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Housing equity as a buffer: evidence from UK households

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Abstract

The decision to extract home equity is examined using household-level data for the United Kingdom, 1993 to 2003. At its peak during the period, around one in ten homeowners withdrew equity per year. The paper finds that the equity withdrawal decision conforms to predictions from the standard life-cycle framework and models that predict its use as a financial buffer. The paper also estimates responses to the large house price appreciation and significant reductions in mortgage rates seen during the period. This has implications for the size of the ‘collateral channel’ and credit channel models of monetary policy.

Key words: Collateral; housing equity; buffer stock.

JEL classification: E2, E4, G4.

Summary

The links between consumer spending and the housing market have been the focus of much debate. On several occasions in the past, swings in consumption and house prices have coincided. Precisely how to interpret that is by no means clear. One view has it that house prices are an asset price for an essential commodity, shelter, and that they largely reflect macroeconomic conditions with no special role of their own. Another view is that there is an important causal effect of housing in providing collateral for households' borrowing and spending decisions. Previous work by the Bank of England in this area has emphasised both views. Much of the comovement of house prices and consumption is driven by common movements in other variables. But there is likely to have also been a causal effect on consumption from house prices that results from the collateral channel. That reflects the fact that after a rise in house prices, homeowners enjoy capital gains that improve the terms on which they can obtain credit. For those wishing to borrow, that may have implications for their spending. Both of these views downplay the notion that house prices have an aggregate 'wealth effect' on consumption.

In this paper, one stage in that collateral channel is examined in finer detail: the withdrawal of home equity by households that enjoy gains in home equity (often referred to as 'mortgage equity withdrawal'). To look at this, the paper uses data on UK households over the period 1992 to 2003. Most previous analysis of mortgage equity withdrawal has used aggregate data. But aggregate mortgage equity withdrawal data conflate together rather different decisions by distinct groups of households. For example, the decisions by homeowners to actively borrow against the value of their homes are quite different from decisions by last-time sellers. Employing data for large numbers of homeowners and focusing solely on whether they actively borrow against their home equity or not avoids that drawback. In the period examined, the UK housing market went from a depressed state to one of its most remarkable booms. That varied experience, also reflected in the use of housing equity withdrawal, makes it a particularly useful period to examine.

Modelling the decision to withdraw versus retaining equity in the home helps us build up a picture of what influences this decision. This leads to a view that, among other things, housing equity plays the role of a financial buffer, being retained in normal times but drawn upon (and withdrawn) when a temporary, adverse shock has been experienced.

As well as the experience of some adverse financial shock, the findings also indicate that households are more likely to withdraw home equity if they are liquidity constrained, if they hold relatively large amounts of home equity and if they have higher incomes. There is also some evidence that they are more likely to withdraw equity if they face less house price uncertainty. Changes in marital status are particularly important. It is much more common for withdrawn equity to flow into housing investment than into consumption. That suggests the ‘collateral channel’ should be stronger for housing investment than consumer spending.

An emphasis on housing equity as a buffer is consistent with the view that many households seem to look at their housing equity as an asset that they would be prepared to draw on in an emergency to support their consumption plans. This is important since most homeowners have relatively little cash but relatively large amounts of home equity. The precautionary savings literature has, however, generally emphasised the use of liquid assets as a buffer.

‘your future dream is a shopping spree’ - Johnny Rotten (1976)

1 Introduction

In many countries, housing equity is the largest component of the typical household’s balance sheet. That equity is also more evenly dispersed across households than other assets. This suggests that the decision to withdraw or retain that equity in the home is likely to be an important decision for homeowners. Moreover, aggregate data indicate that the sums of home equity that *are* withdrawn are large and volatile.⁽¹⁾ Since an important motive for withdrawing home equity is to spend it, these funds may be associated with significant swings in aggregate consumption and housing investment. That suggests decisions to withdraw or retain home equity are important for the aggregate economy. But to date, little is known about what drives these decisions. In this paper, the decision of withdrawing equity from the home is studied using household-level data for the United Kingdom. In the period examined, 1993 to 2003, the UK housing market experienced significant swings in activity and in the incidence of borrowing against home equity.

Understanding the links between home equity, borrowing and spending is vital to policymakers. Credit view models of the household sector (eg Iacoviello (2005); Aoki *et al* (2004)) emphasise the potential for the effects of monetary policy to be amplified through their effects on the collateral value of the home.⁽²⁾ In those models, the decision to withdraw home equity is the main mechanism through which that effect on spending takes place.

A number of studies (eg Miles (1992); Westaway (1995)) have used aggregate data to examine home equity withdrawal and its effects. This paper takes the view that using household-level data is likely to be more informative (see also Zeldes (1992)). Hurst and Stafford (2004) provide a recent study of equity withdrawal using household-level data for the United States. They also examine the effects on home equity withdrawal and spending from the loosening of monetary policy in the United States in the early 1990s. The UK mortgage market considered here has special features and so warrants separate study. In the United States, most households have long-term fixed nominal mortgage contracts but in the United Kingdom such contracts are

(1) At its recent peak, mortgage equity withdrawal (MEW) was equivalent to 9% of post-tax household income. During the period 1990 Q1 to 2004 Q4, this averaged 2.2%, but its standard deviation was greater, at 2.7%. MEW can be negative when housing investment (purchases of newly built housing and home improvements) exceeds net new secured borrowing.

(2) See also Bernanke and Gertler (1989) for a model that emphasises collateral effects on spending.

unavailable. That means that compared to the United States, the motive to remortgage in order to withdraw housing equity is likely to be more important rather than refinancing in order to ‘lock in’ a lower interest rate. Movements in house prices are therefore likely to be relatively more important (compared to the United States) than movements in interest rates in shaping remortgaging.

Many households seem to look at their housing equity as a financial buffer that they would be prepared to draw on in an emergency. A survey by the Financial Services Authority found that if the policy interest rate *rose* significantly, the most popular response among households experiencing financial difficulty would be to remortgage their properties (Nuttall (2004)).⁽³⁾ This suggests the possible use of housing equity to weather income and other shocks. Conceivably, that could be as important as drawing on liquid assets, at least for homeowners. That seems particularly likely since, on average households in Britain have much larger amounts of home equity than liquid savings.⁽⁴⁾ Moreover, Carroll *et al* (2003) find, among US households, that the precautionary saving motive is reflected in a reluctance to withdraw home equity more than it is reflected in the accumulation of liquid assets.

