

16 October 2008

House Price Shocks, Negative Equity and Household Consumption in the United Kingdom

by

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Abstract

We examine the impact of unanticipated housing capital gains on consumption behaviour using data from the British Household Panel Survey and county-level house price data. We condition the models on household financial expectations and on household real financial capital gains imputed from the Family Resources Survey. We find a marginal propensity to consume out of unanticipated shocks to housing wealth of 0.01. Omitting the measure of financial expectations biases the results upwards. We find little evidence of heterogeneity in responses of young and old homeowners, but differences between owners and renters. We also find asymmetric behaviour between house price rises and falls, and a disproportionate impact on saving if the household had negative housing equity at the start of the period.

Keywords: Saving Housing Wealth Negative Equity

JEL Classification: D91 E21 R31

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This research was supported by the Economic and Social Research Council funding, grant R000223349. Thanks to David Jevons for invaluable research assistance at an earlier stage of this paper, and to Martin Browning, to participants in an Applied Microeconomics Seminar at University College London, a seminar at the Bank of Sweden, at Watson Wyatt, at the Royal Economic Society Annual Conference, the ESEM meetings in Venice and at a Finance and Consumption Workshop at EUI Florence for comments. The data used in this paper were made available through the UK Data Archive. The British Household Panel Survey data were originally collected by the Institute for Social and Economic Research at the University of Essex, funded by the ESRC.

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1. Introduction

This paper examines the impact on household consumption of shocks to the value of household housing wealth in the United Kingdom (UK) between 1994 and 2003. It uses panel data on individual households from the British Household Panel Survey, but incorporates matched county-level house price data and also household real financial capital gains imputed from the Family Resources Survey. The use of household panel data, as well as the use of highly disaggregated house price data and imputed capital gains on financial assets, differentiates the study from other UK studies on this topic. However, the paper also differs from studies of the United States (US) housing market (and indeed from studies of the UK) in incorporating self-reported changes in financial expectations to control for expected changes in income. This is because expectations are often cited as a key ‘omitted variable’ in the relationship between house prices and consumption. In common with other recent UK studies, we examine heterogeneity in responses between old and young homeowners and renters.¹ But in contrast to those studies we also examine asymmetries in the response to house price gains and losses, and in particular also the response of households with negative housing equity.

The pattern of house price growth and consumer spending in the UK over the last 35 years is illustrated in Figure 1. Aggregate consumption growth closely tracks the housing market ‘cycles’ of the early seventies, eighties and nineties, although the link is less clear cut since 2000. Over the longer time frame, the UK is not alone in its experience: Case, Quigley and Shiller (2005) finds strong correlations between aggregate house prices and aggregate consumption across a panel of developed countries since 1975. For example, as the ratio of average housing wealth to personal disposable income in the US rose from 145% in 1998 to 210% in 2007, the personal saving rate fell from 4% to –1% and rate of withdrawal of housing equity rose from 2% of GDP to 10% of GDP (Congressional Budget Office, 1997, Figure 2). The observed correlation between changes in house prices and changes in aggregate

¹ See Attanasio and Weber (1994), Attanasio *et al* (2008), Campbell and Cocco (2007) and Disney, Bridges and Gathergood (2008).

consumption and saving has led many to argue that house price changes have a significant impact upon consumption at the household level either through life-cycle wealth effects (for example, Skinner, 1994) or else through collateral effects, whereby house price rises relax borrowing constraints imposed by lenders (Aoki *et al*, 2004, Iacoviello, 2004).

The argument made by the Congressional Budget Office (2007) is representative of those that believe house price changes influence household consumption spending through wealth effects, and provides an estimate of the magnitude of that effect:

“Most analysts believe that an increase in home values permanently increases consumer spending in every subsequent year by some fraction of that rise in value – the so-called wealth effect. An increase in the housing wealth of households reduces the need for homeowners to save for the future, allowing them to spend more than they would otherwise have spent.

...[with] moderate declines in house prices, for each dollar by which the increase in housing wealth falls short of the increase needed to keep the ratio of housing wealth to income constant, consumers will trim their outlays by between 2 and 7 cents per year from what they otherwise would have spent.” [p.1]

A recent study which is close in spirit to that of the present paper, by Campbell and Cocco (2007), examines changes in UK household consumption in response to house price changes using a pseudo-panel created from the Family Expenditure Survey together with changes in county level house prices in order to estimate the effect of house prices changes on consumption for both regional and homeownership cohorts. They find large effects of housing wealth on consumption behaviour. But these effects are heterogeneous across old and young households who are ‘long’ and ‘short’ in their lifetime holdings of housing wealth respectively, with an estimated elasticity of house prices to consumption as high as 1.7 for the older group, implying a marginal propensity to consumer out of housing wealth at the average housing wealth-income ratio of close to 0.1. Nevertheless, their calculated elasticity is significantly lower in specifications that attempt to measure house price ‘shocks’, as we do here, rather than pure changes.

However, the view that changes in housing wealth induces large measurable changes in consumption spending and in saving rates has not met with universal

agreement. Buitert (2008) has recently forcibly argued that housing wealth should not simply be treated as ‘another asset’ in the household balance sheet. Housing is both an investment good and a consumption good (Henderson and Ioannides, 1986, 1987) and households pay or impute rent as well as earning a ‘return’ on their housing asset. Under certain variants of the efficient market hypothesis there is *on average* no pure wealth effect of a change in house prices, although there will be short run effects arising from speculative ‘bubbles’, from redistribution effects between households who are ‘long’ and ‘short’ in housing and from any role of liquidity constraints or collateral constraints whereby holdings of secured assets permit households to increase their borrowing capacity.² And, as Carroll, Otsuka and Slacalek (2006) argue, *associations* between housing wealth, consumption and saving, especially in macroeconomic data, may simply reflect omitted variables. Indeed according to these authors there is no evidence of long-run cointegrated vectors between these key macroeconomic variables.

This scepticism as to the strength of the housing wealth-consumption/saving effect is reinforced by some studies using household data. Attanasio *et al* (1994, 2008) demonstrate for UK data that, while older households are the main beneficiaries from house price gains, consumption growth among young *renters* as well as young homeowners also responds positively to house price changes. They infer from this finding that both house prices and consumer spending could be co-determined by income expectations. This casts doubt on the strength of the housing wealth-consumption link from a life-cycle perspective; moreover, from such a perspective, *anticipated* gains in housing wealth should have no impact on the forward-looking consumer. It has therefore become fashionable to attribute any causal link between house price changes and consumption to other factors such as unwinding buffer-stock saving or collateral effects, whereby higher house prices allow households to unbind borrowing constraints. However, Disney, Bridges and Gathergood (2008) cast doubt on the relationship between changing housing wealth and buffer-stock saving, finding no evidence that positive housing wealth gains lead UK households to reduce accumulated financial assets. They also suggest that, while house price changes do indeed have a disproportionately strong effect on the consumption of households with

² Of course, the assumptions required to consider the housing market an ‘efficient market’ may be rather steep: see Farlow (2005).

high loan-to-value ratios in housing, the proportion of such households in the UK is low, leading to a small aggregate effect.

This brief summary suggests that the debate on the link between housing wealth and household consumption and saving rates is far from resolved. The issue has of course gained renewed interest given the sharp reversal of the long boom in house prices in several OECD countries (and notably the US and the UK) after 2006 and the associated turbulence in financial markets. Although household data are not yet available that can capture the recent period (at least, for the UK), our dataset allows us to go back to the end of the last downturn in UK house prices, which occurred at the beginning of the 1990s, and examine household behaviour among a considerable sub-set of households with ‘negative equity’. All this, in our view justifies a new study of the issue, but with new variables and new results.

The starting point of the present study is the life-cycle model in which only unanticipated or ‘surprise’ increases in the value of housing wealth lead to increases in consumption and reductions in saving. Unlike previous UK studies, we use a panel data to observe household-specific changes in spending (as derived from reported saving behaviour). We use these data to back out an estimate of a marginal propensity to consume (MPC) out of house price surprises over the period 1994-2003. Our central result is the finding of an average MPC out of unanticipated gains in housing wealth of around 0.01. This MPC is lower than previous estimates based on US household data and recent UK estimates, and at the lower bound of recent short run estimates from US aggregate data. The difference from other studies most probably arises from our inclusion of household financial expectations and imputed gains (losses) on financial wealth in our estimating equation, as well as our distinction between anticipated and unanticipated changes in housing wealth. The importance of financial expectations is consistent with the hypothesis advanced by Attanasio *et al* (1994, 2008). As we measure changes in household spending through movements in household savings rates, our estimates do not capture any additional effect arising from unbinding restrictions on spending arising from collateral constraints, but we have measured this effect elsewhere, as described previously.

