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House Price Volatility and Household Indebtedness in the United States and the United Kingdom

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HOUSE PRICE VOLATILITY AND HOUSEHOLD INDEBTEDNESS IN THE UNITED STATES AND THE UNITED KINGDOM

by

Richard Disney† and John Gathergood*

Abstract

Recent household financial models predict that collateral-constrained households are more likely to increase debt-financed spending in response to rising house values. We augment this model to consider the use of unsecured debt such as credit cards. Using household panel data, we consider microeconomic evidence on the behaviour of households in the United States and the United Kingdom in response to rising house prices. The evidence confirms that previously collateral-constrained households in both countries increase their indebtedness more than unconstrained households as house prices rose. But whereas United Kingdom households used house price gains primarily to refinance existing unsecured debt, United States households were more likely to increase their total indebtedness. Our results imply that on average households in the United States extract as much as 10% of their housing equity gains to fund consumption spending, and suggest that housing wealth effects predominantly arise through unbinding liquidity constraints.

Key words: Housing wealth; collateral; unsecured debt; consumer spending

JEL classification: D12 D14 R21

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HOUSE PRICE VOLATILITY AND HOUSEHOLD INDEBTEDNESS IN THE UNITED STATES AND THE UNITED KINGDOM

1. Introduction

The strong co-movements in house prices and household consumption behaviour in several countries, including the United States and the United Kingdom, has understandably received widespread attention. Table 1 illustrates house price and consumption growth in the two countries between 1987 and 2007. For both countries, consumption growth tracks house price growth through the housing market downturn of the early 1990s and recovery during the late 1990s. However Carroll, Otsuka and Slacalek (2006) urge caution in interpreting such data as evidence of any long run relationship between house price changes and consumption levels.[1] Indeed, as Table 1 suggests, from 2000 onwards this relationship appeared to detach as consumption growth moderated and house price growth accelerated in both countries.

House price fluctuations may affect consumption through a generalised wealth effect, as suggested by Congressional Budget Office (2007):

> "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." [p.1]

The primary channel through which such a wealth effect operates is by allowing households to extract housing equity via mortgage refinancing. So we might expect to see a close relationship between changes in housing wealth, in the growth of debt secured on housing wealth, and in consumption spending. Iacoviello (2004, 2005), among others, argues that the relationship between changes in debt-financed consumption and house prices is disproportionately large among households that were previously liquidity-constrained: that is, whose ability to borrow was limited by the value of their available wealth which could act as collateral. In this case, this refinancing channel is particularly important for these 'collateral-constrained' households; a hypothesis that is supported by that Iacoviello's calibrated models.

[1] In addition, the co-movement of house prices and consumption spending may be driven by other factors: on this see Attanasio and Weber (1994), Attanasio, Blow, Hamilton and Leicester (2009) and Disney, Gathergood and Henley (2008).

The present paper estimates the impact of house price movements on housing equity withdrawal behaviour in the United States and the United Kingdom in recent years using individual household-level panel data. It thereby examines the relationship between household indebtedness and 'shocks' to house prices. It finds important differences in the responses of households to house price shocks in the two countries. The results show that a significant fraction of collateral constrained home-owning households did indeed respond to rising house prices by extracting housing equity via mortgage refinancing, but that this behaviour was much more prevalent in the United States than in the United Kingdom. We show that households in the United Kingdom primarily extracted housing equity in order to pay-off non-mortgage-secured debts such as credit cards. By contract, households in the United States who also held non-negligible non-mortgage debts instead appeared to utilise equity withdrawal to finance additional consumption spending.

The increase in household indebtedness arising from the recent house price boom therefore appears to be very different between the two economies. We hypothesise that the United States behaviour was facilitated by the more rapid growth of the sub-prime mortgage market in that country relative to the United Kingdom, which allowed already highly leveraged households to draw on marginal housing equity gains. More generally, the paper infers that the stimulus to consumer spending that was provided by house price growth in recent years might best be understood as a collateral-based effect rather than a general wealth-based effect, but in a world where households can borrow both secured against their housing equity and unsecured, thereby augmenting the basic 'collateral constraint' model of household behaviour.

The central role of collateral

Support for the view that house price movements stimulate household consumption via collateral effects is evident from aggregate measures of housing equity withdrawal. Measures of 'Housing Equity Withdrawal' (HEW) attempt to calculate equity extracted from the housing stock but not invested in it, such as proceeds from downsizing or cash-out mortgage refinancing, although by construction do not perfectly measure equity withdrawn for non-housing consumption (see Davey, 2001). Table 1 also illustrates HEW measures for the United Kingdom constructed by the Bank of England and for the United States calculated from flow-of-funds data by Kennedy and Greenspan (2007). By these measures, house price growth is strongly correlated with households extracting equity from their homes. The

slightly longer series of available HEW estimates for the United Kingdom suggest a close correlation with house price growth and the marked increase in HEW by the Kennedy-Greenspan measure since 1998 correlates with the corresponding housing market boom in the United States.

Despite the correlation between house price growth and equity extraction, policymakers have been reluctant to attribute a sizeable part of the aggregate housing–consumption 'link' to collateral effects – a caution reflected by the recent paper by Congressional Budget Office (2007) on housing wealth and consumer spending cited earlier. This is because aggregate level studies rely on cross-country comparisons of and temporal variations in aggregate house price movements, consumption and aggregate equity withdrawal measures predicated on differing institutional factors and lending regimes in mortgage markets. The advantage of using household-level panel data is that we are able to observe collateral positions, housing equity gains and equity extraction at the individual household level, and to exploit cross-sectional variation across households for the two economies. We know of no other study that has utilised household-level panel data, as opposed to calibrated models of hypothesised collateral constraints, to examine these issues. Using such data, we argue that there is clear evidence for a strong collateral-based relationship between house price growth and housing equity extraction which gave rise to increased consumer indebtedness, at least in the United States.

In the standard collateral constraint model without unsecured debt, a household can borrow secured against some fraction of its housing wealth. The budget constraint has a cliff non-convexity where the collateral constraint 'bites': that is, the maximum that a household can consume in any period is its current income and cash-in-hand, plus the expected value (to the lender) of the value of its house, discounted at the rate of interest on a loan secured on the collateral. Hence a rise in the house price allows a highly leveraged household to increase its consumption up to (or within) the budget constraint augmented by the higher value of the collateral.

