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HOUSE PRICES, WEALTH AND CONSUMPTION: NEW EVIDENCE FROM AUSTRALIA AND CANADA

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Over the past two decades, a number of countries have experienced appreciation in house prices at the same time that aggregate consumption has increased. This paper tests alternative hypotheses for this phenomenon by using repeated household surveys from Australia and Canada to identify the transmission mechanism that links consumption and household wealth. The empirical analysis suggests that neither a direct wealth effect nor a common causal factor likely accounts for the observed correlation between wealth and consumption in these two countries. Rather, indirect factors such as collateral effects arising from relaxation of credit constraints are a more likely explanation.

JEL Codes: D12, D91, E21

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1. Introduction

The relationship between household wealth and consumption has been of ongoing interest to economists following the development of the life-cycle and permanent income hypotheses during the 1950s. More recently, increases in house prices associated with financial innovations have received the attention of policy makers, especially monetary authorities.

While increases in house prices may not translate directly into greater household wealth for a variety of reasons,[1] there is a broad consensus about the existence of a positive relationship between asset prices, household wealth, and consumption. There is less agreement, however, about its size and its cause. The literature identifies three main potential causal mechanisms by which an increase in household wealth induced by higher house prices leads to higher consumption. First, an unanticipated increase in wealth may lead directly to an increase in consumption (Muellbauer and Murphy, 1990; Campbell and Cocco, 2007). Alternatively, increases in house prices may induce higher consumption through collateral effects whereby a rise in housing wealth relaxes credit constraints on borrowers (Iacoviello, 2004; Campbell and Cocco, 2007). Finally, both housing wealth and

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[1]These are discussed in Section 2.

consumption may be affected by a common causal factor, such as productivity growth (Attanasio and Weber, 1994; Attanasio *et al*., 2009).

The principal aim of this paper is to distinguish between the alternative explanations for the wealth effect underpinning the observed correlation between unanticipated increases in house prices and consumption. Although each of the mechanisms may have contributed to the growth in consumer spending through the early 2000s, they have different policy implications (Attanasio and Weber, 1994). For this reason, it is important to distinguish between them. The substantial slowdown of asset price growth following large macroeconomic shocks in 2008 has reinforced the importance of identifying the channels through which unanticipated changes in asset prices and especially house prices affect consumption.

This paper makes a number of contributions to the empirical literature on these issues. First, it provides new evidence on the relationship between house prices and consumption using Australian and Canadian household level data spanning three decades. Second, unlike earlier studies that have used a similar methodology, such as Attanasio *et al*. (2009) and Campbell and Cocco (2007), it relies on house price and wealth data at the household level to identify the relationship between consumption and wealth. This obviates the need to rely on aggregate or regional level data to identify the relationship between consumption and wealth and facilitates a better analysis of the wealth-consumption nexus. Nonetheless, the results from using household level data are compared to those derived from aggregate data to provide a robustness check. Third, the empirical estimates provide insight into the magnitude of the relationship between consumption expenditure and house prices. The marginal propensity to consume out of housing wealth is estimated to be around 0.02–0.03 for Australia and Canada, consistent with estimates from studies using household level data but lower than estimates based on aggregate data.

Finally, and most importantly, the results shed light on the underlying causal mechanism linking housing wealth and consumption, providing support for the collateral channel. It suggests that the increase in house prices for Australian and Canadian households in the early 2000s relaxed credit constraints for some households and thereby induced higher consumption. Thus, the analysis does not provide evidence consistent with explanations based on a direct wealth or a common cause effect.

The remainder of this paper is set out as follows. The next section describes in more detail the various mechanisms by which house price and consumption may be related and reviews the empirical evidence on the size and cause of this relationship. Section 3 sets out the methodology used to distinguish between alternative transmission channels. Section 4 describes the household surveys used in the empirical analysis. Section 5 presents and discusses our results, and the final section sets out conclusions.

2. Theoretical Considerations and Literature Review

The life-cycle model (LCM) or permanent income hypothesis (PIH) (hereafter LCM/PIH) provides a rationale for a relationship between wealth and household consumption. In the simplest version of this framework, consumption depends on

expected lifetime income. Households smooth fluctuations in current income by borrowing against future earnings early in life; by accumulating wealth through saving when income is relatively high; and by drawing on that wealth through dis-saving when income is relatively low. Anticipated changes in wealth are incorporated into consumption plans; unanticipated changes induce a revision of those plans. This stylized description may be enriched by incorporating real world considerations such as liquidity constraints, bequest motives, and uncertainty about future income and expenses (Browning and Lusardi, 1996).

The prediction of the LCM/PIH that unanticipated increases in wealth will lead to an increase in consumption provides the basis for the first of the three causal mechanisms identified above: the "direct wealth effect." In short, an unexpected rise in wealth allows a consumption smoothing household to increase consumption at all points in its life-cycle, ceteris paribus. One possible source of increased wealth, at least among home-owning households, may be the increased housing wealth derived from unanticipated increases in house prices (Muellbauer and Murphy, 1990).

In their simplest form, neither the LCM nor the PIH distinguishes between different types of wealth, although there are a number of reasons why housing wealth may affect consumption differently from financial wealth (Dvornak and Kohler, 2007; Sierminska and Takhtamanova, 2007). For example, the illiquid nature of housing assets suggests that changes in them may have a smaller impact than changes in financial wealth. Other factors, such as the permanency of increases in house prices or psychological factors that lead households to earmark housing assets for long-term savings may lead to greater or lower impacts of changes in housing wealth on consumption (Shefrin and Thaler, 1988).[2]

Distinguishing between different types of wealth leads to two further, indirect, mechanisms through which household consumption might be affected. One, commonly referred to as the "credit constraint effect" or "housing collateral channel," reflects the role of housing as collateral for loans. For households relying on housing to provide collateral against secured loans, increases in housing wealth facilitate increased borrowing and hence consumption capacity through mortgage equity withdrawal (Hurst and Stafford, 2004). Moreover, if improvements in household balance sheets result in access to cheaper finance than would otherwise have been possible, this can give rise to a financial accelerator as changes in net worth affect external finance premiums and the cost of credit (Aoki *et al.*, 2004; Klyuev and Mills, 2007).

