Research
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Home Prices and Household Spending

Callan Windsor, Jarkko Jääskelä and
Richard Finlay

RDP 2013-04

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Abstract

This paper explores the positive relationship between home prices and household spending by following a panel of Australian households over the period 2003 to 2010. There are three hypotheses put forth in the literature to explain this relationship: (1) increases in home prices raise spending via a 'traditional wealth effect'; (2) increases in home prices raise spending by easing credit constraints; and (3) home prices and spending are influenced by a common 'third factor' such as something that affects expectations regarding future income. Identifying differences in behaviour across households of different ages helps to distinguish among these hypotheses. Younger homeowners exhibit the largest home-price wealth effects, with a 3 to 4 cent increase in spending per dollar increase in home price. As young homeowners are more likely to be credit constrained, their relatively large marginal propensity to spend supports hypothesis (2) as an important determinant of the co-movement between home prices and household spending. Further, the non-response of young renters to changes in home prices argues against hypothesis (3).

JEL Classification Numbers: E21, R21, R31

Keywords: dwelling prices, consumption, micro data

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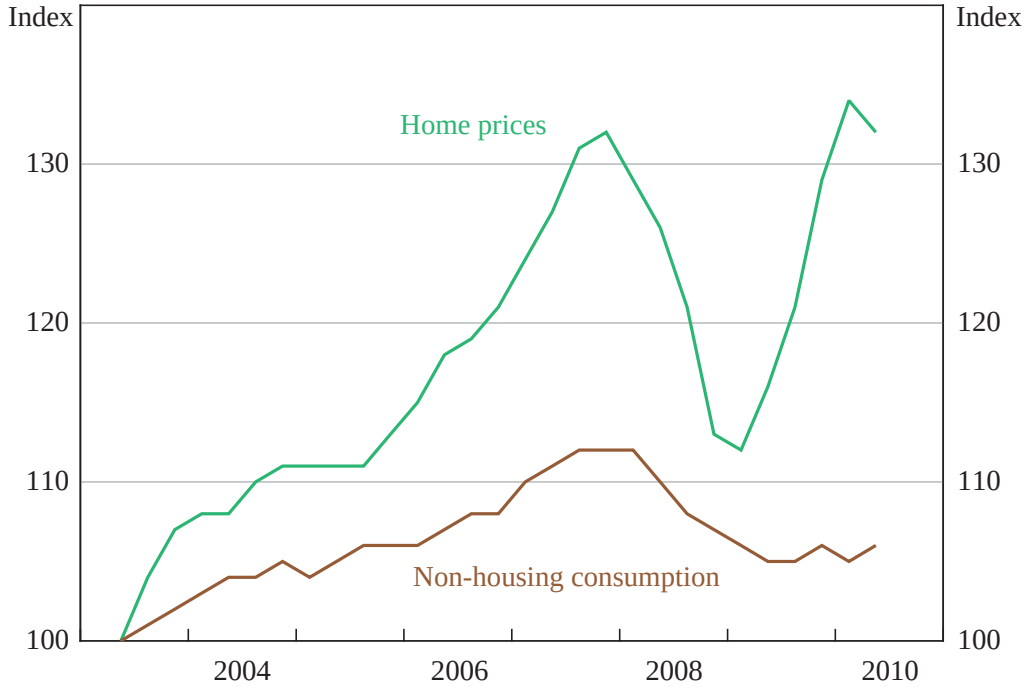
1. Introduction

Although home prices and consumption tend to move together, understanding the relationship between the two has proven a vexing task for policymakers and commentators (Figure 1; Dvornak and Kohler 2003; Fisher, Otto and Voss 2010).

Figure 1: Real Home Prices and Consumption
Per household, June 2003 = 100



Notes: June 2009/10 dollars; deflated using trimmed mean CPI; consumption excludes rents and other dwelling services

Sources: ABS; RBA; RP Data-Rismark; authors' calculations

Existing estimates for Australia suggest that a 1 dollar change in housing wealth is associated with a 3 cent change in non-housing consumption (see, for example, Dvornak and Kohler (2003)). Likewise, taking the log difference of the series in Figure 1 and regressing non-housing consumption on home prices implies a

marginal propensity to consume (MPC) of around 2½ cents per dollar change in home prices.[1]

Such findings may be useful for policymakers trying to gauge the future pace of consumption growth given a series of housing price shocks. In this setting, the reliability of the MPC is arguably more important than the mechanism driving the result. Nevertheless, aggregate regressions tell us very little about why there is a positive relationship between home prices and consumption. In particular, there are strong arguments against interpreting the aggregate MPC as a 'traditional wealth effect', whereby spending rises with unanticipated changes in home prices due to an increase in homeowners' lifetime resources.

Housing assets, like consumer durables, are different from financial assets. A dwelling is both an asset and a consumption item that provides a stream of services over its lifetime. Accordingly, increasing home prices have a distributional impact on wealth, creating winners and losers whose spending responses may differ. For those who own more housing than they foresee needing in the future (for example, an older household looking to trade down), increasing home prices increase lifetime resources; for those who own less housing than they foresee needing in the future (for example, a young family who will need a larger home in the future), increasing home prices decrease expected lifetime resources. In aggregate, therefore, the causal relationship between home prices and spending is ambiguous, and depends on the MPCs of different groups.[2]

In the context of an overlapping generations model, Buiter (2010) concludes that there is no traditional wealth effect on aggregate consumption. Rather, he argues that changes in home prices affect spending because housing can be used as collateral against which people can borrow to finance consumption. The effect on current spending could be quite large if homeowners were credit constrained before any increase in home prices. In the long run, however, there would be no

1 Here, the estimated elasticity is converted to a MPC using the sample average ratio of non-housing consumption to home prices of 16 per cent.

2 A related but distinct argument against traditional wealth effects is that an increase in home prices (not associated with some other factor relevant to future incomes) cannot affect the quantity of goods and services available for consumption, at least in a closed economy. In an open economy, this need not be the case. For example, increases in home prices increase domestic households' collateral values, allowing for increased borrowing from the rest of the world, which would allow for an increase in consumption.

wealth effect: an increase in home prices would stimulate debt-financed spending in the short run while depressing it in the long run as households repay debt.

Other factors may also affect the relationship between home prices and spending. If older households plan to leave money or even a home to their children or grandchildren, and/or younger households anticipate such bequests, then irrespective of home prices, younger and older households may not perceive any change in their lifetime resources available for spending (see, for instance, Mishkin (2007)). Debelle (2004) suggests the empirical relationship between home prices and consumption could be due to households regarding their homes as saving vehicles, with a rise in home prices increasing perceived savings and thus driving consumption behaviour. Households may also perceive housing wealth as a precautionary saving vehicle against unanticipated future events such as redundancy (Carroll, Dynan and Krane 2003). Finally, the relationship between housing market turnover and consumption – high turnover leading to increased spending on furnishings, audiovisual equipment and the like – could drive co-movements between home prices and spending, since turnover tends to increase when home prices rise.

Against this background, it is perhaps not surprising that there is no clear consensus on the cause of the correlation between home prices and household spending. Broadly speaking there are three hypotheses that have predictions for how households with certain characteristics should respond to changes in home prices. Under hypothesis (1), increases in perceived home prices raise spending via a traditional wealth effect. This channel points to a stronger effect on the spending of older homeowners (who are most likely to own 'excess' housing). Under hypothesis (2), increases in home prices loosen credit constraints and therefore raise spending through an increase in the value of collateral, the opportunity for home equity redraws and/or through a reduction in the necessary level of buffer-stock, or precautionary, saving. Younger homeowners are more likely to be credit constrained (Disney, Bridges and Gathergood 2010) as well as buffer-stock savers (Gourinchas and Parker 2001). Accordingly, loosening of credit constraints suggests a stronger link between home prices and spending for younger homeowners. And under hypothesis (3), home prices and spending are influenced by a common third factor such as something that affects expectations regarding future income. A common influence like unexpectedly higher income expectations should have a stronger effect on the spending of younger households, regardless of

home tenure status; that is, this hypothesis implies that the spending of young homeowners and young renters should both rise, as both have relatively more years of work ahead of them and so benefit the most from a rise in the wages they may expect to earn in the future.