If we incorporate the availability of unsecured debt into this mechanism, the consumer now faces a non-linear budget constraint: cheaper secured debt can be supplemented by the use of more expensive unsecured credit. The unbinding of the collateral constraint when house prices rise with secured (mortgage) debt fixed in nominal terms allows the household to refinance its debt portfolio. In this setting, the wealth effect arising from this reduction in the average interest rate on the household's borrowing allows it to increase

its consumption spending so that the new equilibrium can involve no use of unsecured debt, or a higher proportion of secured debt in its portfolio. However, the net effect on household spending of a general rise in nominal asset values for a previously collateral-constrained household, whilst positive, is smaller than in the scenario without unsecured credit. Indeed where, as in practice, there are transactions costs involved in refinancing secured debt, there will be a discontinuity at the original kink point in the budget constraint and the household may not change its debt structure or debt level at all should the costs of refinancing outweigh the gains to be had in reducing the average interest rate of its debt portfolio. Housing collateral effects, therefore, are weakened somewhat by the inclusion of unsecured debt.

2. Data issues

To examine these issues, we use well-established household panel data sets. For the United States, the long-running Panel Study of Income Dynamics (PSID) provides detailed individual household level data on aspects of household finances, labour market participation, health and demographic data. We utilise the most recent four years of data: 1999, 2001, 2003 and 2005 which include additional questions on household wealth, including household mortgage debt and non-mortgage debt. We construct a panel of 1,582 households of working age, excluding households where the head of households is retired, self-employed or the household is a non-home owner. Table 2 provides summary statistics for the finances of this panel of households. Non-mortgage debt includes the value of credit cards and personal loans. Mortgage debt is the sum of all outstanding debts secured against property owned by the household, including second and third homes. Auto-debt is the value of outstanding automobile leases and loans, which we classify separately from secured (mortgage) debt and non-mortgage debt. Household financial wealth includes the self-reported value of Individual Retirement Accounts (IRAs). The household Loan-to-Value Ratio (LVR) is the value of all mortgage debt divided by the value of all debt secured against dwellings. Outright owners (who owe nothing against their property) are assigned an LVR of zero.

For the United Kingdom, the British Household Panel Study (BHPS) is an annual survey of approximately 10,000 adults in around 5,000 households that has been running since 1991, with a question format modelled on the PSID. The 1995, 2000 and 2005 waves provide detailed data on household finances in wealth modules similar to those supplemented in the PSID. We construct a panel of 1,368 households of working age, excluding households where the head of household is retired, self-employed or the household is a non-home owner

as before. Summary statistics are provided in Table 2. Non-mortgage debt includes the value of credit cards and personal loans plus other forms of unsecured credit – the BHPS question is more detailed than the PSID equivalent. Mortgage debt is the sum of all outstanding debt secured against property owned by the household, including second and third homes, as for the PSID. There is no separate value for loans secured against automobiles, which are far less prevalent in the United Kingdom than the United States. Household financial wealth includes the self-reported value of Personal Pension Plans (PPPs), similar to IRAs. Hence our measures of wealth in both surveys exclude the value of employer-provided pensions and pension rights accrued through social security.

In both samples households vary greatly in their collateral positions. As illustrated in Table 3, approximately one fifth of sampled United States households and one third of United Kingdom households are outright owners. In both samples, approximately 20% of households have LVRs above 0.8 and might be considered as having little or no scope for increasing their borrowing secured against housing on their first (= conforming in United States parlance) mortgage. The period considered is one of sustained house price increases in both countries, and this is reflected in the growth in self-reported house values, which double for households in the United States and treble for households in the United Kingdom over the period. On average, households in both samples experience substantial falls in LVRs. Increases in the average value of mortgage debt are greatly outweighed by increases in housing values over the period. Rising house values also contribute to the growth in household net worth, illustrated in Table 3.

Household LVRs typically fall over the life-cycle. Typically, households purchase dwellings when young via mortgage contracts and repay the mortgage principal over the course of their working life. Households often upsize their dwellings and, less typically, downsize their dwellings over their lifetime. The majority of high-LVR households who face collateral constraints are young, though the potential for older households to extend their mortgage lender to high LVRs might be limited by the length of their working life. Table 3 illustrates the correlation between household age and LVR. The negative correlation is somewhat sharper for the U.K. compared to the U.S., with the figure for the U.S. showing a greater mass of the distribution lying towards the older / higher LVR quadrant.

3. Results

High loan-to-value ratios and use of unsecured debt

Our primary interest is in the household's acquisition of secured and unsecured debt, and how this is affected by house price changes. We first examine the use of unsecured debt: in particular testing the hypothesis that it is disproportionately used by households with high loan-to-value ratios (LVRs). As discussed in Section 1, in this case, we might then expect such households to utilise rising home values as an opportunity to reduce debt servicing costs by substituting less costly secured debt for unsecured debt balances. Questions about values of unsecured debt in both the PSID and BHPS make no distinction between credit card balances which are 'revolved' as an interest-bearing debt or cleared before interest charges are applied. Hence our measure of outstanding balances on unsecured credit, which is composed of balances on a range of credit instruments, will overstate the true cost of interest-bearing unsecured debt.

We estimate a random effects tobit model with censoring at zero, pooling the four waves of PSID observations / 3 waves of BHPS observations in order to examine whether households with higher LVRs also hold greater values of unsecured debt. We cannot exploit within-household changes in LVRs over time as, by construction, in the relationship we wish to test, changes in LVRs are endogenous to changes in unsecured debts. The estimates therefore depend heavily on the cross-sectional association between LVRs and unsecured debt, and we make no claim to identification. Instead, the purpose of the estimates is to establish that the correlation between the household LVRs and unsecured debt values is not readily explained simply by household income, or demographics. Table 4 presents the estimates. For both sets of estimates, the coefficient on the LVR is positive and significant at the 1% level after we control for demographics. The coefficients on household income and age are also positive, as is the coefficient on the value of automobile-related debt owed by the households.

We further expect the relationship between LVRs and unsecured debt values to be non-linear, increasing at LVR values close to mortgage lending limits (typically 0.7-0.85 for both economies for first / conforming mortgages in the period considered), consistent with the idea that households utilise unsecured debt as a substitute for secured debt when they reach the ceiling on their use of housing as collateral. Hence, the tobit model is re-estimated using decile LVR splines and marginal effects calculated at each spline, conditional on non-

censoring and at the means of other variables. Table 5 plots marginal effects for the PSID / BHPS samples. The conditional relationship between the LVR and unsecured debt increases sharply at LVR values of 0.6-0.7 in both samples, consistent with the idea that household use of unsecured debt increases as households approach LVR values close to the limit of mortgage lending. This result underpin the proposition that households exhibiting both high LVRs and high values of unsecured debts are those most likely to refinance their debt portfolio via extending their mortgage debt as house values increase. This is tested next.