In this paper, I focus on the decision to withdraw home equity, as opposed to remortgaging without changing the outstanding mortgage balance to secure a better mortgage rate. That focuses the analysis on the portfolio allocation and spending decisions of households.⁽⁵⁾ As emphasised by Hurst and Stafford (2004) the scope for housing equity to be used as a financial buffer in this way has generally been overlooked, despite the emphasis in consumption models on the role for precautionary liquid savings balances (eg Deaton (1991)). Although the result that equity is withdrawn in response to an adverse financial shock – that is, acts as a buffer – is highlighted, the paper presents a more general analysis of the decision to withdraw home equity.

The remainder of the paper is organised as follows. Section 2 describes the theoretical background and recent models of household consumption that include a mortgage equity

(3) Institutional developments in the mortgage market are assisting this. There has been significant growth in the availability of ‘flexible mortgages’, now offered by practically all lenders, where the direct transactions costs of accumulating and withdrawing equity are zero (see Smith and Ford (2002)). However, a small minority of UK households have these mortgages.

(4) Banks *et al* (2003) report average liquid savings of around £7,000 but over £40,000 of home equity. The median figures are significantly lower, with the median household having £1,000 in liquid savings in 2000 in Britain according to Banks *et al* (2002).

(5) Greenspan and Kennedy (2005) provide estimates of the discretionary liquidation of home equity in the United States.

withdrawal decision. Section 3 turns to the data and estimation. Theoretical predictions are confronted with panel data on around 5,000 owner-occupying households in the United Kingdom from the British Household Panel Survey (BHPS), 1993 to 2003. The study also estimates the conversion of home equity to cash resulting from variations in interest rates, and house price inflation. The significant movements in mortgage rates and house price inflation witnessed during the period examined make this especially worthwhile. The estimation consists of random effects models for the decision to withdraw housing equity and for how much equity to withdraw. Section 4 concludes.

2 Theoretical background

A small number of models of household consumption incorporate a housing equity withdrawal decision. This section reviews those models and what they say about when a household will be more likely to withdraw equity and what types of households they tend to be.

In Hurst and Stafford (2004), the household is an owner-occupier, and in each period it chooses its level of consumption, holding of liquid assets, and mortgage borrowing in order to maximise the present value of utility from current and future consumption. It starts out with a given amount of home equity and faces a collateral constraint, in that borrowing cannot exceed a fraction of the value of its home. If a household remortgages it pays off its existing debt and takes out a new higher mortgage but incurs fixed costs in the process. Income uncertainty is also allowed for with the lowest income state being thought of as a spell of unemployment. Under these conditions, Hurst and Stafford (2004) show that a household should be more inclined to pay the fixed cost and withdraw home equity when it experiences an adverse financial shock. In the United Kingdom, for those on standard mortgages, the typical costs of withdrawing equity are around £500, although indirect ('hassle') costs should also be taken into account. A household that has the liquid assets available in order to smooth through a shock would not incur the fixed cost, preferring to draw on its liquid assets.

In Hurst and Stafford's (2004) model, house prices are, in fact, assumed constant. That precludes being able to see how house price inflation influences the mortgage refinancing decision, though clearly having equity in the home is a precondition to extracting any equity. Banks *et al* (2004) highlight an insurance demand for housing associated with house price volatility. Being a

homeowner insures the owner against buying at a higher price in the future. They present a three-period model where housing services as well as consumption appear in the utility function. The hedging motive means that among owner-occupiers those who live in areas where house prices are generally more volatile should be more reluctant to withdraw equity from their home. They present empirical evidence consistent with that for both the United Kingdom and the United States.

Angelini and Simmons (2005) present a life-cycle model of mortgage refinancing. The life-cycle aspect implies that borrowing against home equity can be thought of in a similar way as borrowing in general. Those that want to bring forward consumption against a rising income profile will be inclined to borrow. A rising income profile is likely to apply to homeowners up to around age 50. This model allows for employment and house price uncertainty as well as a collateral constraint. At any point there is a wedge between the mortgage rate and savings rate of interest and this wedge plays an important role. Households pay the fixed cost of remortgaging when the difference between mortgage and savings rates is sufficient to cover the transaction cost of remortgaging. The refinancing and equity withdrawal decision is therefore driven by a financial efficiency motive with little role for consumption smoothing. Households are no more likely to withdraw equity when they experience a financial shock.

This paper does not attempt to test among the different models outlined above. Nor does it encompass all motives for withdrawing equity. In particular interactions between equity withdrawal and the amount or price of unsecured borrowing are relatively unexplored in these models and are not the focus of the analysis to follow.⁽⁶⁾

Taken together, the key implications from these models are that a homeowner is more likely to withdraw equity from their home in the following circumstances. First, among younger homeowners or those with rising income profiles who wish to bring forward consumption. Second, households that have experienced an adverse financial shock. This reflects the use of housing equity as a buffer, as emphasised by Hurst and Stafford (2004). Third, if they have a high level of equity in the home. Having equity is a precondition for being able to withdraw it and

(6) Bridges *et al* (2006) study the link between home equity, remortgaging and unsecured debt. In their model, the availability of unsecured debt moderates the effect of collateral on secured borrowing and spending. In their empirical analysis, the unsecured debt data are only available in years 1995 and 2000 of the survey. It is not clear how much of the credit card balances reflects its use to finance transactions (being paid off within the month) rather than being genuine credit on which interest is paid.

most lenders will require the household to keep a certain cushion of equity after any withdrawal. Fourth, if there is less local house price volatility, the point emphasised by Banks *et al* (2004). Fifth, the consumption-smoothing motive suggests that those who are liquidity constrained, or have few other liquid resources to call on, should be more likely to withdraw home equity. That is especially true when these households experience some financial shock. Some shocks are of course unobserved, which suggests that at a particular point in time, the liquidity-constrained should be more likely to withdraw equity. Sixth, although not derived explicitly in these models, other non-financial shocks such as marital breakdown (which clearly have financial consequences) would also be related to the propensity to withdraw equity.

In terms of aggregate influences on the decision to withdraw equity, there are two key influences. First, house price inflation increases the amount of equity in the home and also raises the likelihood of withdrawing equity, *ceteris paribus*. The idea that asset price movements affect borrowing (and spending) is, in particular, associated with credit channel models. Second, interest rate reductions increase the benefits of remortgaging and that may be associated with extracting home equity. That facilitates the consumption-smoothing motive of equity withdrawal. Variations in interest rates (both mortgage and savings rates) also drive the financial efficiency benefits of remortgaging, although this would not necessarily be associated with extraction of equity from the home.⁽⁷⁾ The next section focuses on confronting these predictions with data for UK households.