It is difficult to discriminate between these competing hypotheses based on the aggregate relationship between home prices and non-housing consumption. In light of this, a number of studies have used micro data to understand the co-movement between home prices and consumer spending, but with mixed results. Using a survey of UK households, Attanasio *et al* (2009) argue that income expectations, as per hypothesis (3), have played an important role, because the association between home prices and spending is stronger for younger households irrespective of home tenure type. Using the same UK survey, Campbell and Cocco (2007) draw the opposite conclusion. They find home-price wealth effects are largest for older homeowners and lowest for renters. They interpret this heterogeneity in home-price wealth effects as being consistent with a traditional wealth effect. Muellbauer (2009) and Duca, Muellbauer and Murphy (2011) disagree, arguing that a housing collateral effect is the key to understanding the role of home prices in explaining consumption fluctuations. While Muellbauer (2009) agrees with the results presented by Attanasio *et al* (2009), there is disagreement over interpretation. In addition to the common association between home prices, income innovations and spending, Muellbauer finds that credit-constraint effects are significantly positive for young homeowners and negative for the old.

For Australia, Yates and Whelan (2009) examine the variation in spending by home price across households at given points in time after controlling for household demographics and financial conditions. They show that in 2003 the spending of younger households was more sensitive to home prices than that of older households.[3] They interpret their results as being consistent with the credit constraints hypothesis.

In this paper we use the Household, Income and Labour Dynamics in Australia (HILDA) Survey to examine home-price wealth effects, using household-level data for the eight years to 2010.

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3 This was not the case in 1998, when the variation in spending to home prices was more sensitive for older households.

Our analysis contributes to the literature in a number of ways. To begin, we fully exploit the panel nature of our dataset that follows individual households through time. That is, we estimate the dynamic response of a household's spending to changes in the perceived price of their home while controlling for unobservable, time-invariant differences between households (such as their level of optimism or thriftiness). To our knowledge this is the first paper to do this using the HILDA dataset.

At the household level, we estimate home-price wealth effects that are larger for younger homeowners, and find that renters exhibit negative home-price wealth effects. We suggest that young homeowners' relatively strong spending response to an increase in home prices supports the hypothesis of credit constraints.

We also examine whether these results can be replicated in a more parsimonious, but less informative, model that relies on a 'pseudo-panel' of birth cohorts instead of household-level data. This is done to assess the effect that aggregating may have had on earlier studies using UK data (see Attanasio *et al* (2009)). For instance, Muellbauer (2007) has argued that some of the studies cited above fail to control for cross-sectional variation across households; our dataset allows us to assess this criticism directly. The results from the cohort pseudo-panel are similar to those obtained from the equivalent actual panel. This suggests that pseudo-panels are a reasonably good substitute for actual panels. However, the necessary use of aggregate home prices rather than self-assessed home prices in pseudo-panels tends to inflate estimated wealth effects.

The remainder of this paper is set out as follows. Section 2 introduces the dataset used in this study and presents some stylised features of the variables of interest. Section 3 presents our methods and Section 4 details results. Section 5 concludes.

2. Data

2.1 The HILDA Survey Data

The HILDA Survey is a nationally representative annual household panel. It began in 2001 with around 7 700 responding households. It asks questions regarding families, household financial conditions, employment and wellbeing. Special modules provide another layer of detailed household-level information on

household wealth every four years. In this study we use the household wealth modules of 2006 and 2010, which allow the dynamics of households' net worth to be examined at the component level.

We use three panels of responding households over the period 2003 to 2010. Panel one comprises households that did not split into different households over the sample and responded to the survey every year from 2003 to 2010 while maintaining their home tenure type (i.e. renter or homeowner).[4] The criteria for selection into panel one are detailed in Table 1: from an average responding sample of around 7 100 households each year we are left with a balanced panel of 1 947 households over eight years, for a total of 15 576 observations. Panel two drops renters from panel one. Panel three drops homeowners that moved house during the sample period from panel two, leaving us with 9 416 observations on stable home-owning households that provide a self-assessed home price for the same property in every wave of the survey. This sub-sample is of interest because housing transactions may be associated with higher spending if homeowners purchase goods and services when they move home. Moving home also provides an easy opportunity to add or reduce housing equity.

4 For example, if between 2009 and 2010 the adult membership of a household changed due to divorce there would be two households with the same 2009 household identification number in the 2010 dataset. Because divorce is often associated with financial stress and a fall in income, this could result in a changing pattern of consumption for both households. Accordingly, we drop these households from the sample.

Table 1: The Panels – 2003–2010

	Number of observations	
	Dropped	Remaining
Criteria for selection into panel one – households		
Responded in any given year		57 027
Responded in all waves without household splitting	37 395	19 632
Did not change home tenure type	3 840	15 792
Born after 1919 and before 1981	216	15 576
Sample size		**15 576**
Criterion for selection into panel two – homeowners		
Homeowner	2 752	12 824
Sample size		**12 824**
Criterion for selection into panel three – non-moving homeowners		
Did not move	3 408	9 416
Sample size		**9 416**

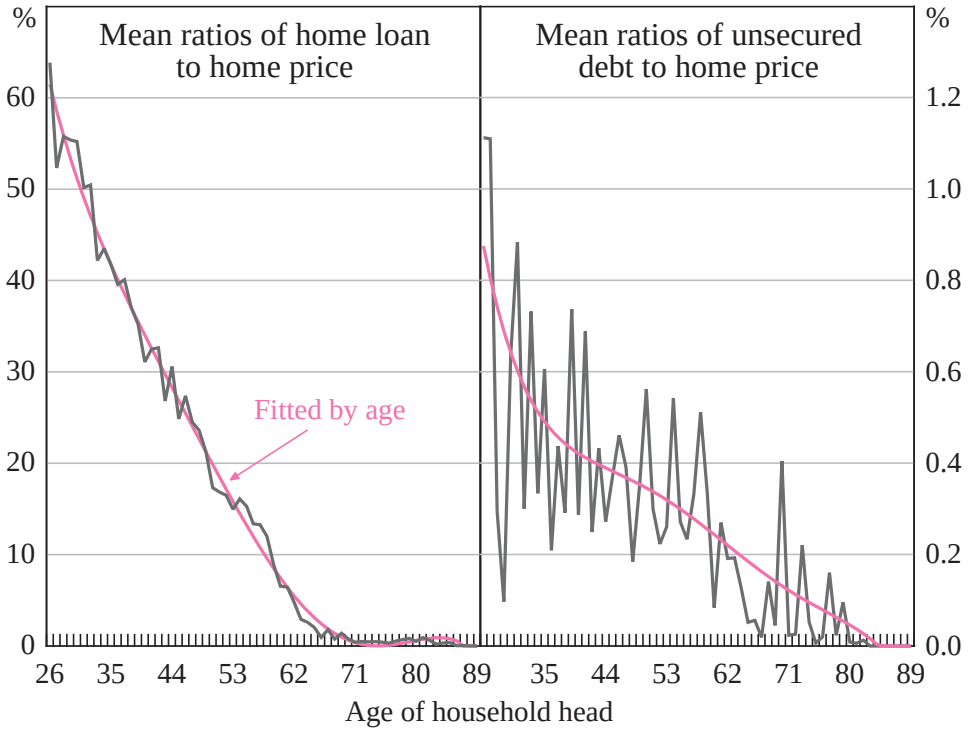
Sources: HILDA Release 10.0; authors' calculations

Demographic variables considered are the age of the household head (the person most likely to make financial decisions for the household), number of children and adults in the household, education, occupation, region of residence and labour force status. The distribution of these variables for our panel of responding, non-splitting but possibly moving homeowners (panel two) is shown in Table A1.