Mortgage refinancing and household indebtedness

To estimate the impact of rising house values on household secured debts, we exploit household-level changes in house prices, in secured debt and in unsecured debt in the panel. The empirical strategy is to regress the change in household secured debt against the change in house value and a set of financial, labour market and demographic controls. Three econometric issues thereby present themselves. First, while we surmise that households might draw on their housing gains by extracting housing equity via increasing mortgage debts, a reverse causality might exist whereby households extend their mortgage debt in order to finance home improvement work and hence increase their housing value (we exclude home movers from the sample – see below). Neither household survey contains comprehensive information on home improvement work. Consequently, the growth in housing values is instrumented using a local-level house price index. For PSID households, we utilise the Office of Federal Housing Enterprise Oversight (OFHEO) state-level house price index as an instrument for the change in the household's self-reported house value. For the BHPS we construct a similar instrument using a county-level house price index collated by the Halifax Bank, as of 2007 the United Kingdom's largest mortgage lender. The Halifax index tracks house values at a finer level of disaggregation (the county) than the United States index (the state).

A second issue is that equity extraction is likely to be correlated with home moving activity, which often involves purchases of non-housing durables funded by over-mortgaging. As mortgage refinancing involves non-negligible fixed costs (more so in the United States than the United Kingdom) households may delay equity extraction until a home move event. Changes in mortgage debt for home movers cannot be decomposed in the data into the proportion which funds additional housing purchases and the proportion which is used for non-housing consumption. This limits inference on the relationship between changing house

values and secured debt for households observed to move between waves, so we limit our analysis to non-movers. This reduces the sample size to 1381 non-moving PSID households observed over the waves (3 changes) and 1158 BHPS households observed over 3 waves (2 changes). However, across our sample of non-movers the likelihood of moving in the near future (and hence likelihood of delaying equity extraction until a moving event) varies considerably. Both BHPS and PSID measure moving intentions through a question which asks respondents whether they intend to move home in the near future. To control for variation in the underlying likelihood of moving across households in our regression, the samples of movers and non-movers are pooled to estimate a probit model for whether the household moved home between waves based on this moving intentions questions and a set of covariates. A predicted probability of moving is then calculated for each household. This predicted probability is utilised as an additional regressor in the final regression to control for variation in the likelihood of moving and hence in delaying equity extraction.

Finally, the analytical model sketched out earlier implies that we expect to observe a differential relationship between changes in house values and secured debt across households dependent upon their initial collateral position. Households which initially exhibit low LVRs would not necessarily be expected to respond to rising house values by extending their secured debt. Should such households have desired additional borrowing we might expect them already to have utilised leverage on their initial housing collateral. By contrast, households with high LVRs can be considered the collateral-constrained group for which we might expect a stronger relationship, particularly so among those households who can reduce their debt service costs by refinancing outstanding unsecured debts onto their home mortgage. This distinction is central to the model of 'collateral-constrained' households. Hence, in the regression we interact the instrumented change in house value with a series of dummy variables which distinguish households by their initial LVR positions, estimating different conditional coefficients for households with initially high LVRs compared to the rest of the sample. Our definition of a 'high LVR' is not precise as we do not observe individual-specific collateral constraints, so we present a series of regressions in which this high LVR threshold is set at an LVR of 0.9 or 0.8. To implement a similar sample split based on outstanding unsecured debt we also utilise dummy variable interactions for threshold values of initial unsecured debts.

Estimates for the United Kingdom from the BHPS are presented in Table 6. In Column 1 the coefficient on the (instrumented) change in house value is not significant.

Household secured debt is increasing in the growth in household income and negatively related to the age of the household, as expected. Other demographic and labour force variables are not significant. In Columns 2 and 3 the change in house value is interacted with dummy variables for the initial LVR with no significant coefficient on either threshold interaction term. In Columns 4 and 5 a further interaction term is included for the initial value of unsecured debts held by the household. Here the coefficient on the interaction term capturing households with high LVRs plus higher values of unsecured debt is positive, sizeable and statistically significant at the 1% level. For households with LVRs above 0.8 and unsecured debts about £1,000 an increase in instrumented housing value of £1,000 is associated with an increase in secured debt of £310. In the sample 10% of household-observations fall into this category. No such relationship is evident for households with an equivalent level of unsecured debt but lower LVR, or among the other LVR groups as identified by the interaction terms. In Column 4 the unsecured debt threshold is increased and the coefficient on the interaction also increases. As expected, a significant relationship between house value increases and increases in secured debt is only observed for a sub-set of the population based on initial collateral position and initial unsecured debt. These results are consistent with the story described earlier.

Estimates for the United States from the PSID presented in Table 7 display a much stronger relationship between (instrumented) changes in house values and secured debt. In Column 1 the coefficient on the instrumented change in house value is positive and significant at the 1% level and implies sampled households increase secured debt by approximately 10% of their housing gains. Age, household income and other demographics are not statistically significant in this regression, but there is a positive and significant conditional relationship between increases in auto-related debts and secured debts. In Columns 2 and 3 we again interact changes in instrumented house values with dummy variables distinguishing the household's initial LVR position. Households with initial higher LVRs exhibit a stronger relationship between changes in house values and secured debt, statistically significantly stronger at the 1% level. Columns 4 and 5 present results for the addition of the unsecured debt dummies. The interaction term in Column 4 for the unsecured debt threshold dummy variable in Column 4 exhibits a coefficient of 0.74; this implies that households with an initial LVR above 0.8 and unsecured debts of over $2,000 (17% of the sample observations) increased their secured debts by nearly three-quarters of the increase in

house value. Estimates for a higher unsecured debt threshold of $3,000 in Column 5 show a similar magnitude of response for a smaller sample (12%) of households.

