assess the reliability of expenditure survey data. They conclude that the surveys cover nearly 75 per cent of household expenditure in Australia, with no discernible change in coverage over time. This is in marked contrast to surveys in the UK and US in which coverage has steadily declined.

Nonetheless, it is important to note that the HES collects only 'snapshot' data for a cross-section of households at a given point in time and so is not truly longitudinal, and that estimation of consumption profiles of age defined cohorts over the course of the seven surveys is undertaken through the construction of pseudo-cohorts. Differences in consumption between households of different ages will reflect both genuine age (lifecycle) effects and also differences across cohorts. Other factors that may impact on consumption, such as income, immigrant status and household type, can be controlled for using regression techniques. Importantly, the wealth data available in the 1998–99, 2003–04 and 2009–10 surveys are included in the analysis to examine the impact of unanticipated increases in housing wealth defined as a household's level of net housing wealth.

1.4.2.2   Household Income and Labour Dynamics in Australia (HILDA)

Some of the robustness analysis, which covers the period until 2014, uses the Household, Income and Labour Dynamics in Australia (HILDA) data. The HILDA survey is funded by the Department of Social Services (DSS) and is a general population survey that follows individuals and households over time. It is this panel feature of HILDA that makes it unique among the general population surveys in Australia. The analysis in this report uses waves one to fourteen of the HILDA dataset collected between 2001 and 2014. Each annual wave of HILDA includes a rich set of topics that are repeated every year, along with a set of special topics, or 'modules', that are one-off or repeated over longer intervals. Each year includes detailed questions on household income, economic wellbeing, measures of labour market activity, and a broad array of socio-demographic characteristics. Housing-related information such as tenure, value of residential properties and mortgage debt held, is also available in every wave.

The analysis in this report uses the information available on household consumption expenditures, the key economic variable in the analysis being household expenditure on groceries, food at home (where available) and food purchased for consumption outside of the home. The expenditure items reported correspond to usual spending over a week and while reasonably comprehensive, spending on alcoholic beverages is explicitly excluded. Nominal expenditures (and income) were inflated to 2014 prices using the national CPI.

There are, however, potential limitations with the grocery and food expenditure items measured across waves 1–14 of the HILDA data. The expenditure information in the HILDA Survey is collected through recall questions rather than using diary methods as applied in some specialised expenditure surveys such as the HES. One concern is that recall data may be less reliable than data collected through the diary method. This issue was considered in Browning, Crossley et al. (2003) who provided a comparison of 'food at home' expenditure recorded using recall and diary methods across a variety of Canadian surveys. They found that the information

collected through interview recall questions was closely aligned with the information obtained through diary methods and concluded that 'respondents do a remarkably good job of reporting their household's expenditures on food at home' (Browning, Gortz et al. 2013). An additional consideration is that the set of grocery and food expenditures measured across waves 1–14 in HILDA is narrower than the set of nondurable commodities usually employed in distributional studies based on specialised expenditure surveys. Such studies typically include expenditure on household utilities, such as fuel and telephone bills, and transport services. These limitations should be borne in mind when making comparisons between results from HES and HILDA.

Of the special modules, the most pertinent for this report are those with detailed questions on wealth. Every four years, HILDA includes a wealth module that asks respondents a comprehensive series of questions about their holdings of assets and liabilities. The wealth module was included in the survey in 2002 (Wave 2), 2006 (Wave 6), 2010 (Wave 10) and 2014 (wave 14). Significantly, the repeat nature of wealth modules will enable us to examine the dynamics around the behaviours of the households. Moreover, analysis of wealth modules pre-GFC (2002 and 2006) and post-GFC (2010 and 2014) enables the investigation of the relationship between changes in house prices, debt and consumption expenditures of households.

1.5 Report structure

The remainder of this report is set out as follows. Chapter 2 is the analytical chapter and each subsection of it focuses on the research questions identified in Section 1.1. In particular, we examine the existing link between house prices and consumer spending in Australia, and focus specifically on how these links might have been affected by the GFC. The analysis considers different types of households' responses to house price changes, and pays particular attention to identifying the main drivers of aggregate consumption. These questions have been addressed, in the first instance, by using post-GFC data to duplicate and extend the analysis undertaken in the earlier, pre-GFC AHURI study of the impact of housing wealth on household consumption (Yates and Whelan 2009) to determine whether or not there has been a change in the relationships reported in that study. The focus of the chapter then turns to an examination of the impact of rising household debt on household consumption in Australia. In Chapter 3 we discuss the policy implications of the analysis presented in this report.

2 House prices, household debt and household consumption

This chapter addresses the following Inquiry research question:

How have house prices and house-price induced increases in debt affected consumption spending in Australia since the GFC, and what are the implications for economic and financial stability?

To address this research question, this section will present key findings on:

- *Whether the consumption response of households in different age groups has been affected by the GFC.*

- *The extent to which changes in house prices and debt have contributed to a change in the consumption response of households since the GFC.*

Empirical examinations of Australian data covering the period pre- and post-GFC find:

- *A strong relationship between house price changes and household consumption for old and middle aged households.*

- *Results consistent with the hypothesis that the increases in housing prices affect household consumption through the relaxation of a credit or collateral constraint that enables households to increase their borrowing in order to finance consumption.*

- *Evidence that since the GFC, households with high LTVs have become more conservative—they may no longer be increasing their debt to increase consumption in response to a change in house prices.*

- *Impacts of house price movements on the consumption behaviour of investors are following the GFC, highly leveraged home owners have become more conservative, and conversely, investors—especially investors with debt—exhibit greater responsiveness in their consumption to a change in house prices. A comparison of investors with or without debt prior to and following the GFC highlights the amplified role of the collateral channel for investors.*

This chapter examines the effects of housing prices and house-price induced increases in debt on general consumption spending in Australia, focusing specifically on how their links may have been affected by the GFC and the distribution of debt between owners and investors. We begin by presenting descriptive evidence around the relationship between household consumption and house prices covering the last 30 years in Australia. The key focus of the empirical analysis is on determining whether it is possible to identify the causal mechanisms that underpin this relationship. Three mechanisms are considered, namely, a direct wealth effect, a credit constraint or collateral effect, and a common cause effect. These mechanisms have distinct implications for different types of households as described in Section 1.3.1. The analysis indicates the important role played by the collateral channel pre- and post-GFC period. That is,

changes in house prices led to higher household consumption as the collateral constraint on borrowing was relaxed enabling households to borrow more. The results also point to differences in the sensitivity of the high leveraged households and investors consumption responses in the period after the GFC.

2.1 Household consumption in Australia

Household consumption alone accounts for more than half of Australian GDP. Its share of aggregate demand rose steadily from the mid-1990s until the late-2000s, but since then has stabilised at around 55 per cent. Its growth until the mid-2000s and its subsequent stabilisation mirrored closely real house price movements. This contributed to a significant body of research into the links between house price movements and consumption levels and, as indicated in Section 1.3, to a broad consensus that household consumption is positively correlated with household wealth (Hiebert 2006).

Following the GFC, however, the rate of growth in housing prices slowed relative to the pace of growth from the mid-1990s. Indeed, both household and housing wealth declined as a share of annual HDI between 2007 and 2015, having suffered significant double-dip downturns during this period. Household and housing debt, on the other hand, continued to rise in relation to HDI, albeit at a considerably slower pace than in the pre-GFC period. In the mid-1990s, household debt was around 50 per cent of household disposable income. It rose to over 150 per cent of HDI by 2007 (with housing debt alone accounting for almost 90% of this) and has remained at approximately this level since. Australia has not experienced the deleveraging experienced in countries more severely affected by the GFC. However, since the GFC there has been a rapid turnaround in the household savings ratio which rose after a steady decline over two-decades. One of the questions addressed in this report is whether this turnaround can be attributed to rising household debt.

Despite expressed concerns about the potential impact of rising household debt on macro-economic and financial stability by policy-makers in Australia, and despite clear international evidence of the correlation between high debt levels and the likelihood of recession (see Section 1.2), there has been limited efforts to examine the impact of rising household debt on household consumption in Australia. A number of recent studies undertaken by the RBA, however, are relevant for the questions raised in this project. These studies focus on explaining the dramatic turnaround in the household savings ratio in the mid-2000s. The counterpart to this, the consumption ratio, is shown in Figure 4 below.

Beech, Dollman et al. (2014) provide some insight into the changing pattern of the consumption ratio illustrated in Figure 4. Using the same HES data employed in this study, they examine changes in the share of consumption by different age groups over a 20-year period. Their analysis shows that, as a result of increasing (both absolute and relative) disposable incomes and wealth, the average expenditure of older households increased relative to that of other households over the past two decades.

Figure 4: Household consumption ratio: 1985–2015
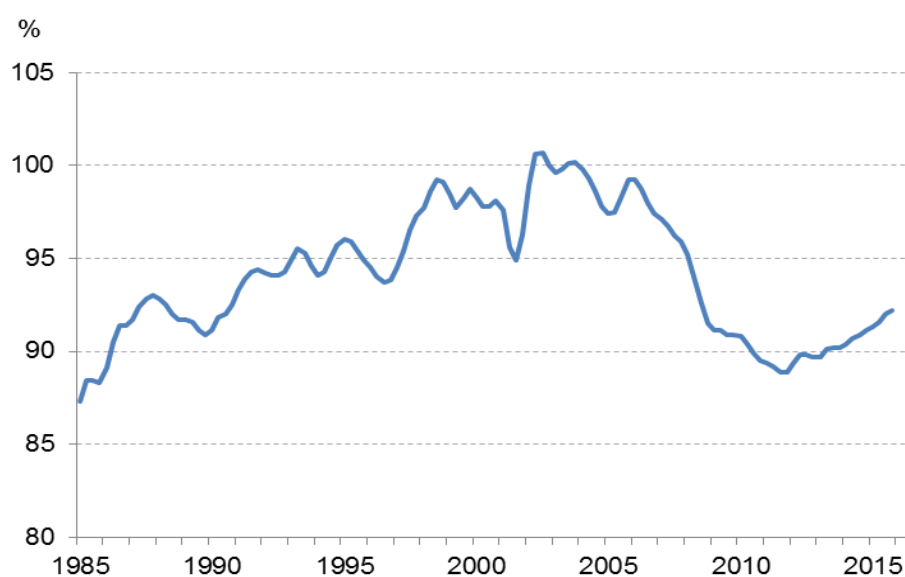
Source: ABS Cat. No. 5206.0, Table 1; consumption ratio derived as 100-saving ratio.

Finlay and Price (2014) (summarised in Price and Finlay 2014) use HES data for 2003–04 and 2009–10 to provide the most comprehensive current investigation of household saving behaviour undertaken in Australia. Their descriptive results show that saving ratios decrease with wealth and gearing and that 'relatively young and old households, but not middle-aged households, considerably increased their saving between 2003–04 and 2009–10' (Finlay and Price 2014: 16). They formally investigate possible drivers behind the sharp rise in the savings ratio over the past decade by modelling the savings ratio as a function of a number of drivers including: (1) life-cycle motives (age dummies); (2) credit constraints (based on subjective responses to attitudinal questions); (3) precautionary motives (based on unemployment risk proxies and vulnerable household dummies) and (4) wealth effects based on tenure and wealth to income and gearing (debt to asset) ratios interacted with age dummies. In their analysis they also control for a standard range of socio-demographic variables.[3] The analysis in Finlay and Price (2014) suggest that the rise in household saving between the 2003–04 and 2009–10 surveys was driven by changes in behaviour. Households with less secure income and/or those vulnerable to asset price shocks, higher educated households, younger households with debt and older households with wealth all increased their propensity to save. Finlay and Price (2014) interpret this change in behaviour as being underpinned by precautionary motives, possibly due to a reduction in future income expectations for higher income households and an effort to rebuild wealth after the GFC. However, they claim they are unable to 'definitively conclude' what caused the observed change in behaviour.

A final RBA study that has the potential to provide insights for this study is that undertaken by Bilston, Johnson et al. (2015). In that study the HILDA data is used to examine if the financial position of households is sufficiently robust to make them resilient to macro-economic shocks such as asset price, interest rate and unemployment rate shocks. The results of that study

---

[3] Their approach, and conclusion, is consistent with the 'buffer stock' macro-economic saving model used by Carroll, Slacalek et al. (2012) with its explicit and transparent roles for three transmission mechanisms: the precautionary, wealth and credit channels. Carroll, Slacalek et al. (2012) identify the first by responses to attitudinal questions about expected changes in unemployment; the second by a household net worth to income ratio and the third, inter alia, by loan to value ratios.

underpin much of the RBA's level of comfort about the current level of debt among Australian households. They conclude that 'despite rising levels of household indebtedness in aggregate, the distribution of household debt has remained concentrated among households that are well placed to service it' (Bilston, Johnson et al. 2015: i). Their concern, however, is with stress testing the household sector in order to determine whether this sector is likely to provide a threat to financial stability. They do not consider explicitly the potential impact of high indebtedness on household consumption.

2.2 The life-cycle model of consumption—a non-technical description

This section provides a general overview of conceptual ideas that underpin the analysis in this report and associated background literature. These provide the context for the empirical analysis in this chapter. The reader is also directed to Yates and Whelan (2009) for a more detailed discussion of the economic framework and a comprehensive literature review of the topic.

Economic analyses of consumption and saving decisions have traditionally been grounded in the life cycle model of consumption (LCM) or Permanent Income Hypothesis (PIH), In the simplest version of the LCM/PIH, household consumption is assumed to depend on expected life time income. Households smooth out fluctuations in current income by accumulating wealth through saving when income is relatively high, and by drawing on that wealth through dissaving when income is relatively low. Anticipated changes in wealth are built into consumption plans; unanticipated changes lead to a revision of those plans.

The LCM/PIH implies that households will save when needs are low, income is high, and the rate of return to saving is high. Conversely, they will tend to dissave (consume or spend) when needs are high, income is low or the rate of return to saving is low. For example, we would expect households to dissave when they are young (when needs are high because of children and the need to acquire durable goods for consumption) and in retirement (when incomes are lower) and to save in the latter part of the working life (when incomes are typically higher, and needs relative to income are generally lower).

Several papers in the literature use this framework to understand the relationship between house price changes and the saving or spending decisions of households (see, e.g. Campbell and Cocco 2007; Attanasio and Weber 1994). According to the LCM/PIH, an increase in house prices may lead home owners to increase their consumption over time and enjoy a higher standard of living. In particular, unexpected increases in house prices effectively make home-owners wealthier. The reverse applies for an unanticipated decrease in house prices. The effect of such developments is generally referred to as the *wealth effect* or *direct wealth effect*. To the extent that the relationship between increased consumption and rising house prices is driven by this wealth effect, it is home-owning households that would be expected to exhibit the largest increase in consumption. Moreover, it is older households that have a shorter timeframe in which to consume the benefits of such an increase in wealth that would exhibit the largest increase in consumption. In comparison, households that currently rent do not benefit from the increased wealth associated with higher house prices and would not be expected to increase consumption.

The LC/PIH model also reveals the potential for an indirect wealth effect on borrowing capacity when house prices increase. For some households, rising prices increase home owners' equity and thereby loosen constraints for those at their borrowing limit. This avenue is known as the *collateral effect* of increasing house prices, whereby the value of property that may be used as security for a loan has increased. These two effects have different implications for potential 'upsizers' and 'downsizers' among households at different ages or stages of the life-cycle.