The notion that young homeowners are likely to be more credit constrained than older homeowners is crucial to the interpretation of our results. This argument is supported by the cross-tabulations in Figure 2, which show the mean ratios of home loans to home prices and the mean ratios of unsecured credit card debts to home prices for panel two (homeowners). Younger homeowners have both high secured and unsecured debt, relative to older homeowners. Given that unsecured debt is likely to be more costly, this suggests that younger homeowners are on average more credit constrained than older homeowners. If younger homeowners were not credit constrained, one would expect them to substitute costly unsecured debt for less costly secured debt, and therefore the right-hand panel of Figure 2 to show no clear age pattern. An alternative, self-assessed, measure of credit

constraints available within HILDA – the ability to raise $3 000 in an emergency – is also significantly positively correlated with age.[5]

Figure 2: Credit Constraints by Age



Notes: Calculated using all homeowners in panel two, defined in Table 1; fitted line obtained by regressing ratios on a polynomial in age; mean ratios of home loan to home price calculated over 2003 to 2010; mean ratios of unsecured debt to home price calculated using the wealth module years 2006 and 2010

Sources: HILDA Release 10.0; authors' calculations

The finding that young homeowners have high levels of secured and unsecured debt relative to the price of their homes is important. Disney *et al* (2010) find that only a sub-sample of homeowners with both high unsecured and secured debt increase their indebtedness (to potentially fund spending) following a rise in housing prices. Figure 2 shows that these homeowners are more likely to be young. The intuition behind the Disney *et al* (2010) result is straightforward: an increase

5 Arguably the best test of the credit constraints hypothesis would be to examine differences in home-price wealth effects for homeowners who could raise $3 000 in an emergency versus homeowners who could not raise $3 000 in an emergency. Unfortunately, non-response rates for this particular question are quite high. It is also difficult to control for a household's selection into subjective self-assessed categories. For these reasons, even the positive correlation between credit constraints and age reported in the text should be treated with some caution.

in home prices allows a household to refinance – by substituting relatively expensive unsecured debt for secured debt – and potentially borrow more to spend.

The main household financial variables used in this study are self-reported non-housing expenditure and self-reported home prices. These data are discussed in the next two sections.

2.2 The HILDA Spending Estimates

The sample covers the period 2003 to 2010. Over this period, the ratio of HILDA non-housing spending to Australian Bureau of Statistics (ABS) final consumption expenditure has been steady at around one-half, and the relationship between movements in the HILDA spending numbers and the aggregate consumption figures has also been broadly stable with a correlation coefficient between the growth rates in these series of around 0.7 (Table 2).[6]

Table 2: Real per Household Spending and Consumption

	2003	2004	2005	2006	2007	2008	2009	2010
HILDA	40 762	40 855	41 862	42 085	43 237	43 498	41 136	42 907
ABS	78 083	79 949	81 807	82 741	85 233	87 403	84 548	84 834
Ratio	0.52	0.51	0.51	0.51	0.51	0.50	0.49	0.51

Notes: 2009/10 dollars; deflated using trimmed mean CPI; HILDA data are from panel two
Sources: ABS; HILDA Release 10.0; authors' calculations

Over the period 2006 to 2010, the HILDA spending estimates were calculated as the sum of the 25 self-reported spending categories defined according to the usual amount spent on weekly, monthly and annual items. However, from 2003 to 2005 self-reported figures are only available for three components: meals eaten out, groceries and childcare costs. The relationship between real spending on these items, the age of the household head and real total expenditure in the years 2006 to 2010 was used to impute real total spending for households from 2003 to 2005

6 In these comparisons, the ABS figures are not adjusted to make them more comparable to the HILDA Survey measure. However, differences in the concept and scope of these data should be borne in mind. The ABS data constitute the broadest, accruals-based measure, while the survey data measure only regular and recurring spending. Aside from these differences, notable omissions from the HILDA spending data include: entertainment expenses, non-fee education expenses, gifts and donations, personal and household services, health and beauty products, ornaments, art and jewellery, and financial service charges.

(with the imputation adjusted for each panel). The estimated imputation regressions for panel two are presented in Table 3, where $total\ spending_{it}$ is real total spending by household i in time t, meo_{it} is real spending on meals eaten out, gro_{it} is real spending on groceries, cc_{it} is real spending on childcare costs and age_{it} is the age of the household head. The first column shows the estimated coefficients from a linear specification, and the second column reports the estimated coefficients from a log-linear specification. Based on the fit, the log-linear model was chosen to impute spending in years 2003 to 2005. The fit of this regression, with an R^2 of around 0.5, is consistent with other papers implementing a similar imputation method (see, for example, Skinner (1989); Lehnert (2004); and Contreras and Nichols (2010)).

Table 3: Spending Imputation

$$total\ spending_{it} = \alpha_0 + \alpha_1 meo_{it} + \alpha_2 gro_{it} + \alpha_3 cc_{it} + \alpha_4 age_{it} + \alpha_5 age_{it}^2 + E_{it}$$

	Linear model	Log-linear model[(a)]
Meals eaten out	4.06***	0.74***
Groceries	2.07***	0.52***
Childcare costs	0.2	0.05***
Age	762.7***	0.029***
Age squared	–9.03***	–0.0003***
Constant	805.57	9.3***
Obs (2006–2010)	8 015	8 015
Adj R^2	0.33	0.53

Notes: 2009/10 dollars; deflated using trimmed mean CPI; regression output above is for panel two; ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

(a) Coefficients on meals eaten out, groceries and childcare costs show the expected percentage change in total spending from a $100 increase in spending on these items, holding all other predictors constant

Sources: HILDA Release 10.0; authors' calculations

Restricting our spending variable in the analysis that follows to only the three items available over the period 2003 to 2010 does not change our qualitative results, although estimated wealth effects are smaller. The results are also robust to restricting the sample to the period 2006 to 2010.

2.3 HILDA Self-reported Home Prices

The home price variable used throughout this analysis is a household's self-reported home price every year from 2003 to 2010.[7] To check the consistency of these self-reported home prices with the aggregate data one can compare the mean of all self-reported home prices in each period to an independent nationwide measure (Table 4). The series appear to move together closely, albeit with a level difference; the correlation coefficient between the growth rates in each series is around 0.6. There is, however, one notable exception: the self-reported home price series misses the decline in nationwide prices that occurred between 2008 and 2009.

Table 4: Self-reported Home Prices and Independent Home Prices

$'000

	2003	2004	2005	2006	2007	2008	2009	2010
HILDA[(a)]	370	417	438	466	498	522	536	574
Independent[(b)]	316	352	371	404	446	462	441	517
Ratio	1.17	1.19	1.18	1.15	1.11	1.13	1.21	1.11

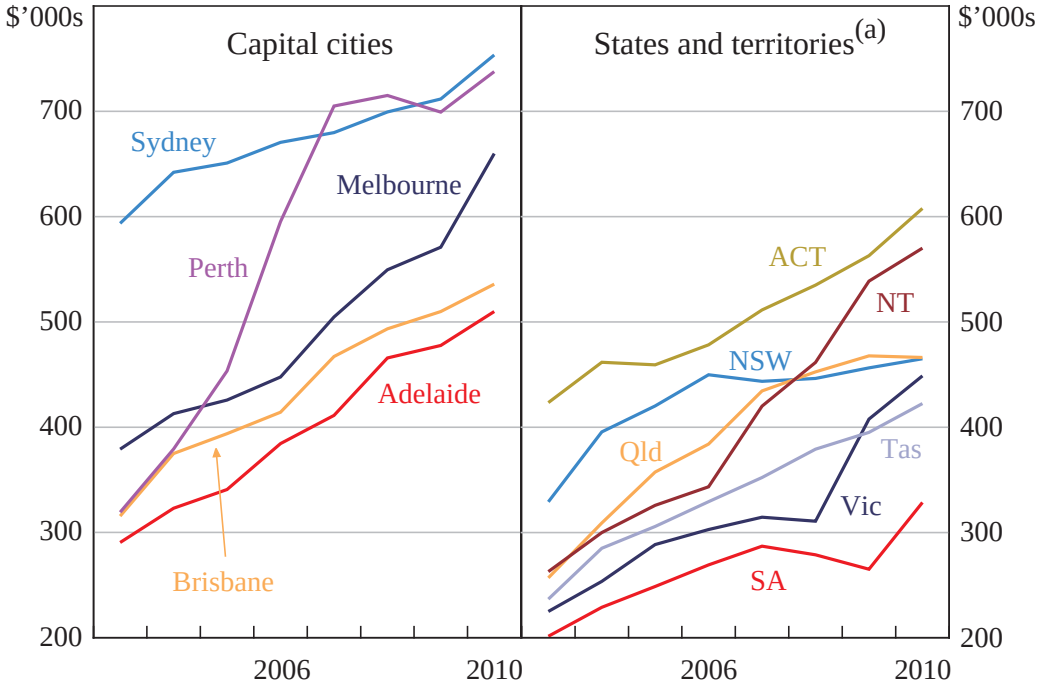
Notes: (a) Unweighted mean from panel two
(b) Calculated as the total value of household dwelling assets from RBA Statistical Table B20 (Selected Assets and Liabilities of the Private Non-financial Sectors), divided by the number of dwellings owned by households

Sources: ABS; HILDA Release 10.0; RBA; authors' calculations

Figure 3 plots the mean of self-reported home prices within 12 major statistical regions identified in HILDA. These show large variations over time, across cities, and between capital cities and regions.