We also present novel findings relative to the previous literature. First we examine the argument that consumption responses to house price shocks are asymmetric, suggested by both Engelhardt (1996) and Skinner (1989, 1994) in their

analyses of US data but not previously explored in UK data. Whereas US studies find consumption impacts of house price changes are stronger when house prices are falling, we find no evidence of a significant asymmetry in the response to surprise gains and losses. However, we do find a strong asymmetry in the response for households in ‘negative equity’ – households in negative equity experiencing a surprise gain exhibit a consumption response five times stronger than households that had initially positive equity values in their housing stock. One straightforward interpretation of this last result is that negative equity induces precautionary saving so that house price inflation that lifts households out of negative equity induces a disproportionately large consumption response; another is that liquidity or collateral constraints limit spending among households with negative net wealth. We cannot differentiate between these ‘stories’ on the basis of the evidence presented here.

The plan of the remainder of the paper is as follows. Section 2 briefly reviews and discusses the existing literature. Section 3 provides a simple model of household housing and consumption over the life cycle to motivate the econometric results. Section 4 describes the data sets, and how we utilise them. Section 5 describes the econometric procedure and the main results. Section 6 concludes.

2. Previous literature on wealth effects

Issues that arose in an earlier debate in the United Kingdom literature as to whether house price increases fuelled consumption booms in the economy (Muellbauer and Murphy, 1990; Attanasio and Weber, 1994) resurfaced in the midst of the housing market boom that occurred in the decade from the mid-1990s to the mid-2000s (Attanasio *et al* 2005, Campbell and Cocco, 2006, Aron, Muellbauer and Murphy 2006). The increased return on both financial and housing wealth in the late 1990s may explain why the UK household saving ratio declined from around 10% in the mid-1990s to less than 4% of post-tax income by mid-2000 (Davey, 2001) and just over 1% by the end of 2007. Of greater pertinence in the current climate, however, is the experience of the late 1980s and early 1990s in the UK when falling house prices were associated with depressed economic activity and lower consumer spending.

Housing wealth is intrinsically less liquid than financial wealth for the reasons described in Section 1. Thus while ‘active’ saving in financial assets seems to be highly responsive to real capital gains and losses on financial assets, active saving

may be less responsive to changes in housing wealth, at least in the short run. Housing bequest motives may be strong, households may be unwilling to extend their debt, or to move, in order to release housing wealth.³ The magnitude of the propensity to consume (MPC) out of housing wealth, and the circumstances and types of households where the greatest response is observed, are ultimately empirical issues. Nevertheless, given that home ownership is a key form of household wealth-holding in the United Kingdom, with the value of home equity accounting for 60% of household financial wealth in the U.K. (Banks *et al* 2002), even a small response to changing house prices may generate a large aggregate impact on financial saving.

Time series evidence for the United States on the effects of aggregate housing wealth on aggregate consumption, whether estimated as a ‘solved out’ consumption function or through a Euler equation, generally give MPCs out of housing wealth which average out around 0.04 to 0.05, but which may rise to larger values in the long run (for the U.S. see Bhatia, 1987; Skinner 1989, 1994; Carroll, Otsuka and Slacalek, 2006; Congressional Budget Office, 2007). Case, Quigley and Shiller (1995) using cross-US state variation, estimate somewhat smaller propensities of around 0.02 to 0.04, while Bosworth, Burtless and Sabelhaus (1991) show that the decline in US saving between the early 1960s and mid-1980s was disproportionately concentrated among the group in the population with the largest housing wealth (i.e. older homeowners).

These results are stronger than those obtained in aggregate cross-country studies of MPCs which are typically in the range 0.01-0.03 (Ludwig and Slok, 2002, Girouard and Blondal, 2001) although Case, Quigley and Shiller (2005) using a panel of international data obtained MPCs of roughly twice that magnitude. In the UK, Carruth and Henley (1990a, 1990b) and Muellbauer and Murphy (1990) present contrasting estimates of the impact of housing price changes on consumption using time series and regional data; however Aron, Muellbauer and Murphy (2006) emphasise the importance of the interaction between changing house price wealth and capital market liberalisation in examining the effect of UK house prices on consumption. These studies also present contrasting evidence as to whether housing wealth effects or stock market effects dominate, although changes in stock market

³ This may be especially the case among older households: see, for example, Venti and Wise (1990) and for the UK, Disney, Henley and Stears (2002) and Banks *et al* (2007).

values tend to impact more quickly on household spending and saving decisions than changes in house prices.

Evidence based on household data gives mixed results. Typically these studies have used household budget data or a self-reported measure of household 'active' saving along with a measure of self-reported housing wealth (or equity, net of mortgage) less any reported value of home improvement work, since there may be a negative correlation between active saving and the latter. US studies tend to report stronger MPCs, in the region of 0.06-0.1 (Skinner, 1989, Engelhardt 1996, Lehnert 2004) than elsewhere. UK studies based on household data estimating a MPC have tended to produce smaller and less robust estimates in the region of 0.02-0.03 (Miles, 1992, 1997); at least until the paper by Cocco and Campbell (2006) described in Section 1 which produced significant consumption effects of changes in housing wealth, especially among older homeowners.

A further empirical finding from the US literature is an asymmetry of response between gains and falls in housing wealth. One explanation for possible asymmetric behaviour in response to housing capital gains is that housing gains may be anticipated, but losses are not (Skinner, 1994). Skinner (1996) finds greater sensitivity of consumption to falls in housing wealth – indeed there is no significant effect of rising house values on consumption in his work, whereas for falls the marginal propensity to consume is 0.1. However, Engelhardt (1996) gets significant responses to shocks in both directions (0.004 to 0.008 to rises, 0.04 to 0.13 for falls) albeit again with greater responsiveness to house price falls. And these results are highly sensitive to estimation method, such as the treatment of outliers. To our knowledge, there are no studies of house price-consumption response asymmetries for the UK.

There is also evidence that households may respond differently to housing shocks which imply nominal wealth losses, as opposed to changes in real prices, although such studies focus primarily on the impact of nominal losses on housing mobility (Engelhardt, 2003; Genosove and Mayer, 2002). The amount of equity contained in the housing also has an effect on mobility (Genosove and Mayer, 1997). Since mobility is a major source of equity release,⁴ this is an important indirect

⁴ For a further discussion of motives for equity release in our data set, see Bridges, Disney and Henley (2006) and Benito (2007).

determinant of the impact of housing wealth on consumption, with Disney, Henley and Stears (2002) finding clear differences in financial saving responses to house price shocks between movers and non-movers among elderly households in the UK. This result suggests that we should control for the selectivity of movers as against non-movers in the sample.

3. Housing and Consumption Over The Life-Cycle

This section presents a simple model of housing and consumption over the life-cycle in order to underpin the empirical analysis of the impact of shocks to housing values on household wealth and therefore on consumption spending and saving behaviour. Skinner (1996) demonstrated how shocks to housing values lead households to revise both spending on housing and on other consumption goods. More generally, households' consumption (and welfare) response to shocks to housing values is also dependent upon their housing position relative to their average lifetime housing holdings. Households with above-average housing see a gain to lifetime wealth from unanticipated rising housing values. Households with below-average housing see an increase in future housing costs arising from rising housing values. Richer formulations of life-cycle models are presented by Banks *et al* (2004), Campbell and Cocco (2007), Li and Yao (2006) and Yang (2008).