Overall, the implications of an unanticipated rise in house prices may be quite nuanced and will differ across households. The expected response to this wealth shock according to the LCM/PIH framework includes:

1. An owner-occupier household who is not credit constrained (i.e. a home owner who is able to borrow additional funds) and is not planning to move, experiences both an increase in housing wealth and in the cost of living (due to the increase in the cost of housing services). This household is insured against the house price fluctuation (by virtue of being a home owner), and if they do not adjust their housing consumption (by moving or changing tenure status), their consumption and borrowing should not change. The life-cycle model predicts that housing wealth will be spent later in life. Therefore, this household may engage in debt financing of consumption by drawing on equity in the home such as through a mortgage redraw facility.

2. An owner-occupier household who is not credit constrained but is planning to move by downsizing will be affected by house prices when they are both selling and buying houses, and hence, they will necessarily adjust their consumption level.

3. An owner-occupier household who is credit constrained may use the positive house price change to relax the constraint and access the additional wealth through a home equity loan, loan refinancing or using a mortgage redraw facility. As a result, such owners may increase their consumption.

4. The behaviour of an owner-occupier with a mortgage is affected by their initial collateral. A home owner with a low initial LTV ratio, and hence high collateral, would not be expected to respond to rising house values by increasing their debt. By contrast, a home owner with a high LTV ratio may be significantly affected by the house price increase through the relaxation of credit constraints. That is, collateral effects might have differential implications depending on LTV ratios.

5. For investors, rising house prices increase equity and thereby loosen constraints for those at their borrowing limit.

6. For the renters, an increase in house prices directly increases the cost of housing services and such a development can be interpreted as a negative wealth effect. Renters who want to purchase housing following the increase in house prices generally need to incur more debt (take on higher mortgages) and/or increase their savings and in turn may reduce their consumption.

Finally, if external shocks such as a productivity growth driven increase in income cause the increase in house prices, we would expect the concomitant increase in consumption growth to be highest among younger households who will benefit from the increased productivity over their entire lives. From a life-cycle perspective, older households effectively experience a smaller positive shock from the increase in productivity than younger households and the increase in consumption among this group would be expected to be more muted. The effect on consumption should also be uniform across tenure status groups as the benefits of a productivity shock should be independent of tenure status. In this case, both house prices and consumption have increased in response to a *common cause* indirect wealth effect. The same argument can be used for a negative shock resulting in a reduction in the growth of income, reduced dwelling price growth and a reduction in consumption.

In trying to explain the observed correlation between housing prices and consumption expenditures, the LCM/ PIH provides a strong methodological framework for understanding why a relationship should exist. What is less clear is which of the three underlying causal mechanisms described above and in Section 1.3.1 links house prices and consumption expenditures. By analysing microdata in the form of household expenditure patterns and comparing behaviours across different types of households, it is possible to distinguish which of

the underlying causal mechanisms provides the best explanation for the correlation observed in the aggregate data. It is the empirical analysis of such data that is now described.

2.3 The empirical methodology—a non-technical description

2.3.1 Pseudo panel data

The analysis of household consumption can be addressed with longitudinal or panel data that follow the same set of households (or individuals) over time. With repeated observations on the same households (or individuals), it is possible to control for unobserved heterogeneity through the use of appropriate econometric techniques. In addition, since the longitudinal data contain time series as well as cross-sectional variation, one can study life-cycle transitions in consumption decisions. It is these features of panel data that facilitate the identification of the underlying causal mechanism that links house prices and consumption decisions.

In general, however, panel data that permit the analysis of the dynamics of household consumption are seldom available. In Australia, the HILDA, which started in 2001, is the only household longitudinal data set currently available. Unfortunately, it has limited information on consumption expenditures. For example, only food expenditure information is available on a consistent basis since 2003. One alternative source of information on household consumption expenditures are repeated cross-sectional household surveys. These surveys, such as the HES, provide information for a random sample of households at a fixed point in time and contain comprehensive information at an individual household level on household income, socio-demographic characteristics and housing as well in addition to their detailed data on household expenditure. In Australia cross-sectional expenditure surveys in the form of HES are available on an irregular basis since 1975.

It is important to note that estimation of consumption profiles over the life-cycle is not possible with the use of a single cross-sectional 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 effects but also differences across cohorts. For example, differences in the consumption patterns of young households and older households reflect more than the disparity in the age of those households. Effectively, older households belong to a different generation from younger households and the consumption behaviour exhibited by each will reflect the unique set of experiences and events faced by households of their respective generations. 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.

With repeated cross sections it is not possible to track specific individuals or households over time. However, in each survey year it is possible to identify a representative sample from each birth cohort and by using successive cross-sectional surveys, to follow the average characteristics and behaviours of a birth cohort across time. Unlike the use of a single cross-section, the use of pseudo panel data or repeated cross-sections enables age and cohort 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 (i.e. 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. An additional benefit associated with the use of repeated cross-sections to follow cohorts is that attrition and small sample problems that often limit panel data analyses are not generally present (Verbeek 2007).

For this study, our key methodology is based on use of the HESs to construct a pseudo-panel data set from repeated cross-sectional surveys.[4] This allows us to trace the average expenditures of a particular cohort through time, even though no household is observed more than once. While cohorts can be defined by any fixed characteristic, the most common choice of grouping is birth year of the head of household or household reference person. That choice is appropriate for the analysis in this study, as distinguishing between alternative transmissions mechanisms requires a comparison between 'younger' and 'older' cohorts. The analysis also requires the comparison of households in different tenures. Again, the detailed information available in the HESs facilitates such a comparison.

The empirical analysis proceeds as follows:

1   In the first step, all available HESs are 'stacked' or pooled to form a single dataset.

2   In the second step, each household in the pooled dataset is assigned into five-year birth cohorts. That is, the heads of households are identified as being born between 1920 and 1924 (cohort 1); those born between 1925–29 (cohort 2) and so on.

3   The consumption behaviour and wealth of each birth cohort is followed over time and a comparison of their behaviours is used to draw inferences around the relationship between house prices and consumption. For example, in each HES it is possible to identify a set of households where the household head was born in the period 1950–1954. This allows us to track the average expenditures of this cohort in 1975 when their average age is 23, in 1984 when their average age is 32, and so on. Even though no individual or household head is observed more than once, by considering the average outcomes of a cohort it is possible to effectively 'trace out' the life-cycle behaviours of a particular cohort.

As many researchers have highlighted, the pseudo panel approach is valid if the composition of cohorts does not change over time. There are a number of reasons why the composition of cohorts may change over time. The composition would change, for example, if there was differential mortality across members of a cohort, or if individuals with potentially different characteristics join a birth cohort over time. In Australia, the latter might happen due to immigration. The proportion of immigrants in a cohort born, for instance, between 1950 and 1954 is a stock variable that increases in value every time a new immigrant born between 1950 and 1954 arrives in Australia. When the inflow of new immigrants is greater than the outflow of past arrivals, the proportion of immigrants in a cohort will increase as the cohort ages. Such a pattern has the potential to bias estimated profiles of behaviours such as consumption if immigrant and native born agents differ with respect to the outcome of interest (viz, consumption). For our purposes this is unlikely to pose significant problems as several Australian studies show only minor differences in the saving and consumption decisions of native born Australians and immigrants (e.g. Islam, Parasnis et al. 2013).[5]

Studies that rely on pseudo panels to analyse consumption or saving behaviours typically must decide what the appropriate unit of analysis is. In general consumption, saving and wealth are typically observed at the household rather than individual level. The HES is an expenditure survey that collects information at the household level and like similar studies, the approach in

---

[4] This method was initially proposed by Browning, Deaton et al. (1985) and is commonly used in studies of consumption, savings and wealth. See Browning, Deaton et al. (1985) and Verbeek (2007) for detail technical discussion of the methodology.

[5] There are a number of other reasons why immigration is unlikely to bias the results of the empirical analysis reported in Section 2.4. The empirical analysis uses survey weights that adjust for the non-random nature of households available in the HES, and the specifications used include controls for immigrant status. In addition, in one robustness check estimated age profiles excluding immigrants were estimated and our results are similar to those when immigrants are included in the sample.

this study is to follow cohorts of households where the age of the household is defined as the age of the 'household head' (see e.g. Browning, Deaton et al. 1985; Campbell and Cocco 2007). It should be noted, however, that such an approach has some potential drawbacks. A household is a collection of individuals and at any given point in time individuals forming the household may be at a different stage of their life-cycle. While we acknowledge this problem that is common to pseudo-panel studies such as ours, the data does not allow the individual consumption profiles of household members to be discerned. While cognisant of this limitation, the analysis adopts the common practice adopted in the literature and follows households.

2.3.2 Examining consumption profiles using pseudo panel data

Our empirical model is based on the reduced form estimation of a life-cycle model and utilises pooled cross-section data. A more detailed technical description of the methodology is set out in Appendix 1, while below we summarise the approach in a non-technical manner.

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 how unanticipated changes in wealth impact on consumption and, importantly, whether those impacts differ for different age groups. The baseline statistical or econometric specification expresses household consumption as a function of a number of observable variables that capture time and cohort effects as well as the broad factors that affect household consumption over the life-cycle. The control variables include age of the reference person in the household (both linear and quadratic terms) and a set of observable household characteristics that include household size, composition, occupational status and immigration status of the household head.

The inclusion of linear and quadratic terms for age of the household head are important to capture consumption over the life-cycle. In general, consumption follows an 'inverted U shape' over the life-cycle. Consumption increases from the age of around 20 years to reach a peak in the early 50s. Thereafter it declines steadily as household's 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 seven surveys.

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 macro-economic variables (e.g. changes in interest rates or macro-economic 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. It is well established that, for various reasons, the average consumption profile of successive cohorts shift up or down (Attanasio, Blow et al. 2009).[6]

---

[6] The baseline specification does not explicitly include measures of household wealth and income as control variables for individual households. Although it might be argued that the omission of these variables may lead to omitted variable bias, in the underlying reduced form life-cycle equation used in this project, and in papers such as Attanasio, Blow et al. (2009), the deterministic part of wealth or income is captured by the constant. Moreover, variation in cohort wealth is also captured by cohort dummies. Transitory shocks are captured as part of the residuals. For these reasons, the baseline specification reported in Section 2.4. do not include income as a control variable. Previous analysis, such as that reported in Yates and Whelan (2009), find that inclusion of income and different wealth measures does not change the results in a material fashion.

2.4 Results

2.4.1 General framework

We begin our analysis by presenting graphically the consumption patterns for household heads of different ages across each HES (Figure 5 below). The consumption profiles in Figure 8 show a classic 'hump' pattern, with consumption increasing from the age of twenty to reach a peak in mid-age and declining steadily from then on as households age. This is consistent with the general predictions of the life-cycle theoretical model discussed in Section 2.2.

Figure 5: Household consumption expenditure by age and year of survey
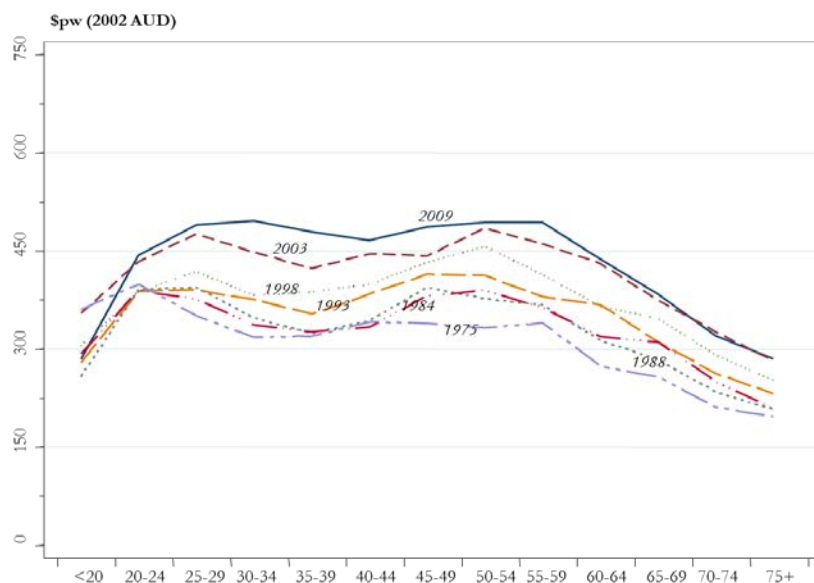
Note: Values have been deflated to $2002 prices for comparability with the Yates and Whelan (2009) AHURI study.

Source: Authors' estimates from pseudo-panel derived from ABS HES, 1975 to 2009–10. Results derived from Basic CURF data.

Two clear observations can be made from investigating Figure 5.

1 There is a strong consumption growth observed through the late 1990s and early 2000s. Prior to 2009, consumption expenditure in each HES survey generally dominates or sits above that from the preceding survey with particularly large increases for some age groups in 2003.

2 Following the GFC (the 2009 profile), consumption by older households is relatively unchanged compared to 2003 but that of young and middle-age households has continued to increase. This suggests that the consumption response of households in different age groups has been affected differently by the GFC.

In Figure 6 below, we present each year-of-birth cohorts' average consumption across the seven HES surveys. Each cohorts' consumption is then tracked over time. In total, we observe 16 birth cohorts beginning with those 'born in 1905' and ending with those 'born in 1980'. Each series in Figure 6 represents average values of equivalised consumption expenditure at different ages for households in the 16 birth cohorts.[7]

---

[7] It is important to note that the sample sizes are small for the cohorts in years 1905–30.

Figure 6: Household consumption expenditure by age and cohort
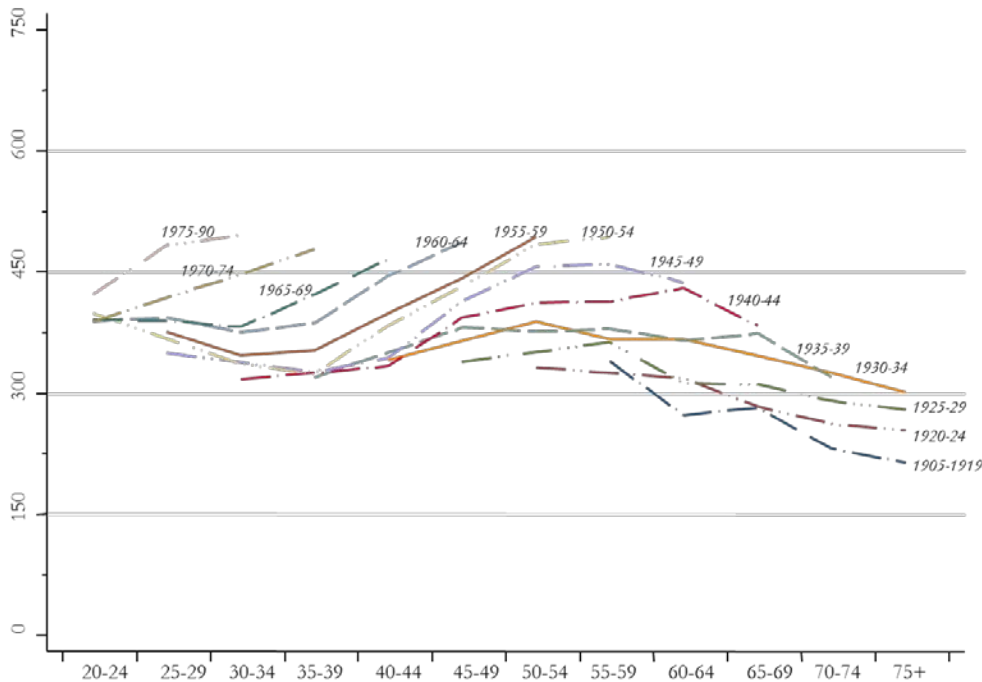
Note: Values have been deflated to $2002 prices for comparability with the Yates and Whelan (2009) AHURI study.