The third channel through which wealth effects may be transmitted is the "common cause channel" (e.g., Attanasio and Weber, 1994). One possible example is the financial liberalization of the 1990s and 2000s. This facilitated an unprecedented increase in house prices through the mid-2000s but also improved access

[2]One view of housing wealth suggests that, unlike increases in financial wealth, increases in house prices do not actually make a household wealthier. If increases in housing wealth are offset by increases in the opportunity cost of the services provided by housing, the net effect of a change in housing wealth on consumption could be minimal (King, 1990; Buiter, 2008). This notwithstanding, changes in house prices may still induce an aggregate consumption response if, for example, there is an asymmetry between gainers and losers from changes in housing wealth which works in favor of a positive effect on consumption from house prices (Poterba, 2000). Buiter (2008) provides other examples based on heterogeneous agents.

to both secured and unsecured credit, thereby relaxing borrowing constraints and inducing higher consumption for all households, not just those with housing wealth.[3] Other factors may have a similar effect. For example, changes in real interest rates or income expectations arising from productivity shocks that affect both consumption and house prices may explain the observed correlation between increases in house prices and in consumption (King, 1990; Attanasio *et al*., 2009; Disney *et al*., 2010). Attanasio *et al*. (2011) provide an elaborate theoretical model of housing and consumption to explain these three competing hypotheses.

Many studies have tried to identify the magnitude and nature of the wealth–consumption relationship. A summary of the key results from such aggregate and household level studies is presented in Table A.1 in the online Appendix. These have identified a positive correlation between household wealth, much of which is tied up in housing, and consumption. One noteworthy pattern is the large variation in the estimated impact of wealth on consumption and the lack of consensus on the relative importance of housing and financial wealth. However, one consistent result is that studies employing household level data tend to find a smaller responsiveness of consumption to changes in wealth than identified in aggregate-based analyses.

A key limitation of aggregate studies is their inability to distinguish between the causal mechanisms by which household wealth and consumption may be related. Household level panel data, however, provide the opportunity to shed light on these mechanisms. Consider, for example, the direct wealth effect from an unanticipated increase in house prices. In this case, the LCM/PIH suggests that older households would increase their consumption by more than younger ones as they are more likely to be owners and have a shorter life-span left in which to enjoy the benefits of the equivalent windfall gain. Similarly, existing homeowners would benefit from increased house prices whereas renters would not. Renters may in fact reduce consumption as higher dwelling prices require additional savings if the household anticipates entering homeownership in the future. Alternatively, if the effects of an increase in house prices and housing wealth are transmitted indirectly by collateral effects, then the consumption of only credit constrained homeowners will be affected by the increased collateral available (Aoki *et al*., 2004; Disney *et al*., 2006; Campbell and Cocco, 2007). Finally, if wealth effects are driven by a common factor such as a productivity shock, then the consumption of renters should be affected as much as that of homeowners. In contrast to the first example above, the young are more likely to be affected than the old because the former have a longer period over which expectations of higher incomes have an impact (Attanasio *et al*., 2009; Browning *et al*., 2013).

Household level studies have employed either true panel data, with repeated observations on the same set of households, or pseudo-panel data relying on synthetic cohorts from pooled cross-section surveys. Those relying on true panel data, such as Berben *et al*. (2006), Bostic *et al*. (2009), Bridges *et al*. (2004), Disney *et al*. (2010), Browning *et al*. (2013), Hurst and Stafford (2004), and Windsor *et al*. (2013), have been constrained by the relatively limited time period for which data were available or by a limited range of information on key variables.

[3]Ellis (2006) provides an overview drawn on work from various central banks and the Bank for International Settlements.

Pseudo-panel studies, such as by Deaton (1985) and Browning *et al*. (1985), addressed these limitations. For this paper, the most relevant of such studies are Attanasio and Weber (1994), Attanasio *et al*. (2009), and Campbell and Cocco (2007). Each of these analyzes the consumption of a set of households by constructing pseudo-cohorts from the U.K. Family Expenditure Surveys. Although the households that form each cohort differ across surveys, they share common characteristics. Attanasio *et al*. (2009) define cohorts according to the birth year of the head of the household. Campbell and Cocco (2007) supplement this definition by regional and tenure characteristics. Importantly for this paper, both studies use changes in regionally defined house price indices to proxy for changes in housing wealth experienced by households.

Despite use of the same dataset, the conclusions of these studies differ significantly. Attanasio *et al*. (2009) find that house price growth has the largest effect on the consumption of the youngest or most recently born cohort and the smallest effect on that of the oldest cohort. They also find that the consumption response of renters to changes in house prices is similar to that of homeowners. They conclude that their results are consistent with a common causal explanation, and explicitly reject the direct wealth effect and the housing collateral transmission channels. They suggest, instead, that expectations about higher incomes in the future are the most likely explanation for the positive correlation between changes in household wealth and consumption. Campbell and Cocco (2007), on the other hand, find that house price increases have the greatest effect on consumption of the old and the smallest effect on that of young renters. They conclude that their results are most consistent with the housing collateral channel view of housing wealth and consumption.

The difference in the results of these two studies appears to stem from their specific methodologies. In addition to different ways of defining cohorts, there are differences in the periods covered and in model specifications. Based on a comparison exercise in which the results from each study are tested for their robustness to their methodological differences, Cristini and Sevilla (2007) find support for the common cause effect postulated in Attanasio *et al*. (2009).

Our paper addresses this debate over causal mechanisms by examining the relation between housing wealth and consumption in Australia and Canada. A novel contribution is its use of household level house price and wealth data in Australia to obviate the need to rely on the aggregate or regional level measures employed in the U.K. studies.

3. Methodology

The econometric methodology employed in this paper is most similar to that of Attanasio *et al*. (2009) where the unit of observation is the individual household. The regression analysis uses pooled cross-section data from a series of surveys conducted before and after 2000 in both Australia and Canada. Controls are included for "year-of-birth" cohort membership and for a variety of socio-demographic characteristics believed to influence life-cycle consumption patterns. In essence, the empirical analysis compares the consumption of different

households in the 2000s with that in the 1970s, 1980s, and 1990s to examine their response to the significant rise of housing wealth stemming from increases in house prices in the 2000s.

3.1. *General Framework*

The theoretical basis for the empirical analysis is the life-cycle model in which households exhibit an age–wealth consumption profile that has the familiar "hump or inverted U shape." Life-cycle consumption profiles are used to determine whether the impact of unanticipated changes in wealth differ across age groups in a way suggested by the three alternative transmission channels described above. This section provides an overview of econometric specifications used to explore this issue; more detail on the variables is provided in Section 4 and the precise specifications employed and the results are presented in Section 5.

The baseline specification in (1) below expresses household consumption as a function of observable variables that capture time and cohort effects as well as the broad factors that affect household consumption over the life-cycle.

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

where X_t^{ch} is the consumption expenditure of household h that belongs to 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 as 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) for each country provides a "baseline" consumption profile for each cohort in that country. As in Attanasio *et al*. (2009), we interpret the deviations of observed consumption from such a profile as being determined by innovations to either lifetime or transitory income.