7 Although we refer to home prices throughout, the data collected by the HILDA Survey are in fact on home values, and so will include changes in home values due to capital improvements as well as changes in home values due to pure price movements.

Figure 3: Self-reported Home Prices
By major statistical region



Note: (a) States exclude respective capital city

Sources: HILDA Release 10.0; authors' calculations

3. Methodology

To study the nature of home-price wealth effects, we use the HILDA panel and the framework proposed by Attanasio and Weber (1994) (see also Campbell and Cocco (2007) and Attanasio *et al* (2009)). Specifically, we estimate home-price wealth effects by examining how the value of goods and services consumed by households responds to changes in home prices, controlling for a number of other factors such as education levels and income. Further, we split households up into young, middle and old households in order to examine differences in wealth effects between age groups. The estimation is performed using a panel regression where each household's home price and spending level is tracked through time.

The main advantage of our study over previous studies is that we use an actual panel rather than a pseudo-panel of birth cohorts constructed from a series of cross-sections. This enables us to move by degrees – from household-level data to cohort-level data – by first tracking the same households through time and then tracking the same 'cohorts' (defined as a group of households with fixed

membership) through time. By doing so, any differences in results due to different levels of data aggregation can be identified.

The appeal of Attanasio and Weber's (1994) framework is the lack of structure it imposes upon empirically estimated relationships, though it can be seen as an approximation to the life-cycle model. The life-cycle model predicts that real spending is equal to an annuity value of lifetime resources and its interaction with the life-cycle of the household:

$$\left(total\ spending_{it}\right) = \omega_{it}\kappa\left(life\,cycle_{it}\right)exp\left(E_{it}\right),$$

where $total\ spending_{it}$ is real annual spending of household i at time t, and ω_{it} is some fraction of total wealth that includes, for instance, financial wealth and housing wealth. The function $\kappa\left(life\,cycle_{it}\right)$ captures the age and composition of household members. What is left unexplained, $exp(E_{it})$, is unexplained variation in lifetime earnings including temporary shocks/measurement error in current earnings. Taking logs of the above equation yields:

$$\ln\left(total\ spending_{it}\right) = \ln\left(\omega_{it}\right) + \ln\left(\kappa\left(life\,cycle_{it}\right)\right) + E_{it}. \qquad (1)$$

Equation (1) can be estimated using proxies for log lifetime wealth $\ln(\omega_{it})$ and for the life-cycle function $\ln\left(\kappa\left(life\,cycle_{it}\right)\right)$ as per Equation (2):

$$\ln\left(total\ spending_{it}\right) = \alpha_i + B'W_{it} + A'Z_{it} + E_{it}. \qquad (2)$$

Log lifetime wealth is proxied with the constant α_i and a vector of variables, W_{it}, which includes: dummy variables for the highest level of education achieved by the household head;[8] the occupational classification of the household head; the log

8 Education is generally considered to be an effective proxy for permanent income. Attanasio and Weber (2010), for instance, document that more highly educated households tend to have higher (and steeper) income profiles than those headed by less educated individuals.

of real financial asset holdings, FA_{it};[9] and the log of real disposable income, $HHDY_{it}$ (we also include the log of real housing wealth, detailed below, but for presentational purposes we consider it separately from the other wealth variables contained in W_{it}). The coefficients in vector B will represent a log-level shift in spending for changes in categorical variables and, for the continuous variables, the elasticity of spending. The life-cycle function is proxied with a vector of variables, Z_{it}, including: the number of adults and the number of children in the household; a dummy for households with three or more adult members; labour force status of the household head; and region of residence.

The impact of changes in real home prices on spending is the key focus of this paper. A variable that we can use to estimate this home-price wealth effect is constructed in several stages.

First we estimate unexplained movements in home prices as the residual from a self-reported home-price regression:

$$\ln\left(HP_{it}\right) = \alpha_0 + f\left(age_{it}\right) + A'SD_{it} + B'Q_{fa(20)it} + C'Q_{hhdy(20)it} + \beta_1 \Delta ir_t + \beta_2 ur_t + HP_{it}^{E},$$

where HP_{it} are self-reported home prices from HILDA;[10] SD_{it} denotes the statistical sub-division where household i resides at time t (130 such sub-divisions are present in panel two, for example); $Q_{fa(20)it}$ is a vector of dummies for financial asset vigintile; $Q_{hhdy(20)it}$ is a vector of dummies for household disposable income vigintile; Δir_t is the percentage point change in nominal average outstanding lending rates between time $t-1$ and time t; ur_t is the unemployment rate at time t; and HP_{it}^{E} is the residual or unexplained component of home prices. Regression outputs for panel two are given in Table B1. This regression fits the data well, with an R^2 of over 50 per cent. Much of the explanatory power comes from the regional

9 Self-reported household financial assets are only available from the HILDA wealth modules of 2006 and 2010. Accordingly, financial wealth was imputed for every household in years 2003 to 2005 and 2007 to 2009. To perform the imputation, a linear trend was interpolated for all households' financial assets between wealth module years. Household-level financial assets were then shifted about this trend according to the annual percentage point deviation of the ABS aggregate household sector financial asset series from its trend.

10 The use of self-reported home prices – given their availability in the dataset – are an obvious choice over independent data from dwelling-price providers; ultimately it is self-reported 'perceived' home prices that should matter for household-level spending decisions.

dummy variables capturing a range of characteristics associated with the home location, including the amenities in the region and the average quality of housing in the area.[11]

Second, the variable HP_{it}^{E} is interacted with a vector of dummies, Age_i, indicating the age group of the household head in the first survey year as either young (23 to 35 years), middle (36 to 50 years) or old (over 50 years).

It is the existence, or lack thereof, of differences in home-price wealth effects across different age groups that will allow us to distinguish between the various hypotheses put forward for the cause of these wealth effects. Larger wealth effects for older homeowners would be consistent with a traditional wealth effect, while larger wealth effects for younger homeowners could reflect credit constraints and/or common factors.

To examine the relative merit of these latter two explanations, the panel including renters is considered (panel one in Table 1), a renter dummy is added, and the term $C'\left(HP_{it}^{E} \times Age_i \times Tenure_i\right)$ is added to the baseline model, where $Tenure_i$ is a dummy variable indicating the home tenure type of the household. If home-price wealth effects are due to common factors then consumption should increase for young renters as well as young homeowners following a positive home-price shock. If these effects are due to credit constraints then the consumption of young homeowners should again increase, but the consumption of young renters should not.