Results for both the PSID and BHPS samples show markedly different relationships between the growth in mortgage debt and changes in house values for high-LVR and low-LVR households, more so for the PSID sample than the BHPS sample. Table 8 describes the evolution of household finances for high-LVR and low-LVR households in both samples over the period considered. In Table 8 the PSID and BHPS samples of household-year-observations are split by an LVR threshold of 0.7. Approximately one quarter of observations in each sample are for household-years with LVRs above 0.7 The evolution of mortgage debt for households in the high-LVR group is markedly different compared to that for households in the low-LVR group. Among the PSID sample of households exhibiting an LVR in excess of 0.7 over the following two-year period the mean increase in mortgage debt is equivalent to two-thirds of the gain in house values, compared to an average decrease in mortgage debt among the low LVR sample. Households in the high-LVR sample also on average increase their unsecured debts and auto-related debts. Hence the increase in mortgage debt appears not to be utilised to pay-off non-mortgage debts; rather these households increase their indebtedness across the range of secured and unsecured borrowing instruments. The pattern on borrowing among the BHPS sample also differs between high-LVR and low-LVR households, however high-LVR households increase their mortgage debt by only one-twentieth of the value of their housing gain. These households also exhibit lower growth in unsecured debt compared to the rest of the sample, suggesting that the increase secured debt may have been utilised in part to offset accrual of, or pay down, unsecured debts. It is evident from these summary statistics that high-LVR PSID households increased their indebtedness markedly over the period compared to the rest of the sample, and compared to similarly high-LVR households in the BHPS sample. The regression estimates in Tables 6 and 7 suggest that much of this increase in mortgage debt is attributable to increases in housing values for these households.

4. Discussion

Why is the mortgage debt of collateral-constrained households in the United States so much more responsive to increases in house prices than in the United Kingdom? One option, of course, is that households in the United States are more impatient for consumption. Two other possible reasons relate to the structure of mortgage markets in the United States

compared to the United Kingdom. First, households in the United States typically hold fixed rate mortgages which they choose to refinance at the point of interest rate reset. Fixed fees associated with mortgage refinancing can be added to the value of the mortgage debt. This would go some way to explaining increases in mortgage debt across all households; however the evidence in Table 8 suggests that for low-LVR households outstanding mortgage debt is actually falling over the period. Secondly, the summary statistics in Table 1 indicate that households in the United States on average hold greater values of unsecured debt and auto-related debts, hence giving them a greater incentive to substitute secured for unsecured and auto-related debts when house prices increase and collateral constraints unbind. However, Table 8 indicates that household debt among high-LVR was increasing across secured, unsecured and auto-related debts over the period.

Alternatively, the greater willingness of collateral constrained households in the United States to extend their mortgage leverage positions in response to rising house values than their counterparts in the United Kingdom might be explained by differential lower downside risk to falling house values in the two economies. No-recourse clauses on conforming mortgage loans in the United States protect households from exposure to liabilities arising from negative housing equity positions. Households can effectively walk-away from negative equity and benefit from an immediate wealth gain from relinquishing negative housing equity positions. Indeed, Bajari, Chu and Park (2009) find that declining home prices are a major factor in explaining increasing default on mortgage loans among households in the United States. In contrast, mortgage contracts in the United Kingdom do not offer the same option to holders, increasing the potential liabilities to households experiencing negative equity.

Without data on household consumption spending it is not possible to confirm that the increases in mortgage debt documented were utilised by households to fund consumption spending. Whilst we can present evidence that the households which most aggressively increased their mortgage debts also increased their other debts, we do not know whether increase mortgage debt was used to fund durable purchases, home improvements or consumption spending, or indeed whether households chose to hold additional borrowing as cash. However, increased mortgage debt was most likely used to fund some form of consumption spending. This being the case, our results suggest that households in the United States might have consumed approximately 10% of their housing gains via increasing their

mortgage debt, whereas for the United Kingdom this figure is much lower, most likely around 3-4% of the gain.

These results may also go some way to reconciling existing findings on the magnitude of housing wealth effects in aggregate and micro-data studies. Previous studies based on aggregate data in the United States have found large housing wealth effects in the region of 0.1 (Case *et al.*, 2005; Carroll *et al.,* 2006). However, studies based on micro-data, which have been limited to studies on household savings data, have found much smaller estimates in the region of 0-0.03 (Juster *et al.*, 2006; Engelhardt, 1996). If housing wealth effects primarily act through collateral effects on credit-constrained households, and hence are observed in increased indebtedness, estimates based on savings data are likely to be small. Our implied consumption effect of 0.1 suggests that most of the housing wealth effect can be considered a collateral-based effect, and reconciles estimates from micro-data with those from aggregate data studies. For the U.K. a recent study by Disney *et al.,* 2009 based on household savings data also find very small housing wealth effects. Studies based on household consumption data find that consumption is unresponsive to unpredictable changes in house prices but responsive to predictable changes in house prices (Campbell and Cocco, 2006; but see Attanasio *et al.*, 2009). This result is also consistent with our story of housing wealth effects primarily occurring through collateral channels.

5. Conclusion

Recent versions of the 'financial accelerator' model (see Bernanke, Gertler and Gilchrist, 1999) as applied to households have been formulated on the premise that the economy is composed of two types of households: those patient for consumption and those impatient for consumption. Impatient 'spenders' utilise housing gains as additional collateral against which to extend mortgage positions and finance consumption spending. Patient 'savers' benefit from housing wealth effects which lead to much smaller consumption response than those exhibited among spender households. This paper has estimate the impact of changes in house values on the indebtedness of households in both the United States and the United Kingdom. It finds that the distinction between spenders and savers made in household financial accelerator models may not be far off as a description of the behaviour of U.S. households over the past decade. Incorporating unsecured debts into the story, collateral constrained households with non-negligible unsecured debts in our sample respond most aggressively to house price increases by increasing their mortgage debts, with the most

constrained households increasing the value of their mortgage debt equivalent to three-quarters of the value of their housing gain. This story appears less applicable to the sample for the United Kingdom, where the same pattern of responses is found but the magnitudes of responses to house price volatility are much lower. Time will tell as to whether household behaviour in response to the sharp reversal of house prices from 2007 onwards is consistent with these findings for the two economies.