Source: Authors' estimates from pseudo-panel derived from ABS HES, 1975 to 2009–10. Results derived from Basic CURF data.

Overall, there are two key points to be derived from Figure 6.

1   The consumption profiles of younger cohorts tend to lie above those of older cohorts. This reflects the increase in income levels (and hence consumption) that has been experienced by successive generations of households.

2   For many cohorts the jump in consumption in the final two data points relative to the earlier pattern appears to be particularly pronounced at young and median age cohorts. The final two points in each cohort line in this graph correspond to the 2003 and 2009 HES. The 2003–04 HES was undertaken at a time when asset prices and housing wealth had accelerated quickly relative to previous trends (2003). The 2009–10 HES was undertaken after the economic shocks that followed the GFC. Comparison of the 2009 and 2003 data points shows that GFC has affected the growth rates of consumption between 2003 and 2009, and had a particularly large impact on the older and middle cohorts (i.e. those born between 1930 and 1950). Consider the 1940–44 cohort, we observe that average consumption is very similar across the last two data points representing the 2004 and 2009 HES.

2.4.2 How has the consumption response of different age groups changed since the GFC?

The life-cycle consumption profiles are used to determine whether the impact of unanticipated changes in wealth, in particular the negative shocks to house prices experienced after the GFC, differ across age groups in a manner suggested by the three alternative transmission mechanisms described in Sections 1.3.1 and 2.3 above.

If a 'common cause channel' (e.g. from a general loss of consumer confidence) is the explanation for the observed relationship between housing wealth and consumption, then

declines in consumption should be highest among the young following the GFC. It is this group who are impacted over their entire lives. In contrast, older cohorts will experience the impact of this shock for a shorter period of time in a life-cycle sense than younger cohorts and should therefore exhibit a smaller consumption response. A direct wealth channel, on the other hand, should be apparent only in the consumption of households who own housing assets. Finally, the housing collateral channel should result in a greater response by the young and middle-aged groups relative to the older group of households because the former are more likely to be credit constrained and therefore affected by changes in house prices that tighten credit constraints.

In the context of the regression or statistical analysis, the inclusion of age dummies allows us to determine whether consumption responses across three age groups defined as young, middle-aged and older households, differ significantly in the 2000s from their baseline consumption profiles (as undertaken in the earlier study by Yates and Whelan in 2008) (for the purpose of this report) to compare consumption profiles in 2009–10 with the patterns observed in 2003–04. Figure 7 below shows the average difference between actual and predicted consumption (the 'residuals') from the baseline and extended age specifications in each survey year. These residuals can be interpreted as the responses to the unexpected changes in income profiles of individuals.

Figure 7: Gap between predicted and actual levels of consumption by age group
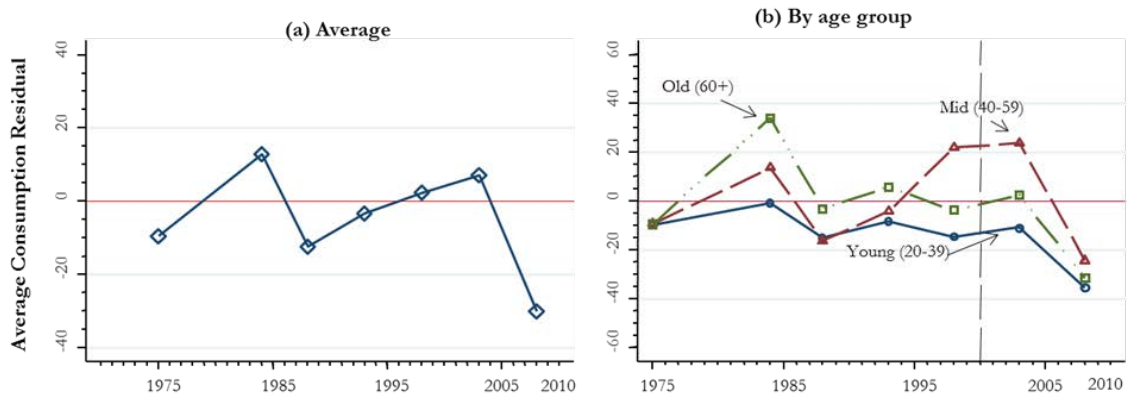
Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics Household Expenditure Surveys, 1975 to 2009–10. Results derived from Basic CURF data.

Figure 7 indicates that following the mid-1990s dip,[8] the 'residuals' become positive as actual consumption exceeds predicted levels. During the mid-2000s the gap between actual and predicted consumption tends to be largest for middle-aged households and lowest for the 'young' households in both years. The residuals for old-aged households generally lie in between those of the young and middle-aged cohort.

Following the GFC, there is a dramatic reversal in the residuals with actual consumption being significantly lower than predicted across all age groups. Of particular interest is the fact that, although actual consumption by young and old households decreases below that predicted by the fitted life-cycle consumption profile, the greatest decline between actual and predicted consumption occurs for households in the middle-age group. The results highlight the importance of the middle-age group prior to and after the GFC period. This result and its implications are considered more fully below.

---

[8] This dip can be attributed to the economic conditions of the time.

2.4.3 Impact of house prices and debt on consumption responses pre- and post-GFC

Effect of house prices and housing wealth on household consumption

The three specifications estimated and results presented in this sub-section are all based on equation (2) in Appendix 1. All specifications include terms which interact age-defined cohort dummies with a house price or housing wealth variable though the specifications vary in the way in which the price or wealth variable is used. Alternative measures of price and wealth variables are employed to ensure the conclusions drawn are robust and are not affected by potential limitations of a specific measure.

Key variables in the specifications are the interactions terms between time dummies, age cohort measures and house price or wealth measures. Results for the coefficients (and standard errors) for these key interaction terms are presented in Table 1 below. These coefficients provide the basis for comparing the consumption behaviour of different households in 2003 and 2009 with their behaviour in the 1970s, 1980s and 1990s and allow us to examine response of different households to the significant changes in their housing wealth during 2000s. In other words, comparison of the coefficients on the 2003 and 2009 interaction terms is the key to understanding the effect of the GFC.

The first specification estimated, reported in column (1) in Table 1, employs changes in the self-reported house value in HES. These can be interpreted as providing a good proxy for the changes in lifetime resources of each household. The results from this specification indicate that the largest effect belongs to the middle-aged cohorts in 2003 and 2009, with an implied Marginal Propensity to Consume (MPC) approximately equal to 0.02 both in 2003 and in 2009. Hence, a $1,000 increase (decrease) in housing wealth would lead to an increase (decrease) in annual consumption of $20 for middle-age households. In both years the response of older age cohorts is positive but smaller in magnitude and has a lower level of statistical significance.

The specification reported in column (2) of Table 1 addresses the possibility that individual house values may be endogenous to household consumption and, therefore, the potential limitations associated with the use of self-reported house values in the HESs. Endogeneity may arise if, for example, households reduce consumption to purchase additional housing or consider some forms of consumption purchases, such as durables in the form of household appliances or furniture, as increasing the value of their homes. A two-step strategy is used to address this concern. First, regional level average house prices are generated using self-reported house prices. Second, we instrument these constructed variables using regional level house price index changes as instruments. This specification, using house price variables that use the valuable information contained in self-reported prices, are less likely to be influenced by measurement error, imputation and endogeneity problems and allow the robustness of our findings to be assessed (see Atalay, Barrett et al. 2016) .The results are reported, in column (2) of Table 1. They reinforce the findings reported in column (1) that the largest response to changes in house prices and housing wealth is exhibited by the middle-aged group of households.

In the final column we use the data on household wealth available at an individual household level in the final three HESs. A distinguishing characteristic of this specification is its use of the theoretically preferable measures of net household wealth rather than gross household wealth or house prices as a proxy for housing wealth. Despite the different measures employed, the results reported in column (3) are similar to those reported in columns (1) and (2). That is, in general, higher (lower) net housing wealth is associated with higher (lower) household consumption in both 2003 and 2009. The coefficients on the interaction terms in column (3) indicate that, *ceteris paribus*, a $100,000 increase (decrease) in housing net wealth in 2003–04 is associated with an increase (decrease) in weekly household expenditure of $34 per week for

a household that belongs to the middle-aged cohort. This response in 2009 is marginally lower, $31. Again, the change in consumption expenditure implied by these estimates is consistent with an annual MPC out of housing wealth of approximately 0.02.

In summary, Table 1 indicates that:

- The results for 2009–10 confirm the previous findings for 2003–04 reported in the earlier AHURI paper, *viz.* the largest response to house price induced changes in housing wealth is exhibited by middle-aged households even after the GFC.

- There are no significant differences between the coefficients for 2003 and 2009. In 2009, as in 2003, it is the middle-age cohort who are the most likely to be liquidity constrained which exhibit the greatest consumption response to changes in housing wealth.

- As was the case in 2003, the results continue to indicate the existence of a positive and largely unchanged wealth effect. These results are robust to the three different price and wealth measures reported.

Table 1: Effect of house prices or housing wealth on household consumption

	Self-reported house value		Instrumented house price		Self-reported housing wealth	
	Coef.	[se]	Coef.	[se]	Coef.	[se]
[2003/4][House price level]*						
*Young	12.43	[14.43]	-0.06	[5.40]	8.51	[5.35]
*Middle	31.75***	[12.91]	17.38***	[3.82]	34.42***	[5.24]
*Old	18.03**	[12.91]	8.1**	[4.58]	18.49***	[3.60]
[2009/10][House price level]*						
*Young	10.8	[6.15]	-3.74	[5.14]	6.02	[4.32]
*Middle	34.2**	[18.72]	19.67***	[2.84]	31.2***	[6.42]
*Old	21.42*	[16.92]	8.08**	[3.35]	12.01	[11.52]
Demographics						
Couple	-8.5	[13.39]	-8.34	[13.39]	-8.41	[13.39]
Single	6.41	[15.49]	6.38	[15.49]	6.36	[15.49]
Lone parents	-32.72*	[18.40]	-32.38*	[18.40]	-32.42*	[18.40]
Number of adults	243.59***	[6.15]	243.59***	[6.15]	243.65***	[6.15]
Number of children:						
1	74.02***	[10.52]	73.83***	[10.53]	73.81***	[10.53]
2	104.65***	[10.09]	104.47***	[10.11]	104.43***	[10.11]
more than 3	68.12***	[11.70]	67.80***	[11.71]	67.79***	[11.71]
Professional	320.06***	[9.60]	319.54***	[9.61]	319.62***	[9.60]
Occupation other	152.12***	[7.95]	151.64***	[7.95]	151.73***	[7.95]
Age	16.81***	[1.53]	16.45***	[1.61]	16.44***	[1.60]
Age square	-0.14***	[0.02]	-0.14***	[0.02]	-0.14***	[0.02]
States						
Vic	4.94	[7.76]	5.04	[7.76]	4.91	[7.76]
QLD	-50.90***	[7.50]	-50.72***	[7.50]	-51.58***	[7.51]
SA	-37.95***	[9.50]	-37.76***	[9.50]	-38.22***	[9.49]
WA	-15.87*	[9.63]	-15.72	[9.64]	-16.09*	[9.64]
TAS	-53.76***	[11.26]	-53.57***	[11.26]	-54.84***	[11.26]
ACT and NT	86.49***	[15.20]	86.83***	[15.21]	86.51***	[15.21]

*Note: *** $p < 0.01$, ** $p<0.05$, * $p<0.1$. The regressions also control birth cohorts and other demographics—see Yates and Whelan (2009) AHURI report for details.*

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics *Household Expenditure Surveys, 1975 to 2009–10*. Results derived from Basic CURF data.

As a robustness check we examine whether anticipated or unanticipated changes in house prices (and housing wealth) better explains changes in household consumption. For this set of specifications, we adopt the approach described in Attanasio, Blow et al. (2009) and model the 'anticipated' regional house price by regressing regional self-reported house values against regional household income levels and the real interest rate. This approach assumes that house price growth has a predictable trend—which is a function of past prices and macro-economic conditions. We classify this predicted part as anticipated house price. We interpret the difference between actual and predicted values as the 'unanticipated' component of changes to wealth. The LCM/PIH suggests that in the absence of borrowing constraints current

consumption should respond only to unexpected changes in wealth (Campbell and Cocco 2007; Attanasio, Blow et al. 2009). Anticipated housing wealth movements, therefore, should only have an impact on consumers if they are credit constrained and changes in house prices affect borrowing constraints.

Table 2: : Effect of anticipated and unanticipated levels of house prices on household

	Coef.	[se]
2003–04		
Anticipated: young	7.22	[15.38]
Anticipated: middle	2.78	[14.35]
Anticipated: old	8.88	[14.67]
Unanticipated: young	-0.2	[16.04]
Unanticipated: middle	34.18**	[15.89]
Unanticipated: old	8.99	[16.29]
2009–10		
Anticipated: young	2.38	[14.38]
Anticipated: middle	9.78*	[5.03]
Anticipated: old	12.88	[18.45]
Unanticipated: young	-1.25	[21.04]
Unanticipated: middle	15.81**	[9.42]
Unanticipated: old	4.99	[23.29]
Demographics		
Couple	-8.34	[13.39]
Single	6.37	[15.49]
Lone parents	-32.37*	[18.40]
Number of adults	243.59***	[6.15]
Number of children:		
1	73.81***	[10.53]
2	104.46***	[10.11]
more than 3	67.78***	[11.71]
Professional	319.53***	[9.61]
Occupation other	151.63***	[7.95]
Age	16.45***	[1.61]
Age square	-0.14***	[0.02]
States		
Vic	4.96	[7.78]
QLD	-50.79***	[7.51]
SA	-37.87***	[9.51]
WA	-15.79	[9.64]
TAS	-53.69***	[11.27]
ACT and NT	86.76***	[15.21]

*Note: *** $p < 0.01$, ** $p<0.05$, * $p<0.1$. The regressions also control birth cohorts and other demographics—see Yates and Whelan (2009) AHURI report for details.*

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics *Household Expenditure Surveys*, 1975 to 2009–10. Results derived from Basic CURF data.

Table 2 presents the interaction terms between age groups and both anticipated and unanticipated components of house prices. In 2003, the regressions results indicate that the anticipated changes have no impact on the household consumption while unanticipated changes are significant (and positive) only for the middle-aged households. Note that in 2009, the response to unanticipated changes are lower and we see a small positive response for the middle-age group to anticipated changes. These results are similar to those reported in Table 1. In particular, consider if price changes beyond what might have been explained by incomes and real interest rates are unanticipated. These results indicate that our refined measure of housing wealth, which distinguishes between anticipated and unanticipated changes, shows a very similar trend with our main results; the consumption growth in 2000s is largely driven by middle-aged households.

Effect of tenure status and LTV on household consumption

The empirical analysis is further extended by adding tenure status and loan to value (LTV) ratios interacted with house prices to the previous specification (details can be found in Appendix 1). The results for the first set of empirical specifications are presented in Table 3 and show the effect of interacting tenure status and house price level terms with a dummy variable capturing tenure status in 2003 and 2009. With this specification it is possible to compare the behaviour of households of different ages and in alternative tenures relative to their baseline patterns. This comparison of home owners' and renters' consumption responses allows us to directly examine alternative transmission mechanisms. In particular, if the consumption is driven by a common causal factor, then both home-owning households and renter households will benefit from the shock and increased consumption should be observed both for owner-occupiers and for renters. If the wealth effect was driven by increase in house prices, we also would expect that coefficients on house prices to be zero for renters. This specification also facilitates the analysis of the consumption responses of households who might face different borrowing constraints and, in particular, the responses of owners with high LTVs who are most likely to face credit constraints. Again, our particular interest is investigating the behaviour of this group pre- and post-GFC.