3.2. *Extended Framework*

We then extend equation (1) by including "age group dummies" interacted with time dummies (T_t) for the periods after 2000 to determine whether consumption responses across 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 under age 40 $\left(DY_t^{ch}=1\right)$; 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 behavior of all members of age-group cohorts in the 2000s relative to their behavior 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 $\left(g\left(hp_t^c\right)\right)$ in the following manner:

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

In the empirical analysis below, equation (3) is estimated using a range of different and arguably more relevant measures of house prices and household wealth than used by Attanasio *et al*. (2009) and Campbell and Cocco (2007). However, we also include an estimated regional level house price measure as used in those studies. This allows us to directly compare our results with theirs and provides a robustness check on our results.

A final set of extensions of equation (3) includes a tenure dummy variable interacted with the house price variables as well as the age group dummies to allow for potential differences in the behavior of owners and renters. This allows the 2000s consumption behavior 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 is not set out here.

As a final robustness check we follow Attanasio *et al*. (2009) in modeling "anticipated" regional house price as a function of regional trends in earnings and macro-economic conditions to improve the power of our tests.

3.3. *Interpreting the Results*

To distinguish between the alternative mechanisms linking house prices, wealth, and consumption, a careful examination of the age-defined coefficients is required. In all cases, differences in the consumption patterns of the age defined cohorts, reflected in differences in θ_Y, θ_M and θ_O, are used to assess three causal channels outlined in Section 2.

In the case of a direct wealth channel, for example, we expect the coefficients on the house prices or wealth variable to be positive for all cohorts experiencing an increase in wealth. In addition, pair-wise comparisons of age-defined cohorts should reveal that older cohorts, with a long housing position and a shorter time span in which to consume any windfall gain, would have a higher consumption response and hence a larger coefficient than would younger cohorts. If the wealth effect was driven by increases in house prices, we also would expect coefficients on house prices to be zero for renters.

For the second "collateral" or "credit constraint" channel, the expected signs on the coefficients are similar to those for the direct wealth effect. A rise in house prices that increases housing wealth increases the scope for mortgage equity withdrawal, implying that the coefficients on house prices or wealth variable would be positive for all homeowner cohorts and zero for renters. However, because older owners are more likely to own their houses outright or have considerably higher housing equity, they would be more likely to be less constrained in their ability to withdraw equity than the young. Thus, we would expect the coefficients for older households to be smaller than those for the young and middle-aged. Moreover, because the young are at an earlier stage in their life-cycle, they are more likely than middle-aged cohorts to face an income as well as a wealth constraint. If this is the case, they might be less able to respond to the relaxation of the collateral constraint and we might expect the coefficients for the young to be lower than those for the middle-aged homeowners.

The third channel, a common causal effect, implies that all households increase consumption in response to increases in housing wealth, with younger age groups exhibiting the largest response for the same reasons as given for the direct wealth effect. Further, if consumption is driven by a common causal factor then both homeowners and renters will benefit and both should increase their consumption.

Finally, it is important to emphasize that the LCM/PIH suggests that in the absence of borrowing constraints current consumption should respond only to unanticipated changes in wealth (Campbell and Cocco, 2007; Attanasio *et al*., 2009; Disney *et al*., 2010; Browning *et al*., 2013). Anticipated housing wealth movements, therefore, should only affect consumers if they are credit constrained and higher house prices relax borrowing constraints.

Table 1 summarizes evidence testing the consistency of the competing hypotheses that link household wealth and consumption. These tests entail examining the magnitude and significance of the coefficients on the "age defined

TABLE 1

Tests for Competing Hypotheses for Wealth Effects

	Individual Coefficients (1.1)	Pair-wise Comparisons (1.2)	Unanticipated Shocks (1.3)	Housing Tenure (1.4)
Direct wealth channel	$\theta_Y > 0;\ \theta_M > 0;\ \theta_O > 0$	$\theta_O > \theta_Y$	$\theta_A = 0;\ \theta_u > 0$	$\theta_{renter} \leq 0;\ \theta_{owner} \geq 0$
Collateral channel	$\theta_Y \geq 0;\ \theta_M \geq 0;\ \theta_O \geq 0$	$\theta_Y,\ \theta_M > \theta_O$	$\theta_A \geq 0;\ \theta_u > 0$	$\theta_{renter} \leq 0;\ \theta_{owner} \geq 0$
Common causal channel	$\theta_Y > 0;\ \theta_M > 0;\ \theta_O > 0$	$\theta_Y > \theta_O$	$\theta_A = 0;\ \theta_u > 0$	$\theta_{renter} \geq 0;\ \theta_{owner} \geq 0$

cohort–time–wealth" interaction terms; that is, on the θ's in equations (2) and (3). Of particular interest are the significance and sign of those coefficients, and any differences across cohorts.

4. Data and Descriptive Statistics

The empirical analysis uses household expenditure survey data from Australia and Canada before and after 2000 to assess the impact of housing wealth on consumption. It does not cover the period following the financial crises in the late 2000s.

Increases in real house prices in Australia and Canada in the early part of the 2000s were considerably greater than experienced previously. In neither country could these increases be explained by fundamentals (André, 2010), which suggests they were unanticipated. At the same time, both countries also experienced strong growth in consumption (Figure 1). Hiebert (2006) illustrates the close correlation between asset price inflation and declines in the saving rates for Australia and Canada (as well as for the U.S. and U.K.) for the period 1972 to 2002. Figures A.1 and A.2 in the online Appendix also show that trends in real house prices are similar in both countries.