3 Data, estimation and results

3.1 The data

The data are drawn from the British Household Panel Survey (BHPS) for the years 1992 to 2003. During that period, the UK housing market experienced significant swings in house price growth and activity. In the early 1990s the market was somewhat depressed with falls in nominal house prices; a protracted period of recovery followed, up to the mid-1990s. In the late 1990s and early 2000s, the market was supported by reductions in unemployment alongside reductions in nominal and real interest rates. By the end of the sample period, annual house price growth exceeded 20%. The ratio of aggregate net home equity to income (and relative to total financial wealth) fell during the first half of the 1990s, but then increased significantly rising to all-time highs by 2004/05.

(7) The financial motive for remortgaging would be relatively weak in the UK, compared to the US, since rates can only be fixed over short periods of time and a large proportion of mortgages are on variable rates.

The BHPS consists of an annual, panel-based survey of approximately 5,500 households in Britain that began in 1991, and includes around 2,400 households with a mortgage. The data set provides detailed information on employment, education, income and demographic characteristics of households. It also contains some information on the household balance sheet in terms of outstanding mortgage debt, a (self-reported) estimated value of the home and interest-bearing assets.⁽⁸⁾

In each year of the survey, households are also asked if they have ‘taken out any additional mortgage or loan on this house/flat’ since the previous year; if so, they are asked how much.⁽⁹⁾ Those responses provide our data on (gross) equity withdrawal.

The sample used is selected on the basis of households that are mortgage holders, with a head of household aged between 21 and 75, and that the household has provided information on the variables of interest. Summary statistics for these variables are presented in Table A, where the raw data are split by whether the household has withdrawn equity in the past year or not. In the raw data, on average, those that have withdrawn equity are more likely to have experienced an adverse financial shock, are more likely to be without financial assets, have higher levels of home equity and have slightly higher levels of income. They also appear more likely to have experienced some marital shock in the form of getting divorced or getting married and are less likely to have moved home.

3.2 Preliminary data description

Chart 1 shows the proportion of households that withdrew home equity over the eleven-year period, 1992-2003. In the early part of the 1990s, the incidence of home equity withdrawal began at quite a high level with almost one in ten homeowners withdrawing equity. Despite the depressed housing market at the time – and widespread negative equity – and historically high interest rates, the recession may have meant that households were in need of liquidating what housing assets they had. The incidence of equity withdrawal then declined to around 1 in 25 households until around 1995-96. It has since picked up and, by 2003, exceeded its earlier level.

(8) The relevant question concerning mortgage debt was only asked from 1993 which explains our restriction to data from that year onwards in the regression analysis. Estimation of outstanding mortgage debt for those with endowment mortgages is particularly complicated and here the value reported by the household is used.

(9) In 1991, the first year of the BHPS, households were asked if they had *ever* taken out additional mortgages or loans that were secured on the property. The data description on home equity behaviour therefore omits 1991.

The average amounts withdrawn by those households withdrawing equity follows a similar profile, falling in the early to mid-1990s but then increasing in the latter parts of the 1990s and early 2000s.

Chart 2 shows the distribution of amounts withdrawn for those households that do withdraw equity (in 2000 prices). The mean amount withdrawn, at £15,612, is significantly above the median amount, £9,827. Chart 3 shows these amounts as a proportion of the home equity held before the extraction. On average, households extract 25% of the home equity, with the median amount being 19%.⁽¹⁰⁾ Only 5% of households extract more than 65% of their home equity. The fact that so few households withdraw anything like the full amount of home equity might suggest that there is a significant cost associated with running down that buffer of home equity.⁽¹¹⁾

The average standard variable rate (SVR) mortgage was 15.1% in 1990, then fell through the early 1990s, being 7.8% in 1994. It then remained relatively stable but declined in the latter part of the 1990s and early 2000s, reaching a low of 5.5% in 2003.⁽¹²⁾ Such large movements in mortgage rates make this a particularly interesting period to consider. Those movements in SVR largely reflected movements in monetary policy. The Bank of England's official interest rate had been lowered through the recession of the early 1990s; as sterling left the European Exchange Rate Mechanism in 1992 and with a new inflation-targeting regime in place, inflationary pressures also subsided. The official interest rate stayed mostly in the 6-7 percentage point range from the mid-1990s until 1998 when interest rates were lowered, partly in response to the Asian crisis. After being raised in 1999, the Bank's official interest rate was lowered by 250 basis points between February 2000 and July 2003. Increased competitiveness in the mortgage market meant that by the end of the period fewer households were on SVR mortgages, instead having mortgages at discounted rates relative to the SVR. Note also that since borrowers cannot 'lock-in' to lower rates in the United Kingdom for very long, households might take into account the subsequent cash-flow effects of future rises in interest rates if rates were lowered temporarily.

Why did households withdraw the equity? A summary of responses to a question asked in the

(10) This is larger than the 9% figure cited by Hurst and Stafford (2004) for the United States.

(11) The risk that house prices might fall, with the household then facing negative equity if it extracted close to the full amount of equity, might be a factor. Another likely factor is the debt-servicing constraint. For those households that witnessed particularly large increases in equity during this period, extracting that equity would imply a large increase in repayments. The size and persistence of any shock will also matter.

(12) These SVRs are the average quoted building society SVR up to 1995 and then an average of the building society and bank SVRs.

survey is shown in Table B. Making home improvements – and therefore reinvesting the gross withdrawal of equity back into the home – is the dominant reason for withdrawals, cited by three quarters of households that withdraw equity. This spending stimulates aggregate activity but represents housing investment rather than consumer spending.⁽¹³⁾ In practice, it is likely that even when withdrawn funds are stated as being for home improvements, some of the funds will be used to support consumption.⁽¹⁴⁾

Only a minority, around 10%, state that they extracted home equity in order to spend it on goods. The more common use of home equity extraction for home improvements rather than consumer spending does suggest, however, that the collateral channel should be stronger for housing investment than household consumption. A sizable proportion of households withdrew equity for ‘other’ reasons. That is likely to include consolidating other debts, investing in a business and to spend on non-durable goods and services.

Since households can merely withdraw home equity only to recycle it, by investing it back in the home through extending or improving the property, this suggests an alternative definition of households withdrawing home equity on a net basis. Such a definition refers to those households that withdraw home equity and do not state that they did so in order to make improvement or extensions to their property.⁽¹⁵⁾ One other interesting dimension of home equity withdrawal is whether it is done repeatedly by the same household or is very infrequent. Given the fixed costs of withdrawing equity, there is an incentive to do so infrequently. But some households have withdrawn equity several times in a short period of time, although they are clearly a minority (Table C). There is little evidence that those households that withdraw equity more often withdraw smaller amounts on average.

(13) The fact that this represents housing investment means it is netted off the official mortgage equity withdrawal (MEW) figures. That is one reason why that aggregate measure is not a good guide to the stimulus provided by withdrawing home equity for the economy (see Benito and Power (2004)).