In similar vein to Skinner (1996), we utilise a simple two-period model in which households derive utility from consumption of housing units (H) and consumption of other goods (C). Households can adjust their housing between periods. For example, periods 1 and 2 might be considered 'young' and 'middle-aged' with a young household upsizing its housing. Alternatively, periods 1 and 2 might be considered 'middle-aged' and 'old' with a household downsizing its housing as it moves into the second period. The household maximises the sum of period 1 and period 2 utility, where δ is the discount rate:

$$\max U(C_1, H_1) + \frac{1}{1+\delta} U(C_2, H_2) \quad (1)$$

Assume that the household enters period 1 with a house yielding H_1 units of consumption and that the user cost of this in that period is μ_1 .⁵ We assume that user cost is proportional to the holdings of units of housing in each period, and that the *anticipated* return on holding housing as an asset, r_h is equal to its user cost. Period labour income is denoted as Y and we also assume that in period 1 the household may purchase a risk-free financial asset, A , which yields a rate of return r_a . The period 1 budget constraint is therefore:

$$C_1 + \mu_1 H_1 + A = Y_1 \quad (2)$$

In period 2 the household may upsize or downsize housing and spend any released equity on consumption. We assume that adjusting housing units incurs a financial and psychic cost of moving, ν , and that ν is proportional to the size of the upsize/downsize. Period 2 resources therefore consist of labour income, the principal and return from holding the risk-free asset and the net proceeds/cost of any housing upsize or downsize. The 2 period budget constraint is therefore:

$$C_2 + \mu_2 H_2 = A(1+r_a) + \lambda(1+r_h - \nu)(H_1 - H_2) + Y_2 \quad (3)$$

where λ is an indicator variable which takes the value -1 if the household is upsizing ($H_2 > H_1$) and the value +1 if the household is downsizing ($H_1 > H_2$). The returns from holding housing, r_h and the financial asset r_a are applied to period 1 holdings of the assets and are received at the start of period 2. At the end of period 2 the household leaves a bequest of not less than H_2 . The inter-temporal constraint is therefore:

$$C_1 + \mu_1 H_1 + A + \frac{C_2 + \mu_2 H_2}{1+r_a} = Y_1 + \frac{A(1+r_a) + \lambda(1+r_h - \nu)(H_1 - H_2) + Y_2}{1+r_a} \quad (4)$$

We wish to capture the idea that housing ‘needs’ may vary over the life-cycle. One strategy is to assume Stone-Geary preferences, with, for tractability, strict inter-temporal separability. The household’s utility maximisation problem is therefore:

$$\max U = (C_1 - \bar{C}_1)^\theta (H_1 - \bar{H}_1)^{1-\theta} + \frac{1}{1+\delta} (C_2 - \bar{C}_2)^\theta (H_2 - \bar{H}_2)^{1-\theta} \quad (5)$$

⁵ ‘User cost’ is either measured explicitly as mortgage, maintenance costs etc., or as the imputed rental value of the house. These values should be closely related in a close-to-efficient market.

subject to (4), where \bar{C}_i, \bar{H}_i are the reference levels of the consumption good and housing and $0 < \theta < 1$. These consumption levels incorporate the desirable property that no household can manage without a minimum, subsistence level of both goods which may differ between periods according to the household's changing demographics (tastes). From the first order conditions for the maximisation of (4) subject to (5), the intertemporal consumption optimising condition (Euler equation) is:

$$(C_1 - \bar{C}_1)^{\theta-1} = \left[\frac{1+r_a}{1+\delta} \right] (C_2 - \bar{C}_2)^{\theta-1} \left[\frac{H_1 - \bar{H}_1}{H_2 - \bar{H}_2} \right]^{\theta-1} \quad (6)$$

where $\theta-1$ is the coefficient of relative risk aversion. The Euler equation is augmented beyond the single consumption good case by an additional term capturing the ratio of period 1 to period 2's supernumerary housing expenditure. This formulation captures the desirable features that a household's desired consumption of C^* and H^* in each period depends on its total wealth, its preferences and asset returns, whilst the 'life-cycle' aspect of the consumption/housing decision depends on changing consumption needs over the life cycle (as reflected in the Stone-Geary formulation) and, in the case of housing, by the transaction costs involved in changing the household's total units of housing from period to period.

For plausible values of θ an increase in period 1 housing expenditure relative to period 2 will reduce period 1 consumption. In addition, if the period 2 reference level of housing is higher than that in period 1 – because, for example, we are considering the 'upsizing' transition from childless young households to middle-aged families – optimal period 1 consumption must also be lower, *ceteris paribus*. In the reverse case – where for example, we are starting from the point where a middle-aged family is considering 'downsizing' to retirement, optimal period 1 consumption may be higher.

Now consider the impact of unexpected changes in household wealth on housing and consumption for upsizing and downsizing households. Assume that households are on their period 1 trajectory for consumption and housing when an unexpected change occurs at the start of period 2 spendable resources in the form of higher-than-expected realised r_a or r_h , or an expected increase in Y_2 . Two of these outcomes are straightforward: a higher realised return on financial assets r_a or

expected return in Y_2 will increase spendable resources in the second period for both upsizing and downsizing households. Period 2 optimal housing and consumption spending would then both increase. Households not intending to change their housing stock will also do so if the welfare gain from higher or lower housing stock, consonant with the increased spendable resources, exceeds the cost of moving, ν .

An unexpected increase in the return (and implicit user cost) on housing r_h would also alter period 2 spendable resources. As we have assumed that changes in the rate of return on housing r_h are reflected in the user cost, μ_2 , but that this unexpected change to r_h occurs at the beginning of period 2,⁶ the impact of unanticipated changes in r_h on period 2 wealth would differ between households moving from ‘young’ to ‘middle-aged’ or ‘middle-aged’ to ‘old’ between periods. Households moving into middle age (upsizers) would experience a net loss from the increase in r_h and μ_2 as holdings of housing in period 2 exceed period 1. Household consumption spending and spending on acquiring extra housing will both decrease. However, households moving into old age (downsizers) would experience a net gain as holdings of housing in period 2 are less than period 1. Household consumption spending and housing will increase. On this basis, the model predicts that whereas inter-period unexpected increases in human wealth (labour income) and the return on financial assets benefit all households, the impact of inter-period unexpected changes to the return on housing is dependent upon the household’s current reference housing level relative to future reference housing level. This is the theoretical basis for heterogeneity in life-cycle wealth effects arising from house price shocks.

There are of course various nuances to the simple model which can be described without further explicit theorisation. Households may wish to acquire additional financial assets in period 1 because they wish to upsize their housing units in period 2 but require a down-payment to do so (Engelhardt, 1996). Households may wish to borrow in the future to finance consumption in a later period and believe that they can acquire loans on more favourable terms if they have a higher stock of housing as collateral. Households facing adverse shocks to labour income may wish

⁶ i.e. households find that the return on their housing investment has increased but that the future user cost of housing has also increased.

to downsize housing in order to maintain their basic level of consumption of other goods but may be constrained by moving costs.⁷

4. Data

In the absence of a panel data set containing comprehensive information on household consumer spending over a long period, we utilise household-level longitudinal data on savings and holdings of financial wealth and exploit cross-sectional variation in house price movements to identify saving behaviour over time. The British Household Panel Survey (BHPS) provides longitudinal data on ‘active’ saving; that is non-negative transfers from current income into financial wealth. It is an annually repeated survey of around 5000 households resident in Great Britain, commencing in 1991. We utilise ten waves of data covering the period 1994-2003.⁸ The BHPS does not ask about consumption spending as such,⁹ so we infer MPCs from the estimated relationship between this measure of saving and housing gains and losses, thereby closely following the method of studies on US panel data by Engelhardt (1996) and Juster *et al* (2001).

The precise form of the question on saving asked of each individual in the household is ‘*do you save any amount of your income for example by putting something away now and the in a bank, building society or Post Office account other than to meet regular bills?*’ Note that this form of the question purges acquisition of financial assets from that arising because of the discreteness of the payment period. From Wave 2 onwards a similar supplementary question is asked about monthly contributions to private pension schemes. We define ‘active’ savings as the sum of these two responses aggregated across all adult household members. Summary information on this saving measure for each wave from 1994 to 2003 is reported in Table 1. Just under half of all households report some active saving by this criterion.

Turning to real housing gains, we have in principle two alternative methods for calculating the real appreciation in the value of the household’s home over the

⁷ Moreover if adverse shocks to labour income are correlated with negative returns on their housing assets (falling house prices), such a household faces further difficulties. The user cost of the lower desired housing stock is also lower, but the household is having to finance the user cost of its existing housing stock, not its lower, desired, housing stock.