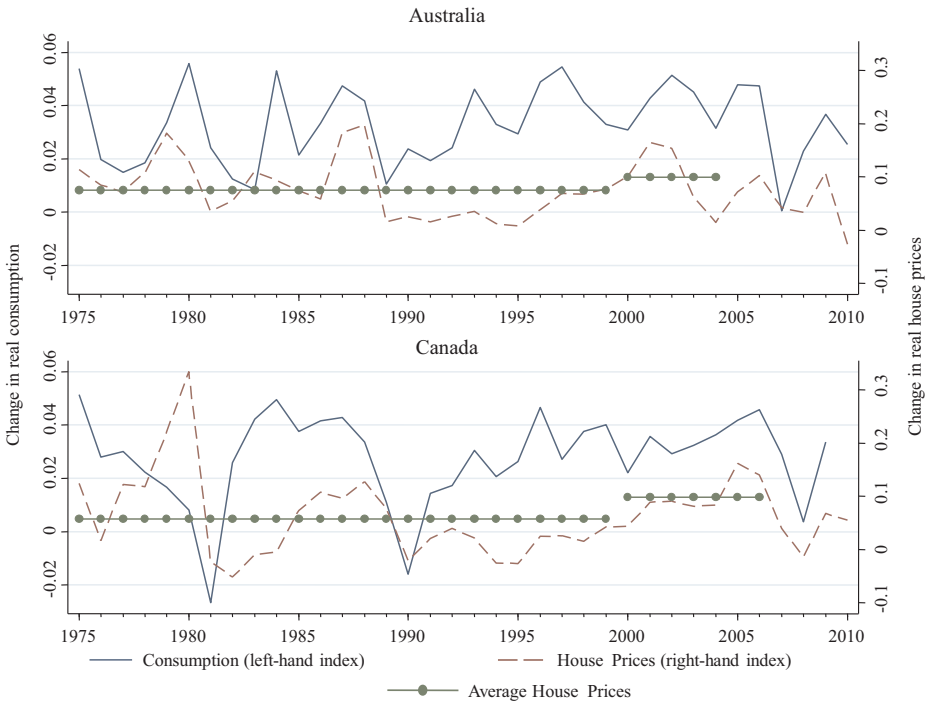

Figure 1. Annual Real House Price and Consumption Growth

Source: House Prices are from Federal Reserve Bank of Dallas international house price dataset. The dataset is described in Mack and Martínez-García (2011). Consumption data is from OECD statistics.

TABLE 2
SUMMARY STATISTICS

	Australia		Canada	
	2003–04	1975–98	2000–06	1969–99
Expenditure, $ 2002/pw				
Total expenditure	1160	851	860	778
Expenditure on goods and servicess exc. housing	710	654	672	618
Income, $ 2002/pw				
Household Disposable Income	865	777	980	892
Tenure status dummies				
Outright owner	0.35	0.40	0.29	0.29
Owner purchaser	0.35	0.30	0.39	0.35
Renter and other tenures	0.30	0.30	0.33	0.35
Loan to Value Ratio	0.52			
Demographics				
Single	0.28	0.26	0.23	0.20
Couple	0.60	0.62	0.65	0.62
Lone parent	0.06	0.06	0.08	0.05
Other	0.06	0.06	0.06	0.12
Household size	2.52	2.72	2.64	2.88
Kids present	0.35	0.39	0.34	0.40
Age of reference person (years)	49	47	47	47
Observations	6,919	32,227	92,186	114,942

For Australia, the data are from six Household Expenditure Surveys (HES) undertaken in 1975–76, 1984, 1988–89, 1993–94, 1998–99, and 2003–04. For Canada, the main data are from Family Expenditure surveys (FAMEX) in 1969, 1974, 1978, 1982, 1984, 1986, 1990, 1992, and 1996 and from the annual Survey of Household Spending (SHS) since 1997. For details of these surveys, see Barrett *et al*. (2013), which compares micro and macro measures of expenditure in Australia and Canada (and the U.K. and U.S.), to assess the reliability of expenditure survey data. They conclude that the surveys cover nearly 100 percent of expenditures in Canada and 60–75 percent in Australia, with no discernible change in coverage over time. This is in marked contrast to surveys in the U.K. and U.S. in which coverage has steadily declined.

Australian and Canadian survey data contain comprehensive information at the individual household level on household income, socio-demographic characteristics, housing and household expenditure. Where relevant, household characteristics are defined as those of the reference person for each household, chosen with selection criteria based on marital status and household structure, income, and age in that order. Table 2 reports the broadly similar descriptive statistics for the variables from these surveys. Additional details are in the online Appendix.

Cohorts are defined by the year of birth of the household reference person. As discussed in Section 3, the methodology requires the construction of a pseudo-panel from repeated cross-sections (Deaton, 1985). In the empirical analysis the data are "stacked" and each household assigned to a five-year birth cohort. Those born before 1915 are put in cohort 1, those born 1915–20 in cohort 2, and so on. In the surveys where age is recorded using five-year bands, individuals are assumed

to be the median age of their band. There are 14 birth cohorts in both countries, starting from 1905 (1895) in Australia (Canada) and ending in 1984 (1979). Relevant variables for each "year of birth cohort" are then followed over time through the use of repeated cross-sectional surveys. Consumption is measured in this study by total expenditure on goods and services excluding current housing costs,[4] and is valued at 2002 prices using the consumer price index for each country.

One distinct advantage of the Australian surveys over those in many other countries is the availability of self-reported data on housing and wealth at an individual household level. Measures of self-reported housing wealth from the 2003–04 survey in Australia are used to determine the post-2000 impact of house price changes on household consumption.[5] In the Canadian surveys, self-reported house prices are available before 1997 and sale prices are available post-1997.[6]

Because they may be contaminated by measurement error, there may be problems from using self-reported house values.[7] Nevertheless, using an owner's estimate of their housing wealth has the strong advantage of providing a better indication of their perceived housing wealth and of the size of any shock to it than an externally determined, aggregate measure which might suffer less from survey measurement error but more from omitting heterogeneous information.

To address potential problems from using self-reported house values, we estimate additional specifications based on aggregate house price data for robustness checks and for comparison with similar studies. These additional specifications are similar to those in the U.K. studies of Attanasio *et al.* (2009) and Campbell and Cocco (2007). For Australia we use the Australian Bureau of Statistics' regional quarterly house price index (HPI), and for Canada we use the Teranet–National Bank of Canada (2012) composite price index. Both provide cross-section as well as time variation.

5. Results and Discussion

We describe in more detail the precise specifications estimated and present the results in Sections 5.1 to 5.4. We interpret and discuss these results in Section 5.5.

5.1. *Baseline Specification*

For both countries, the baseline specification (1) models consumption as a function of time, year-of-birth cohort effects and observable variables, yielding the well-known "inverted U" pattern of consumption over the life-cycle. In this

[4]Estimates using a broader measure including housing costs and a narrower measure excluding expenditure on durables have also been undertaken. The results are similar and reported in the working paper version of the paper (Atalay *et al.*, 2013).

[5]Where a measure of real house price levels is required for renters, an estimate is imputed by regressing self-reported house values for homeowners on a series of indicator variables including state and house characteristics.

[6]Details on the adjustments made to generate these data for post-1997 surveys in Canada are provided in the online Appendix.

[7]Kiel and Zabel (1999) found that Americans overestimated house values by around 5 percent but that these measurement errors were not systematically related to household or housing characteristics. Melser (2013) found that Australian households overestimated the value of owner-occupied housing by a lower amount of 2.5 percent.