(14) It is also worth noting that a buffer role of housing equity does not mean home equity extraction fulfils that role to the exclusion of other motives. For instance, the withdrawal of equity to be spent on home improvements does not reflect an obvious response to an adverse shock.

(15) This is the definition used by Banks *et al* (2004). That gives rise to very few households withdrawing equity in a particular year. For that reason, and because part of the stimulus to aggregate activity is through the effects on housing investment, the focus here is on the decision to withdraw gross equity. Hurst and Stafford (2004) focus on whether a household withdrew gross equity *at any stage* in the 1991-94 period. In order to say something about the timing of the equity withdrawal decision, the analysis here will mostly focus on exploiting the panel nature of the data.

3.3 Estimation strategy

Random effects probit models are estimated for the decision to withdraw home equity ($y_{it} = 1$) versus retaining all home equity ($y_{it} = 0$). Random effects Tobit models for the amount of home equity withdrawn are also estimated.

The estimating equation for the discrete decision of whether to withdraw equity or not consists of the following:

$$y_{it} = 1\{\alpha_i + X'_{it}\beta + \gamma_t + \varepsilon_{it} > 0\} \quad (1)$$

where ' i '=1,2... N indexes households and ' t '=1994,1995..2003 indexes years. $1\{A\}$ is an indicator function for the event A , in this case whether equity is withdrawn. α_i are random effects to control for household-level idiosyncrasies, with $\alpha_i \sim N(0, s_\alpha^2)$. ε_{it} represents random error, assumed normally distributed and independent of α_i . α_i and ε_{it} are also assumed to be orthogonal to the set of covariates, X_{it} , which has an associated parameter vector, β . γ_t are aggregate time effects (year dummies) for common influences on the propensity to withdraw equity. Those year dummies will primarily pick up the effects of changes in the policy rate of interest and aggregate house price inflation. The within-household correlation κ indicates the proportion of the total variance accounted for by the panel variance component α_i . Under the testable restriction that $\kappa = 0$, the model collapses to the pooled cross-sectional probit model. Standard errors reported are robust to heteroskedasticity.

Estimation is by maximum likelihood, with the likelihood function evaluated by the adaptive quadrature numerical technique shown by Rabe-Hesketh *et al* (2005) to be superior to standard quadrature methods, particularly where the number of cross-sectional observations is large and/or the intraclass correlation (κ) is high.⁽¹⁶⁾ The former situation applies in this application.

Maximisation of the likelihood function over the set of parameters is achieved by a Newton-Raphson algorithm.

For the decision of how much equity is withdrawn, the response to be modelled is 'mixed' in the

(16) This involves using the GLLAMM software written for STATA and described in Rabe-Hesketh *et al* (2004). See Rabe-Hesketh *et al* (2005) for the likelihood function.

sense that it combines a binary response, whether to withdraw equity, with a continuous response, how much home equity to withdraw. Tobit models which also include random effects for household-level heterogeneity are also estimated. As a generalized linear latent and mixed model (GLLMM) this involves mixing a linear estimator with a Gaussian distributional assumption and a probit estimator with binomial distribution (see Rabe-Hesketh *et al* (2004)). Numerical integration again employs adaptive quadrature, with the standard random effects Tobit estimates used as starting values.

3.4 Variable construction

The measure of a financial shock compares a household's expectation for its financial situation over the coming year with what, one year later, it says it actually experienced. This variable has been used successfully elsewhere as a measure of a financial shock, in otherwise unrelated studies (eg Boheim and Ermisch (2001)).⁽¹⁷⁾ The emphasis on adverse financial shocks assumes these are temporary (albeit persistent to some extent) rather than permanent. A persistent positive shock would imply a household wanting to bring forward future consumption. Borrowing against the home would be a good way of doing that.

The other key variable in Hurst and Stafford's (2004) analysis concerned being liquidity constrained. Here, results from a general model for the likelihood of being credit constrained produced by Benito and Mumtaz (2006) are employed. That model consists of a switching regression which estimates two consumption Euler equations jointly with a probit model for the probability of being in either group (see also Garcia *et al* (1997)). The consumption growth of households facing liquidity constraints responds to lagged income growth. The liquidity constraints variable used here is the predicted probability of being in the excess sensitivity group of households. The set of variables allowed to influence the propensity to be credit constrained are positive liquid assets, income growth, age, married, white, male and education (3 dummies), where individual-level variables refer to the head of the household; the variable is dated 1994 for all households.

A similar measure of house price uncertainty to Banks *et al* (2004) is used but a finer definition of location is also considered. That involves using the standard deviation of house price inflation in a

(17) Hurst and Stafford (2004) measured a financial shock by whether the head of household became unemployed. Becoming unemployed may not be a shock at all (and for a small minority of households may even be voluntary).

local authority district, of which there are 271, rather than the twelve larger regions used by Banks *et al* (2004). There is considerable variation within regions in house price volatility (Benito (2006a)).⁽¹⁸⁾

Variation in the propensity to withdraw equity by age might be expected, associated with the life-cycle accumulation and running down of assets (eg Bridges *et al* (2006)). Income may be correlated with (unobserved) human capital traits that may also be associated with more stable patterns of income and higher income growth. The type of mortgage, and in particular whether it is an endowment mortgage might also matter. Endowment mortgages, which account for around 58% of the stock of mortgages in our sample, have different risk properties.⁽¹⁹⁾

Moving home may be an especially convenient time to withdraw equity. That holds particularly strongly if the household wanted, in any case, to withdraw equity. If households are in the process of trading up when moving home then they may want to retain as much equity as possible given the down-payment constraint. In addition, a further advance against home equity may be less likely for a household that moved home because they are more likely to withdraw equity by overmortgaging than taking out a further advance. That suggests that the link between the propensity to withdraw home equity and moving home is ambiguous, *a priori*.

The estimating equations control for marital ‘shocks’ through becoming divorced/separated in the past year as well as getting married.⁽²⁰⁾ Aggregate conditions, including the policy interest rate, vary significantly during the sample period and those factors are controlled for through the inclusion of a set of year dummies.

The analysis views people withdrawing home equity by remortgaging and increasing their mortgage balance or taking out a further advance against the home. That is the standard view of

(18) House price volatility is measured as the standard deviation of house price inflation in a region or local authority district. House price inflation is the change in the log average house price (self-)reported of the district by those who have not moved home since the previous year’s survey. For the district-level analysis, only districts with at least 20 household observations are used. See Benito (2006b) for a study of consumption using these data.

(19) These interest-only mortgages rely on the investment performance of the associated fund to repay the mortgage principal, exposing the household to greater investment risk. That might be inversely related to the propensity to withdraw any home equity. However, it seems likely that those who are more risk tolerant would be more likely to take out the endowment mortgage. That might be associated with a greater willingness to withdraw equity.