⁸ We are constrained to this period by the availability of FRS asset data, which began in 1994 and by the removal of county-level geographic identifiers from the BHPS in the waves following the 2003 wave.

⁹ The BHPS questions respondents on food consumption and durables purchases.

period of analysis. The first is to make use of each respondent's annual estimate of the current market value of his or her home. However this measure of housing capital gain is contaminated by expenditure on home improvements and additions and by moving behaviour, both of which are likely to correlate with measures of financial saving.¹⁰ The BHPS provides only incomplete information on home improvement activity.¹¹ To resolve the endogeneity problem, an alternative approach is adopted here, using changes in the average market value in the locality in which the household was resident at the beginning of the period. More precisely, we make use of data on the change in the average market price of a semi-detached residence¹² for the respondent's reported county of residence (using data for 65 counties deflated by the UK retail price index, excluding mortgage repayments, as reported on a quarterly basis by the Halifax Bank). Although arguably insufficiently disaggregated to capture local housing market trends, use of county-level data captures cross-sectional variation in house price trends to a much greater extent than the standard regional-level indicator.

The distribution of real house price changes measured in this way across the BHPS sample of owner-occupiers over the period 1994 to 2003 is reported in Table 2, Panel A. There is also widespread variation in the scale of house price changes across time periods, as illustrated in the aggregate data in Figure 1. The variation can be illustrated by the fact that, between 1994 and 1995 54% of households actually experienced a real capital loss, with the average loss being over £1500. However, robust recovery in the housing market led to the average household experiencing a capital gain of over £40,000 over the whole period. In contrast to this imputed figure, Table 2, Panel B, Row 1, shows that just over 6% of households reported having

¹⁰ Home improvements (raising housing equity) may be negatively correlated with financial saving measures, if partially or wholly funded out of financial wealth. Moving will involve transaction costs, which may again be borne out of financial wealth, but may also be utilised to release housing equity, especially among older households.

¹¹ Information is available where improvements and additions were financed through an additional mortgage or loan advance. There is some aggregate evidence of overestimation of house values particularly during the early 1990s when the housing market was in recession, and this further complicates the use of self-reported gains. Nevertheless, as Engelhardt (1996) notes, self-reported or perceived gains may be a more informative driver of savings behaviour than actual gains.

¹² The Halifax house price index utilised here, based on the UK's largest sample of housing sales data over the longest unbroken series available, calculates a standardised or 'mix-adjusted' house price based on approximately 15,000 house purchases per month. Instead of using a simple average of all house price sales, which is sensitive to the types of properties sold within a time period, the mix-adjusted index aims to track the price of a representative house (a three-bedroom semi-detached property).

negative equity at the start of the period, but that negative equity had pretty much disappeared by the second half of the decade which we consider.

As highlighted in Section 1, anticipated gains in house prices may not induce changes in measured saving behaviour if households are forward-looking, and so we focus on the impact of house price ‘surprises’ on consumer spending, rather than simple first differences. Therefore we derive year-on-year surprises as the residuals from an AR (2) process using the county level price data for 1992-2003 with fixed effects (at the county level).¹³ Results are shown in Table 3. In fact 89% of the variation in county level house prices is ‘explained’ by the autoregressive structure, so that the shocks are identified off the remaining 11%. We use the year-on-year residuals (Section 5.1) and the cumulated residuals over a longer period (Section 5.2) from the county-level data as measures of the household-specific unanticipated gain or loss. It should also be noted that, by construction, the number of positive and negative house price shocks is approximately equal (whereas, as we saw, in terms of absolute changes total gainers exceed total losers over the period as a whole).¹⁴ Table 2, Panel B, Row 2 shows that the standard deviation of the residuals in each period, normalised on the average house price, was pretty constant from year to year in the first half of the decade, but exhibited more variability in the second half, especially between 2000 and 2001 (for an interpretation of the numbers in the last two rows, see footnote 21 in Section 5.2).

Section 1 pointed out that much of the debate as to whether a causal link exists between changes in house prices and consumer spending focuses on the role of income expectations. We therefore control for household-specific income expectations using a question about financial expectations in the BHPS not previously utilised in estimates of housing wealth effects from microeconomic data. The wording of the question, asked in each wave, is: *Looking ahead, how do you think you yourself will be financially a year from now, will you be better than now / worse than now / about the same?*¹⁵ Whilst this question is asked only of a short time-frame, it captures

¹³ Our approach is similar to that of Campbell and Cocco (2007) who use residuals from an MA(1) process for county level house prices provided by the Nationwide Building Society as estimates of the ‘unpredictable’ component of house price movements. They do not state how much of the variance in house prices is contained in the residuals from their autoregressive process.

¹⁴ Zero at the county level, although of course weighted by households, the mean shock may not be zero.

¹⁵ The BHPS also questions respondents on their financial experience over the previous year.

something of changes in the household's financial expectations which might cause changes in saving behaviour in the current period. Brown and Taylor (2006) find that this measure of financial expectations is inversely related to household saving and that younger households are more likely to be optimistic than older households¹⁶. The distribution of year-on-year changes in household financial expectations in our sample is illustrated in Figure 2 (averaged over homeowners and renters). The proportion of households whose financial expectations change between years is steady at approximately 40% in each year of the sample, evenly distributed between households seeing a positive change in expectations (from 'worse' to 'about the same' or from 'about the same' to 'better') and households seeing a negative change in expectations (*vice versa*).

In order to estimate the true relationship between a real house price shock and active saving, account must be made of any correlation between the shock to housing wealth and other financial components of the household balance sheet, by controlling for the effect of 'passive' saving which occurs through the real appreciation or depreciation of financial wealth (as in Engelhardt 1996). Few studies of this kind exist, especially in the UK (but see Miles, 1993) despite the likelihood that returns financial assets and house prices are correlated.¹⁷ Failing to control for the effects of passive saving is likely to overstate the impact of house price gains in such circumstances.

Unfortunately, the BHPS does not regularly question respondents about their levels of financial wealth.¹⁸ Consequently for information on financial wealth we use the annually repeated cross-sectional Family Resources Survey (FRS). The FRS covers the same geographical area as the BHPS, but has a much larger sample for each year (April to March) of 23,000-25,000 households since 1993-94. The questionnaire includes detailed information on financial asset balances. Financial

¹⁶ Another strand of the literature finds evidence that the self-employed are more likely to report positive financial expectations (Fraser and Greene, 2006). We find no significantly different impact of positive financial expectations upon saving behaviour between the self-employed and employees in our results.

¹⁷ Although not always positively in individual years – the fall in equity markets in the late 1980s preceded the fall in house prices in the early 1990s in the UK, whereas the boom in house prices in the latter part of our sample period was not reflected in equity markets.

¹⁸ Information on financial wealth holding was gathered in wave 5 and wave 10 of BHPS as well as Wave 15. We have attempted to cross check our instrumented values for 2000 against the BHPS 2000 data but it should be noted that some imputation procedures are required even using the 2000 wave of BHPS data (see Banks, Oldfield and Wakefield, 2002).

wealth is defined as including money left in any current account at the end of the month, the balance of any form of interest-bearing deposit or savings account and the value of stocks, shares, national savings and premium bond issues. Assets held by children in the household are also included. However, it should be noted that this measure ignored the liabilities side of the household balance sheet as information on mortgage debt is not solicited.

We use cell-based matching on observables using the FRS to derive financial assets for the BHPS using the following method. We estimate two reduced form models estimated on FRS to explain financial assets, one for assets classed as ‘shares’ (the value of stocks, trusts, shares and gilts) and one for assets classed as ‘bonds’ (savings accounts, national savings certificates & income/deposit bonds and premium bonds), explaining the level in holdings on each in terms of demographic characteristics, the economic activity status of the head of household and spouse (if present), on household composition and housing tenure status. This model is used to impute ‘shares’ and ‘bonds’ values for each individual in owner-occupied households in the BHPS from 1993 onwards and the household value of shares and bonds is then obtained by aggregating within households.¹⁹ In effect, we construct an imputed value for (unobserved) financial wealth for BHPS households using the FRS right-hand side variables as matched onto equivalent variables in the BHPS.