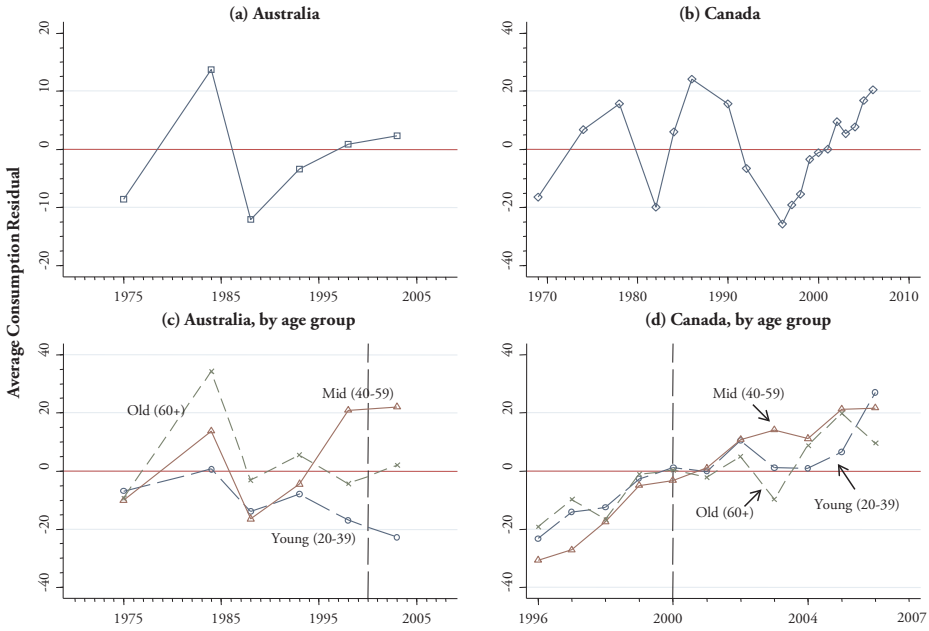

Figure 2. Gap between Predicted and Actual Levels of Consumption by Age Group

reduced form equation (equivalent to those in other studies such as Attanasio *et al.*, 2009), the deterministic part of income and wealth is captured by the constant and cohort dummies and only innovations to life-cycle income and transitory shocks to current income are part of the residuals. For robustness, we estimated some specifications including income, which did not affect our findings.

Results from baseline specification are shown in Figures A.3 and A.4 and reported in column (1) of Tables A.2 and A.3 in the online Appendix. The coefficients on controls that proxy for the household life-cycle, preferences, and other considerations are consistent with *a priori* expectations. For example, expenditure increases with household size and, reflecting a general increase in real household incomes over time, cohort coefficients indicate successively higher spending by younger cohorts.

Figure 2 shows the average difference between actual and predicted consumption from specification (1) for Australia and Canada in each survey year. In both countries following the mid-1990s dip, these residuals become positive as actual exceeds predicted consumption. During the mid-2000s this gap tends to be largest for the middle-aged and lowest for the young in each country. The residuals for older households generally lie between those of the young and middle-aged cohorts.

The extended specifications assessing these apparent differences are presented below.

5.2. *Extended Specifications with Alternative House Price Measures*

The specifications used in this sub-section are all based on equation (3) above and include terms which interact the age-defined cohort dummies with a house

price or housing wealth variable. Estimated coefficients for key variables are presented in Table 3, along with the implied marginal propensity to consume (MPC) out of housing wealth. Detailed results are reported in Tables A.2 to A.6 in the online Appendix.

The first specification estimated (column (3.1) in Table 3) employs changes in aggregate regional house price indices and replicates the approach of Attanasio *et al.* (2009) using Australian and Canadian data. The results from specification (3.1) show that the largest effect belongs to the middle-aged cohorts for Australia and Canada and that the implied MPC for this cohort approximately equals 0.03 in both countries. The implications of these estimates for assessing wealth-consumption transmission channels are discussed in Section 5.5 after all of the results are presented.

Our second specification (column (3.2) of Table 3) repeats the specification in column (3.1) but uses self-reported house values in place of aggregate regional price data. Given the possibility of significant within-region variation in house prices, individual house values plausibly provide a better proxy for the lifetime resources of each household than an aggregate index. The results from specification (3.2) follow the same pattern as those from (3.1), with the largest effect of a change in real house prices belonging to the middle-aged cohorts for both Australia and Canada.

Specifications reported in columns (3.3) and (3.4) of Table 3 address potential limitations from using self-reported house values and the possibility that individual house values may be endogenous to consumption.[8] First regional level average house prices are generated using self-reported house prices. Second, we instrument these constructed variables using regional level house prices index changes as instruments. These specifications, using house price variables that utilize the valuable information contained in self-reported prices, are less likely to be influenced by measurement error, imputation, and endogeneity problems while allowing us to assess the robustness of our estimates. The results are reported, respectively, in columns (3.3) and (3.4) of Table 3. They reinforce the findings reported in columns (3.1) and (3.2) that the largest response to changes in house prices and housing wealth is exhibited by middle-aged households.

Due to data limitations, the final set of specifications is estimated only for Australia. In these, we use wealth data at an individual household level in the final two Australian HES. A distinguishing characteristic of these specifications is their use of the theoretically preferred measures of net household wealth rather than gross household wealth or house prices as a proxy for housing wealth. These are reported in columns (3.5) to (3.8) in Table 3 and replace the various house price variables employed in the specifications reported in columns (3.2) to (3.4) with self-reported net housing wealth. Those reported in columns (3.6) and (3.7) include controls, respectively, for income and financial wealth, as a robustness check for alternative specifications as in Campbell and Cocco (2007).

[8]Endogeneity may arise if, for example, households reduce consumption to purchase additional housing or consider some forms of purchases (e.g., durables such as household appliances of furniture) as increasing the value of their homes.