(20) Chetty and Szleidl (2004) find that marital shocks affects home tenure and equity extraction is related to the ‘extent’ of homeownership. Obviously, the change in marital status is likely to be anticipated for some, if not most, households.

equity withdrawal. But there are significant other ways of withdrawing home equity, including trading down to a less valuable house or simply allowing the value of the property to deteriorate, eg without carrying out general maintenance and repairs. Those forms of equity withdrawal lie beyond the scope of this paper which instead focuses on the active decision to mortgage refinance.⁽²¹⁾

3.5 *Estimation results*

3.5.1 *The decision to withdraw home equity*

Estimation results from the random effects probit models outlined above are presented in Table D. The results are consistent with most priors and the discussion in Section 2. First, housing equity withdrawal is closely tied to the life cycle. Under a quadratic specification the propensity to withdraw equity among homeowners is high in one's 20s and 30s, reaching a peak around age 40 before declining. The second important result is that an adverse financial shock raises significantly the probability of withdrawing equity, relative to having no shock (or a positive shock). This suggests that in normal times, households are less likely to withdraw home equity, but do so when there is a consumption-smoothing demand for the resources owing to an adverse shock. Being liquidity constrained at the beginning of the sample period also significantly raises the likelihood of subsequently withdrawing equity. Quantitatively, the estimates suggest that having experienced an adverse shock according to the subjective indicator raises the probability of withdrawing equity by 0.01, evaluated at the means. Compared to a mean probability of 0.07 that is quite a large effect. A one standard deviation increase in the predicted probability of being liquidity constrained raises the probability of equity withdrawal by 0.004 (around 6%).

A fourth key hypothesis is whether house price volatility in an area reduces a household's willingness to withdraw home equity. In Column 1, a regional-level measure of house price volatility is used and there is some evidence for this hypothesis, with the house price volatility term attracting a 't-ratio' of -1.5. This emerges more strongly in Column 3 where the term attracts a 't-ratio' of -1.9. In the specifications that classify residence in terms of the district rather than the (more aggregated) region, this term is far from significant. The result does not therefore

(21) The decision to trade down is likely to be related to demand for housing services, coinciding with a smaller household, for instance (eg Venti and Wise (1989)). Allowing the house value to depreciate may be particularly true of the elderly who wish to extract value from their homes but are reluctant to move home or take on additional debt (and who may essentially be faced with a higher 'price' for carrying out such repairs).

appear very robust. However, households may have limited information about the volatility of house price in their specific locality and might well consider house price volatility for the region as a result (and particularly so if they are as likely to move to another district in the region). Measurement error also probably plays a role.⁽²²⁾

Households with more home equity are more likely to withdraw equity. The term is highly significant with a 't-ratio' of 4.0. That suggests an important role for house price inflation by making more home equity available to be withdrawn. This is investigated further, below.

Those who have moved home are found to be significantly *less* likely to withdraw home equity.⁽²³⁾

The remaining results are all quite intuitive. Marital shocks also seem to play an important role. Getting married or divorced are both associated with a significant increase in the likelihood of withdrawing equity. Under the estimates in Column 1, getting married raises the probability of withdrawing equity by 0.02. Getting divorced has a particularly large effect, raising the probability of withdrawing equity by 0.04. These shocks appear to be at least as important as purely financial shocks, but will obviously have major financial implications of their own.⁽²⁴⁾

In Column 3, the variable used to predict the likelihood that a household is liquidity constrained is replaced with a more straightforward dummy variable indicating whether the household has any interest-bearing liquid assets. The term is highly significant with a t-ratio of 3.23. Those households with liquid assets are less likely to withdraw equity since they have available the liquid assets to help weather any shocks.

In Column 4, a control is added for the amount of mortgage debt held by the household.⁽²⁵⁾ This helps control for the financial, as opposed to the consumption-smoothing, motive of remortgaging, which may coincide with equity withdrawal. Those households on fixed-rate mortgages with large amounts of outstanding debt have a stronger motive to remortgage when interest rates fall

(22) Given the smaller number of cell sizes per locality compared to per region, that could translate into greater measurement error and classical measurement error generally biases coefficients towards zero.

(23) Distinguishing between those trading up and those trading down did not suggest this distinction was important, however. The coefficients were insignificantly different from one another.

(24) For example, 35.6% of those that get divorced report an adverse financial shock compared to 28.6% for those that did not get divorced that year.

(25) The loan to value ratio might also affect the marginal borrowing cost. Specifications including a term for this, did not suggest a significant role.

since the financial benefit of doing so is correspondingly greater than someone with less debt. This financial motive to remortgage in the United Kingdom can be expected to be substantially weaker than in the United States for two reasons. First, a much larger proportion of households in the United Kingdom have variable-rate mortgages, which adjust automatically. Second, fixed-rate mortgages in the United Kingdom are of a much shorter duration than in the United States, where they are typically 25 years; such mortgages are unavailable in the United Kingdom and instead are typically two to, at most, five years' duration. The results confirm that controlling for other characteristics, those households with higher levels of mortgage debt are more likely to remortgage and withdraw equity.

Those with higher levels of home equity are more likely to withdraw equity. The idea that changes in asset values affect borrowing (and then consumption) is considered in a slightly different form by assessing whether those households living in regions with higher house price inflation are more likely to withdraw equity from their homes. This proposition, which is central to credit view models, also finds support. In Column 5 the regional house price inflation term attracts a significantly positive coefficient, with a 't-ratio' exceeding 6.

A number of further experiments were conducted by interacting the financial shocks terms with the liquidity constraints variables. There was no evidence therefore that it is the *combination* of an adverse shock and being liquidity constrained that heightens the likelihood of extracting home equity beyond the influence of those factors independently.⁽²⁶⁾ As a check on robustness, the appendix presents results for equity withdrawal that is not reinvested in the home. Those results are similar to those presented above.

3.5.2 *The amount of home equity withdrawn*

Estimation results from the random effects Tobit models for the amount of equity withdrawn are shown in Table E, with the marginal effects shown in Table F. The regressors are the same as those for the probit models above. Qualitatively, the results are also mostly similar. Most importantly, the amount withdrawn is greater for those that have experienced an adverse financial shock and also for those who are more likely to be liquidity constrained, using either the model results for the likelihood of being constrained (Columns 1 and 2) or the more straightforward

(26) This contrasts with a finding of Hurst and Stafford (2004) for US households.

indicator for whether the household reports having any investment income (Column 3).