One issue to note in interpreting results from this specification relates to issues around sample selection and endogeneity. In any given cohort some renters are likely to change tenure status over time. In this sense, tenure status is not exogenous and observed behavioural changes are likely to be endogenous. So our results from this specification should be interpreted carefully. Nonetheless this specification has been used in the literature, and provides a robustness check of our results reported in Tables 1 and 2.

Table 3 shows the coefficient for home owners is large, positive and significant and that for renters statistically insignificant. In 2009, we observe a slight decline in the coefficients, which is expected in the light of our previous results.

The theoretical model predicts that change in house prices could have differential impacts on home owners carrying different levels of debt. In the case of rising house prices, home owners who are not credit constrained, that is outright owners or those with a low level of debt, experience a matching increase in their housing wealth as well as the cost of living. These households are perfectly hedged against the house price fluctuations and if they don't adjust their housing consumption by moving, or changing their tenure status, their consumption and borrowing behaviour would be expected to be unchanged. However, in the absence of bequest motives, life-cycle models predict that housing wealth should be dis-saved in later life. Therefore some of these households may borrow against their home equity. Such borrowing may include MEW, refinancing existing mortgages, or adjusting their existing debt portfolios. If the existing home owners do adjust their housing consumption either by downsizing or upgrading, these households will be affected by house prices both when they are selling and buying houses, and hence they may adjust their debt situations.

There is an additional collateral effect on the subset of home owners whose ability to borrow has been limited by the value of their wealth that can act as a collateral, that is, households with high levels of current debt. An increase in house prices, which causes an increase in housing wealth, allows these credit constraint households to refinance and adjust debt portfolios. When house prices decrease, however, credit constraints are likely to be even more severe for households with high levels of debt, restricting their capacity to refinance and adjust their debt portfolios. For home owners with high and low levels of debt, therefore, we may expect different impacts of house price changes.

In Table 4 below, we explore this possibility by categorising our home owners according to their LTV ratios. The first category includes outright owners and home owners with LTV ratios lower than 0.5. The second category includes home owners with medium level LTVs (0.5 to 0.8) and the final group is the high LTV ratios (LTV>0.8). For the purpose of these specifications, renters are the omitted group. The coefficients on the LTV variables in 2003 (after a period of unanticipated house price increases) indicate that households with higher LTVs report higher consumption, *ceteris paribus*. This highlights the importance of the collateral channel in the pre-GFC period. In 2009 (after a period of negative house price shocks), we see that this result no longer holds—there is no difference in response across owners with different LTV ratios.

A comparison of 2009–10and 2003–04 indicates:

- There is a statistically significant increase in consumption responses of households with low LTV ratios, suggesting that these households increase (decrease) their consumption at a greater rate when house prices increase (decrease).

- There is no significant change in consumption response of households with LTV ratios between 50 and 80 per cent.

- There is a (statistically significant) decline in the consumption response of households with high LTV ratios. This suggests that, since the GFC, households with high LTV ratios have become more conservative. That is, they may no longer be increasing their debt to increase consumption in response to changes in house prices.

Table 3: Effect of a change in house prices on household consumption by tenure

	Coef.	[se]
[2003/4]*Owner*House Price	27.37***	[3.02]
[2003/4]*Renter*House Price	1.24	[4.42]
[2009/10]*Owner*House Price	24.7**	[12.8]
[2009/10]*Renter*House Price	-2.56	[6.71]
Home owner	84.18***	[6.13]
Demographics		
Couple	-17.44	[13.40]
Single	13.14	[15.45]
Lone parents	-19.66	[18.38]
Number of adults	242.26***	[6.12]
Number of children:		
1	70.81***	[10.56]
2	98.19***	[10.14]
more than 3	64.87***	[11.68]
Professional	306.15***	[9.66]
Occupation other	141.41***	[7.98]
Age	14.37***	[1.59]
Age square	-0.13***	[0.02]
States		
Vic	-0.81	[7.75]
QLD	-51.72***	[7.48]
SA	-40.22***	[9.46]
WA	-17.75*	[9.60]
TAS	-57.22***	[11.25]
ACT and NT	91.03***	[15.26]

*Note: *** p < 0.01, ** p<0.05, * p<0.1. The regressions also control birth cohorts and other demographics—see Yates and Whelan (2009) AHURI report for details.*

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics *Household Expenditure Surveys*, 1975 to 2009–10. Results derived from Basic CURF data.

Table 4: Effect of LTVs on household consumption by tenure

	Coefficient	Std. error
2003–04: LTV ratio dummies *house prices		
0 to <50%	30.31***	[3.13]
50 to 80%	49.37***	[4.94]
80% +	64.89***	[8.93]
2009–10: LTV ratio dummies *house prices		
0 to <50%	46.56***	[2.39]
50 to 80%	45.50***	[3.89]
80% +	47.13***	[5.29]
Demographics		
Couple	-17.73	[13.40]
Single	13.26	[15.45]
Lone parents	-19.1	[18.38]
Number of adults	242.23***	[6.12]
Number of children:		
1	70.37***	[10.56]
2	97.64***	[10.14]
more than 3	64.26***	[11.67]
Professional	304.87***	[9.66]
Occupation other	141.11***	[7.98]
Age	14.08***	[1.58]
Age Square	-0.13***	[0.02]
States		
Vic	-0.06	[7.76]
QLD	-50.97***	[7.48]
SA	-39.11***	[9.46]
WA	-16.96*	[9.60]
TAS	-56.22***	[11.24]
ACT and NT	91.63***	[15.26]

Note: *** p < 0.01, ** p<0.05, * p<0.1. The regressions also control birth cohorts and other demographics—see Yates and Whelan (2009) AHURI report for details.

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics *Household Expenditure Surveys, 1975 to 2009–10*. Results derived from Basic CURF data.

Effect of house prices on investor's consumption

A final empirical extension involves focusing on the behaviour of investors in the HES. Investors are identified as those households who own rental property, using information on property ownership that only became available in the last two HES surveys. Households are categorised, as renters (who own no property), non-investors (who own a house but not a rental property) and investors (those who own a rental property) and examine each group's reaction to house

price changes. The examination of investors' behaviour is particularly interesting in the light of recent debates and changing patterns of debt between owner-occupiers with no investment property and investors. In Section 2.4.4, we use HILDA to look at the behaviour of investors in more recent periods.

The results from the analysis of the HES are presented in Table 5.

Table 5: Effect of house prices on investor's consumption

	Coefficient	[Std. Error]
2003–04:		
Investor	47.71***	[6.12]
Non-investor	33.44***	[4.23]
2009–10:		
Investor	54.47**	[8.97]
Non-investor	29.78***	[4.36]
Demographics		
Couple	10.1	[12.66]
Single	4.65	[14.44]
Lone parents	-27.6	[17.12]
Number of adults	144.79***	[7.31]
Number of children:		
1	70.37***	[10.56]
2	97.64***	[10.14]
more than 3	64.26***	[11.67]
Professional	130.93***	[11.73]
Occupation other	42.29***	[8.95]
Age	15.18***	[1.49]
Age square	-0.13***	[0.02]
States		
Vic	6.22	[7.25]
QLD	-35.38***	[7.11]
SA	-26.74***	[8.80]
WA	-7.4	[9.09]
TAS	-32.94***	[11.06]
ACT and NT	52.80***	[14.97]

*Note: *** $p < 0.01$, ** $p<0.05$, * $p<0.1$. The omitted group is renters. The regressions also control birth cohorts and other demographics—see Yates and Whelan (2009) AHURI report for details.*

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of Statistics *Household Expenditure Surveys, 1975 to 2009–10*. Results derived from Basic CURF data

A number of observations can be drawn from the results in Table 5:

- In 2003, the coefficient for investors shows that, *ceteris paribus*, investors had a statistically significant higher consumption response to an increase in house prices than non-investors.

- In 2009, the difference between investors and non-investors become larger.

- In 2009–10 relative to 2003–04:

  — There is a (statistically significant) increase in consumption responses of investors, suggesting that a greater response to changes in house prices from these households occurred in 2009–10.

  — The consumption response of non-investors stays positive, but is slightly lower in 2009–10. It reinforces the continued existence of a positive wealth effect which is largely unchanged compared with 2003–04.

These findings suggest that, since the GFC, non-investor's behaviour has not changed while investors have increased their consumption response to changes in house prices. As identified in the earlier study, the response of non-investors (i.e. owner-occupiers with no investment property) to changes in house prices may be interpreted in terms of the pure wealth effect.

For investors, it is useful to consider how consumption responses might differ across heterogeneous investors. To this end, we examine the consumption response of investors who have mortgage debt on their rental properties and compare their behaviour to those who do not have mortgage debt. The results from this analysis, which are presented in Table 6, indicate:

- In 2003, the coefficient on the 'Investors without debt' had a (statistically significantly) higher consumption response to a change in house prices relative to other groups. This result is consistent with a wealth effect associated with higher house prices for investors without debt.

- In 2009, the results are somewhat different and indicate:

  — a statistically significant increase in consumption responses of investors with debt in an environment where the unanticipated growth in house prices had ceased

  — a statistically insignificant increase in the consumption response of non-investors.

These findings indicate that following the GFC, high leveraged non-investors became more conservative. On the other hand, investors—especially investors with debt—became more responsive in their consumption. A comparison of investors with or without debt prior to and following the GFC highlights the amplified role of the collateral channel for investors. In the previous specifications the role of collateral channel was examined by incorporating information on the age of the cohort and LTV ratios (Tables 3 and 4). The groups in those specifications that exhibited the largest consumption response (middle-age home owners, home owners with high LTV ratio) included households that might have high risk aversion. Hence, part of the consumption responses to house prices are muted by the precautionary motives of households. When we consider highly leveraged investors, that is those with lower precautionary motives, we observe large responses to house prices, even after the GFC.

Table 6: Effect of house prices on different type of investor's consumption

	Coefficient	[Std. Error]
2003–04:		
Investor with debt	33.18 ***	[5.76]
Investor without debt	59.86 ***	[7.12]
Non-investor	33.44***	[4.23]
2009–10:		
Investor with debt	55.11***	[5.92]
Investor without debt	51.08 ***	[12.44]
Non-investor	29.78***	[4.36]
Demographics		
Couple	-8.77	[13.39]
Single	6.93	[15.49]
Lone parents	-31.86*	[18.41]
Number of adults	243.64***	[6.15]
Number of children:		
1	73.90***	[10.53]
2	104.74***	[10.10]
more than 3	67.55***	[11.69]
Professional	317.84***	[9.61]
Occupation Other	151.31***	[7.95]
Age	16.36***	[1.54]
Age Square	-0.14***	[0.02]
States		
Vic	5.34	[7.77]
QLD	-50.30***	[7.51]
SA	-37.10***	[9.50]
WA	-15.28	[9.64]
TAS	-52.85***	[11.26]
ACT and NT	87.38***	[15.21]

*Note: *** p < 0.01, ** p<0.05, * p<0.1. The omitted group is renters. The regressions also control birth cohorts and other demographics – see Yates and Whelan (2009) AHURI report for details.*

Source: Authors' estimates from pseudo-panel derived from Australian Bureau of *Statistics Household Expenditure Surveys, 1975 to 2009–10*. Results derived from Basic CURF data

Summary of the results from the HES: Impact of house prices and debt on consumption responses pre- and post-GFC

The results from the analysis of the HES presented in this section are consistent with both a (direct) wealth effect and a collateral effect driving the relationship between house prices, housing wealth and consumption. It could, however, be argued that the results are more supportive of a collateral effect. Coefficients for older home-owning households are less than

those for middle-aged home owners in both 2003 and 2009 (Tables 2, 3 and 4). Given that older owners are more likely either to own their houses outright, or at least to have considerably higher equity in their housing, we would not expect to see a relatively lower response by this group if the wealth effect is the main driver of the relationship. Conversely, young and especially middle-aged home owner cohorts are more likely to be collateral constrained. Consistent with the collateral channel, we observe bigger responses in these cohorts.

Additional evidence to support the collateral or credit constraint hypothesis is provided in Table 2—that is, the results from specifications that included anticipated and unanticipated increases in house prices. These show that, for 2009 at least, consumption responds to anticipated increases in house prices. Young and middle-aged cohorts are more likely to be credit constrained and take the opportunity to borrow against any unanticipated increase in house prices to finance higher consumption.

More generally, the pattern that emerges from an examination of the regression results is that, in general, the econometric evidence is not consistent with a common causal explanation. Rather, the source of the transmission mechanism most consistent with the observed relationship between house price and consumption behaviour is associated with the relaxation of credit constraints arising from increased housing wealth. In particular, it is middle-aged home-owning cohorts in Australia for whom consumption seems most responsive to increases in house prices. Such a pattern is consistent with higher house prices relaxing credit constraints and thereby facilitating higher consumption among this group.

The conclusion that the causal mechanism that links house prices and consumption behaviour to the housing collateral effect is supported by research into patterns of equity withdrawal in Australia and other countries. Schwartz, Lewis et al. (2008) found that middle-aged households in Australia are more likely to withdraw equity from their housing wealth by increasing the debt on an existing mortgage. Wood and Nygaard (2010), using a shorter run but true panel data set, found wealth effects and credit constraints were the most important drivers of equity withdrawal in Australia in 2002 and 2003. They also pointed to the extent to which binding income constraints limit the extent to which young households are able to withdraw equity. Windsor, Jaaskela et al. (2015) also provides support for the collateral mechanism in Australia.

The importance of increased house prices in relaxing credit constraints in inducing higher consumption expenditure has also been identified in recent analysis in the United Kingdom and the United States. Aron, Duca et al. (2012) use aggregate data and show that accounting for changes in the availability of credit reduces the estimated wealth elasticities for the United Kingdom and the United States. Similarly, previous studies found evidence that increases in house prices in the United Kingdom allowed borrowing constrained households to refinance and substitute secured debt for more costly unsecured debt. Similarly for Denmark, Browning, Gortz et al. (2013) found evidence of collateral constraints and argued that house prices impact total expenditure through this channel. Each of these studies, however, was undertaken prior to the shocks brought about by the GFC.

Our results also highlight that, after the GFC, we observe some changes—specifically we observe that households with high LTV ratios have become more conservative in their response to a change in house prices. They may no longer be increasing their debt to increase consumption. An examination of investor behaviour shows that although high leveraged home owners became more conservative, investors—especially investors with debt, became more responsive in their consumption. A comparison of investors with or without debt prior to and following the GFC highlights the amplified role of the collateral channel for investors.

2.4.4 Has the economy reached a new 'equilibrium' in consumption responsiveness since the GFC?

We conclude this section by asking whether the 2009–10 outcomes suggested by analysis of the HES represent a new 'equilibrium' in consumption responsiveness. Alternatively, do the 2009–10 outcomes reflect a temporary state that will revert to longer term pre-GFC consumption responsiveness levels over time? Or, as house prices continue the previous growth trend observed prior to the GFC, how long such a trend could be regarded as unanticipated? At what point will it have been built into the system? It will be possible to begin to address this question using the same analytical approach once the next release of HES becomes available (in late 2017).

In order to gain an earlier insight into post-2010 outcomes, we undertook simpler, descriptive analyses using HILDA. The wealth modules in HILDA available for waves 2, 6, 10 and 14 are particularly pertinent to our research. Wealth data have been collected in 2002, 2006, 2010 and 2014 respectively. In the HILDA survey, respondents are asked detailed questions about their holdings of assets and liabilities and this facilitates examination of the dynamics of household debt and the borrowing behaviour of Australian households during this period. Analysing two wealth modules covering the period before the 2008 GFC and two subsequent to the GFC allows us to investigate changes in the housing debt and consumption over this period.