TABLE 3

EFFECT OF HOUSE PRICES OR HOUSING WEALTH ON HOUSEHOLD CONSUMPTION

	House Price Index (3.1)		Self Reported House Value (3.2)		Regional SRHouse Price (3.3)		Instrumented SR House Price (3.4)	
	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC
Australia								
[2003/4]*[% change in House Price Index]								
*Young	0.96 [0.63]	0.015						
*Middle	2.08*** [0.55]	0.032						
*Old	1.08* [0.55]	0.017						
[2003/4]*[Real house price level]								
*Young			11.35** [4.39]	0.006	3.77 [4.49]	0.002	6.67 [5.20]	0.003
*Middle			32.79*** [4.49]	0.017	17.76*** [4.09]	0.009	18.92*** [4.51]	0.010
*Old			17.64*** [3.54]	0.010	9.12** [4.10]	0.005	9.54 [4.51]	0.005
Canada								
[2000–6]*[% change in House Price Index]								
*Young	0.87*** [0.20]	0.025						
*Middle	1.11*** [0.18]	0.031						
*Old	0.28 [0.21]	0.008						
[2000–6]*[Real house price level]								
*Young			35.43*** [2.87]	0.018	29.50*** [2.15]	0.015	34.26*** [2.56]	0.018
*Middle			44.67*** [2.36]	0.023	37.77*** [1.46]	0.019	38.98*** [1.73]	0.020
*Old			23.62*** [3.21]	0.012	16.80*** [2.17]	0.009	12.07*** [2.57]	0.006

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. Robust standard errors are reported in brackets. Full results are reported in the on-line appendix in Tables A2 and A3.

Australia								
	SR Housing Wealth						SR Non-Housing Wealth	
	(3.5)		(3.6)		(3.7)		(3.8)	
	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC
[2003/4]*[Real net housing wealth]								
Young	8.77 [5.33]	0.004	−5.99 [5.06]	0.003	−0.18 [5.51]	0	13.49** [5.15]	0.007
Middle	35.67*** [5.24]	0.019	17.25*** [4.53]	0.009	22.53*** [5.20]	0.012	24.06*** [4.01]	0.013
Old	18.29*** [5.60]	0.010	7.42** [3.49]	0.004	5.11 [3.85]	0.003	11.00*** [2.53]	0.006
Additional controls: income			X					
Financial wealth					X			

Notes: ***p < 0.01, **p < 0.05, *p < 0.1 This specification uses the self reported net house wealth for the owners and imputed house prices derived from self reported house value. Full results are reported in the Appendix Tables A2. Robust standard errors are reported in brackets.

Despite the different measures employed, the results reported in column (3.5) are similar to those in columns (3.1) to (3.4) insofar as higher net housing wealth is associated with higher consumption. The coefficients on the interaction terms in column (3.5) indicate that, *ceteris paribus*, a $100,000 increase in housing net wealth in 2003–04 is associated with an annual increase in consumption of $1,855 for households in the middle-aged cohort, implying an annual MPC out of housing wealth of 0.019.

Including additional controls in columns (3.6) and (3.7) lowers the estimated effect of a change in net housing wealth but the patterns reported earlier persist. The last column in Table 3 uses non-housing wealth. Interacting this measure with age suggests, like earlier results, that the largest effect is on the middle-aged and is significantly larger than for older and younger cohorts.

5.3. *Extended Specifications with Controls for Tenure Status*

The specifications in Table 4 explore whether tenure affects consumption when controlling for changes in the various measures of house prices. The results show the effect of interacting age, tenure status, and house price level terms with a dummy variable for tenure status in 2000.[9] With this specification it is possible to compare the behavior of households of different ages and tenure relative to baseline patterns. One issue in interpreting results relates to issues of sample selection and endogeneity. In any given cohort some renters will change tenure status over time. In this sense, tenure status is not exogenous and observed behavioral changes are likely to be endogenous. Nonetheless, the approach represents a useful means by which to validate earlier results.

The specification in column (4.1) splits the sample by tenure status which is interacted with real house prices (imputed for renters). In both countries, the coefficient for home ownership is large, positive, and significant and that for renters either negative and significant or insignificant. Column (4.2) reports results from interacting tenure dummies with cohort dummies and, respectively, house prices. In Australia, the coefficients for each age-defined homeowner cohort are positive and significant. For all renter cohorts they are either negative or insignificant. For Canada, all age-defined homeowner cohorts also have positive and significant coefficients. Those for renter cohorts are mixed. Young renters have a positive, significant coefficient; middle aged renters have coefficients that are negative and significant; and older renters have an insignificant coefficient. These results also arise in column (4.4) where self-reported house prices were replaced with the same instrumented variable used in Table 3.

For Australia, an additional specification, reported in column (4.3), controls for loan to value (LTV) ratios for homeowners. Estimates indicate that households with higher LTV report higher consumption, *ceteris paribus*.

[9]Appendix Tables A5 and A6 present specifications that interact the (age group · tenure) terms with a dummy variable for tenure in the 2000s while excluding the house price interaction term. This specification allows a comparison of the 2000s consumption of households of different ages and tenure status relative to their baseline patterns. Results are consistent with those in Table 4.

TABLE 4

EFFECT OF A CHANGE IN HOUSE PRICES ON HOUSEHOLD CONSUMPTION BY TENURE

	Self Reported House Value						Instrumented HP	
	(4.1)		(4.2)		(4.3)		(4.4)	
	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC	Coef. [se]	MPC
Australia								
[Year>=2000][Real house price level]*								
*Home Owner	27.37*** [3.02]	0.014						
*Renter	1.24 [4.42]	0.001						
[Year>=2000][Real house price level]*Owner*								
*Young			15.31*** [5.39]	0.008	21.83*** [6.64]	0.011	6.77 [6.52]	0.004
*Middle			37.62*** [4.89]	0.020	43.20*** [6.06]	0.022	24.31*** [5.01]	0.013
*Old			19.28*** [3.72]	0.010	20.13*** [3.77]	0.01	13.26*** [4.92]	0.007
[Year>=2000][Real house price level]*Renter*								
*Young			4.26 [6.06]	0.002	4.21 [6.07]	0.002	4.71 [6.77]	0.002
*Middle			1.4 [7.45]	0.001	1.25 [7.45]	0.001	−1.25 [6.75]	−0.001
*Old			−16.42** [9.06]	−0.009	−16.64** [7.07]	−0.009	−12.48* [6.60]	−0.006
Loan to Value Ratios								
[2003/4]*[LTV ratio 0 to <50%]					−72.22* [53.32]			
[2003/4]*[LTV ratio 50 to 80%]					−25.41 [23.32]			
[2003/4]*[LTV ratio 80% +]					38.7 [30.46]			
Canada								
[Year>=2000][Real house price level]*								
*Home Owner	60.77*** [2.06]	0.032						
*Renter	−4.21** [1.98]	−0.002						
[Year>=2000][Real house price level]*Owner*								
*Young			53.58*** [3.50]	0.028			46.94*** [3.76]	0.024
*Middle			73.14*** [2.68]	0.038			66.64*** [2.89]	0.035
*Old			37.55*** [3.68]	0.020			23.03*** [3.85]	0.012
[Year>=2000][Real house price level]*Renter*								
*Young			11.80*** [3.09]	0.006			9.17** [3.68]	0.005
*Middle			−18.42*** [2.72]	−0.010			−29.47*** [3.47]	−0.015
*Old			−0.93 [3.44]	0.000			−4.13 [3.90]	−0.002
*Old								

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. Full results are reported in the Appendix Tables A4–A5. Real house prices are defined from reported house values; used for columns 1, 2 (and 3 for Australia). Instrumented House Values are used for column 4.