There is marginal evidence that house price volatility in a region lowers a household's willingness to withdraw equity, attracting a 't-value' of -1.6 in Column 3. Again, the regional definition works 'better' than the district-level one. There is also evidence that those households that had a large amount of equity available withdraw larger amounts of equity. And again, getting married or divorced are strongly related to home equity withdrawal. This is consistent with the view that in more normal circumstances households retain equity in the home; when there is some shock, either purely financial or in terms of living arrangements, equity is much more likely to be withdrawn.⁽²⁷⁾

3.5.3 *Interest rates and house price inflation*

What can the results say about the effects of changes in mortgage rates and house price inflation over this period? To investigate this, the time effects are used, relating them to house price inflation and interest rates over the period during which both varied significantly in the United Kingdom over this period (Chart 4A and Chart 4B). The estimates presented are inevitably uncertain but are presented in order to use the results to shed some light on policy issues.

There is a strong association between the year effects and house price inflation and mortgage rates, as measured by the standard variable mortgage rate (SVR).⁽²⁸⁾ Each of the correlations exceeds 0.9. In a least squares regression of the estimated time effects from the probit model on rates of annual house price inflation and the standard variable rate, the two terms are highly significant with 't-values' of 4.8 and -4.6, respectively. The point estimates indicate that an increase in house price inflation of 10 percentage points (pp) raises the percentage of households withdrawing equity by 1.4pp (or 20%). A 1 percentage point fall in mortgage rates raises the proportion remortgaging by 0.9pp (13%). That suggests that the reduction in the Bank of England's official interest rate by 250 basis points between February 2000 and July 2003 would, if translated into annual average rates of interest, have increased the number of households withdrawing equity by almost one third, say from 7% of homeowners in a typical year to over 9%.

(27) The appendix contains robustness checks including cross-sectional analysis of the amount of equity withdrawn over the period 1998 to 2003. The results are largely robust to that alternative approach.

(28) The time effects denote changes in the propensity to withdraw equity relative to the base year, 1994.

Using the time effects from the Tobit models, a 10% rise in house price inflation is predicted to raise the expected amount of equity withdrawal by a homeowner by around £430. A 1pp cut in mortgage rates would raise expected equity withdrawal by £270 per household. Both terms are highly significant in the least squares regression for the time effects against these terms. Since house prices increased by 75% between 2000 and end-2003, that translates into £35 billion (bn) across the 11 million mortgaged households in the United Kingdom. A 250bp reduction in interest rates would result in aggregate equity withdrawal of £7.4bn. To put those figures in context, over the 2000-2003 period ‘Other loan approvals’, considered by the Bank of England to be a better measure of active borrowing against home equity than the aggregate mortgage equity withdrawal series, totalled £75.7bn.⁽²⁹⁾ That compares to a figure of £7.7bn in 1999. It suggests the figures from the microdata ‘add-up’, broadly speaking, to that kind of total.⁽³⁰⁾

What kind of *spending* response might that liquidisation of home equity imply? Hurst and Stafford (2004) estimated an average propensity to consume from withdrawn equity of 0.66. There is no comparable estimate using UK household-level data. However, using aggregate data Miles (1992) estimated a propensity to consume from withdrawn equity of 0.80 and the figures in Table B might suggest something similar. Those responses also suggest that around one quarter of withdrawn equity that is spent, flows into consumption and around three quarters flows into housing investment. Those point estimates suggest a cumulative impact *from the rise in house prices* of £7bn on consumer spending and £21bn on housing investment; the impact *through falling mortgage rates* is put at over £1bn on consumption and £4bn on housing investment.⁽³¹⁾ The distinction between home improvements and consumer spending is in some cases not clear-cut and it is likely that the official distinction in aggregate data is not matched by the responses given in household surveys.⁽³²⁾

(29) See, for example, the Bank of England’s *Inflation Report* May 2005, page 8.

(30) For instance, suppose that without the rise in house price inflation and fall in interest rates, other loan approvals continued at their rate in 1999, then borrowing would have totalled $4 \times 7.7 = £30.8$ bn. So the additional amount to be accounted for is something like £40bn-£45bn. That attributed to the combined effects of house price inflation and interest rates is $35 + 7.4 = £42.4$ bn.

(31) These figures are indicative since they do not do complete justice to the dynamics of the spending response. Housing investment was steady around £28bn per annum between 1996 and 2000 (2002 prices). It then increased steadily to £36bn for 2004. In nominal terms, the growth was even more pronounced, increasing from £23bn 1998-99 to over £40bn for 2004. The figures in the text refer to cumulative effects.

(32) Formally, home improvements refer to spending that significantly enhances the dwelling through enlargement, restructuring or refitting; routine repair and maintenance is classified as consumer spending. Whether household are aware of these differences in responding to surveys seems unlikely. Official home improvements data for the economy are calculated by National Statistics from surveys of construction firms, as well as estimates of DIY and the shadow economy.

A significant amount of reported housing investment might be classified as consumption. Despite that, the consumption responses to house prices through additional withdrawn equity are not large. £7bn represents a little over 1% of annual household consumption. That is small, given the change in house prices, relative to some published estimates of the overall consumption response to house prices. For instance, Bertaut (2002) estimates that a 10% rise in house prices raises consumption by 1% in the long run. That suggests that much of the consumption response to house prices does not occur through the collateral channel, ie through households withdrawing equity and spending that withdrawn equity on consumption goods and services.⁽³³⁾

The estimated effect of interest rate reductions is somewhat smaller than that estimated by Hurst and Stafford (2004) for the United States, even allowing for the larger US household sector. Again, the uncertainty present in both estimates should be recognised. In the United States, there are approximately 65 million owner-occupying households compared to 14 million in the United Kingdom. Hurst and Stafford (2004) estimated that the reduction in the Fed funds rate from 6.75% to 3% between 1991 and 1993 resulted in a spending stimulus of at least \$28bn in 1993. The smaller UK response makes sense as far fewer households in the United Kingdom have long-term fixed-rate mortgages. But that view, and the calculation above which controls for house price inflation over the period, does not take account of the indirect effects on equity extraction through effects on house prices and the amount of collateral. Depending on how sensitive house prices are to interest rates, the indirect effects of changes in interest rates on equity extraction through the collateral effects could make the overall effect larger.

The calculations here also highlight how the collateral channel appears significantly stronger for housing investment, a much more volatile component of aggregate demand, than household consumption. A similar result was found in theory by Aoki *et al* (2004) based on houses being more commonly used as collateral for housing investment than for consumption.

4 Conclusions

This paper has investigated the households' decisions to withdraw home equity. Despite the fact that home equity dominates the typical household's balance sheet, the active withdrawal of home equity has attracted relatively little previous analysis. A further motivation has been the

(33) Two recent household-level studies of consumption and house prices are Attanasio *et al* (2005) and Campbell and Cocco (2005). These two studies come to rather different conclusions on the nature of the consumption response.

importance of using household-level data to examine home equity withdrawal. That contrasts with most previous studies that have used aggregate data.