A limitation of the HILDA data for our purpose is the lack of comprehensive information about consumption items. Data on food expenditure are available on a consistent basis from 2003, but data on durable consumption are available only in the 2006 and 2010 waves. Hence, our examination of the consumption and debt relationship using HILDA is restricted to an eight or five-year period spanning 2003–10 or 2006–10 respectively. A recent AHURI study (Atalay, Barrett et al. 2016), examined the evolution of household debt through 2002 to 2010 using the HILDA data. The results indicated that increased housing wealth led to higher household debt—especially for households that have initial high debt holdings. In Table 7 below some descriptive statistics around the debt holdings and consumption levels of home owners in Australia are presented.

As detailed questions relating to household finance have been asked only in the HILDA wealth modules (2002, 2006, 2010 and 2014), we restrict our analysis sample to these four waves.[9]

---

[9] We also exclude the top-up sample added to the HILDA survey in wave 11; households with multiple families; self-employed individuals; and observations with missing key demographic variables such as education and state of residence. In addition, we restrict the sample to household heads aged between 20 to 75. With a true panel dataset such as HILDA one challenge is tracing household heads in households that dissolve between waves. As a result of this, we restrict our attention to heads whose marital status has not changed between waves. Finally, we further restrict our sample to home-owning households who have consecutively responded in two waves and exclude households where the calculated LTV is greater than 1.1.

Table 7: Descriptive statistics from HILDA— 2002 to 2014

Year	2002		2006	
	Whole sample	LTV>0.8	Whole sample	LTV>0.8
Household head's age	47.2	35	51.2	37.2
Household gross income ($`000)	96.5	95.2	106	117
Property value ($`000)	412.3	253	743	406
Total debt ($`000)	112.8	271	176	439
Food consumption ($`000)	NA	NA	13	13.7
Non-durable consumption ($`000)	NA	NA	36.5	38.4
Durable consumption ($`000)	NA	NA	10.7	12.9
N	3,198	111	3,170	109
Year	**2010**		**2014**	
	Whole sample	LTV>0.8	Whole sample	LTV>0.8
Household head's age	52	39	55	44
Household gross income ($`000)	116.4	135	127	143
Property value ($`000)	639.7	567	827	589
Total debt ($`000)	207	543	210	542
Food consumption ($`000)	13.5	15.6	13	14.9
Non-durable consumption ($`000)	37.9	38.6	33.4	37.2
Durable consumption ($`000)	10.4	0.97	NA	NA
N	2782	87	1,604	92

Note: Dollar values are inflated to 2014 price levels.

Source: Authors' estimates from the 2002, 2006, 2010 and 2014 HILDA Survey.

Table 7 displays demographics and household finance summary statistics of households in the four waves of HILDA used in the analysis. Across the four waves of data, there are 10,754 observations in an unbalanced panel of 3,198 households. Household demographics, due to our selection criteria, are relatively stable over these four waves. The mean age of heads is 47.2 years in 2002 and 55 in 2014. Approximately 60 per cent of household heads are male, more than 70 per cent of household heads reside with a partner and, on average, households have one child. Despite the stability in demographics, households vary greatly in their financial positions. Some noteworthy patterns include:

- Between 2002 and 2006, household income grew at 2.8 per cent per annum. In comparison, housing value rose at 9.45 per cent per annum.

- Between 2006 and 2010, household income growth slowed to 1.9 per cent per annum. At the same time, annual house price growth equalled 3.3 per cent and food expenditure increased by 3.8 per cent.

- Between 2010 and 2014, household income continued to grow at around 3 per cent per annum while house price growth almost stagnated at 0.02 per cent per annum. Food expenditure decreased by 3.8 per cent.

- The changes in income growth rates suggest that household incomes were negatively impacted by the GFC, but this trend started to reverse as household incomes recovered post-GFC.

- The growth of house values had slowed down over the long-run between 2002 and 2014.

- An examination of highly leveraged households (households with LTV>0.8) indicates that trends are similar but more pronounced in this group. Consistent with the findings reported in Table 4 above, after the GFC households with high LTV ratios exhibit negative growth in non-durable consumption suggesting they have become more conservative and may no longer be increasing debt levels so as to increase consumption.

The empirical results reported in Table 8 below examine the effect of house prices on household consumption across waves of HILDA. Taking advantage of the longitudinal aspect of HILDA—we examine the changes in consumption variables for a particular household due to the changes in house values. This approach controls for unobserved heterogeneity similar to fixed effects panel models.[10] There are three panels in Table 8: Panel A reports the results for specifications in which the dependent variable is 'change in Food expenditure'; Panel B reports with the dependent variable as 'Non-Durable Consumption' which is similar to the measure used in the analysis of the HES; and Panel C uses a measure of 'durable consumption'. For each panel, we run four different specifications. The first model examines the direct impact of the change in house prices on household consumption for the entire sample. The second model is similar to the specification in Table 3 and focuses on households with different LTV ratios. In particular, we examine the households whose initial LTV ratio is above 0.8—and investigate the effect of house price changes on the consumption of these households. The third and fourth columns focus on the behaviour of investors. In column (3), we focus on the change in the investors' (home owners with rental income) consumption associated with house price movements. In the final column we consider highly leveraged investors (investors with initial LTV>0.8). For all specifications, we control for a range of observable characteristics including age and age squared, female, indicator variables for household head's education level, number of children, an indicator variable for owning more than one property, years remaining to pay the mortgage, indicator variables for major statistical regions, household gross income and household gross income squared and change in financial assets. Full results are reported in Appendix B.

---

[10] In particular a first difference approach is used in the econometric analysis.

Table 8: Estimates from HILDA

		Panel A		
		Dependent variable is the change in the food consumption		
	Full sample	**Households with initial LTV>0.8**	**Investors**	**Investors with initial LTV>0.8**
Change in house value	0.00477*	0.00520*	0.00029	0.00287
	[0.00265]	[0.00304]	[0.000417]	[0.00194]
Observations	5,323	147	1,019	207
R-squared	0.04	0.236	0.073	0.18
		Panel B		
		Dependent variable is the change in the non-durable consumption		
	Full Sample	**Households with initial LTV>0.8**	**Investors**	**Investors with initial LTV>0.8**
Change in house value	0.00401*	0.0422	0.0019	0.00903
	[0.00239]	[0.0443]	[0.00202]	[0.00786]
Observations	5,323	147	1,019	207
R-squared	0.023	0.155	0.049	0.269
		Panel C		
		Dependent variable is the change in the durable consumption		
	Full Sample	**Households with initial LTV>0.8**	**Investors**	**Investors with initial LTV>0.8**
Change in house value	0.00263	-0.0238*	0.000848	-0.000831
	[0.00284]	[0.0135]	[0.00177]	[0.00622]
Observations	2,816	85	529	93
R-squared	0.018	0.533	0.052	0.165

Note: *** $p < 0.01$, ** $p<0.05$, * $p<0.1$. Full Results are reported in Appendix B.

Source: Authors' estimates from the 2002, 2006, 2010 and 2014 HILDA Survey.

The results from HILDA are consistent with the general trends found in our HES estimations. The first column indicates that a $10,000 increase in house value is associated with an increase in total food expenditure by $477 annually, ceteris paribus. This estimate points to a positive association between house wealth changes and food expenditure during the GFC period. Looking at the highly leveraged individuals, we see larger impacts that are statistically insignificant at standard levels.

In columns (3) and (4), we examine the behaviour of investors. The results show no significant impact on these households' food expenditure. The results reported in Panel B, which considers the change in nondurable consumption, confirms the findings set out in Panel A. These results are consistent with wealth effects. The fact that we see bigger but insignificant impacts for high LTV households suggest some of this wealth effect is transmitted via a credit constraint channel, but it is not as strong as the period leading up to the GFC.

In Panel C, durable consumption is considered. Due to data availability limitations, the analysis is restricted to changes between 2006 and 2010. The results are potentially important for understanding the impact of the GFC. From Panel C, it is clear that the only significant impacts

belong to households and investors with high LTV ratios. Moreover, contrary to previous findings, these effects have a negative sign. This suggests that when highly leveraged households experience an increase in their property price, they decrease their durable consumption. It might be the case that these households may choose to tap into housing equity to buffer against a possible future income shock. US studies, for example, show that households may attempt to draw on their housing equity if they were to receive an unexpected and substantial negative income shock and have a low liquid wealth. This result can be also interpreted as an increase in precautionary motives possibly due to a reduction in future income expectations for higher income households and an effort to rebuild wealth following the GFC.

2.5 Summary of findings

In Chapter 1, five SRQs were listed, namely:

1 *What is the existing evidence of a causal link between house prices and consumer spending?*

2 *Have previously established links between house prices and consumer spending in Australia been affected by the GFC?*

3 *What is the role of debt in the house price and consumption relation?*

4 *How has the consumption response of households in different population groups to changes in housing prices and housing debt been affected by the GFC?*

5 *What are the implications of these relationships for the economic performance of Australia?*

These questions have been addressed, in the first instance, by using post-GFC data to duplicate and extend the analysis undertaken in the earlier, pre-GFC AHURI study of the impact of housing wealth on household consumption (Yates and Whelan 2009). This study has relied upon a repeated cross-section analysis generated from the unit record data available in ABS Household Expenditure Surveys (HES). The current analysis uses data covering the period from 1975 through to 2009–10. Data from all surveys have been used to generate cohort consumption profiles.

The key focus of the earlier study was to determine whether it was possible to identify which of the three potential causal mechanisms could best explain why the increase in household wealth induced by higher house prices observed in the run up to the GFC contributed to the observed increase in household consumption over that period. The three mechanisms considered included a direct wealth effect; a credit constraint or collateral effect; and a common cause effect. In the earlier AHURI study, the weight of evidence pointed to the collateral effect as being the transmission mechanism as the collateral constraint on borrowing was relaxed and thereby enabling households to increase their borrowings (Yates and Whelan 2009).

In general, the empirical evidence using post and pre-GFC data highlight the resilient role played by the direct wealth channel, especially for elderly Australians. More importantly, however, the evidence is consistent with a credit constraint or collateral channel for others. The analysis in this project is consistent with recent studies from the United Kingdom and United States that have also identified the relaxation of collateral constraints as being a key factor in explaining the link between housing wealth and consumption. An important feature of the transmission mechanism identified in those studies is the potential for increases in dwelling prices to allow credit constrained households to substitute secured debt for unsecured debt. A recent AHURI project by Atalay, Barrettet et al. (2016) also finds some support of this trend in Australia. While the effect of increased housing wealth on overall consumption is likely to be more muted by allowing for this possibility, our results indicate that in Australia it remains the case that aggregate increases in housing wealth induce an aggregate consumption response.

It is also important to note that there are limitations with the pseudo panel methodology adopted in this report. Nevertheless, our view is that, at a minimum, our analyses highlight the importance of using disaggregated data to provide the evidence needed to implement appropriate policy responses given the clear evidence that responses differ between households depending on the extent of their housing wealth and housing debt.

2.6 Policy development implications

Concerns about economic and financial stability raise questions about the ongoing impact of housing wealth on consumption in light of associated increases in debt when rising household debt means net household worth has ceased to increase. In countries that have experienced deleveraging since the GFC, attention increasingly has focused on the impact of debt on consumption even though, traditionally, economic theory has not regarded debt as having an independent impact on consumption. Rather, it has merely been a vehicle for facilitating consumption smoothing over the life-cycle. The post-GFC experience, however, has raised concerns that high levels of debt may force indebted households to reduce consumption.

In Australia, similar questions have been raised with concerns more specifically focused on the rise in housing debt among household investors, many of whom are the same households who used MEW to increase their consumption with the initial onset of the housing price boom (RBA 2014a). The results from the analysis in this report are consistent with those in Finlay and Price (2014) and indicate this increase is seen as being driven by changes in behaviour by households with specific household characteristics. In particular, older households with wealth and middle-aged households with debt and investors are specifically identified as being important drivers of this relationship.

Our findings are relevant for policy-makers considering macro-economic stability in Australia. In particular, our finding that the responsiveness of household consumption to house prices is greatest among households with higher levels of indebtedness highlights a potential systemic risk. Financing higher consumption through taking debt among highly leveraged households (through the 'collateralisation effect') exposes those households to the risk of significant loss if house prices fall or if interest rates rise. This is in contrast to a general belief in Australia that debt is held by those most able to service it, namely, higher income and higher wealth households. Macro-economic policy-makers should interpret high levels of household debt and rising household income-to-debt ratios in Australia with concern. In a number of countries with similar situations, regulations have been implemented to limit the growth of household indebtedness. The implications of these findings for policy and possible policy responses are discussed more fully in Chapter 3.

3 Policy development options

The experience of economies across the globe following the GFC highlights the important role that household indebtedness can have for macro-economic outcomes and macro-economic policy settings. As discussed in Chapter 1, the period prior to the GFC was characterised by a large build-up of household debt. This was particularly acute in the United States and is widely identified as one of the key developments that contributed to the GFC (Ellis 2009). Moreover, notwithstanding sustained fiscal efforts on the part of governments and monetary stimulus from central banks in the period following the GFC, major economies have continued to experience lacklustre economic growth. Indeed, the period since the GFC has been characterised as one in which unconventional monetary policy has been widely adopted, partly in response to a perception that traditional policy levers around interest rates have proved somewhat ineffective. While interest rates have been lowered to historically low levels across industrialised countries for a protracted period, this has not in general precipitated a rebound in the economy. In the United Kingdom, for example, financial institutions took a conservative approach to lending by imposing more demanding credit standards leading to substantially lower levels of lending for housing-related activity. Though not as pronounced in Australia, it was nonetheless the case that the period following the GFC saw a contraction in housing-related activity and lending notwithstanding low interest rates (Morling and McDonald 2011).

The period preceding and the experience following the GFC raises important policy questions around how such events can be avoided and what the appropriate policy response to such events may be. It is these questions that the analysis in this report is motivated by and in doing so add to the evidence base around which policy can be formulated.

Existing evidence points to the important role that increased household indebtedness played in sustaining higher consumption in the period leading up to the GFC. While house price inflation in Australia slowed in the period leading up to the GFC as interest rates were steadily increased, the financial shocks associated with the GFC led to a significant decrease in the rate at which house prices increased. Notwithstanding this, housing-related debt continued to increase and by 2015 represented 150 per cent of household disposable income, an increase of over 300 per cent over a 25-year period.

It is against this backdrop that increasing attention has been paid to how policy settings can influence accumulation of household debt, and the role that housing and housing wealth should play in determining macro-economic policy settings more generally. Traditionally, central banks have relied on monetary policy in the form of interest rate settings to influence, albeit indirectly, outcomes in housing markets and the behaviour of households in accumulating household debt. In Australia, the RBA has remained largely unconcerned about rising levels of household debt, in part because of the perception that the debt was serviceable. The experience of the GFC and the prolonged downturn that followed it has highlighted the potential implications of developments in housing markets can have on macro-economic and financial stability more generally.

Given the experience of the GFC, understanding the behaviour of households in the accumulation of debt; the response of households to asset price inflation; and the transmission mechanism via which developments in housing markets spill over to macro-economic and financial stability more generally, an enhanced understanding of the relationship between household and housing wealth and consumption expenditures is critical for policy formulation. It is this understanding of how household consumption responds to developments in housing markets that the analysis in this report addresses, which in turn is critical for formulating appropriate policy.