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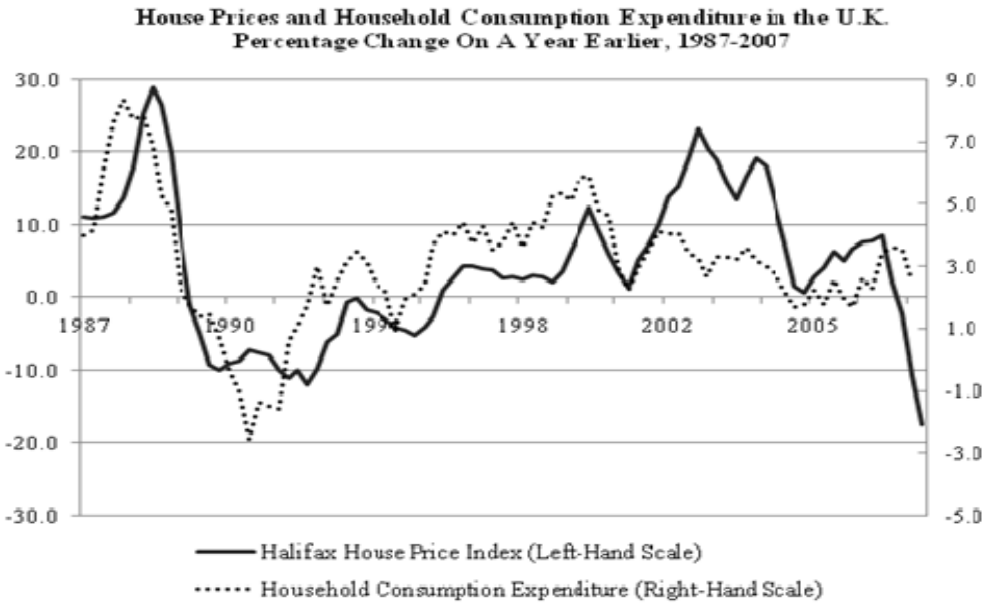
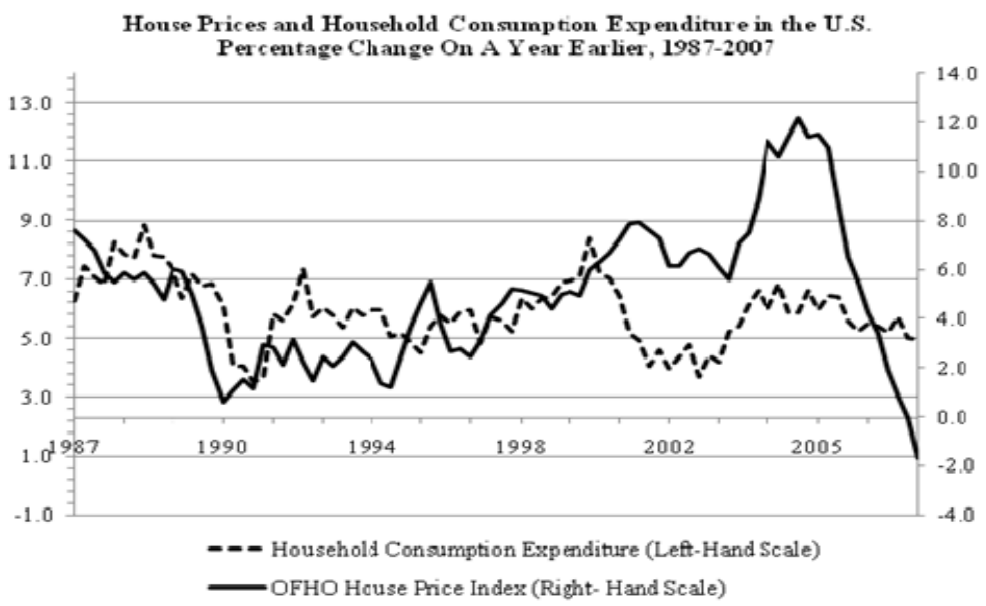
Table 1: Real House Price Growth, Real Consumption Growth and Housing Equity Withdrawal in the U.S. and the U.K., 1987-2007



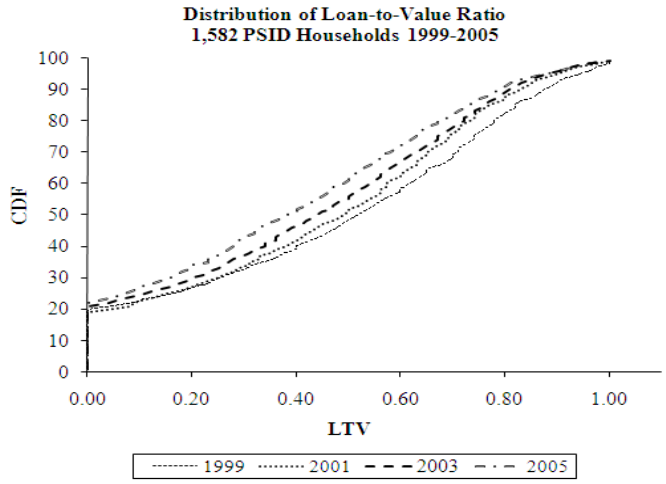


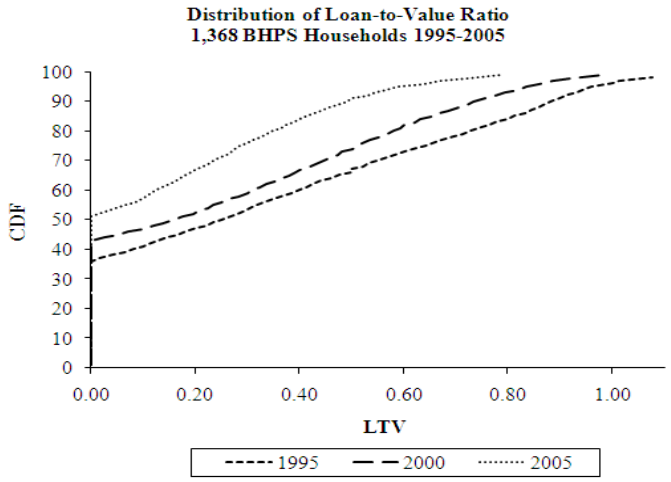
Source: Halifax National House Price Index, Office for National Statistics, Bank of England. House price and consumption data deflated using RPI-X index.

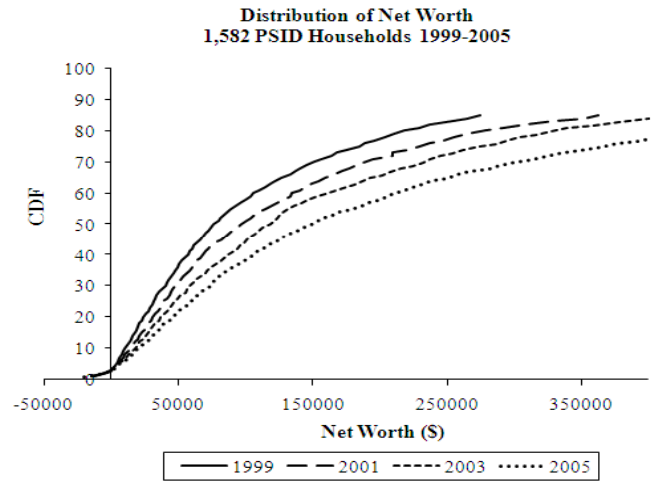
Source: Federal Reserve Economic Data Service, Office of Federal Housing Oversight, Kennedy-Greenspan Housing Equity Withdrawal Estimates (Kennedy and Greenspan, 2007). House price and consumption data deflated using CPI index.