For ease of interpretation, we present results in Section 4 in a form that is comparable to the aggregate MPCs discussed in the introduction and commonly referred to in the literature. Estimated elasticities for each age group are converted

11 Under the traditional wealth effects hypothesis it is unexplained or unanticipated changes in the value of wealth that induce households to spend more or less each period. Moreover, a household's perceived buffer-stock saving level is more likely to be affected by unanticipated changes in home prices rather than anticipated changes. These conceptual arguments notwithstanding, our results do not change greatly if we use actual self-reported home values instead of their unanticipated components (see Model 1 in Table C1).

to MPCs by multiplying the elasticities by the sample average ratio of non-housing consumption to dwelling wealth over the period 2003 to 2010 for each age group.[12]

Finally, as shown in Table 1, to aid the interpretation of our results we exclude a number of households from our panels. This may result in selection bias. For example, restricting the sample to households that maintained their tenure type over the period 2003 to 2010 could result in selection bias if, for example, homeowners who maintain the same tenure type over a long period have smaller wealth effects because they are less likely to be aware of fluctuations in home prices. To detect possible selection bias in a panel data model with fixed effects, we perform Wooldridge's (1995) variable addition test. This involves estimating a pooled probit (across all *i* and *t*) on same-tenure and changing-tenure households, and calculating the inverse Mills ratio (IMR) for the likelihood of maintaining the same tenure type over eight years.[13] The IMR is then added to Equation (2) and the model estimated using both same-tenure and changing-tenure households. The significance or otherwise of the coefficient on the IMR indicates whether there are sample selection issues. The IMR was found to be insignificant, indicating that sample selection is not biasing our results.[14]

4. Results

4.1 Household-level Analysis

At the household level, Equation (2) becomes:

$$\ln\left(total\,spending_{it}\right) = \alpha_i + T_t + B'W_{it} + D'\left(HP_{it}^{E} \times Age_i\right) + A'Z_{it} + E_{it}, \qquad (3)$$

where α_i are household-fixed effects that control for unobserved time-invariant differences between households and T_t are time-fixed effects. In this specification,

12 These ratios are 0.2, 0.18 and 0.13 for young, middle and old age groups respectively.

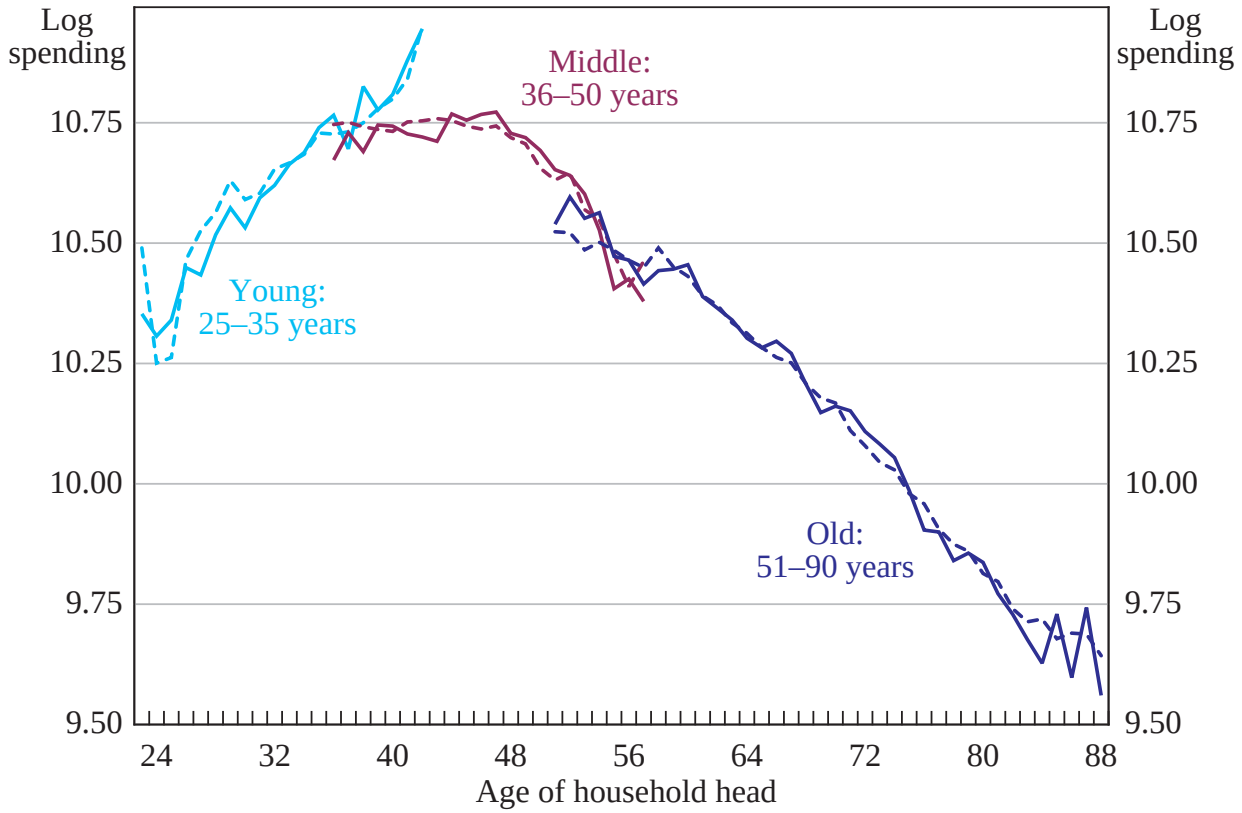
13 All regressors from Equation (2) were included in the probit plus current and prospective job security/worries and the ability to raise cash in an emergency (results are available upon request).

14 Correcting for selection bias in panel data models is not as straightforward as detecting selection bias. This point notwithstanding, and despite failing to reject the null of no selection bias, we examined results using a correction for the likelihood of maintaining home tenure type (Wooldridge 1995). The qualitative results were unchanged.

we omit dummies for occupation and education from our wealth term since these are typically time-invariant and so are captured by the household-fixed effect.

We estimate the model using the unexplained component of home prices, HP_{it}^{E}, where the coefficient on home prices is allowed to vary across age groups (full regression output is given as Model 2 and Model 3 in Table C1). Figure 4 compares, for our panel of possibly-moving homeowners (panel two), predicted real spending from this model (dashed lines) to actual spending (solid lines), using real spending averages over the eight years to 2010 for all households within each age group. This allows us to assess the functional form of the model by examining whether the life-cycle pattern of spending follows a hump-shape; such patterns are well-known and widely reported in the literature – see, for instance, Attanasio and Weber (2010). From a visual examination it seems that this specification provides a good fit to the data in the spending-age space for each age group.

Figure 4: Real Household Spending
By age within age group



Notes: 2009/10 dollars; deflated using trimmed mean CPI; data are for panel two, defined in Table 1; dashed lines are fitted values; age groups defined in 2003

Sources: HILDA Release 10.0; authors' calculations

The first column of Table 5 shows that home-price wealth effects in panel two are estimated to be largest (and most statistically significant) for young homeowners, at around 4 cents per dollar. For middle-aged and old homeowners we find no significant positive home-price wealth effects. The difference between wealth effects for young and middle-aged homeowners is statistically significant, as is the difference between young and old homeowners. However, there appears to be no statistical difference between wealth effects for middle-aged and old homeowners (Table 5). The second column of Table 5 shows that the age distribution of home-price wealth effects is not sensitive to restricting spending to non-durable items.[15]

Table 5: Household-level Wealth Effects by Age

Cents per dollar change in wealth

	Total spending	Non-durable spending
Young	3.90***	3.45***
Middle	0.10	0.35
Old	–0.69*	–0.48
H_0: Young = Middle[(a)]	R***	R**
H_0: Young = Old[(b)]	R***	R***
H_0: Middle = Old[(c)]	F	F

Notes: R refers to a rejection of the null hypothesis H_0, F refers to a failure to reject H_0; ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

(a) H_0 is that home-price wealth effects for young and middle-aged homeowners are not statistically different from one another

(b) H_0 is that home-price wealth effects for young and old homeowners are not statistically different from one another

(c) H_0 is that home-price wealth effects for middle-aged and old homeowners are not statistically different from one another

Sources: HILDA Release 10.0; authors' calculations

The finding of large and significant home-price wealth effects for younger households is consistent with the credit constraints hypothesis and the common third factor hypothesis. To distinguish between these hypotheses, the panel with renters is considered (panel one from Table 1). Of course renters do not provide a self-assessed home price. To address this issue, all households were attributed with independent aggregate home prices for their region. The results (see Model 4 in Table C1) show negative but statistically insignificant home-price wealth effects

15 The following items are classified as durable: new and used motor vehicles, motorbikes or other vehicles; computers and related devices; televisions, home entertainment systems and other audiovisual equipment; whitegoods such as ovens and fridges; and furniture.

for young renters, and a negative and significant wealth effect for middle-aged renters. This supports the idea that larger estimated wealth effects for younger homeowners reflect credit constraints, rather than a third common factor such as higher expected lifetime earnings being captured by housing prices.