In order to calculate a value of ‘passive’ saving in the BHPS (i.e. the real appreciation or depreciation of financial wealth), we apply respectively the annual real return on the FTSE 100 share index to our imputed household value of the ‘shares’ component of household wealth and the interest rate on a National Savings Investment Account to our imputed value of the appreciation of the ‘bonds’ component of household wealth. The value of these returns is the one period change in wealth at the start of the next period i.e. ‘passive saving’. To illustrate: define the two types of imputed financial assets at $t-1$: ‘shares’, A_{St-1} and ‘bonds’ A_{Bt-1} and two estimated rates of return r_{St-1} on ‘shares’ and r_{Bt-1} on ‘bonds’. The household’s imputed ‘passive saving’ from $t-1$ to t is given by $\Delta A_t = \overline{sp}_t = r_{St-1}A_{St-1} + r_{Bt-1}A_{Bt-1}$. This measure of course abstracts from any change in financial assets arising from ‘active

¹⁹ The Family Resources Survey (FRS) is conducted throughout the year on a fiscal year (April to March) cycle. The BHPS is conducted in the final quarter of each year, broadly in the middle of each FRS survey period, and so FRS 1993/4 is matched to BHPS 1994 etc.

saving' which the model is intended to explain. The FRS questionnaire does however limit its self-reported estimates of financial wealth to several bands with lower and upper censoring respectively of £1,500 to £20,000. This affects, on average, 8% of the sample. We therefore use a tobit estimator to impute values for 'shares' and 'bonds' using data pooled from ten available cross-sections, with upper and lower censoring points imposed to coincide with the questionnaire design.

5. Estimating the Impact of Housing Gains on Saving

5.1 *A model in year-on-year differences: Testing for Life-Cycle effects of house prices on saving and consumption*

In the theoretical model presented earlier the evolution of consumption was dependent upon the interest rate, the household's subjective discount rate and the households' preferences for consumption and housing over time. With perfect foresight, anticipated higher future house prices would be factored into the household's period 1 trajectory for consumption and housing expenditure. Hence contemporaneous changes in housing values have no impact on household consumption growth if they were anticipated by consumption-smoothing households. However, unanticipated changes in housing values would impact upon consumption growth, the direction of the impact being dependent upon the household's current and future housing needs.

In order to implement this model empirically we estimate the impact of unanticipated changes in house prices on the change in active saving.²⁰ From the estimate of the impact of house prices on saving, we infer an estimate of the impact on consumption. Here we utilise the house price residuals as the unpredictable component of the house price and the change in household active saving in place of consumption. In the context of the life-cycle model of the form derived in Section 3, it is essential that we control for changes in income, interest rates and asset returns as well as changes in future income, here proxied by our measure of income expectations. We do not observe household housing needs directly, so control for

²⁰ Although superficially similar in structure to the model in Campbell and Cocco (2007), our model in this section contains important differences. Most of the regressions in their paper refer to absolute changes in consumption and house prices in contrast to our model of *unanticipated* (or unpredictable) changes. The former is not a direct test of the LCH model. When Campbell and Cocco respecify their model to consider unanticipated changes using residuals from a moving average process, they apply their residual method to *all* variables and not just to house prices.

changes in housing needs over the life-cycle using household age, marital status, family size and other demographic variables as ‘preference shifters’.

Our baseline ‘life-cycle’ specification is:

$$\begin{aligned} \Delta sa_{i,t+1} = & \beta_0 + \beta_1 \Delta y_{i,t+1} + \beta_2 \Delta \bar{sp}_{i,t+1} + \beta_3 (\Delta h_{i,t+a} - E \Delta h_{i,t+a}) + \beta_4 \Delta r_{t+1} \\ & + \beta_5 \Delta f_{i,t+1} + \beta_6 Z_{i,t+1} + \varepsilon_{i,t+1} \end{aligned} \quad (7)$$

where, for each household i , and yearly change between years t and $t+1$, $\Delta sa_{i,t+1} = \ln(sa_{i,t+1}) - \ln(sa_{i,t})$ is the difference in the log of active saving as described in Section 3, $\Delta y_{i,t+1} = \ln(y_{i,t+1}) - \ln(y_{i,t})$ is the difference in the log of gross household real income, $\Delta \bar{sp}_{i,t+1} = \ln(\bar{sp}_{i,t+1}) - \ln(\bar{sp}_{i,t})$ is the difference in the log of real imputed ‘passive’ savings calculated from the FRS, $(\Delta h_{i,t+1} - E \Delta h_{i,t+1})$ is the unanticipated component of house price growth, here estimated as residuals from an AR(2) process for house prices, $\Delta r_{t+1} = \ln(r_{t+1}) - \ln(r_t)$ is the change in the log of the real interest rate, $\Delta f_{i,t+1} = f_{i,t+1} - f_{i,t}$ is the change in household financial expectations and $Z_{i,t+1}$ is a vector of household characteristics.

We estimate the model over both households who move during the period and those who do not move. To adjust for possible selection between movers and non-movers (for example, where variations in house prices across counties induce differential rates of moving), we use a selectivity correction that controls for the probability that a household is a non-mover between 1994 and 2003. The BHPS questions respondents on whether they would prefer to move house, like their current neighbourhood and whether work commitments prevent the household from moving. We use these responses (using a lag of the response to the preference for moving question) as exclusion restrictions via a first-stage regression for whether the household is a non-mover over the period. The coefficients on the exclusion restrictions are jointly significant at the 5% level. The estimates cited here are conditioned on this selectivity correction. Results when we estimate the saving model separately for movers and non-movers over the whole period are available on request.

Table 4 reports estimates for the household saving model in pooled short-differences for the BHPS from 1994-2003. The specifications also include controls for age, age squared, the number of children in the household and also dummy

variables for marital, ethnic and employment status, education qualifications and whether the head of the household is a member of an occupational pension scheme. All monetary variables are converted to 1995 prices using the UK retail price index (excluding mortgage repayments). The construction of the key variables such as house price ‘shocks’, imputed passive saving etc., are as described previously. All standard errors are bootstrapped.

Column 1 is a simple specification where we focus on the effects of changes in income, interest rates and (for comparison with Campbell and Cocco, 2006) the county-level change in house price changes, on changes in ‘active’ saving in the BHPS. The estimated coefficients are all strongly statistically significant at the 1% level. The estimated coefficient on the change in the house price is -0.508 . Hence, for the average household, a 1% increase in the value of the house is associated with just over a 0.5% decrease in real saving. With the average house price in the last quarter of 1998 at £70,296 and average yearly saving in our sample at £2302 in the same year, a 1% house price rise of £702.96 would give rise to a fall in household saving of £11.51 (rise in consumption), equivalent to 2% of the house price increase. The magnitude of this effect seems to be considerably smaller than that found by Campbell and Cocco, although it may arise from the use of a measure of change in saving, rather than consumption, as the LHS variable. In any event, it is not our preferred specification.

Column 2 uses our preferred measure of house price ‘shocks’ rather than changes in house prices, defined as the AR2 residuals from the county house price series. The coefficient on the house price shock is approximately one fifth the magnitude and, using the previous scenario, the fall in household saving due to the rise in house prices is now equivalent to only 0.4% of the unanticipated house price increase. We now examine this model in column (2) in greater detail; in the interim however, it is interesting to see whether the stronger relationship between changes in levels of house prices and saving arises from an omitted variable: changing financial expectations, as suggested by Attanasio and Weber (1994). By way of illustration, when we add the change in financial expectations as an additional regressor to Column (1), the coefficient on the change in house prices becomes -0.368 (0.132).

Column 3 investigates heterogeneity in responses between homeownership types and age. Campbell and Cocco (2007) in particular emphasise that older owning

households respond disproportionately to house price changes since they are ‘long’ in housing – a conclusion disputed empirically by Attanasio *et al* (2008). We define ‘old’ as a head of household aged 45 or over in our sample. Relative to our default group (older renters), we would expect a strong negative saving response to house price shocks among old owners, with a smaller response among young owners and young renters. Indeed to the extent that these groups are ‘short’ in housing and might want to trade up, the coefficient could be reversed. We therefore interact the house price shock with a dummy variable for whether the household is an old owner, young owner or young renter. Hence the baseline group is old renters, for which there is no statistically significant relationship between house price shocks and saving. Column (3) illustrates that the coefficients on old and young homeowners are both negative, but stronger in the latter case (although not statistically so). Moreover, the coefficient on young *renters* is also negative and equivalent to that for old owners. In our estimates, a 1% increase in house prices is associated with a 0.09% decrease in saving among renters; a result that does not accord with our priors. This suggests that other factors are also at work.