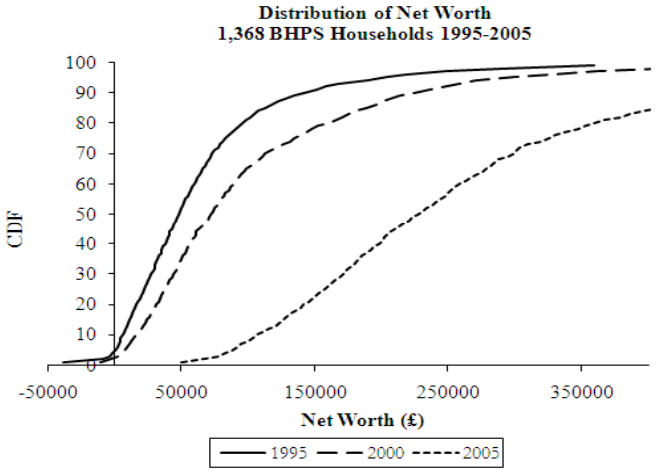
Table 2: Means of Financial Variables for PSID / BHPS Households				
PSID (financial variables in U.S. dollars, 2001 prices)				
Year	*1999*	*2001*	*2003*	*2005*
No. Households	1582	1582	1582	1582
Age	42.3	44.4	46.4	48.34
Income	72,000	83,000	82,000	88,000
Financial Wealth	52,000	58,000	61,000	78,000
Auto-Debt	6,200	6.800	7,100	6,200
Non-Mortgage Debt	5,400	6,200	7,100	8,000
Value all Housing	138,000	169,000	200,000	256,000
Mortgage Debt	65,000	72,000	80,000	90,000
LVR	0.47	0.44	0.42	0.38
BHPS (financial variables in U.K. pounds, 2000 prices)				
Year	*1995*	*2000*	*2005*	
No. Households	1368	1368	1368	
Age	40.4	44.9	49.8	
Income	24,000	30,000	34,000	
Financial Wealth	11,000	13,000	17,000	
Non-Mortgage Debt	1,600	2,500	3,500	
Value all Housing	75,000	119,000	236,000	
Mortgage Debt	33,000	37,000	44,400	
LVR	0.48	0.34	0.18	

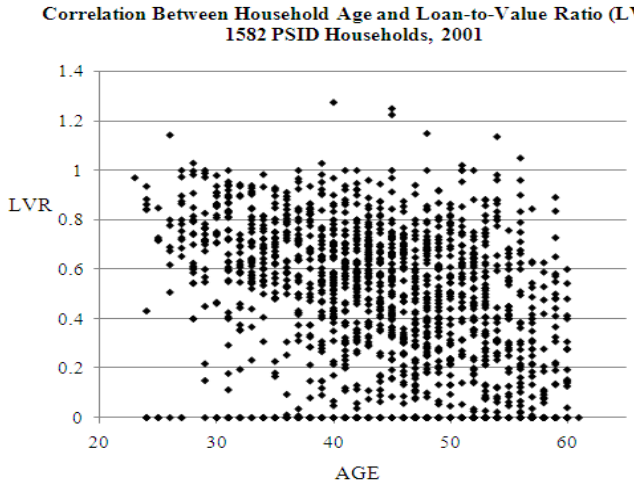
Table 3: Summary Figures: LVR, Networth and Age-LVR Correlations in PSID and BHPS.











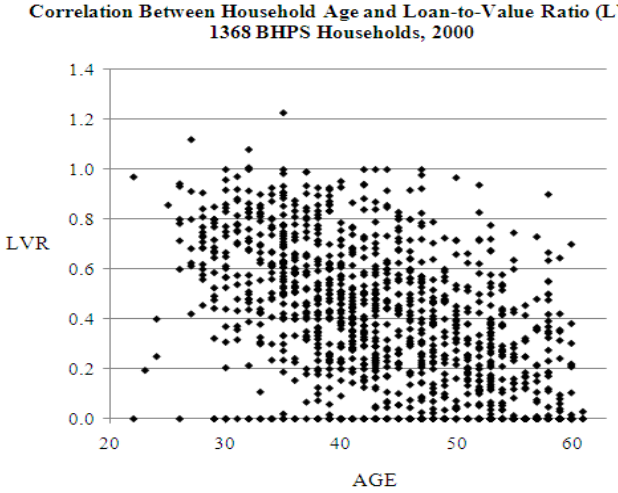
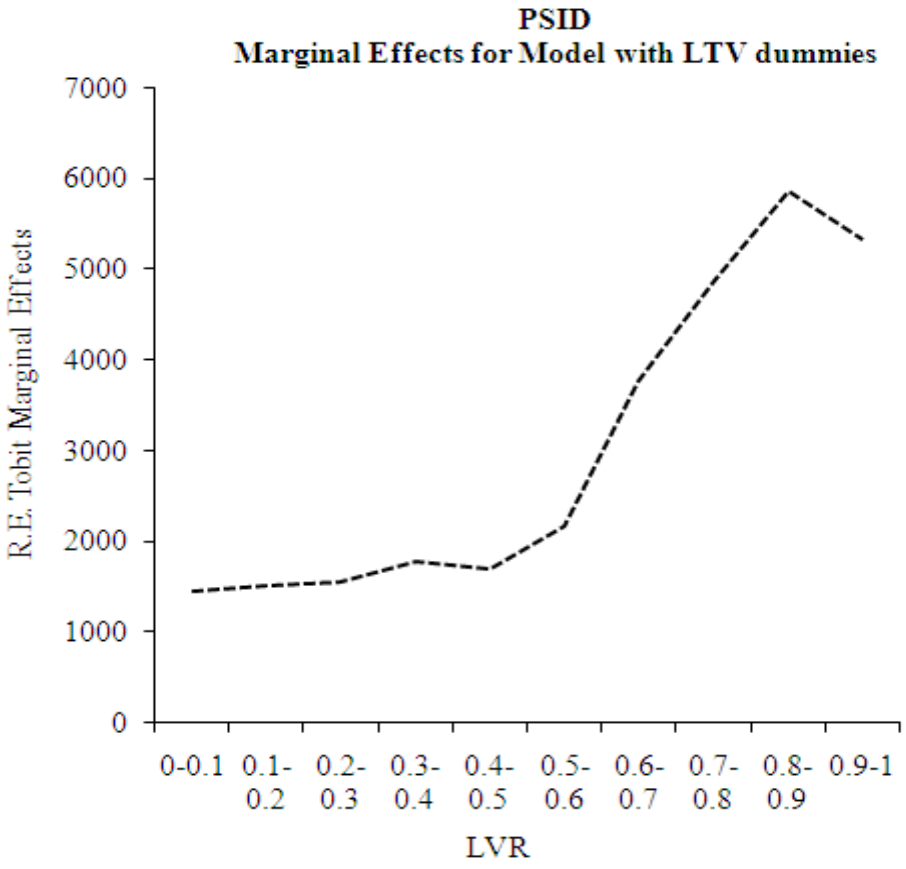