Two hypotheses are that households will be more likely to withdraw equity if they experience an adverse financial shock and also if they are more likely to be credit constrained. The results present support for both of these hypotheses. That is consistent with the use of housing equity as a 'buffer' against shocks.

Other types of shock clearly matter. Changes in marriage status (getting married and divorced) have particularly large estimated effects on the likelihood of withdrawing equity. By no means all withdrawn equity reflects its use as a buffer in response to an adverse shock. The fact that a large component of withdrawn equity flows into housing investment also suggests this. That finding also suggests that collateral channel effects on spending should be greater for housing investment than for consumption.

Tables and charts

Table A: Summary statistics

Variable	Withdrawing equity	Retaining equity	Total sample
shock ⁻	0.312	0.282	0.284
shock ⁺	0.185	0.195	0.194
probability liquidity constrained	0.137	0.139	0.139
no liquid assets	0.125	0.102	0.104
home equity	67,952	65,922	66,064
house price volatility	0.033	0.033	0.033
monthly income (£, 2000)	3,111	2,911	2,925
age (year, head of household)	40.6	42.2	42.1
endowment mortgage	0.568	0.585	0.583
get divorced	0.021	0.011	0.012
get married	0.032	0.023	0.023
move home	0.036	0.075	0.072
Observations	1,300	17,214	18,514

Note: Table shows sample means (ie sample proportions for dummy variables).

Table B: Reasons for home equity withdrawal

Reason	Per cent
Home extension	20.8
Home improvements or repairs	51.8
Car purchase	8.9
Other consumer goods	5.0
Other	30.2

Note: Sample size=1,465. Households may state more than one reason.

Table C: Repeated withdrawals

Number of times	Per cent	Average amount (£)	Per cent	Average amount (£)
0	79.8	n.a.	92.0	n.a.
1	14.7	17,208	6.8	21,948
2	4.1	12,119	1.0	16,594
3	1.2	12,129	0.1	21,181
4 or more	0.3	19,814	0.0	n.a.

Note: Table summarises number of withdrawals per household during sample period and average amounts withdrawn by the number of withdrawals made.

Table D: Random effects probit models for incidence of home equity withdrawal

	[1]	[2]	[3]	[4]	[5]
shock $_{it}^-$	0.078** (2.04)	0.078** (2.05)	0.076** (1.99)	0.075** (1.96)	0.066* (1.82)
shock $_{it}^+$	-0.017 (-0.40)	-0.016 (-0.37)	-0.015 (-0.36)	-0.016 (-0.39)	-0.022 (-0.53)
liquidity constrained $_{i94}$	0.256* (1.92)	0.286** (2.17)		0.239* (1.79)	
no liquid assets $_{it}$			0.182** (3.23)		0.159** (2.95)
log home equity $_{it-1}$	0.077** (4.04)	0.075** (3.97)	0.085** (4.48)	0.071** (3.71)	
regional house price inflation $_{jt}$					2.614** (6.23)
house price volatility $_{j94}$	-2.552* (-1.54)	0.267 (0.29)	-3.088* (-1.87)	-2.841* (-1.74)	-0.853 (-0.58)
<i>Other controls:</i>					
log household income $_{it}$	0.106** (3.38)	0.104** (3.32)	0.114** (3.64)	0.087** (2.68)	0.124** (3.87)
endowment mortgage $_{it}$	0.005 (0.13)	0.005 (0.14)	0.008 (0.21)	0.012 (0.31)	-0.013 (-0.37)
get divorced $_{it}$	0.425** (3.41)	-0.425** (-3.42)	0.428** (3.43)	0.416** (3.35)	0.445** (3.67)
get married $_{it}$	0.205** (2.11)	0.207** (2.13)	0.209** (2.15)	0.203** (2.09)	0.219** (2.34)
moved home $_{it}$	-0.433** (-5.57)	-0.439** (-5.65)	-0.430** (-5.71)	-0.424** (-5.38)	-0.440** (-5.91)
age $_{it}$	0.042 (2.63)	0.042 (2.64)	0.043 (2.69)	0.042** (2.64)	0.052** (3.69)
age-squared $_{it}$	-0.001 (-3.34)	-0.001 (-3.34)	-0.001 (-3.36)	-0.001** (-3.29)	-0.001** (-4.14)
outstanding mortgage $_{it-1}$				1.040** (2.13)	0.342** (1.91)
log-likelihood	-4,457.289	-4,458.761	-4,453.887	-4,455.047	-4,520.935
κ	0.190** (0.020)	0.189** (0.020)	0.189** (0.019)	0.187** (0.020)	0.182** (0.020)
households / observations	4,744 / 18,514	4,744 / 18,514	4,744 / 18,514	4,744 / 18,514	4,744 / 18,514

Note: Maximum likelihood random effects probit coefficient estimates (robust t-statistics in parentheses). * indicates significance at the 95% level and ** at the 99% level. κ indicates the proportion of the total variance that is accounted for by the within-household component. All regressions also include a control for number of children and a set of year dummies. Column 2 replaces the regional-level house price volatility measure with a local authority district definition of house price volatility. Sample restricted to those with positive home equity. The coefficient on mortgage debt is multiplied by 1×10^6 . These notes also apply to Table E on page 28.

Table E: Random effects Tobit models for amount of home equity withdrawn

	[1]	[2]	[3]	[4]	[5]
shock $_{it}^-$	2573.96** (2.23)	2582.21** (2.24)	2502.72** (2.16)	2437.41** (2.11)	2541.11** (2.24)
shock $_{it}^+$	-812.06 (-0.60)	-789.56 (-0.58)	-753.62 (-0.56)	-801.35 (-0.59)	-1156.65 (-0.86)
liquidity constrained $_{i94}$	10985.10** (2.75)	11757.11** (2.96)		10170.47** (2.57)	
no liquid assets $_{it}$			5497.14** (3.17)		5033.30** (3.04)
log home equity $_{it-1}$	2908.13** (4.78)	2861.15** (4.71)	322.462** (5.31)	2613.03** (4.29)	
regional house price inflation $_j$					81874.89** (6.33)
house price volatility $_j$	-51617.94 (-1.13)	18954.34 (0.68)	-72383.45 (-1.59)	-65165.99 (-1.43)	6805.03 (0.16)
<i>Other controls:</i>					
log household income $_{it}$	4158.65** (4.04)	4111.94** (4.00)	4410.68** (4.25)	3205.89** (3.04)	4996.00** (5.23)
endowment mortgage $_{it}$	-276.51 (-0.24)	-261.589 (-0.23)	-123.48 (-0.11)	63.32 (0.06)	-605.40 (-0.59)
get divorced $_{it}$	17129.46** (4.55)	17143.81** (4.55)	17359.17** (4.60)	16694.91** (4.44)	17782.33** (4.79)
get married $_{it}$	6334.72** (2.07)	6371.00** (2.09)	6486.98** (2.12)	6195.71** (2.03)	6640.41** (2.22)
moved home $_{it}$	-12856.82** (-5.44)	-13023.08** (-5.51)	-12740.69** (-5.39)	-12469.74** (-5.29)	-13192.26** (-5.62)
age $_{it}$	1289.92** (2.80)	1300.513** (-3.59)	1337.71** (2.90)	1286.05** (2.81)	1562.96** (3.75)
age-squared $_{it}$	-19.06** (-3.58)	-19.11** (-3.59)	-19.47** (-3.65)	-18.50** (-3.51)	-20.04** (-4.13)
outstanding mortgage $_{it-1}$				0.05** (3.31)	0.021** (4.15)
log-likelihood	-18,112.318	-18,112.738	-18,111.121	-18107.043	-18432.008
κ	0.169** (0.020)	0.168** (0.020)	0.169** (0.020)	0.161** (0.020)	0.161** (0.020)
households / observations	4,742 / 18,497	4,742 / 18,497	4,744 / 18,514	4,742 / 18,497	4,744 / 18,497