To distinguish our estimated wealth effects from the relationship between housing turnover and spending, the results from Table 5 are re-estimated excluding moving homeowners (panel three from Table 1).[16]

For total spending, dropping moving homeowners decreases estimated wealth effects for young homeowners by less than half of one cent (Table 6 and Model 1 in Table C2). This suggests the turnover effect on spending of young homeowners is not significant. Conversely, wealth effects for middle-aged homeowners increase by around one cent. A middle-aged homeowner's wealth effect is now statistically different to an older homeowner's and, at standard levels of significance, the hypothesis that these effects are the same as those estimated for younger homeowners cannot be rejected.

16 An alternative way to control for the possible effects of moving is to continue to work with panel two (homeowners), but to introduce dummy variables to capture the year of the move as well as any possible level shift in spending post-move. The results from such a model are similar to those already presented – wealth effects for young homeowners are positive and significant, wealth effects for middle-aged homeowners are negative but not significant, while wealth effects for older homeowners are negative and statistically significant.

Table 6: Household-level Wealth Effects by Age – Non-movers

Cents per dollar change in wealth

	Total spending	Non-durable spending
Young	3.67**	2.54*
Middle	1.00	1.35*
Old	–0.81**	–0.58
H_0: Young = Middle[(a)]	F	F
H_0: Young = Old[(b)]	R***	R**
H_0: Middle = Old[(c)]	R**	R**

Notes: R refers to a rejection of the null hypothesis H_0, F refers to a failure to reject H_0; ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

(a) H_0 is that home-price wealth effects for young and middle-aged homeowners are not statistically different from one another

(b) H_0 is that home-price wealth effects for young and old homeowners are not statistically different from one another

(c) H_0 is that home-price wealth effects for middle-aged and old homeowners are not statistically different from one another

Sources: HILDA Release 10.0; authors' calculations

4.2 Cohort-level Analysis

In this section, the results are replicated using the synthetic cohort techniques applied by Attanasio *et al* (2009). While this is a less informative dataset, comparing results at different levels of data aggregation allows the effect of aggregating data on model results to be examined.

This approach controls for unobservable time-constant differences between *cohorts* rather than *households*, thereby reducing the number of parameters in Equation (2). Twelve five-year birth cohorts are defined, from before 1926 to 1980, and are entered into Equation (2) as dummy variables (Table 7).

Table 7: Households per Cohort
Data are for panel two

Cohort dummy	Birth year	Cohort size
Cohort 1	1976 to 1980	33
Cohort 2	1971 to 1975	90
Cohort 3	1966 to 1970	145
Cohort 4	1961 to 1965	216
Cohort 5	1956 to 1960	174
Cohort 6	1951 to 1955	135
Cohort 7	1946 to 1950	164
Cohort 8	1941 to 1945	160
Cohort 9	1936 to 1940	157
Cohort 10	1931 to 1935	144
Cohort 11	1926 to 1930	118
Cohort 12	Pre-1926	67

Sources: HILDA Release 10.0; authors' calculations

With these cohorts, the model becomes:

$$\ln\left(total\,spending_{it}^{c}\right) = \alpha_c + T_t + B'W_{it} + D'\left(HP_{it}^{E} \times Age_i\right) + A'Z_{it} + u_{it}^{c} + E_{it}, \quad (4)$$

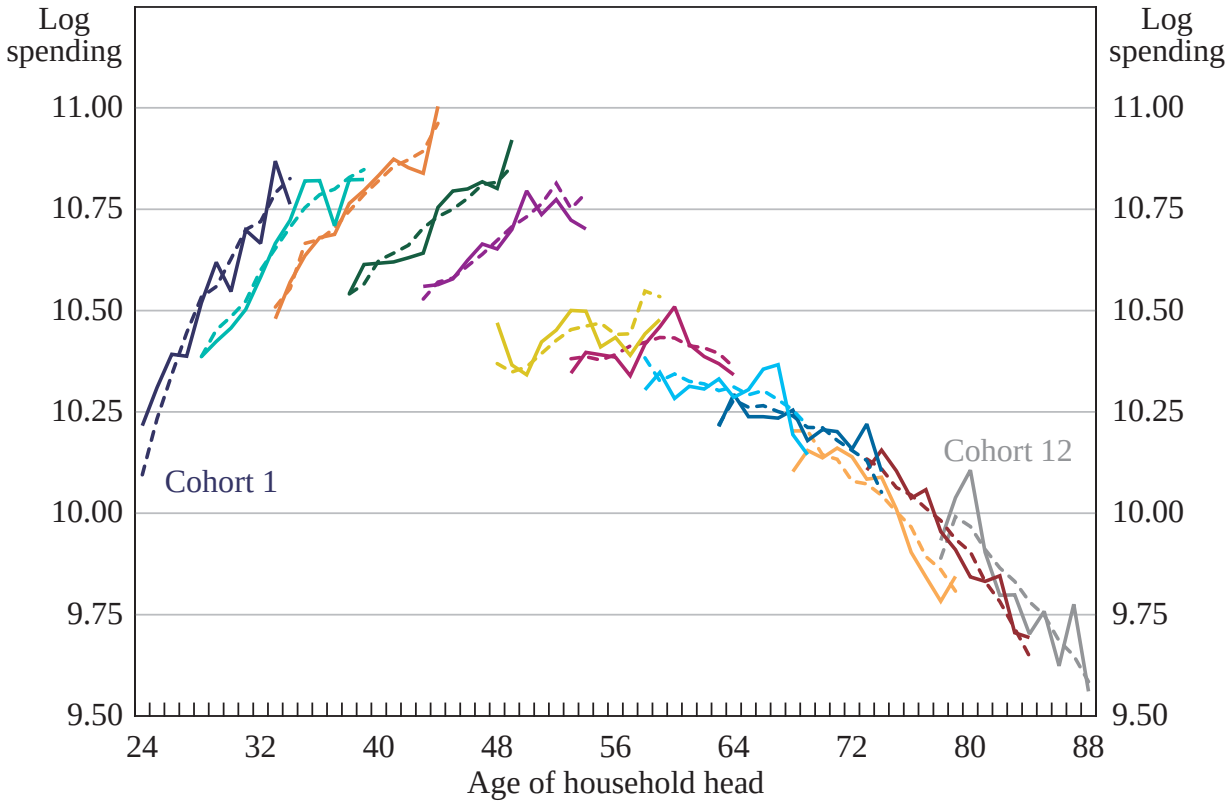
where α_c are the cohort dummies (for c = 1,…,12) and u_{it}^{c} is household i's deviation from the cohort average. This model implicitly assumes that the age profile of spending is the same within each cohort (except for the cohort-specific intercept α_c); again our proxy for wealth includes the highest education level of the household head, the occupation of the household head, real disposable income, real financial assets and real housing assets.

When estimating Equation (4), $u_{it}^{c} + E_{it}$ is treated as a composite error term which is uncorrelated with the explanatory variables. When self-assessed home prices are used, however, this assumption becomes tenuous. It is likely that the cohort dummies, α_c, capturing unobserved cohort heterogeneity, and households' deviations from these values, u_{it}^{c}, will be correlated with self-assessed home prices. In this case, our estimates of home-price wealth effects will be biased. In light of this, in addition to using self-assessed home prices, we estimate Equation (4) using the unexplained component of aggregate home prices, where for each state we

have a separate home price for capital city dwellings and rest-of-state dwellings. This breaks the link between a household's home price and any unobserved household heterogeneity.[17]

The fit of the model using unexplained aggregate home prices is examined in Figure 5, which compares predicted real spending from Equation (4), averaged across birth cohorts, to actual spending. It seems that this specification provides a good fit to the data within the spending-age space for each cohort (regression output for the model using aggregate home prices is given as Model 1 in Table D1).

Figure 5: Real Household Spending
By age within birth cohort



Notes: 2009/10 dollars; deflated using trimmed mean CPI; data are for panel two, defined in Table 1; series represent birth cohorts as defined in Table 7; dashed lines are fitted values

Sources: APM; HILDA Release 10.0; authors' calculations

17 The same rationale is used by Attanasio *et al* (2009) to justify using the level of regional housing prices in their analysis rather than homeowners' estimates of the price of their homes, which are available in the UK Family Expenditure Survey data they use.

Table 8 shows the coefficient on unexplained home prices across the age distribution, and, for the model using aggregate home prices, the equivalent coefficients from a household-level regression. In contrast to the results of Table 5, the self-assessed home price results are similar across the age distribution, with home-price wealth effects of around 3 cents per dollar for young and middle-aged homeowners. Older homeowners now show significantly positive wealth effects.