3.1 Key questions

In Chapter 1, five SRQs that were to be addressed in this report were identified, namely:

1 *What is the existing evidence of a causal link between house prices and consumer spending?*

2 *Have previously established links between house prices and consumer spending in Australia been affected by the GFC?*

3 *What is the role of debt in the house price and consumption relation?*

4 *How has the consumption response of households in different population groups to changes in housing prices and housing debt been affected by the GFC?*

5 *What are the implications of these relationships for the economic performance of Australia?*

The discussion and analysis in this report means that those questions can now be addressed and the policy implications of the analysis highlighted.

What is the existing evidence?

The relationship between house prices and consumer spending is premised on the LCM/PIH model of behaviour. These models argue that households take a 'life-cycle' approach to decisions around consumption and saving. Importantly, unanticipated changes in housing prices can have important implications for decisions such as consumption. While there is a broad consensus that increased housing prices are associated with an increase in aggregate consumption, there is less agreement about the causal mechanism underlying this association. In general, three transmission mechanisms are readily identified as the possible reasons for the observed correlation between house prices and household consumption. These are a direct wealth effect, an indirect wealth effect via a credit constraint channel, and a common causal effect. While studies differ in their methodologies, there is a broad consensus that supports the collateral channel as being a significant reason why house prices and household consumption are linked. Effectively, increased housing wealth relaxes the constraint faced by credit constrained households, facilitating greater consumption. While significant empirical support existed for this relationship pre-GFC, a number of questions remained. In particular, it was not clear if the relationship was symmetric, so that a decrease in house prices such as that experienced by many households following the GFC would induce a decrease in household consumption expenditure.

How has the GFC affected the house price household consumption relationship?

The empirical analysis in this report identifies a differential effect of the GFC across households. While house price responses on consumption across older households have remained largely unchanged, that of young and middle-aged households has continued to increase. Significantly, the pre-GFC relationship between house prices and household consumption continues to hold post-GFC. The analysis indicates it is the liquidity constrained households, namely the middle-aged households, that exhibit the largest response to changes in house prices and which appear to be the most likely mechanism via which housing wealth and consumption is linked. This finding confirms the findings of the earlier analysis reported in Yates and Whelan (2009).

What role does debt play?

The experience in Australia over the past three decades has been one in which households have accumulated increasing amounts of property-related debt. This debt is associated with both owner-occupied housing and investment properties. Unlike many other countries, households in Australia have not undertaken a pronounced deleveraging, though the rapid rate at which debt has accumulated has moderated. Existing evidence highlights the concern that

high levels of debt can impact on the ability of households and governments to respond in the face of adverse economic shocks.

Analysis of how consumption responses varies across households with different LTVs indicates that following the GFC, those households with high LTVs have become less responsive to changes in house prices. Such a finding potentially has important implications for policy in that consumption expenditures will tend to be less responsive to changes in house prices for those households.

Do responses differ across population groups?

An important characteristic of the Australian institutional and policy landscape is the important role played by individual housing investors. Indeed, the accumulation of debt and its impact on house prices by investors has been one area of concern for policy-makers over time. The analysis in this report finds that home owners with a rental investment property exhibit a larger response to changes in house prices compared to those without investment properties. While those who own for owner-occupation have not changed their behaviour, investors with debt have become more responsive to changes in house prices. That is, the house price-consumption nexus has become more pronounced for this group.

What does this mean for policy?

The analysis in this report has highlighted the relationship between housing and the broader macroeconomy. In many ways, the analysis confirms existing evidence around what is known about the relationship between housing prices and consumption. The policy lessons arise from the experience immediately preceding and post-GFC. This experience has served to highlight that housing markets can have important implications for macro-economic and financial stability. The policy implications can be separated into two broad categories.

Monetary policy

Across developed countries including Australia, the traditional monetary policy tools of interest rates have proved largely ineffective in ensuring growth returns to pre-GFC levels. There are a variety of reasons for this, including the tighter credit standards that have accompanied the more accommodative monetary policy, but also because of the muted response on the part of households and businesses to stimulus that lower interest rates provide.

An obvious question which arises in light of the research reported here is whether monetary policy should have goals that specifically relate to housing and housing markets. This of course is challenging, as monetary policy has for the past few decades been directed towards an overarching goal of maintaining low and steady rates of inflation (Treasurer and Governor of the Reserve Bank of Australia 2016). Arguably, it is unlikely that monetary policy can specifically target outcomes in housing markets. Rather, it is likely that policy settings that ensure steady growth and avoids speculative bubbles can at best be supported rather than be achieved directly through monetary policy settings. When setting interest rates, the Reserve Bank of Australia takes into account a range of considerations including international and domestic developments such as the growth of aggregate demand and conditions in credit markets (see e.g. Reserve Bank of Australia 2014d and 2014e). While developments in housing markets represent an important consideration, they are simply one of the many determinants of the appropriate setting of interest rates.

Nonetheless, the analysis in this report can help inform the likely implications of developments in the macroeconomy and policy settings. Although the evidence suggests that response of households to changes in house prices has remained relatively stable since the GFC, there are some important differences. As noted above, while the consumption across older households has remained largely unchanged, that of young and middle-aged households has continued to increase post-GFC. Similarly, home owners with a rental investment property exhibit a larger

response to changes in house prices compared to those without investment properties. Recall that increases in housing-related wealth has played an important role in supporting household consumption over time. Perhaps the key lesson for monetary policy that flows from the analysis on this report is that the more muted response of consumption to changes in house prices means that the 'bite' that monetary policy has is somewhat diminished. This potentially makes the task of identifying the appropriate policy settings, that is the appropriate level of interest rates, more difficult, but is one that will need to be identified to ensure economic growth returns to what might be termed 'normal levels'.

Prudential regulation and lending standards

A key lesson from the GFC was that rapid increases in housing prices accompanied by a run-up of household debt represented a precarious foundation for sustained economic growth. Indeed, post-GFC prudential regulation and macro-economic stability has garnered increasing attention of policy-makers and central banks around the globe. The Reserve Bank of Australia notes that one of its key responsibilities is the stability of the Australian financial system (Treasurer and Governor of the Reserve Bank of Australia 2016).

In some cases, central banks and regulators have taken a proactive role in pre-empting potential risks to the financial system through macro-prudential regulation. In the case of New Zealand, for example, the Reserve bank of New Zealand has applied restrictions on the lending activities of financial institutions in an attempt to minimise the risks around housing markets. In particular, restrictions on lending at high LTVs have sought to minimise the risk of a house-price bubble while at the same time strengthening the credit risk on bank mortgage portfolios (Reserve Bank of New Zealand 2016), Other countries such as Canada, Norway and Ireland have adopted or are considering similar proposals that limit the risk profile of mortgage-related lending (IMF 2016).

Regulators in Australia have not adopted a broad set of macro-prudential standards designed to curtail what might be perceived as excesses in mortgage lending markets like those in other countries. Indeed, caution has been expressed around the effectiveness of such an approach (Ellis 2013). The experience of the GFC highlights the need for strong regulatory settings, a point that APRA, for example, has suggested could be revisited by reassessing loan serviceability standards (APRA 2013). Moreover, there is a recognition that regulatory standards be set in a manner that does not encourage excessive lending to investors and ensures responsible lending practices more generally. This will most likely ensure the integrity of the financial system and macro-economic stability more generally.

3.2   Final remarks—Caveats and future research

Uncertainty about the relation between housing prices, debt and household consumption highlights the need for cautious policy responses to growing debt. The results presented here reinforce the continued operation of a credit constraint channel. This was identified as the most likely key transmission mechanism for the wealth effect on consumption in earlier studies undertaken after a period of rising aggregate net wealth associated with rising housing prices and rising household debt. In this study, there appears to be some evidence that it continues to hold in a period of stagnant or even falling aggregate net wealth associated with, at best, stable housing prices and rising household debt. Our examination of the subgroups from HILDA also provides some support to the tentative conclusion drawn by Finlay and Price (2014) that decreased household consumption (increased household saving) between 2003–04 and 2009–10 is most likely underpinned by precautionary motives possibly due to a reduction in future income expectations for higher income households and an effort to rebuild wealth after the financial crisis. However they, like we, are unable to 'definitively conclude' what caused the change in behaviour they observed.

Until there is more agreement and broader based evidence on the causal mechanisms that drive the clear empirical correlations between the key variables that affect household consumption, the same caution needs to be applied to proposing specific policy responses to address current policy concerns. As Ellis has argued:

> *You don't need to know the causes of a crisis … to encourage a bit more resilience to their effects. More capital and faster debt amortisation are two good examples of increasing financial resilience. As soon as you start to talk about policy, though, you should at least have a good theory about the mechanism, and some evidence to back it up. Otherwise, how can you distinguish what is really causal, from what is merely a correlation? (Ellis 2015: 11)*

The research that has been presented in this report, however, as that cited above, provides a strong case for the continued use of disaggregated data to provide the evidence needed to implement appropriate policy responses given the clear evidence that responses differ between households depending on the extent of their housing wealth and housing debt.

References

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

Aron, J., Duca, J., Muellbauer, J., Murata, K. and Murphy, A. (2012) 'Credit, housing collateral, and consumption', *Review of Income and Wealth*, vol. 58, no. 3: 397–423.

Atalay, K., Barrett, G. and Edwards, R. (2016) *House prices, household debt and labour supply in Australia*, AHURI Final Report No. 266, Australian Housing and Urban Research Institute Limited, Melbourne, http://www.ahuri.edu.au/research/final-reports/266, doi:10.18408/ahuri-7304101.

Attanasio, O. and Weber, G. 1994, 'The UK consumption boom of the late 1980s: aggregate implications of microeconomic evidence', *Economic Journal*, vol. 104, no. 427: 269–1302.

Attanasio, O., Blow, L., Hamilton, R. and Leicester, A. (2009) 'Booms and busts: consumption, house prices and expectations', *Economica,* vol. 76, no. 301: 20–50.

Australian Bureau of Statistics (2002) 'The construction industry's linkages with the economy', *Year Book Australia*, cat. no. 1301.0, ABS, Canberra.

Australian Bureau of Statistics (2012) *Australian system of national accounts, concepts, sources and methods, Australia 2012*, cat. no. 5216.0, ABS, Canberra.

Australian Bureau of Statistics (2015a) *Australian National Accounts: finance and wealth*, cat. no. 5232.0, ABS, Canberra.

Australian Bureau of Statistics (2015b) *Building approvals, Australia*, cat. no. 8731.0, Times Series Spreadsheet, ABS, Canberra.

Australian Bureau of Statistics (2015c) *Consumer Price Index, Australia*, cat. no. 6401.0, Times Series Spreadsheet, ABS, Canberra.

Australian Prudential Regulatory Authority (APRA) (2013) 'Loan serviceability standards in housing lending', *APRA Insight*, Issue 2, viewed 12 September 2013, http://www.apra.gov.au/Insight/Pages/APRA-Insight-Issue-2-2013.aspx#standards.

Australian Prudential Regulatory Authority (APRA) (2014) *Prudential Practice Guide APG 223 Residential Mortgage Lending*, viewed 29 December 2014, http://www.apra.gov.au/adi/Pages/May-2014-response-PPG-residential-mortgage-lending.aspx.

Baker, S. (2014) 'Debt and the consumption response to household income shocks', viewed 17 July 2015, http://web.stanford.edu/~srbaker/Papers/Baker_DebtConsumption.pdf.

Barrett, G., Levell P. and Milligan K. (2013), 'A comparison of micro and macro expenditure measures across countries using differing survey methods', in C. Carroll, T. Crossley and J. Sabelhaus (eds.), *Improving the Measurement of Expenditure Measures*, NBER-CRIW conference volume.

Beech, A., Dollman, R., Finlay, R. and La Cava, G. (2014), 'The distribution of household spending in Australia', *Reserve Bank Bulletin*, March: 13–23, viewed 23 July 2015, http://www.rba.gov.au/publications/bulletin/2014/mar/bu-0314-2a.html.

Benito, A., Waldron, M., Young, G. and Zampolli, F. (2007) 'The role of household debt and balance sheets in the monetary transmission mechanism', *Bank of England Quarterly Bulletin*, vol. 47, no. 1: 70–78, viewed 5 October 2007, www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb070105.pdf.

Bhutta, N. (2015) 'The ins and outs of mortgage debt during the housing boom and bust', *Journal of Monetary Economics*, vol. 76 (November): 284–298.

Bilston, T., Johnson, R. and Read, M. (2015) 'Stress testing the Australian household sector using the HILDA Survey', *Reserve Bank of Australia Research Discussion Paper* RDP2015-01, viewed 9 April 2015, http://www.rba.gov.au/publications/rdp/2015/pdf/rdp2015-01.pdf.

Boivin, J., Kiley, M., and Mishkin, F. (2011) 'How has the monetary transmission mechanism evolved over time', in B.M. Friedman and M. Woodford (eds.), *Handbook of Monetary Economics*, vol. 3, Elsevier, Amsterdam, Chapter 8: 369–422.

Bouis, R. (2015) 'Household deleveraging and saving rates: a cross-country analysis', February, viewed 19 January 2016, http://dx.doi.org/10.2139/ssrn.2394121.

Bunn, P. and Rostom, M. (2014) 'Household debt and spending', *Bank of England Quarterly Bulletin*, (Quarter 3): 304–315, viewed 7 July 2015, http://www.bankofengland.co.uk /publications/Documents/quarterlybulletin/2014/qb14q304.pdf.

Browning, M., Deaton, A. and Irish, M. (1985) 'A profitable approach to labor supply and commodity demands over the life-cycle', *Econometrica*, vol. 53, no. 3: 503–544.

Browning, M., Gørtz, M. and Leth-Petersen, S. (2013) 'Housing wealth and consumption: a micro panel study', *Economic Journal*, vol. 123, no. 568: 401–428.

Browning, M., Crossley, T. F. and Weber, G (2003) *Asking Consumption Questions in General Purpose Surveys*, The Economic Journal, Vol. 113(491), pp.F540–F567.

Browning, M. and Lusardi, A. (1996) 'Household saving: micro theories and micro facts', *Journal of Economic Literature*, vol. 34, no. 4: 1797–1855.

Bunn, P. and Rostom, M. (2014) 'Household debt and spending', *Bank of England Quarterly Bulletin*, (Quarter 3): 304–315, viewed 17 July 2015, http://www.bankofengland.co.uk/ publications/Documents/quarterlybulletin/2014/qb14q304.pdf.

Byres, W. (2015) Banking on Housing, Australian Business Economists Lunchtime Briefing, Sydney 26 August, viewed 3 September 2015, http://www.apra.gov.au/Speeches/Documents/1508-ABE-Lunchtime-Briefing-Banking-on-housing-26August2015.pdf.

Campbell, J. and Cocco, J. (2007) 'How do house prices affect consumption? Evidence from micro data', *Journal of Monetary Economics*, vol. 54, no. 3 591–621.

Carroll, C., Slacalek, J. and Tokuoka, K. (2012) 'Dissecting saving dynamics: measuring wealth, precautionary and credit effects', *ECB Working Paper Series*, no. 1474, viewed 6 January 2016, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2148382.

Carr, M. and Jayadev, A. (2014) 'Relative income and indebtedness: evidence from panel data', *Review of Income and Wealth*, article first published online: 25 July 2014, DOI:10.1111/roiw.12134.

Case, K., Quigley, J. and Shiller, R. (2011) 'Wealth effects revisited', *Cowles Foundation Discussion Paper*, no. 1784, viewed 6 May 2011, http://cowles.econ.yale.edu/.