TABLE 5
Effect of Anticipated and Unanticiapated Level of House Prices

	Australia		Canada	
	Coef. [se]	MPC	Coef. [se]	MPC
Anticipated: young	7.22 [15.38]	0.004	29.40*** [3.12]	0.015
Anticipated: middle	2.78 [14.35]	0.001	37.17*** [2.41]	0.019
Anticipated: old	8.88 [14.67]	0.005	15.96*** [3.26]	0.008
Unanticipated: young	–0.20 [16.04]	0.000	63.88** [23.75]	0.033
Unanticipated: middle	34.18** [15.89]	0.018	100.52*** [21.96]	0.052
Unanticipated: old	8.99 [16.29]	0.005	42.63 [27.99]	0.022

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. Robust standard errors are in brackets.

5.4. *Extended Specifications with Anticipated and Unanticipated House Price Effects*

The final set of estimates in Table 5 address whether anticipated or unanticipated changes in house prices (and housing wealth) better explain changes in consumption. In this set of specifications, we follow Attanasio *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. 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 *et al*., 2009; Disney *et al*., 2010; Browning *et al*., 2013). Anticipated housing wealth movements, therefore, should only affect consumers if they are credit constrained and higher house prices relax borrowing constraints.

Table 5 presents the interaction terms between age groups and both anticipated and unanticipated components of house prices. For Australia, the anticipated changes have no impact on consumption and unanticipated changes are significant and positive only for the middle-aged. For Canada, both anticipated and unanticipated changes are largest for the middle-aged but are positive and significant for all households. These results are similar to those in Table 3. 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; consumption growth in the 2000s in both countries is mainly driven by middle-aged households.

5.5. *Interpretation and Discussion of Empirical Results*

The results on the coefficients, θ_Y, θ_M and θ_O, of the interaction terms reported in Tables 3 to 5 provide evidence on which of the three transmission mechanisms link consumption with house prices or wealth using Australian and Canadian data. To distinguish among transmission channels, we test whether these interaction term coefficients are significantly different and consistent with our *a priori* expectations on their sign and relative size outlined in Table 1. We do this by supplementing the *t* tests reported in Tables 3 to 5 with a series of *F* tests under-

taken on pair-wise comparisons of the θ_Y, θ_M and θ_O coefficients and a joint test of significance on all coefficients. Table 6 summarizes these individual, pair-wise, and joint tests, with the final row for each country providing the implications of these tests for the various transmission channels of housing wealth.

Consider, for example, the statistical tests of the coefficients in column (6.1). These apply to the results presented in Table 3 which report on the specification based on interaction of age-cohort dummies and real house price levels after 2000. The first test for each country summarizes the significance results already reported for each of the coefficients in Table 3. For both countries, the coefficients on the young, middle-aged, and older cohorts are all positive and statistically significant ($\theta_Y > 0$, $\theta_M > 0$, $\theta_O > 0$). Pair-wise comparisons of the coefficients indicate that, for both countries, the middle-aged group has a coefficient that is larger than that for the young and the older aged group ($\theta_M > \theta_O$, $\theta_M > \theta_Y$). For Australia, the coefficients for the young and the older aged groups are not statistically different ($\theta_O \approx \theta_Y$) whereas for Canada, that for the young is statistically larger than that for the old ($\theta_Y > \theta_O$).

The evidence in column (6.1), for example, is not consistent with a direct wealth effect in either country. If the link between housing wealth and consumption were driven by a direct wealth effect, then the individual coefficients on the house price/wealth variables should be positive and significant for all age cohorts which is contradicted by column (1.1) in Table 1. They should also be greatest for the older cohort (that is, $\theta_O > \theta_Y$, θ_M) as indicated in column (1.2), but the pair-wise tests summarized in column (6.1) indicate that the coefficient on the middle-aged cohort wealth interaction term is greater than for the old and young ones. Thus, these pair-wise tests for Australia and Canada are inconsistent with a direct wealth effect explaining the relationship between housing wealth and consumption.

Similar reasoning can be applied when considering if the increase in consumption accompanying an increase in housing wealth were driven by a common causal factor. The first condition is similar to that outlined above, namely a requirement that the coefficients on the wealth variables/proxies in all age cohorts are positive and significant. Further, the increase in lifetime incomes, and hence consumption should be largest for younger households ($\theta_Y > \theta_O$). The statistical tests summarized in column (6.1) are inconsistent with this pattern for Australia, but are consistent for Canada.

Finally, the evidence in column (6.1) indicates a housing collateral effect in both countries. As required by the tests outlined in Table 1, the individual coefficients on the interaction terms are non-negative for all age cohorts and are jointly significant. The pair-wise comparisons indicate a greater response for the young and middle-aged groups than for the old.

The second column of Table 6 summarizes the findings when the impact of house prices is allowed to vary by tenure status. The results of these specifications were reported in Table 4. For both countries homeowners' response is significantly positive while that of renters is insignificant. Further, the pair-wise tests indicate that the coefficient on the homeowner middle cohort interaction term is greater than that for the older and younger homeowners in both countries. For Australia, the coefficients for the young and old are not statistically different whereas for Canada, that for the young is statistically larger than that for the old. This

TABLE 6

Summary of Results

Specifications	(6.1) Table 3 (3.1)–(3.8) Age Group * House Price /Wealth	(6.2) Table 4 (4.1)–(4.4) Age Group* Tenure Status * House Price /Wealth	(6.3) Table 5 Anticipated/Unanticapated
	Consistency of results with alternative transmission mechanisms		
Australia			
Individual	Y > 0, M > 0, O > 0	Owners: Y, M, O > 0, Renters: Y ≈ 0, M ≈ 0, O < 0	Anticipated: Y, M, O ≈ 0; Unanticipated: MO, Y, O ≈ O
Pairwise	M > O, M > Y, O ≈ Y	Owners: M > Y, M > O, O ≈ Y, Renters: Y > O, M > O, M ≈ Y	Anticipated: Y ≈ M ≈ O; Unanticipated: M > Y, M > O, O ≈ Y
Joint test	>0	Owners: >0, Renters: ≈0	Anticipated ≈ 0; Unanticipated > 0
Consistency of results with alternative transmission mechanisms	Collateral	Direct Wealth, Collateral	Collateral
Canada			
Individual	Y > 0, M > 0, O > 0	Owners: Y, M, 0 > 0, Renters: Y > 0, M < 0, O < 0	Anticipated: Y, M, O > 0; Unanticipated: Y, M, O > 0
Pairwise	M > O, M > Y, Y > O	Owners: M > Y, M > O, Y > O, Renters: Y > O, Y > M, M ≈ O	Anticipated: M > Y, M > O, Y > O; Unanticipated: M ≈ Y, M > O, O ≈ Y
Joint test	>0	Owners: >0, Renters: ≈0	Anticipated > 0; Unanticipated > 0
Consistency of results with alternative transmission mechanisms	Common Cause, Colleteral	Direct Wealth, Collateral	Collateral