Table 8: Cohort-level Wealth Effects by Age

Cents per dollar change in wealth

	Cohort regression		Household-level regression
	Self-assessed home prices	Aggregate home prices	Aggregate home prices
Young	2.76***	3.77*	4.35**
Middle	3.29***	1.35	2.78**
Old	1.88***	–0.61	–0.68
H_0: Young = Middle[(a)]	F	F	F
H_0: Young = Old[(b)]	F	R*	R***
H_0: Middle = Old[(c)]	F	F	R***

Notes: R refers to a rejection of the null hypothesis H_0, F refers to a failure to reject H_0; ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

(a) H_0 is that home-price wealth effects for young and middle-aged homeowners are not statistically different from one another

(b) H_0 is that home-price wealth effects for young and old homeowners are not statistically different from one another

(c) H_0 is that home-price wealth effects for middle-aged and old homeowners are not statistically different from one another

Sources: APM; HILDA Release 10.0; authors' calculations

As mentioned earlier, however, these results are likely biased. Replacing self-assessed home prices with an aggregate measure of home prices removes this potential source of bias. Results are shown in the second column of Table 8. These suggest that home-price wealth effects follow a remarkably similar, albeit slightly weaker, pattern to those estimated with household-level data using aggregate home prices (third column of Table 8): young homeowners have higher wealth effects than middle-aged homeowners, who in turn have higher wealth effects than old homeowners. This suggests that 'pseudo-panels' are a reasonably good substitute for actual panels. However, point estimates of the age distribution of home-price wealth effects are less precise in the cohort model. A young homeowner's home-price wealth effect is statistically indistinguishable from a middle-aged

homeowner's wealth effect which, in turn, is statistically indistinguishable for an old homeowner's wealth effect. Moreover, the use of aggregate home prices appears to inflate estimated wealth effects.

Finally, Table 9 shows home-price wealth effects across the age distribution for the cohort model using aggregate home prices when moving homeowners are dropped from the cohort regression, as well as the equivalent coefficients from a household-level regression. These again show that home-price wealth effects are similar, although slightly weaker in a cohort model, with home-price wealth effects larger for younger homeowners. Dropping moving homeowners gives rise to higher and more precise estimates of the home-price wealth effect across the age distribution, suggesting that moving does indeed change spending in ways that are difficult to control for at the cohort level. Again, the use of aggregate home prices appears to inflate estimated home-price wealth effects.

Table 9: Cohort-level Wealth Effects by Age – Non-movers

Cents per dollar change in wealth

	Cohort regression	**Household-level regression**
	Aggregate home prices	Aggregate home prices
Young	6.31***	7.30**
Middle	0.57	2.23
Old	–0.45	–0.47
H_0: Young = Middle[(a)]	R**	F
H_0: Young = Old[(b)]	R***	R**
H_0: Middle = Old[(c)]	F	R*

Notes: R refers to a rejection of the null hypothesis H_0, F refers to a failure to reject H_0; ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively

(a) H_0 is that home-price wealth effects for young and middle-aged homeowners are not statistically different from one another

(b) H_0 is that home-price wealth effects for young and old homeowners are not statistically different from one another

(c) H_0 is that home-price wealth effects for middle-aged and old homeowners are not statistically different from one another

Sources: APM; HILDA Release 10.0; authors' calculations

5. Conclusion

We use a household-level dataset, the HILDA Survey, to explore the relationship between home prices and household spending in Australia. Three main arguments have been put forward in the literature to explain the apparent co-movement between home prices and spending: (1) a 'traditional wealth effect', whereby spending rises with home prices due to an increase in households' lifetime resources; (2) the removal of credit constraints, whereby spending rises with home prices due to households' ability to borrow more, given more valuable collateral, and the related buffer-stock savings argument, whereby higher home prices act as a form of precautionary savings for low-saving households, allowing them to increase spending; and (3) that spending and home prices move together due to a common third factor, such as changing perceptions of lifetime income.

Our analysis most strongly supports the second explanation – that credit constraints and/or buffer-stock saving are the vehicle through which home prices affect spending. At both the cohort and household level we find that the spending by younger (and so more credit constrained) households is more responsive to changes in home prices than that of older households. This argues against the traditional wealth effect hypothesis; this wealth effect should be stronger for older households who typically own more housing than they will need over their remaining lifetimes. We also find that young and middle-aged homeowners respond more than young renters to rising home prices. This argues against the explanation of a common third factor, since renters and homeowners should both be affected by non-home-price shocks, for example increased income expectations.

By analysing the same dataset at two different levels of aggregation, we are able to assess the effect that aggregating data has on model results. We find that household-level and cohort regressions imply very similar spending reactions in response to a change in home prices. This suggests that 'pseudo-panels' are a reasonably good substitute for actual panels, although the necessary use of aggregate home prices in pseudo-panels seems to inflate estimated wealth effects.

Appendix A: The Household Head

Table A1: The Household Head

(*continued next page*)

	Obs	Mean	Min	Max
Age groups defined in 2003				
All ages	1 603	53	23	87
Young	197	31	23	35
Middle	534	43	36	50
Old	872	65	51	87
	Obs	Per cent	Cumulative per cent	
Education				
Postgraduate – masters or doctorate	716	6	6	
Grad diploma/grad certificate	900	7	13	
Bachelor or honours	1 661	13	26	
Advanced diploma	1 410	11	37	
Certificate III or IV	2 971	23	60	
Certificate I or II	87	1	60	
Certificate not defined	94	1	61	
Year 12	1 062	8	69	
Year 11 and below	3 906	30	100	
Undetermined	17	0	100	
Occupation				
Non-response	5 137	40	40	
Agriculture, forestry and fishing	264	2	42	
Mining	112	1	43	
Manufacturing	927	7	50	
Electricity, gas, water and waste services	85	1	51	
Construction	605	5	56	
Wholesale trade	261	2	58	
Retail trade	383	3	61	
Accommodation and food services	162	1	62	
Transport, postal and warehousing	443	3	65	
Information, media and telecommunications	235	2	67	
Financial and insurance services	355	3	70	
Rental, hiring and real estate services	125	1	71	

Table A1: The Household Head

(*continued next page*)

	Obs	Per cent	Cumulative per cent
Occupation			
Professional, scientific and tech services	663	5	76
Administrative and support services	184	1	78
Public administration and safety	676	5	83
Education and training	927	7	90
Health care and social assistance	908	7	97
Arts and recreation services	56	0	98
Other services	316	2	100
Labour force status			
Employed full time (FT)	6 131	48	48
Employed part time (PT)	1 581	12	60
Unemployed looking for FT work	68	1	61
Unemployed looking for PT work	17	0	61
Not in labour force, marginally attached	274	2	63
Not in labour force, not marginally attached	4 750	37	100
Employed, but usual hours worked unknown	3	0	100
Number of adults			
1	3 400	27	27
2	7 940	62	89
3	946	7	96
4	448	3	99
5	72	1	100
6	8	0	100
7	10	0	100
Number of children aged 0–14			
0	9 025	70	70
1	1 139	9	79
2	1 903	15	94
3	612	5	99
4	116	1	100
5	25	0	100
6	4	0	100

Table A1: The Household Head

(*continued*)

	Obs	Per cent	Cumulative per cent
Region of residence			
Sydney	2 328	18	18
NSW excluding Sydney	2 263	18	36
Melbourne	2 836	22	58
Vic excluding Melbourne	91	1	59
Brisbane	1 307	10	69
Qld excluding Brisbane	1 538	12	81
Perth	384	3	84
WA excluding Perth	6	0	84
Adelaide	940	7	91
SA excluding Adelaide	477	4	95
ACT	222	2	97
NT	43	0	97
Tasmania	389	3	100