As a first step to examine these other factors, Column 4 includes our measure of the change in household financial expectations. The inclusion of this additional variable highlights why the positive relationship between house price shocks and consumption among young homeowners and renters has previously been attributed to omitted income expectations. With the inclusion of the change in financial expectations measure, the coefficients of young owners falls and is not longer significantly different from the coefficient on old owners. Hence controlling for financial expectations we find no heterogeneity in the response of young and old owners – what might be described as ‘life-cycle effects’. Moreover, the coefficient on young renters is now *positive* and from these estimates a house price shock of 1% is associated with *increased* saving by renters of almost 0.2%. This revised result on renters versus owners very much accords with our priors and suggests that the absence of financial expectations from other studies of this issue pose a serious omitted variable problem. Nevertheless, we still do not find any difference in the effects on saving between young and older owners, as the life cycle theory of housing demand might suggest.

These results are confirmed in Column 5, which includes our variable for ‘passive saving’. Gratifyingly, the coefficient on the imputed change in financial assets is negative and significant – a 1% rise in the value of a household’s financial assets reduces its financial saving by 0.3%. Its inclusion also reduces the coefficient on the house price shock for all the interaction terms for homeownership status and age. Indeed, the average size of the saving response to house price shocks among owners in this regression is only one seventh of that in the house price changes specification in column (1).

Taken together, these results suggest that, although we observe a small but significant effect of house prices on saving, significant life-cycle effects of house price increases on homeowners are absent. In our specification, which controls for the impact of changes in financial expectations on saving behaviour and for changes in the value of financial assets and interest rates, young homeowners respond to surprise gains in housing wealth neither by increasing their saving relative to that of older homeowners (as might be expected if they are ‘short’ on housing relative to their housing demand in mid-life), nor by decreasing their saving as would be explained by the common causality hypothesis. However, amongst renters we do find a life-cycle effect, with renters increasing their saving relative to that of older homeowners. As we have demonstrated, the importance of controlling for other asset values and for expectations is paramount in this analysis.

5.2 The marginal propensity to consume out of house price shocks.

The previous section presented estimates of the effect of unanticipated changes in housing wealth on *changes* in household saving, somewhat similar in structure to Campbell and Cocco (1996) but with rather different results. In this section we estimate the marginal propensity to consume out of unanticipated shocks to housing wealth by looking at *levels* of active saving, in similar vein to some of the US literature described in Section 2. We also investigate asymmetries in responses to house price surprise gains and losses, and the behaviour of households with negative housing equity at the beginning of the sample period. We use long differences in asset values to calculate saving and cumulative house price ‘shocks’ in line with the US literature on asymmetric response to house price changes. As discussed in

section 2, that US literature points to a marginal propensity to consume out of house price surprises of between 0.02 and 0.05.

Define cumulative net household active saving from period 0 to current period 1 as sa and total household financial assets ('stocks' plus 'bonds' in our previous formulation) as A . Then it follows that the change in financial assets for household i is equal to the sum of active and passive saving sp over the same period is as follows:

$$A_{1i} - A_{0i} \equiv \Delta A_i \equiv sa_i + sp_i \quad (8)$$

where all variables are expressed in real terms. We investigate the effect of housing wealth shocks on active saving. The estimating equation specifies the dependent variable, cumulative active saving, and right-hand side variables in 'long' differences to control for both the stock adjustment impact of the initial level of financial assets and the scale of passive saving (both imputed from the Family Resources Survey as described in Section 4) and to model the impact of cumulative real housing wealth shocks:

$$sa_i = \alpha_0 + \alpha_1 \bar{A}_{0i} + \alpha_2 sp_i + \alpha_3 (\Delta h_{i,t+1} - E\Delta h_{i,t+1}) + \alpha_4 \Delta h_i \cdot D_{0i}^{ne} + \alpha_5 Z_i + \varepsilon_i \quad (9)$$

where imputed financial assets are indicated by \bar{A}_{0i} , the imputed change in financial assets $\Delta \bar{A}_i$ replaces sp_i in (8), $(\Delta h_{i,t+1} - E\Delta h_{i,t+1})$ is the real house price surprise as before, D_{0i}^{ne} is a dummy variable to investigate the differential impact of a shock on a household initially in negative equity, and Z_i is a vector of other control variables. This gives:

$$sa_i = \alpha_0 + \alpha_1 \bar{A}_{0i} + \alpha_2 \Delta \bar{A}_i + \alpha_3 (\Delta h_{i,t+1} - E\Delta h_{i,t+1}) + \alpha_4 \Delta h_i \cdot D_{0i}^{ne} + \alpha_5 Z_i + \varepsilon_i \quad (10)$$

Using (8), the underlying marginal propensity to consume from housing wealth (given by $-\alpha_3$ in equation 9) is now given by $-\alpha_3/(1-\alpha_2)$, and that for a household in negative equity, given by $-(\alpha_3 + \alpha_4)$ in equation (9), is now $-(\alpha_3 + \alpha_4)/(1-\alpha_2)$.

Table 5 reports estimates of equation (10) for home owning households. We break the sample into two period over which we cumulate variables: 1994-1998 and 1999-2003. These periods are somewhat different in character (see Figure 1) as the

first period saw many households initially in (and in nearly all cases emerging from) negative equity (see Henley, 1998 and Table 2, Panel B) whereas the second period saw sustained growth in house prices. The overall trends are netted out by our construction of the house price ‘shock’ variable (see Section 4) but we wish to identify separately households that had reported absolute negative equity in the first period as well as positive and negative cumulative shocks.²¹ All reported estimates are selectivity-corrected using the same exclusion restrictions as described previously for whether a household moved home at least once over the five-year period (but noting that the number of ‘movers’ in any period is greater than in our previous approach in ‘short’ differences). The regression includes control variables for real household income in each year covered by the period in question and also dummy variables for marital, ethnic and employment status, education qualifications and whether the head of the household is a member of an occupational pension scheme.

Column 1 reports a base specification which includes the initial level of real financial assets, our measure of passive saving (the change in imputed financial assets) and the unanticipated real housing gain or loss. The coefficient for the effect of the real house price shock on the level of household saving between 1994 and 1998 has the anticipated negative sign and is significant at the 1% level. The implied marginal propensity to consume out of the house price surprise in this specification is approximately 0.01, implying that a household experiencing a unanticipated £10,000 gain in housing wealth decreases its active saving by £100. Column 5 reports the base specification for the second period, 1999-2003. Again, the estimated marginal propensity is approximately 0.01 for a similarly-sized sample of households. In both Columns (1) and (5), the initial level of assets is positively related to cumulative household saving suggesting that we have not fully controlled for household preferences; however there is a negative relationship with imputed ‘passive’ saving, as standard theory would suggest.

²¹ Table 2 Panel B shows that the average cumulated ‘shock’ in each sub-period exceeds the average value of the calculated ‘shock’ in each year, but not by a large amount (e.g. the average SD over the 5 years 1994 to 1998 for each household was £4382; the cumulated household average SD over the same period was £7419. If the latter number was close to say, five times the first, this would suggest that we had mistakenly incorporated a predictable component into the ‘shock’; however a cumulated SD close to or even lower than the year-on-year average would suggest a mean-reverting process that would lead us to question whether households would or should respond to the ‘surprise’ at all.

Columns 2 and 6 include the effect of financial expectations on active saving. Here we use the sum of the level of household financial expectations recorded each year as 1= positive, 0=neutral or -1=negative. Summing the values over each five-year period creates a score between -5 (for a household which reports negative financial expectations in each year) to +5 (*vice versa*). The estimated coefficient in Column 2 implies that a household which expected its situation to improve in all five years reduced its active saving by approximately £870 over the period. With the addition of this variable the implied marginal propensity to consume out of the shock to housing wealth falls to less than 0.01. A very similar result is found in the second period.