Cecchetti, S. (2012) 'Closing remarks: property markets and financial stability—issues and interpretations', in A. Heath, F. Packer and C. Windsor (eds), *Property Markets and Financial Stability*, Reserve Bank of Australia conference proceedings, viewed 12 September 2013, http://www.rba.gov.au.

Chiuri, M. & Jappelli, T. (2010) 'Do the elderly reduce housing equity? An international comparison', *Journal of Population Economics*, no. 23: 643–663.

Christelis, D., Georgarakos, D. and Jappelli, T. (2015) 'Wealth shocks, unemployment shocks and consumption in the wake of the Great Recession', *Journal of Monetary Economics*, viewed 2 February 2015, http://dx.doi.org/10.1016/j.jmoneco.2015.01.003.

Commonwealth Bank (2013) 'Household debt trends,' *Global Market Research*, viewed 21 October 2015, https://www.commbank.com.au/content/dam/commbank/corporate/research/publications/economics/economic-issues/australia/2013/250713-HouseHold_Debt.pdf.

Cooper, D. (2012) *U.S. Household Deleveraging: What Do the Aggregate and Household-Level Data Tell Us?* Federal Reserve Bank of Boston, Public Policy Briefs 12–2, viewed 12 January 2016, http://www.bostonfed.org/economic/ppb/2012/ppb122.pdf.

Cooper, D. and Dynan, K. (2016) 'Wealth effects and macroeconomic dynamics, *Journal of Economic Surveys,* vol. 30, no. 1: 34–55.

Cunliffe, J. (2014) 'Momentum in the housing market: affordability, indebtedness and risks', speech given by the Deputy Governor of the Bank of England, 1 May 2014, viewed 17 August 2014, http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech725.pdf.

Deaton, A. (1985) 'Panel data from time series of cross sections', *Journal of Econometrics*, vol. 30, no. 1:109–126.

Debelle, G. (2004) 'Household debt and the macroeconomy', *BIS Quarterly Review*, March: 51–65, viewed 24 August 2014, http://www.bis.org/publ/qtrpdf/r_qt0403e.pdf.

Dobbs, R., Lund, S., Woetzel, J. and Mutafchieva, M. (2015) 'Debt and (not much) deleveraging', *McKinsey Global Institute Report*, viewed 27 August 2015, http://www.mckinsey.com/insights/economic_studies/debt_and_not_much_deleveraging.

Drehmann, M. and Juselius, M. (2012) 'Do debt service costs affect macroeconomic and financial stability?', BIS Quarterly Review, September: 21–35, viewed 24 August 2015, http://www.bis.org/publ/qtrpdf/r_qt1209e.pdf.

Drehmann, M. and Juselius, M. (2015) 'Leverage dynamics and the real burden of debt', BIS Working Paper no. 501, viewed 26 October 2015, http://www.bis.org/publ/work501.pdf.

Dvornak, N. and Kohler, M. (2007) 'Housing wealth, stock market wealth and consumption: a panel analysis for Australia', *Economic Record*, vol. 8, no. 261: 117–130.

Dynan, D. and Edelberg, W. (2013) 'The relationship between leverage and household spending behavior: evidence from the 2007–2009 survey of consumer finances', *Federal Reserve Bank of St. Louis Review*, vol. 95, no. 5: 425–432.

Dynan, K. (2012) 'Is a household debt overhang holding back consumption?' *Brookings Papers on Economic Activity,* Spring 2012: 299–362, viewed 17 July 2015, http://www.brookings.edu/~/media/projects/bpea/spring-2012/2012a_dynan.

Eberly, J. and Krishnamurthy, A. (2014) 'Efficient credit policies in a housing debt crisis', *Brookings Papers on Economic Activity*: 73–136, viewed 4 September 2015, DOI: 10.1353/eca.2014.0013

Emanuelsson, R., Melander, O. and Molin, J. (2015) 'Financial risks in the household sector', Sveriges Riksbank Economic Commentaries no. 6, viewed 24 August 2015, http://www.riksbank.se/Documents/Rapporter/Ekonomiska_kommentarer/2015/rap_ek_kom_nr6_150601_en.pdf.

Edey, M. and Ellis, L. (2014) 'Expert witness report', *Senate Economics References Committee into Affordable Housing*, Canberra, 2 October 2014, viewed 20 October 2014, http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Affordable_housing_2013/Public_Hearings.

Ellis, L. (2013 March) 'Macroprudential policy: What have we learned?', in *Bank of England Workshop for heads of financial stability*, vol. 6.

Ellis, L. (2015) 'Property markets and financial stability: what we know so far', speech to the University of New South Wales (UNSW) Real Estate Symposium 2015, Sydney 8 September 2015, viewed 21 June 2016, http://www.rba.gov.au/speeches/2015/sp-so-2015-09-08.html.

Ellis, L. (2009) 'The Global Financial Crisis: causes, consequences and countermeasures', speech to *Emerging from the Global Storm: Growth and Climate Change Policies in Australia Conference*', Victoria University, Melbourne, 15 April.

Finlay, R. and Price, F. (2014) 'Household saving in Australia', Reserve Bank Discussion Paper, RDP 2014–04, viewed 1 August 2014, http://www.rba.gov.au.

Fisher, I. (1933) 'The debt-deflation theory of great depressions', *Econometrica*, vol. 1: 337–357.

Fletcher, M. and Guttmnan, B. (2014) 'Income inequality in Australia', *Economic Roundup*, vol. 2013, no. 2: 35–54, viewed 10 April 2014, http://www.treasury.gov.au/~/media/Treasury/Publications.

Flodén, M. (2014) 'Did household debt matter in the Great Recession?, viewed 12 January 2016, http://martinfloden.net/files/hhdebt_supplement_2014.pdf.

Girouard, N. (2010), 'Housing and mortgage markets: An OECD perspective', in S. Smith and B. Searle (eds.), *The Blackwell Companion to The Economics of Housing: The Housing Wealth of Nations,* Wiley Blackwell, Chichester.

Glick, R. and Lansing, K. (2009) 'U.S. household deleveraging and future consumption growth,' *FRBSF Economic Letter*, 2009–16, Federal Reserve Bank of San Francisco, viewed 10 November 2015, http://www.frbsf.org/economic-research/files/el2009-16.pdf.

Grant, C. and Peltonen, T. (2005) 'Housing and equity wealth effects of Italian households', *DNB Working Paper* no. 43, May.

Heath, A., Packer, F. and Windsor, C. (2012) 'Introduction' in A. Heath, F. Packer and C. Windsor (eds), *Property Markets and Financial Stability*, Reserve Bank of Australia conference proceedings, viewed 12 September 2013, http://www.rba.gov.au.

Hunt, C. (2015) 'Economic implications of high and rising household indebtedness', *Reserve Bank of New Zealand Bulletin*, vol. 78, no. 1: 1–11, viewed 17 July 2015, http://www.rbnz.govt.nz/research_and_publications/reserve_bank_bulletin/2015/2015mar78-1.pdf.

Hiebert, P. (2006) *Housing 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.

Hiebert, P. (2006) *Housing 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.

International Monetary Fund (IMF) (2012) 'Dealing with household debt,' in *World economic outlook: growth resuming, dangers remain*, International Monetary Fund, April, viewed 7 January 2014, http://www.imf.org/external/pubs/ft/weo/2012/01/.

International Monetary Fund (2016) 'Ireland financial sector assessment program, technical note—macroprudential policy', *IMF Country Report*, no. 16/316, Washington.

Isaac, S. (2014) 'Links between household debt and macroeconomic stability: dynamic conditional correlations GARCH model', mimeo, viewed 24 August 2015, https://www.ruor.uottawa.ca/handle/10393/31125.

Islam, A., Parasnis, J. and Fausten, D. (2013), 'Do immigrants save less than natives? Immigrant and native saving behaviour in Australia', *Economic Record*, vol. 89: 52–71.

Jansson, P. (2013) 'How do we stop the trend in household debt? Work on several fronts', speech by Mr Per Jansson, Deputy Governor of the Sveriges Riksbank, at the SvD Bank Summit, Stockholm, 3 December, viewed 17 July 2015, http://www.bis.org/review/r131203h.pdf.

Jappelli, T. and Pagano, M. (1989) 'Consumption and capital market imperfections: an international comparison', *American Economic Review* , vol. 79, no. 5: 1088–1105.

Johnson, K. and Li, G. (2007) 'Do high debt payments hinder household consumption smoothing?' Finance and Economics Discussion Series no. 2007–52, Washington: Board of Governors of the Federal Reserve, viewed 20 July 2015, www.federalreserve.gov/pubs/feds/2007/200752/200752abs.html.

Jorda, O., Schularick, M. and Taylor, A. (2013) 'When credit bites back', *Journal of Money, Credit and Banking*, vol. 45, no. 2: 3–28.

Jordà, O., Schularick, M. and Taylor, A. (2014) 'The great mortgaging: housing finance, crises, and business cycles', *Federal Reserve Bank of San Francisco working paper* no. 2014–23, September.

Juselius, M. and Drehmann, M. (2015) 'Leverage dynamics and the real burden of debt', *BIS Working Papers,* no. 501, viewed 14 January 2016, http://www.bis.org/publ/work501.htm.

Justiniano, A., Primiceri, G. and Tambalotti, A. (2015) 'Household leveraging and deleveraging', *Review of Economic Dynamics*, vol. 18, no. 1: 3–20.

King, M. (1994) 'Debt deflation: theory and evidence', *European Economic Review*, vol. 38: 419–455.

Kragh-Sørenson, K. and Solheim, H. (2014) 'Transmission channels from high household debt to bank losses', *Norges Bank Staff Memo*, no. 9, viewed 19 January 2016, http://www.norges-bank.no/pages/101118/Staff_Memo_9_14_en.pdf.

Kukk, M. (2015) 'How did household indebtedness hamper consumption during the recession? Evidence from micro data,' *Journal of Comparative Economics*, doi:10.1016/j.jce.2015.07.004

Lydon, R. (2013) 'Do households with debt problems spend less?', *Economic Letter Series*, vol. 2: 1–7, viewed 17 July 2015, https://www.centralbank.ie/publications/Documents/Economic_Letter_2013_V2.pdf.

Lowe, P. (2015) 'National wealth, land values and monetary policy', address to the 54th Shann Memorial Lecture, Perth, 12 August 2015, viewed 21 June 2016, http://www.rba.gov.au/speeches/2015/sp-so-2015-08-128.html.

McCarthy, Y. and McQuinn, K. (2015) 'Deleveraging in a highly indebted property market: Who does it and are there Implications for household consumption?', *Review of Income and Wealth*, article first published online 1 July 2015 | DOI: 10.1111/roiw.12208.

Mian, A. and Sufi, A. (2009) 'Household leverage and the recession of 2007 to 2009', University of Chicago, Booth School of Business Working Paper, viewed 15 January 2016, https://www.imf.org/external/np/res/seminars/2009/arc/pdf/mian.pdf.

Mian, A. and Sufi, A. (2011) 'House prices, home equity based borrowing, and the U.S. household leverage crisis', *American Economic Review*, vol. 101: 2132–2156.

Mian, A. and Sufi, A. (2014) *House of Debt*, Chicago University Press, Chicago.

Mian, A., Rao, K. and Sufi, A. (2013) 'Household balance sheets, consumption, and the economic slump', *Quarterly Journal of Economics*, vol. 128, no. 4: 1697–1726.

Mishkin, F. (1978) 'The household balance sheet and the Great Depression,' *Journal of Economic History*, vol. 38: 918–937.

Morling, S. and MacDonald T. (2011), 'The Australian economy and the global downturn, Part 2: the key quarters', *Economics Roundup*, issue 2, Department of the Treasury, Canberra.

Muthitacharoen, A., Phacharaphot N. and Chotewattanakul P. (2014) 'Rising household debt: implications for macroeconomic stability', presentation at Bank of Thailand Symposium, October 17 2014, viewed 25 August 2014, https://www.bot.or.th/Thai/MonetaryPolicy/ArticleAndResearch/SymposiumDocument/Paper4_2557.pdf/.

OECD (2012) *OECD Economic Surveys: Australia 2012*, OECD Publishing, Paris, viewed 7 July 2015, http://dx.doi.org/10.1787/eco_surveys-aus-2012-en.

OECD (2014) 'House prices—percentage change over the previous period', *Economics: Key Tables from OECD*, OECD Publishing, Paris, viewed 7 July 2015, http://www.oecd-ilibrary.org/economics/house-prices-2014-1_hsprice-table-2014-1-en.

OECD (2015) *Tax and Benefit Systems: OECD Indicators*, OECD Publishing, Paris, viewed 12 October 2015, http://www.oecd.org/els/benefits-and-wages-statistics.htm.

Ong, R., Haffner, M., Wood, G., Jefferson, T. and Austen, S. (2013) *Assets debt and the drawdown of housing equity by an ageing population*, Australian Housing and Urban Research Institute, Melbourne.

Ong, R. (2015) 'Housing equity withdrawal in Australia: prevalence, patterns and motivations in mid-to-late life', *Housing Studies*, DOI: 10.1080/02673037.2015.1009875.

Ong, R., Wood, G. and Cigdem, M. (2013) 'Work incentives and decisions to remain in paid work in Australia,' *Bankwest Curtin Economics Centre Working Paper 13/12*, Curtin University, Perth.

Parkinson, S., Searle, B.A., Smith, S.J., Stoakes, A. and Wood, G. (2009) *Mortgage equity withdrawal in Australia and Britain: towards a wealth-fare state?* European Journal of Housing Policy 9 (4) pp.363–387.

Pence, K. (2012) 'Comment on "Is a household debt overhang holding back consumption?"' *Brookings Papers on Economic Activity*, Spring 2012, vol. 1: 351–58, viewed 17 July 2015, http://www.brookings.edu/~/media/Projects/BPEA/Spring%202012/2012a_Dynan.pdf.

Price, F. and Finlay, R. (2014) 'The rise in household saving', *Reserve Bank of Australia Bulletin*, June 2014: 1–10, viewed 19 January 2016, http://www.rba.gov.au/publications/bulletin/2014/jun/pdf/bu-0614.pdf.

Reserve Bank of Australia (RBA) (2013) *Financial Stability Review*, March, viewed 31 July 2013, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2014a) *Financial Stability Review*, March, viewed 26 March 2014, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2014b0 *Financial Stability Review*, September, viewed 5 February 2015, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2014c) *Statement of Monetary Policy*, March, viewed 29 August 2014, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2014d) *Statement of Monetary Policy*, August, viewed 29 August 2014, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2014e) *Statement of Monetary Policy*, November, viewed 5 February 2015, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2015a) *Financial Stability Review*, March, viewed 29 June 2015, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2015b) *Financial Stability Review*, October, viewed 15 August 2016, http://www.rba.gov.au.

Reserve Bank of Australia (RBA) (2016) *Financial Stability Review*, April, viewed 15 April 2016, http://www.rba.gov.au.

Reserve Bank of New Zealand (2016) *Adjustments to restrictions on high-LVR residential mortgage lending*, Consultation Paper, viewed 22 December, http://www.rbnz.govt.nz/-/media/ReserveBank/Files/regulation-and-supervision/banks/consultations/Consultation-paper-july-2016-adjustments-restrictions-high-LVR-lending.pdf?la=en.

Schwartz, C., Lewis, C., Norman, D. and Hampton, T. (2008) 'Factors influencing housing equity withdrawal: evidence from a microeconomic survey', *Economic Record*, vol. 84, no. 267: 421–433.

Son, J. (2014) 'The effect of household debt on consumption: deleveraging and financial stability in Korea', RP 84 in F. Cacnio, (ed.), *Mortgage Finance and Consumer Credit:*

Implications on Financial Stability in Seacen Economies, viewed 17 July 2015, http://www.seacen.org/file/file/2014/RP94/consumer_chapter5_zamri.pdf.