Sources: HILDA Release 10.0; authors' calculations

Appendix B: Regression Output – Home-price Model

Table B1: Home-price Model

Parameters	Coefficients	Parameters	Coefficients
$\Delta(ir_t)$	–0.068***	8	0.129***
	(–8.92)		(5.85)
age	0.825***	9	0.142***
	(5.19)		(6.26)
age^2	–0.029***	10	0.181***
	(–4.81)		(8.39)
age^3	0.001***	11	0.197***
	(4.47)		(8.90)
age^4	–0.000***	12	0.173***
	(–4.18)		(8.04)
age^5	0.000***	13	0.216***
	(3.92)		(9.64)
ur_t	–0.085***	14	0.255***
	(–11.48)		(10.64)
Dummy: log real financial asset vigintile:		15	0.211***
			(9.04)
2	0.079***		
	(3.49)	16	0.243***
3	0.040*		(10.62)
	(1.87)	17	0.278***
4	0.049**		(12.16)
	(2.20)	18	0.274***
5	0.115***		(11.37)
	(5.20)	19	0.338***
6	0.103***		(13.15)
	(4.71)	20	0.455***
7	0.142***		(16.90)
	(6.25)		
Constant	4.560***	Obs	12 824
	(2.84)	Adj R^2	0.538

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; *t* statistics in parentheses; dependent variable: $\ln(HP_{it})$; regional dummy variables and dummies for real disposable income vigintiles omitted from table

Sources: HILDA Release 10.0; authors' calculations

Appendix C: Regression Output – Wealth Effects

Table C1: Household-level Wealth Effects – Panels One and Two

(*continued next page*)

	Model 1	Model 2	Model 3	Model 4
No of adults	0.106***	0.123***	0.139***	0.113***
	(4.33)	(5.05)	(6.00)	(4.64)
No of children (aged 0–14)	0.104***	0.125***	0.135***	0.126***
	(5.87)	(7.31)	(8.41)	(7.19)
Dummy: more than 2 adults	0.106***	0.116***	0.114***	0.095***
	(3.12)	(3.40)	(3.56)	(2.85)
$\ln(HHDY_{it})$	0.013**	0.014***	0.010**	0.011***
	(2.44)	(2.59)	(2.03)	(2.63)
$\ln(FA_{it})$	0.016*	0.016*	0.012	0.009
	(1.82)	(1.86)	(1.52)	(1.18)
$\ln(HP_{it}) \times$ young	0.285***			
	(4.85)			
$\ln(HP_{it}) \times$ middle	0.085**			
	(2.30)			
$\ln(HP_{it}) \times$ old	–0.052			
	(–1.62)			
$HP_{it}^{E} \times$ young		0.197***	0.174***	
		(3.56)	(3.19)	
$HP_{it}^{E} \times$ middle		0.006	0.020	
		(0.15)	(0.59)	
$HP_{it}^{E} \times$ old		–0.052*	–0.036	
		(–1.70)	(–1.25)	
$\ln(HP_{it}) \times$ young × renter (aggregate prices)				–0.112
				(–0.68)
$\ln(HP_{it}) \times$ young × owner (aggregate prices)				0.432***
				(4.39)
$\ln(HP_{it}) \times$ middle × renter (aggregate prices)				–0.513***
				(–3.32)

Table C1: Household-level Wealth Effects – Panels One and Two
(*continued*)

	Model 1	Model 2	Model 3	Model 4
ln(HP_{it}) × middle × owner				0.345***
(aggregate prices)				(4.84)
ln(HP_{it}) × old				–0.125*
(aggregate prices)				(–1.92)
Constant	9.379***	9.769***	9.705***	9.275***
	(28.78)	(69.74)	(72.50)	(14.08)
Obs	12 824	12 824	12 824	15 576
Within R^2	0.021	0.019	0.017	0.026
Between R^2	0.234	0.342	0.357	0.288
Overall R^2	0.164	0.239	0.248	0.201

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; *t* statistics in parentheses; dummies for year, labour force status and region omitted from table; robust standard errors clustered at the household level
Model 1 – dependent variable: ln(*total spending*$_{it}$)
Model 2 – dependent variable: ln(*total spending*$_{it}$)
Model 3 – dependent variable: ln(*total spending*$_{it}$) excluding durable items
Model 4 – dependent variable: ln(*total spending*$_{it}$)
Sources: APM; HILDA Release 10.0; authors' calculations

Table C2: Household-level Wealth Effects – Panel Three

	Model 1	Model 2
No of adults	0.126***	0.145***
	(3.98)	(4.84)
No of children (aged 0–14)	0.129***	0.138***
	(4.99)	(5.75)
Dummy: more than 2 adults	0.134***	0.124***
	(3.32)	(3.33)
ln($HHDY_{it}$)	0.015**	0.011*
	(2.53)	(1.94)
ln(FA_{it})	0.019**	0.016**
	(2.43)	(2.29)
$HP_{it}^{E} \times$ young	0.186**	0.129*
	(2.27)	(1.66)
$HP_{it}^{E} \times$ middle	0.057	0.077*
	(1.28)	(1.86)
$HP_{it}^{E} \times$ old	–0.061**	–0.043
	(–2.09)	(–1.60)
Constant	9.688***	9.680***
	(79.27)	(79.43)
Obs	9 416	9 416
Within R^2	0.017	0.020
Between R^2	0.408	0.414
Overall R^2	0.286	0.300

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; *t* statistics in parentheses; dummies for year and labour force status omitted from table; robust standard errors clustered at the household level
Model 1 – dependent variable: ln(*total spending*$_{it}$)
Model 2 – dependent variable: ln(*total spending*$_{it}$) excluding durable items

Sources: HILDA Release 10.0; authors' calculations

Appendix D: Regression Output – Cohort-level Wealth Effects

Table D1: Cohort-level Wealth Effects

(*continued next page*)

	Model 1	Model 2
Dummy: more than 2 adults	–0.150**	–0.136*
	(–2.76)	(–2.08)
No of adults	0.230***	0.227***
	(8.37)	(7.24)
No of children (aged 0–14)	0.080***	0.089***
	(6.22)	(4.76)
Dummy: cohort 1	0.398***	0.327***
	(11.08)	(8.66)
Dummy: cohort 2	0.458***	0.423***
	(12.97)	(13.96)
Dummy: cohort 3	0.500***	0.498***
	(14.54)	(17.65)
Dummy: cohort 4	0.500***	0.518***
	(13.50)	(15.92)
Dummy: cohort 5	0.488***	0.499***
	(14.93)	(18.90)
Dummy: cohort 6	0.400***	0.402***
	(14.46)	(15.32)
Dummy: cohort 7	0.497***	0.495***
	(28.10)	(25.87)
Dummy: cohort 8	0.438***	0.423***
	(34.02)	(33.40)
Dummy: cohort 9	0.362***	0.364***
	(43.40)	(54.19)
Dummy: cohort 10	0.238***	0.220***
	(38.90)	(36.28)
Dummy: cohort 11	0.142***	0.140***
	(39.96)	(31.51)

Table D1: Cohort-level Wealth Effects
(*continued*)

	Model 1	Model 2
Education dummy: postgraduate	0.181***	0.144***
	(4.63)	(3.72)
Education dummy: graduate	0.140***	0.165***
	(5.42)	(4.24)
Education dummy: bachelor	0.147***	0.148***
	(6.27)	(6.08)
Education dummy: diploma	0.111***	0.132***
	(5.19)	(5.36)
Education dummy: occ certificate	0.061***	0.051**
	(4.02)	(2.26)
Education dummy: Year 12	0.024	0.005
	(1.02)	(0.15)
$HP_{it}^{E} \times$ young (aggregate prices)	0.191*	0.320***
	(1.95)	(6.43)
$HP_{it}^{E} \times$ middle (aggregate prices)	0.057	0.032
	(0.67)	(0.30)
$HP_{it}^{E} \times$ old (aggregate prices)	–0.046	–0.034
	(–0.66)	(–0.57)
ln(FA_{it})	0.056***	0.051**
	(9.10)	(8.77)
ln($HHDY_{it}$)	0.040**	0.033**
	(3.58)	(2.84)
Constant	8.295***	8.426***
	(67.89)	(65.31)
Obs	12 824	9 416
Adjusted R^2	0.459	0.457

Notes: ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively; *t* statistics in parentheses; dummies for year, region (Model 1), occupation, young, middle and labour force status omitted from table
Model 1 – dependent variable: ln(*total spending*$_{it}$); panel two
Model 2 – dependent variable: ln(*total spending*$_{it}$); panel three

Sources: APM; HILDA Release 10.0; authors' calculations

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