Table 4: Cross-Section LVR and Unsecured Debt				
Specification: *Random Effects Tobit*	*PSID* *(financial variables in US dollars)*		*BHPS* *(financial variables in U.K. pounds)*	
Dependent Variable: *Unsecured Debt*	(1) Pooled Random Effects Coefficients	(2) Marginal Effects	(3) Pooled Random Effects Coefficients	(4) Marginal Effects
LVR	9343** (1361)	*1493*	3515** (454)	*1612*
Household Income	0.06** (0.01)	*0.03*	0.07** (0.009)	*0.03*
Household Income Sq	-2.88e-08 (1.75e-08)	*-1.32e-08*	-0.00007 (0.00004)	*-0.00003*
Financial Assets	-0.02** (0.003)	*-0.01*	-0.03** (0.006)	*-0.12*
Financial Assets Sq	6.61e-09** (1.23e-09)	*3.03e-09*	0.00002 (0.00002)	*8.91e-06*
Auto Loans / Leases	0.07* (0.03)	*0.03*	-	-
Age	69.1 (410)	*31.7*	230* (102)	*106*
Age Sq	-1.49 (4.6)	*-0.68*	-2.86* (1.17)	*-0.13*
Male Head = 1	-3129 (1842)	*-1493*	224 (261)	*102*
Married = 1	4687** (1741)	*2051*	932** (309)	*427*
Years Education	455* (180)	*208*	216* (123)	*108*
Smoker = 1	1226 (1051)	*570*	620* (266)	*291*
No. Obs No. Groups	6328 1582		4104 1368	
Log L Wald/LR χ^2 (15) Prob > χ^2	-42845.31 174.14 0.0000	Log L Wald/LR χ^2 (19) Prob > χ^2	-7738.37 426.50 0.0000	

Notes to Table 4: Marginal effects conditional on being uncensored. Marginal effects evaluated at means of other characteristics. Predicted value for unsecured debt at means of characteristics is $8400. * = 5% level of significance, ** = 1% level of significance. *PSID estimates*: 2699 censored / 3629 uncensored observations. *BHPS estimates:* 1919 censored / 2185 uncensored observations.

Table 5: Marginal Effects Evaluated at LVR-Splines, Random Effects Tobit Estimates