Sutherland, D. and Hoeller, P. (2012), 'Debt and macroeconomic stability: an overview of the literature and some empirics', *OECD Economics Department Working Papers*, no. 1006, OECD Publishing, viewed 24 August 2015, http://dx.doi.org/10.1787/5k8xb75txzf5-en.

Sutherland, D., Hoeller, P., Merola, R. and Ziemann, V. (2012), 'Debt and macroeconomic stability', *OECD Economics Department Working Papers*, no. 1003, viewed 24 August 2015, www.oecd.org/eco/Workingpapers.

Thakur, A. and Ryan, L. (2015) 'A look at rising household debt in Australia and the implications for policy', *PIMCO Viewpoints*, viewed 17 June 2015, http://europe.pimco.com/en/insights/pages/a-look-at-rising-household-debt-in-australia-and-the-implications-for-policy.aspx#.

Treasurer and Governor of the Reserve Bank of Australia (2016), 'Statement on the conduct of monetary policy', viewed 22 December 2016, http://www.rba.gov.au/monetary-policy/framework/stmt-conduct-mp-7-2016-09-19.html.

Veerbek, M. (2007) 'Pseudo panels and repeated cross-sections',in L. Mátyás and P. Sevestre (eds), (2008), *The Econometrics of Panel Data: Fundamentals and Recent Developments in Theory and Practice*, Springer. Nov.

Vidangos, I. (2015) 'Deleveraging and recent trends in household debt', Board of Governors of the Federal Reserve System FEDS Notes, April 6, 2015, viewed 17 July 2015, http://www.federalreserve.gov/econresdata/notes/feds-notes/2015/deleveraging-and-recent-trends-in-household-debt-20150406.html.

Windsor, C., Jääskelä, J. and Finlay, R. (2015) 'Housing wealth effects: evidence from an Australian panel', *Economica*, vol. 82, no. 327: 552–577.

Wood, G. and Nygaard, C. (2010) 'Housing equity withdrawal and retirement: evidence from the Household, Income and Labour Dynamics in Australia Survey (HILDA)', in S. Smith and B. Searle (eds), *The Blackwell Companion to the Economics of Housing: The Housing Wealth of Nations*, Blackwell, Oxford.

Yates, J. and Whelan, S. (2009) *Housing wealth and consumer spending*, AHURI Final Report no.132, Australian Housing and Urban Research Institute, Melbourne.

Appendix 1: Research methodology—econometric specifications

The econometric methodology employed in this paper is most similar to that used in Attanasio, Blow et al. (2009) and Yates and Whelan (2009) where the unit of observation is the individual household. The regression analysis uses pooled cross-section data from a series of surveys conducted between 1975 and 2009 in Australia. The regression analysis controls for a range of observable characteristics including 'year-of-birth' cohort membership and for a variety of socio-demographic characteristics of the household believed to influence consumption decisions.

In practice, the analysis proceeds as follows. First, the data from each of the seven surveys used in the analysis are stacked or pooled. (Following this each household is assigned to a 'birth cohort'. Each birth cohort represents a five-year period when the head of the household is born. For example, those born between 1920 and 1924 fall into the first cohort; those born between 1925 and 1929 the second cohort, and so on. Finally, the regression analysis effectively follows each of these birth cohorts over time focusing on their wealth and consumption behaviour. In all cases, the regression analysis employs a simple OLS or ordinary least squares specification.

One way to analyse the consumption behaviour would be to use a simple version of the life-cycle model. The regression approach allows the life-cycle profile of birth cohorts to be measured and change over time studied. According to the simple life-cycle model, individual's consumption in each period is a fraction of life-time wealth that depends only on age. In our specification, we also control for observables. The baseline specification in (1) below expresses household consumption as a function of a number of observable variables that capture time and cohort effects as well as the broad factors that affect household consumption over the life-cycle.

Our base specification is:

$$X_t^{ch} = \alpha^c + f(age) + \gamma' z_t^{ch} + \varepsilon_t^c + u_t^{ch} \tag{1}$$

where X_t^{ch} is the consumption expenditure of household 'h' that belongs to 'year-of-birth' cohort 'c' at time 't'; α^c denotes the average life-time wealth of households that belong to 'year-of-birth' cohort 'c' and is captured by cohort dummies. The observable variables, family size and composition and occupational status of the household head, are stacked in the 'z' matrix; $f(age)$ is the age of the reference person in the household entered in both linear and quadratic terms. We assume consumption innovations, ε_t^c, average out to zero over time. The term u_t^{ch} captures household h's deviation from its cohort average.

Estimation of equation (1) provides a 'baseline' consumption profile. As in Attanasio, Blow et al. (2009), we will interpret the deviations of observed consumption from such a profile as being determined by innovations to either life-time income or to transitory income. By comparing different cohorts' innovations, we can investigate the aggregate consumption moves.

In subsequent specifications, additional variables are added to capture some specific changes to resources such as capital gains associated with house price increases. The estimated regressions allow the identification of different cohorts' residuals. For example, by adding state level measures of housing prices into equation (1), it is possible to investigate the extent to which annual regional house price improves our ability to explain the deviation of a cohort's consumption away from its estimated life-cycle profile. More details of the specifications are presented below,

Extended framework

We then extend equation (1) by inclusion of a set of 'age group dummies' interacted with time dummies (T_t) for the periods after 2000 to determine whether consumption responses of households in three age groups differ significantly in the 2000s from their baseline consumption profiles. This is indicated in equation (2).

$$X_t^{ch} = f(age) + \gamma' z_t^{ch} + +\alpha^c + \sum_{t=2000}^{2006} \theta_{t,Y} \cdot T_t \cdot DY_t^{ch}$$
$$+ \sum_{t=2000}^{2006} \theta_{t,M} \cdot T_t \cdot DM_t^{ch} + \sum_{t=2000}^{2006} \theta_{t,O} \cdot T_t \cdot DO_t^{ch} + \varepsilon_t^c + u_t^{ch} \tag{2}$$

The age-group dummies define households as belonging to young, middle-aged, or older groups at the time of the most recent survey. Young households are defined as having a reference person or household head aged less than 40 years $\left(DY_t^{ch} = 1 \right)$; a middle-aged household as having a reference person aged between 40 and 60 years $\left(DM_t^{ch} = 1 \right)$; and an older household as having a reference person aged 60 years or more $\left(DO_t^{ch} = 1 \right)$.

Recall that equation (2) captures the average behaviour of all members of age group cohorts in the 2000s relative to their behaviour in the earlier period. Following Attanasio and Weber (1994), we allow the year cohort mean of consumption to be completely unconstrained after 2000s. In other words, the coefficient $\theta_{t,Y}$ on DY_t^{ch} (for example) effectively represents the average changes in consumption expenditure for those cohorts with a household head who is young (aged less than 40 years) in year t. 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-group dummies with the time dummies (T_t).

A second set of extensions include information on the house prices and wealth holdings of individual households within each age-defined cohort. In particular, equation (2) is extended to incorporate household level information on house prices and household wealth ($g(hp_t^c)$) in the following manner:

$$X_t^{ch} = f(age) + \gamma' z_t^{ch} + +\alpha^c + \sum_{t=2000}^{2006} \theta_{t,Y} \cdot g(hp_t^c) \cdot T_t \cdot DY_t^{ch}$$
$$+ \sum_{t=2000}^{2006} \theta_{t,M} \cdot g(hp_t^c) \cdot T_t \cdot DM_t^{ch} + \sum_{t=2000}^{2006} \theta_{t,O} \cdot g(hp_t^c) \cdot T_t \cdot DO_t^{ch} + \varepsilon_t^c + u_t^{ch} \tag{3}$$

A final set of extensions of equation (3) include a tenure dummy variable interacted with the house price variables as well as the age group dummies to allow for potential differences in the behaviour of owners and renters. This allows the 2000s consumption behaviour of households of different ages and in alternative tenures to be compared with their respective baseline patterns. For simplicity of presentation, the underlying equation employed for the estimations is not set out here.

Appendix 2: Full results for HILDA

Table A1: Full results for food expenditure HILDA

Variables	(1) All	(4) LTV08	(5) Investor	(6) highLev_Investor
Change in home value	0.00477*			
	[0.00265]			
Change in financial asset	-0.000379	-0.00531	-0.000200	-0.00180
	[0.000292]	[0.00945]	[0.000557]	[0.00183]
Change in household income	0.00862***	0.0182*	0.00770**	0.0141
	[0.00182]	[0.0102]	[0.00299]	[0.0112]
Household head's age	-492.9***	108.2	-802.0***	-1,650*
	[56.90]	[585.5]	[189.5]	[857.7]
Household head's age square	4.073***	-3.370	6.765***	16.98*
	[0.499]	[6.771]	[1.720]	[9.202]
Household income square	-1.96e-09*	7.98e-09	-4.28e-09**	-1.14e-08
	[1.09e-09]	[4.04e-08]	[1.78e-09]	[7.10e-09]
Lag value of HECS debt	-0.0530***	0.0356	-0.0861***	-0.112
	[0.0144]	[0.0527]	[0.0287]	[0.0724]
Lag household assets	-0.000160*	-0.000865	-8.64e-05	0.000780
	[9.43e-05]	[0.00204]	[0.000153]	[0.000766]
Number of children	190.0*	485.0	226.1	302.5
	[99.66]	[512.7]	[254.2]	[581.2]
Household head is female	-237.0	-290.6	48.03	-163.8
	[177.4]	[1,101]	[434.3]	[1,120]
University graduate	25.07	1,857	-43.57	-95.62
	[250.3]	[1,453]	[605.8]	[1,909]
Have diploma	-391.8*	424.2	-742.6	-1,300
	[232.5]	[1,507]	[607.3]	[1,680]
Finished high school	-26.75	1,299	-804.9	-303.0
	[400.8]	[2,650]	[904.7]	[2,223]
Year left to pay mortgage	-26.00*	48.31	-7.055	-46.86
	[14.80]	[71.66]	[43.14]	[87.90]
Have LTV>0.8*(change in home value)		0.00520		
		[0.00304]		
Investor*(change in home value)			0.000290	0.00287
			[0.000417]	[0.00194]
Observations	5,323	147	1,019	207
R-squared	0.040	0.236	0.073	0.180

*** $p < 0.01$, ** $p<0.05$, * $p<0.1$

Table A2: Full results for non-durable consumption HILDA

Variables	(1) All	(4) LTV08	(5) Investor	(6) highLev_Investor
Change in home value	0.00401*			
	[0.00239]			
Change in financial asset	-0.000559	0.0257	0.00411	0.0391
	[0.00224]	[0.0503]	[0.00445]	[0.0294]
Change in household income	0.0373***	0.104*	0.0507**	0.239*
	[0.0119]	[0.0564]	[0.0246]	[0.124]
Age	-793.0**	994.3	-2,108	-5,654*
	[375.9]	[3,420]	[1,489]	[3,027]
Age square	5.740*	-16.33	15.69	51.03*
	[3.226]	[36.23]	[12.74]	[28.31]
Household income square	-8.03e-09	-4.46e-07	-1.66e-08	-1.92e-07*
	[5.61e-09]	[3.74e-07]	[1.75e-08]	[1.12e-07]
Lag value of HECS debt	-0.0854	-0.196	-0.266*	-0.0608
	[0.0708]	[0.344]	[0.141]	[0.243]
Lag household assets	-0.00138**	0.0141	-0.000468	0.00186
	[0.000603]	[0.0156]	[0.000919]	[0.00524]
Number of children	68.30	1,946	-3,150*	-1,856
	[526.0]	[2,694]	[1,822]	[4,971]
Household head is female	-367.8	-18,815**	715.7	1,157
	[1,109]	[8,799]	[3,740]	[7,635]
University graduate	-1,644	10,402	-3,428	-11,381
	[1,372]	[7,975]	[4,477]	[11,380]
Have diploma	-2,222*	1,245	-2,187	-10,029
	[1,153]	[8,273]	[4,856]	[8,828]
Finished high school	-1,568	30,159	-872.7	-6,847
	[2,151]	[37,887]	[5,567]	[10,899]
Own a second house	167.2	-4,336		
	[1,549]	[19,808]		
Year left to pay mortgage	-51.73	-223.1	332.6	271.3
	[74.90]	[813.2]	[234.0]	[355.2]
Have LTV>0.8*(change in home value)		0.0422		
		[0.0443]		
Investor*(change in home value)			0.00190	0.00903
			[0.00202]	[0.00786]
Observations	5,323	147	1,019	207
R-squared	0.023	0.155	0.049	0.269

*** p < 0.01, ** p<0.05, * p<0.1.

Table A3: Full results for durable consumption HILDA

Variables	(1) All	(4) LTV08	(5) Investor	(6) highLev_Investor
Change in financial asset	-0.00191	0.131***	0.00158	0.00340
	[0.00228]	[0.0475]	[0.00294]	[0.0133]
Change in household income	0.0355**	0.305***	0.0626**	0.0128
	[0.0169]	[0.0830]	[0.0316]	[0.0909]
Household head's age	844.5	-6,128**	150.0	-5,050
	[514.4]	[2,723]	[2,029]	[5,937]
Household head's age square	-7.687*	68.27**	-1.913	47.42
	[4.559]	[30.55]	[18.02]	[62.08]
Household income square	1.42e-08	-1.09e-07	1.17e-08	6.21e-08
	[2.23e-08]	[3.49e-07]	[2.32e-08]	[2.06e-07]
Lag value of HECS debt	0.176*	-0.814*	0.142	-0.341
	[0.0913]	[0.428]	[0.225]	[0.426]
Lag household assets	-0.000834	0.0159*	-0.000619	-0.00280
	[0.000794]	[0.00848]	[0.000835]	[0.0107]
Number of children	357.6	-2,446	-2,519	-4,442
	[783.5]	[2,845]	[2,952]	[5,555]
Household head is female	370.9	-7,862	2,275	270.1
	[1,633]	[7,868]	[5,831]	[10,002]
University graduate	-1,102	5,943	-10,894	-7,260
	[2,051]	[9,907]	[7,325]	[13,191]
Have diploma	-3,186*	-10,436	-6,692	-10,791
	[1,647]	[7,958]	[8,066]	[10,817]
Finished high school	-3,569	19,318	-5,592	-16,587
	[2,730]	[11,909]	[9,382]	[15,976]
Year left to pay mortgage	-22.06	1,031**	496.0	217.9
	[103.3]	[434.2]	[376.2]	[579.1]
Change in home value	0.00263			
	[0.00284]			
Have LTV>0.8*(change in home value)		-0.0238*		
		[0.0135]		
Investor*(change in home value)			0.000848	-0.000831
			[0.00177]	[0.00622]
Observations	2,816	85	529	93
R-squared	0.018	0.533	0.052	0.165

*** p < 0.01, ** p<0.05, * p<0.1.

AHURI Research Centres

AHURI Research Centre—Curtin University

AHURI Research Centre—RMIT University

AHURI Research Centre—Swinburne University of Technology

AHURI Research Centre—The University of Adelaide

AHURI Research Centre—The University of Sydney

AHURI Research Centre—University of New South Wales

AHURI Research Centre—University of Tasmania

AHURI Research Centre—University of Western Australia

Australian Housing and Urban Research Institute

Level 1
114 Flinders Street
Melbourne Victoria 3000

T +61 3 9660 2300
E information@ahuri.edu.au

ahuri.edu.au

ACN 090 448 918

twitter.com/AHURI_Research

facebook.com/AHURI.AUS

evid.in/AHURI_LinkedIn