Column 3 examines the issue of the symmetry of real housing gains and losses. Both unanticipated real housing gains and losses attract significant coefficients. Households experiencing a £10,000 surprise gain in housing wealth reduce active saving by approximately £200, whereas households experiencing a £10,000 surprise loss in housing wealth increase active saving of £400. In the second period (Column 7) this asymmetry is also apparent, with losses having a larger impact than gains. The results confirm the US finding that the impact on consumption from adverse shocks outweighs that from gains, however we find that these differences are not statistically significant.

Finally, Column (4) examines the impact of real housing gains and losses for households in negative equity at the beginning of the period (there are very few households in such a position in the second period). A strong asymmetry appears in our results when we include an interaction variable for the real housing gain or loss with a dummy variable for whether the household was in negative equity at the beginning of the period. As background, during the early part of the 1990s nominal house price falls were common and a significant minority of households experienced negative housing equity (i.e. their loan to house value ratio exceeded 1) so that among our sample over 6% of households owed existing mortgage debt in excess of their (self-reported) valuation of housing wealth in 1994. As the results in Column 4 illustrate, households in negative equity have a marginal propensity to consume out of housing gains of six times the magnitude of households not in the negative equity group. However, this strong response is not matched for households experiencing losses whilst in negative equity for which we find no statistically significant

difference to households without negative equity. This is not surprising as too few households in negative equity experienced adverse shocks over the period.

This finding on negative equity could be caused by a variety of factors. Moving into negative equity exposes households to a greater degree of income risk than that of households with net housing equity. If unanticipated shocks to income result in the household being no longer able to service its debt, the household would be unable to cover fully the outstanding principal upon termination of the loan. As default on mortgage loans / subsequent bankruptcy results in a significantly worsened credit score which limits access to subsequent credit, households who experience negative equity might have increased their active saving so as to mitigate the increased income risk. Hence we might explain the strong marginal propensity to consume out of unanticipated gains in housing wealth for households in negative equity as being the off-loading of a buffer of saving accrued during the period of negative equity. That the reverse effect is not observed (at least, at a significant level or comparable magnitude) for households experiencing unanticipated real housing losses whilst in negative equity may be due to households having deteriorated past a point where precautionary saving is longer feasible and the small number of such households. Among these findings, which broadly confirm the results of the previous section, the evidence on behaviour of households with negative equity, which may have implications for our understanding of the precautionary behaviour of households experiencing increased default risk, is a novel result in the literature.

6 Conclusion

Macroeconomic research has suggested that personal sector spending and saving behaviour in the UK may have become closely related to movements in house prices since financial deregulation of the housing finance industry during the 1980s. Life-cycle theory would suggest that unanticipated housing gains ought to result in offsetting effects on saving, although in practice these may be small and attenuated by capital market rigidities, bequest motives and the effects of precautionary saving.

This paper has presented the first attempt at a micro-econometric investigation of this issue using British panel data on owner-occupied households. Our results suggest that the life-cycle impacts of unanticipated changes in housing wealth are weaker than previously estimated in the literature. Employing a specification which

includes financial expectations and changes in the value of financial assets, we find that a story in which heterogeneous responses of young and old households can be explained by their ‘long’ and ‘short’ positions on holdings of housing is not substantiated by our results. Young homeowners do not appear to exhibit significantly different responses to unanticipated real housing surprises from those exhibited among older homeowners, a result at odds with Campbell and Cocco (2007). Young renting households, however, do increase saving relative to older homeowners controlling for the effect of financial expectations when house prices increase. Hence we do find evidence of a weak wealth effect between renters and homeowners.

The estimate is robust to a number of econometric specifications and periods, including evidence on accumulated saving consistent with the US literature. We find no evidence of a significant asymmetry in responses to gains and losses among the majority of households, however households emerging from negative equity do exhibit a faster offloading of savings in response to unanticipated real housing gains compared to households not experiencing negative equity at the beginning of our sample period.

Our results imply that the marginal propensity to consume from real housing gains during the past decade was 0.01 or lower for the average household. This coefficient is smaller than that obtained in many other studies but we have controlled for factors that are omitted in many other studies (such as ‘passive’ accumulation of financial wealth and financial expectations) and which have led other studies to question whether there is a robust house price-consumption relationship at all. Moreover, we find that estimated coefficients are higher for some sub-groups of the population in accordance with priors (those with initial negative equity and owners *in general* relative to renters). It may also be the case (as has been argued elsewhere) that imputing consumption elasticities from saving data may impart some downward bias to the estimated coefficient insofar as the saving data contain measurement error. But consumption data are also not immune from measurement error, arising from both omitted consumption categories (this applies particularly to the BHPS – see footnote 4) and to definitional issues concerning investment in durable goods. We therefore conclude that our finding of a small, but significant, impact of house price shocks on household consumption is plausible.

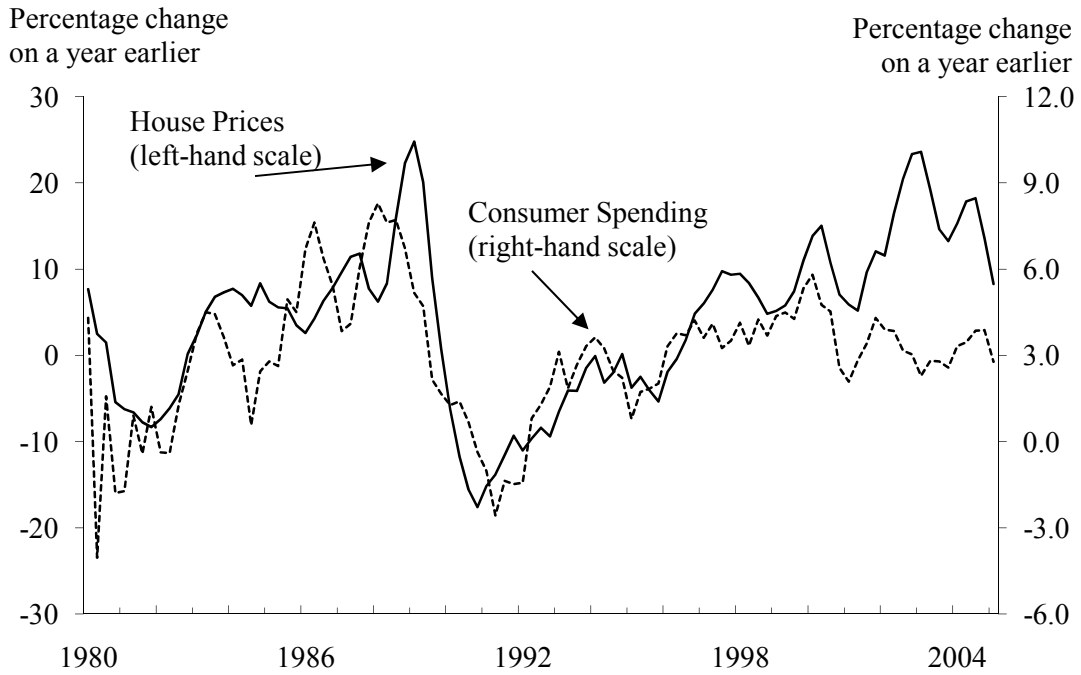
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Figure 1
House Prices and Consumer Spending



Source: Halifax House Price Index / Office for National Statistics.