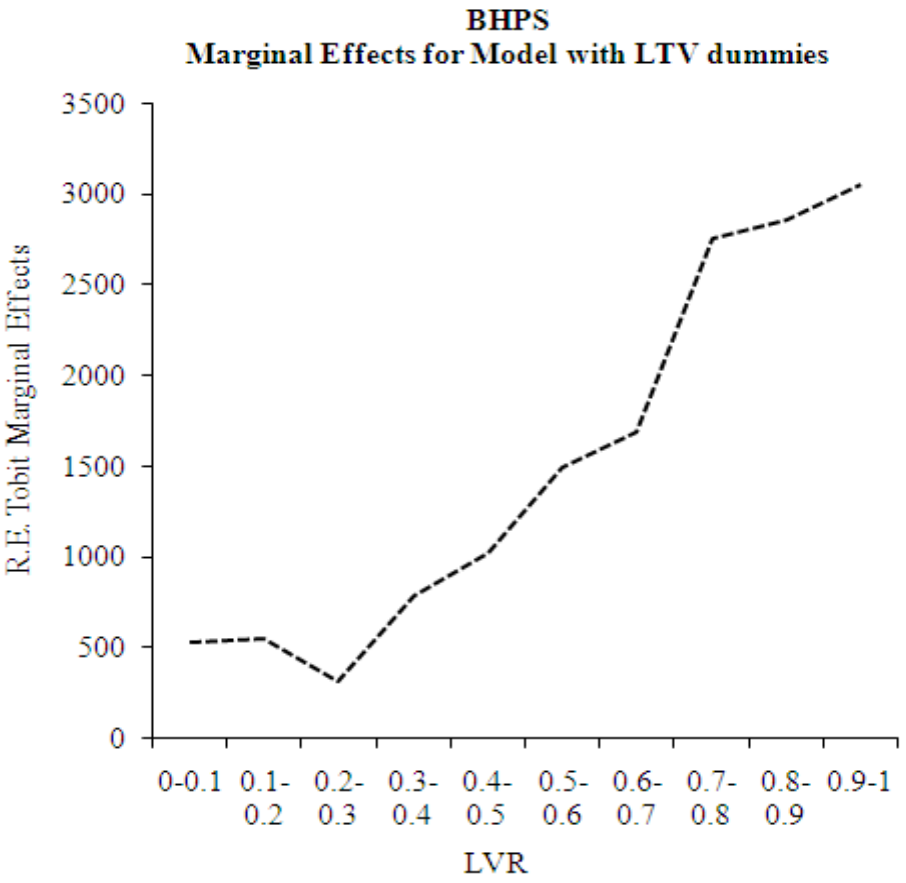


Table 6: House Price Changes and Growth in Secured Debt - BHPS

Specification: *I.V. Regression* Dependent Variable: *Change Secured Debt*	(1.)	(2.) 0.X=0.9	(3.) 0.X=0.8	(4.) 0.X=0.8 Y=1,000	(5.) 0.X=0.8 Y=1,500
Δ House Value (£,000s)	-0.01 (0.01)	-	-	-	-
Δ House Value (£,000s)* LVR_{t-1}>0.X	-	0.02 (0.02)	0.02 (0.02)	0.01 (0.01)	0.01 (0.01)
Δ House Value (£,000s)* LVR_{t-1}<0.X	-	-0.02 (0.01)	-0.02 (0.02)	-0.03 (0.02)	-0.03 (0.02)
Δ House Value (£,000s)* LVR_{t-1}>0.X* $Udebt_{t-1}$>£Y	-	-	-	0.31** (0.07)	0.42** (0.06)
Δ House Value (£,000s)* LVR_{t-1}<0.X* $Udebt_{t-1}$>£Y	-	-	-	0.05 (0.06)	0.04 (0.04)
Δ Household Income (£,000s)	0.07** (0.03)	0.09** (0.03)	0.09** (0.03)	0.07** (0.03)	0.07** (0.03)
Δ Financial Assets (£,000s)	0.02 (0.04)	0.03 (0.04)	0.04 (0.05)	0.04 (0.05)	0.04 (0.05)
Change in L.F. Status (Employed = 1)	1095 (1270)	1083 (1230)	1086 (1226)	1084 (1224)	1081 (1234)
Household Income $_{t-1}$	-0.11 (0.06)	-0.11 (0.06)	-0.10 (0.08)	-0.10 (0.07)	-0.10 (0.07)
Age	-0.57** (0.21)	-0.57** (0.20)	-0.57** (0.24)	-0.54** (0.22)	-0.55** (0.22)
Male Head=1	629 (635)	631 (638)	631 (639)	628 (627)	630 (634)
Married	503 (732)	516 (746)	517 (749)	520 (758)	526 (576)
No. Children	128 (84)	126 (87)	123 (89)	127 (85)	124 (84)
No. Observations F Prob > F Adj. R-Sq	2316 15.84 0.0000 0.17	2316 14.45 0.0000 0.17	2316 14.53 0.0000 0.17	2316 15.42 0.0000 0.17	2316 15.46 0.0000 0.17

Notes to Table 6: Additional control variables: household income squared, household assets squared, age squared, years schooling, degree, smoker, predicted probability of being a non-mover. 2316 observations of household-changes (1995-2000, 2000-2005). IV estimates using change in county-level house price index as instrument for change in self-reported house value. $_{t-1}$ refers to variable measured at beginning of period. * = 5% level of significance, ** = 1% level of significance.

Table 7: House Price Changes and Growth in Secured Debt - PSID					
Specification: *I.V. Regression* Dependent Variable: *Change Secured Debt*	(1.)	(2.) 0.X=0.9	(3.) 0.X=0.8	(4.) 0.X=0.8 Y=2000	(5.) O.X=0.8 Y=3000
Δ House Value ($,000s)	0.11** (0.04)	-	-	-	-
Δ House Value ($,000s)* LVR_{t-1}>0.X	-	0.36** (0.13)	0.25** (0.09)	0.42** (0.13)	0.38** (0.12)
Δ House Value ($,000s)* LVR_{t-1}<0.X	-	0.13* (0.06)	0.12 (0.06)	0.08 (0.06)	0.07 (0.06)
Δ House Value ($,000s)* LVR_{t-1}>0.X* $Udebt_{t-1}$>$Y	-	-	-	0.32* (0.14)	0.28* (0.14)
Δ House Value ($,000s)* LVR_{t-1}<0.X* $Udebt_{t-1}$>$Y	-	-	-	0.14** (0.03)	0.16** (0.03)
Δ Household Income ($,000s)	0.02 (0.04)	0.02 (0.02)	0.02 (0.02)	0.00 (0.02)	0.00 (0.02)
Δ Financial Assets ($,000s)	0.003 (0.005)	0.001 (0.005)	0.002 (0.005)	0.01 (0.01)	0.01 (0.01)
Δ Auto Loans / Leases ($,000s)	0.19** (0.06)	0.22** (0.07)	0.22** (0.07)	0.21** (0.07)	0.21** (0.07)
Change in L.F. Status (Employed = 1)	3852 (2621)	4283 (2785)	4432 (2783)	4135 (2776)	4128 (2775)
Household Income $_{t-1}$	-0.02 (0.03)	-0.03 (0.04)	-0.02 (0.04)	-0.02 (0.04)	-0.02 (0.04)
Age	630 (766)	546 (858)	254 (859)	427 (858)	394 (857)
Male Head=1	-4902 (2809)	-5262 (2992)	-5537 (2991)	-5166 (2983)	-5105 (2982)
Married	6648 (2423)	7060 (2627)	5512 (2686)	6840 (2616)	6854 (2615)
No. Children	-224 (649)	-171 (962)	-177 (692)	-64.6 (690)	-52.7 (690)
No. Observations F Prob > F Adj. R-Sq	4143 18.20 0.0000 0.21	4143 20.59 0.0000 0.21	4143 20.92 0.0000 0.21	4143 20.38 0.0000 0.21	4143 20.53 0.0000 0.21

Notes to Table 7: Additional control variables: household income squared, household assets squared, value of assets and auto loans in $_{t-1}$ age squared, years schooling, degree, smoker, predicted probability of being a non-mover. 4143 observations of household-changes (1999-2001, 2001-2003, 2003-2005). IV estimates using change in state-level house price index as instrument for change in self-reported house value. $_{t-1}$ refers to variable measured at beginning of period. * = 5% level of significance, ** = 1% level of significance.

Table 8: Growth in House Prices and Indebtedness, PSID and BHPS Households				
	PSID		**BHPS**	
LVR at beginning of period	**LVR>0.69**	**LVR<0.7**	**LVR>0.69**	**LVR<0.7**
Sample Split				
% total sample	27%	73%	26%	74%
N household-year observations	1119	3024	602	1714
N unique households	373	1008	257	901
Beginning of Period				
Age	37.2	47.8	36.4	50.1
Income ($,£)	62,400	97,100	27,100	38,200
Networth incl. housing ($,£)	64,600	278,200	17,000	74,000
Changes Over Following Period				
Δ house value ($,£)	27,700	46,400	60,100	103,300
Δ mortgage debt ($,£)	18,800	-2,500	5,000	-6,100
Δ unsecured debt ($,£)	1,100	100	1,000	2,100
Δ family income ($,£)	7,900	4,300	8,200	7,100
Δ auto loan debt ($,£)	3,700	-500	-	-
Refinanced mortgage loan (%)	0.51	0.15	0.31	0.21

Notes to Table 8: PSID Sample: 4143 observations for 1381 non-moving households observed in 1999, 2001 and 2003. Changes are between 1999-2001, 2001-2003 and 2003-2005. BHPS Sample: 2316 observations for 1158 non-moving households observed in 1995 and 2000. Changes are between 1995-2000 and 2000-2005.

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