Notes: All tests are applied at the 5 per cent level of significance. The basis on which competing hypotheses are assessed is summarized in Table 1.

evidence is inconsistent with the common causal explanation which implies that consumption should be affected regardless of tenure status. The tests presented in column (6.2) clearly show that this is not the case: only the response for owners is significant. The results summarized in column (6.2) are consistent with both wealth and collateral effects driving the relationship between house prices, housing wealth, and consumption. Nonetheless, the evidence is more supportive of a collateral effect. Coefficients for older home-owning households are less than those for middle-aged homeowners in both countries and also less than younger homeowners in Canada. 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 if the wealth effect were the main driver. On the other hand, young and especially middle-aged homeowner cohorts are more likely to be collateral constrained. Consistent with collateral channel, we observe a bigger response in these cohorts.

Additional evidence favoring the collateral or credit constraint hypothesis is provided in column (6.3) of Table 6, where the specifications reported in Table 5 include anticipated and unanticipated increases in house prices and are summarized. These show that, for Canada at least, consumption responds to anticipated increases in house prices. The young and middle-aged are more likely to be credit constrained and take the opportunity to borrow against any increase in house prices to finance higher consumption.

The regression results clearly provide evidence inconsistent with either the direct wealth or common causal explanations. Rather, the source of the transmission mechanism most consistent with the observed relationship between house price and consumption behavior is associated with the relaxation of credit constraints arising from increased housing wealth.[10] In particular, in Australia and Canada the consumption of middle-aged homeowners seems most responsive to increases in household wealth, especially house prices. Such a pattern is consistent with higher house price relaxing credit constraints and thereby financing higher consumption. This evidence of a housing collateral effect is consistent with patterns of equity withdrawal in Australia and other countries. Schwartz *et al*. (2008) find that middle-aged households in Australia are more likely to withdraw equity from their housing wealth by increasing mortgage debt. Wood and Nygaard (2010), using a shorter run but true panel dataset, find wealth effects and credit constraints were the most important drivers of equity withdrawal in Australia in 2002 and 2003. They also point to the extent to which binding income constraints limit the extent to which young households are able to withdraw equity. Windsor *et al*. (2013) also provide support for collateral mechanisms in Australia. The importance of increased house prices in relaxing credit constraints and inducing higher consumption expenditure has also been identified in recent analysis in the U.K. and the U.S. Aron *et al*. (2012) use aggregate data and show that accounting for changes in the availability of credit reduces the estimated wealth elasticizes for the U.K. and the U.S. Hurst and Stafford (2004) show that consumption is much

[10]Our empirical approach does not directly identify credit constrained households (Hurst and Stafford, 2004) but it does test some implications of the housing collateral channel for the relative impact of housing wealth on the consumption of households with different ages and tenures.

more sensitive to housing wealth among Americans that are most apt to be credit constrained. Similarly, Disney *et al*. (2009) find that increases in house prices in the U.K. allowed borrowing constrained households to refinance and substitute secured debt for more costly unsecured debt. For Denmark, Browning *et al*. (2013) find evidence of collateral constraints and argue that house prices affect total expenditure through this channel.

6. Conclusion

This paper provides new evidence about the relationship between house prices and consumption in Australia and Canada. The analysis distinguishes between the alternative transmission channels that have been hypothesized to link housing wealth and consumption. Unlike earlier studies that have used repeated cross-sections to define pseudo-cohorts, an important feature of the data we use is detailed information of self-reported house prices and household assets and liabilities. While this information obviated the need to rely solely on aggregate or regional level house price indexes, analysis using aggregated measures of house prices was also undertaken.

In general, empirical evidence using both individual level and aggregate measures of wealth does not support the direct wealth or common causal hypotheses for the observed correlation between household wealth and consumption. Rather, the evidence is consistent with a credit constraint or collateral channel. It is important to stress that the approach adopted in this paper does not invalidate the use of aggregate house price data used elsewhere; rather the analysis using regional or individual information on house prices is consistent across specifications.

The analysis in this paper is consistent with recent studies from the U.K. and the U.S. which also find that the relaxation of collateral constraints is the key channel accounting for the link between housing wealth and consumption. An important feature of the transmission mechanism identified in those studies is the potential for house price increases to allow the credit constrained to substitute secured for unsecured debt. While the effect of increased housing wealth on overall consumption is likely to be more muted by allowing for this possibility, it remains the case that aggregate increases in housing wealth induce an aggregate consumption response.

The analysis in this paper might be extended in several ways. First, the empirical importance of the credit channel for consumption needs to be investigated further. A starting point could be examining the role of external financing in household consumption. Foremost, it would be useful to assess how consumption changes in response to the recent decrease in housing prices. The decline in house prices in Australia and Canada does not appear to have been as severe or as pronounced as that for other countries such as the U.K. and the U.S. Rather, recent evidence suggests that house prices in these countries, especially Australia, continue to increase, at least relative to other countries. Moreover, this change appears to be driven by fundamentals related to migration and real income growth. In this setting, continued increases in house prices might not be unanticipated. Analysis of consumption in this setting may prove useful to understanding more fully the consumption–wealth relationship.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix Figure 1: House Price Indices: Australia and Canada
Appendix Figure 2: Trends in Expenditure to Income and House Price to Income
Appendix Figure 3: Equivalised expenditure on goods and services (excluding housing) by age and year of survey
Appendix Figure 4: Equivalised expenditure on goods and services (excluding housing) by cohort and age
Appendix Table A1: Selected empirical results
Appendix Table A2: Regression Results for Australia—Table 3
Appendix Table A3: Regression Results for Canada—Table 3
Appendix Table A4: Regression Results for Australia—Table 4
Appendix Table A5: Regression Results for Canada—Table 4
Appendix Table A6: Regression Results for—Table 5