Figure 2:

Distribution of Changes in Expectations across Households, by Year

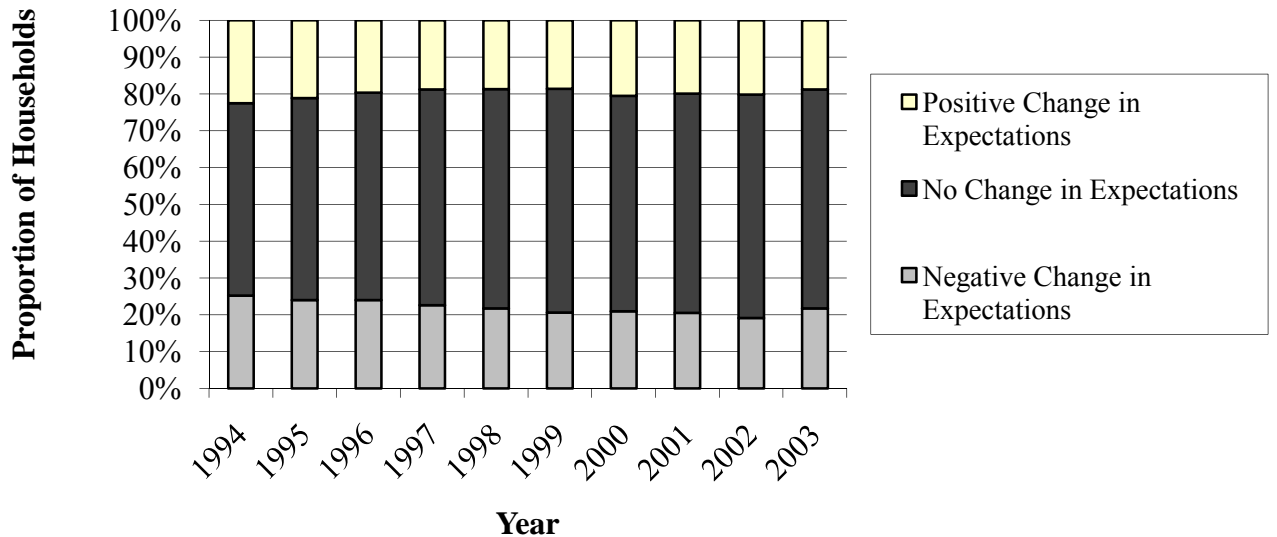


Table 1: Active Saving by Households 1994-2003

Year	% of households with active saving or contribution towards a pension plan	Mean non-zero active saving (1995 £'s per month)	Mean active saving of all households (1995 £'s per month)
1994	45.6	169.91	77.45
1995	44.8	184.63	82.79
1996	45.2	188.95	85.31
1997	48.0	186.44	89.57
1998	48.8	191.84	93.64
1999	46.6	187.30	87.28
2000	47.2	186.38	88.00
2001	46.2	196.00	90.46
2002	46.1	188.22	89.41
2003	46.6	186.44	88.12
All Years	46.1	181.97	83.82

Table 2:
Distribution of Real House Price Changes across Owner-Occupier Households,
% with negative equity, and residuals

Panel A

At 1995 prices	1994-1998	1999-2003
<0	3.1%	0.2%
0 – 10000	18.2%	9.3%
10000 – 20000	19.6%	15.8%
20000 – 30000	4.7%	19.7%
30000 – 40000	12.1%	11.4%
40000 – 50000	17.2%	9.1%
>50000	25.1%	34.5%
Average Change	£22,466	£34,945
Median Change	£19,384	£32,901

Panel B

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
% households with negative equity	0.066	0.065	0.039	0.034	0.020	0.018	0.015	0.013	0.012	0.012
SD of residuals by household/mean house price	0.053	0.061	0.067	0.058	0.089	0.037	0.129	0.057	0.042	0.030
Average SD of residuals per year	1994-98 (£) 4382					1999-2003 (£) 6480				
Cumulated SD of residuals, 5 years	1994-98 (£) 7419					1999-2003 (£) 11765				

SD = standard deviation

Source: Computed from BHPS Waves 4-13, using household sample weights.

Table 3:
AR(2) Estimates for County Level House Prices,
Halifax County-Level House Price Index, 1992-2004

<i>Average House Price (£)</i>	Coefficient (Std. Err)
Average House Price $t-1$	1.41** (0.04)
Average House Price $t-2$	-0.35** (0.05)
No. Observations	780
No. Groups	65
F (2, 768)	3014.45

Notes: Standard errors in parenthesis. Model is estimated using ordinary least squares. Observations are for 65 counties over 13 years beginning 1992 and ending 2004. F-statistic 1.77, p-value of F-statistic 0.01. Significance at **1%, *5%.

Table 4:
Impact of unanticipated house price changes on active saving:
Model in year-on-year differences

Δ active saving	1.	2.	3.	4.	5.
Δ income	0.040** (0.015)	0.056** (0.018)	0.057* (0.020)	0.042** (0.014)	0.035** (0.013)
Δ interest rate	0.037** (0.012)	0.047** (0.016)	0.045** (0.015)	0.044** (0.013)	0.0314** (0.012)
Δ house price	-0.508** (0.175)				
house price shock		-0.103** (0.020)			
house price shock* old owner			-0.087** (0.026)	-0.108** (0.033)	-0.076** (0.028)
house price shock* young owner			-0.120* (0.060)	-0.110* (0.056)	-0.083* (0.030)
house price shock* young renter			-0.085* (0.034)	0.193* (0.094)	0.057* (0.020)
Δ financial expectations				-0.162** (0.040)	-0.153** (0.044)
Δ financial assets					-0.316** (0.083)
N	15198	15198	15198	15198	15198
F-statistic	28.40	25.60	26.61	26.85	28.90
P value of F-statistic	0.00	0.00	0.00	0.00	0.00

Notes: Standard errors in parenthesis; all standard errors are bootstrapped (1000 reps). Significance at **1%, *5%. Observations are for households with characteristics identified by head of household, pooling yearly changes from ten waves of the BHPS 1994-2003 (waves 4-13). Additional regressors are: age, age squared, change in number of children, and dummies for marital status, employment status, educational qualifications and whether the household is a member of an occupational pension plan. Financial expectations variable is the change in household expectations (as measured on a 3-point scale 1=improved, 0=neutral, -1=worsened). The change in financial assets ('passive saving') is as constructed from the FRS as described in the text. The estimates are selectivity-corrected by the standard Heckman procedure to control for the probability of moving/non-moving. There are a total of 1625 mover-observations. We report results for all households. The selection equation uses BHPS questions on whether respondents intend to move (lagged), like their current neighbourhood and whether work commitments prevent the household from moving as instruments.

Table 5: The Marginal Propensity to Consume out of House Price Shocks

Dependent variable: Cumulative Household Saving	1994-1998				1999-2003		
	1.	2.	3.	4.	5.	6.	7.
Initial Assets	0.30** (0.11)	0.31** (0.12)	0.25** (0.11)	0.25** (0.10)	0.30** (0.11)	0.27** (0.11)	0.26** (0.09)
Change Assets 'Passive Saving'	-0.13** (0.03)	-0.09** (0.04)	-0.10** (0.04)	-0.08** (0.03)	-0.16** (0.06)	-0.14** (0.03)	-0.13** (0.04)
House Price Surprise	-0.01** (0.003)	-0.008* (0.003)	-	-	-0.01** (0.002)	-0.006** (0.002)	-
Financial Expectations	-	-86.13* (34.73)	-79.46* (35.71)	-75.43* (33.81)	-	-92.46* (40.61)	-80.31* (40.23)
Surprise Gain	-	-	-0.020** (0.006)	-0.015** (0.003)	-	-	-0.015** (0.005)
Surprise Loss	-	-	0.032* (0.016)	0.037* (0.020)	-	-	0.024* (0.011)
Surprise Gain * -ve equity	-	-	-	-0.111* (0.052)	-	-	-
Surprise Loss* -ve equity	-	-	-	0.040 (0.049)	-	-	-
_cons	3864.27	3646.82	4676.38	4046.27	3946.82	3638.49	4524.76
N	2267	2267	2267	2267	2340	2340	2340
Pseudo R2							
mpc	0.009	0.006			0.009	0.005	
mpc gain			0.022	0.017			0.021
mpc loss			-0.042	-0.042			-0.027
mpc gain – neg equity				0.126			
mpc loss – neg equity				-0.044			

Notes: Standard errors in parenthesis; all standard errors are bootstrapped (1000 reps). Significance at **1%, *5%. Observations are for households with characteristics identified by head of household. Additional regressors are yearly income, age, age squared, number of children, and dummies for marital status, employment status, educational qualifications and whether the household is a member of an occupational pension plan. Financial expectations variable is the sum of household responses on a 3-point scale (1=positive, 0=neutral, -1=negative). The initial level and change ('passive saving') in financial assets if as constructed from the FRS as described in the text. The estimates are selectivity-corrected by the Heckman procedure to control for the probability of moving/non-moving at least once over the period. There are approximately 300 mover-observations. We report results for all households. The selection equation uses BHPS questions on whether respondents intended to move (lagged), like their current neighbourhood and whether work commitments prevent the household moving as instruments.