Table F: Marginal effects for probit and Tobit models

	probit ⁽¹⁾	Tobit - unconditional ⁽²⁾	Tobit - conditional on uncensored ⁽³⁾
shock _{it} ⁻	0.01	158.63	376.18
shock _{it} ⁺	-0.00	-47.82	-117.20
liquidity constrained _{i94}	0.02	655.88	1591.50
log home equity _{it-1}	0.01	173.63	421.32
house price volatility _j	-0.23	-3081.91	-7478.31
<i>Other controls:</i>			
log household income _{it}	0.01	248.30	602.50
endowment mortgage	0.00	-16.53	-40.07
get divorced	0.04	1631.86	2842.42
get married	0.02	448.18	962.62
moved home	-0.04	-569.44	-1714.86
age	0.38	77.02	186.88
age-squared	-0.57	-1.14	-2.76

⁽¹⁾Marginal effects from probit model (Table D, Column 1) are effect of a unit change on the probability of withdrawing equity, evaluated at the means. ⁽²⁾Unconditional marginal effects from Tobit model (Table E, Column 1). ⁽³⁾Marginal effects from Tobit model (Table E, Column 1), conditional on withdrawing equity.

The probit marginal effects for the age (age-squared) terms are multiplied by 100 (1×10^4).

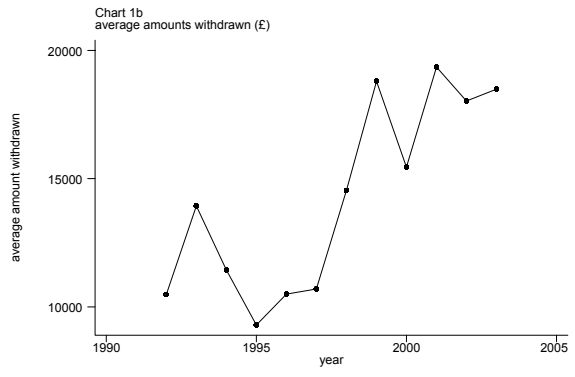
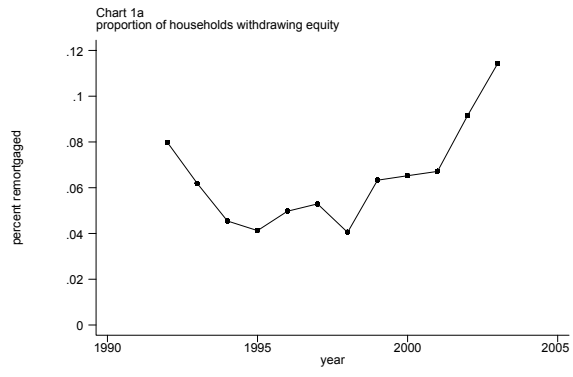


Chart 2
Distribution of amounts of home equity extracted, £ (2000 prices)

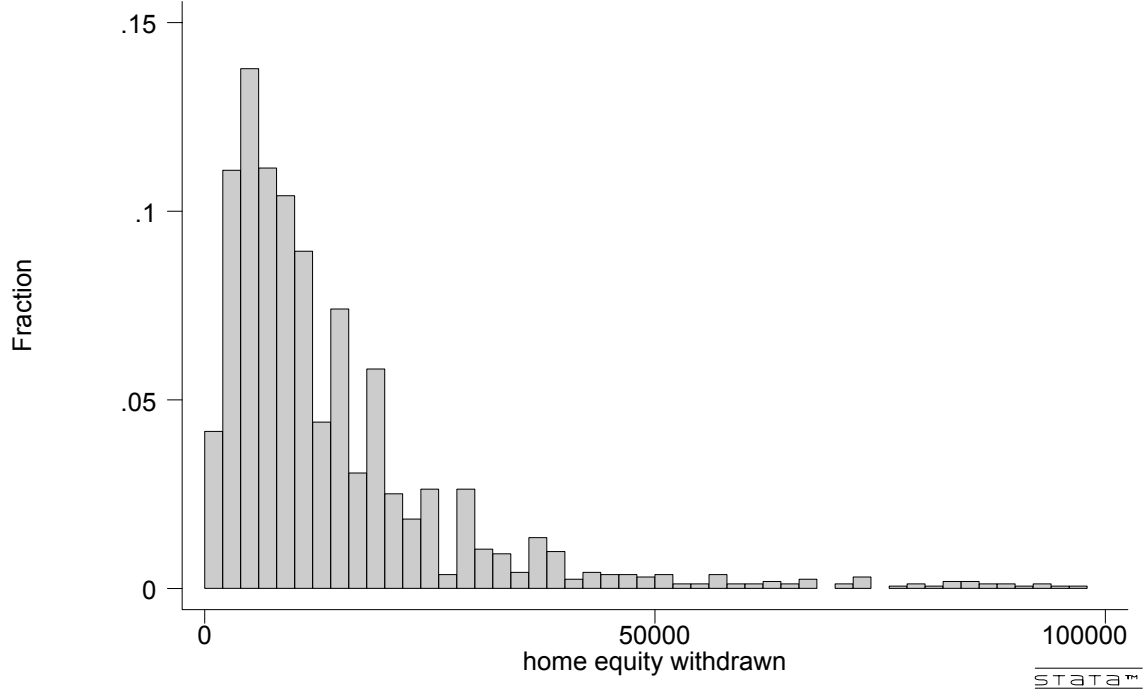
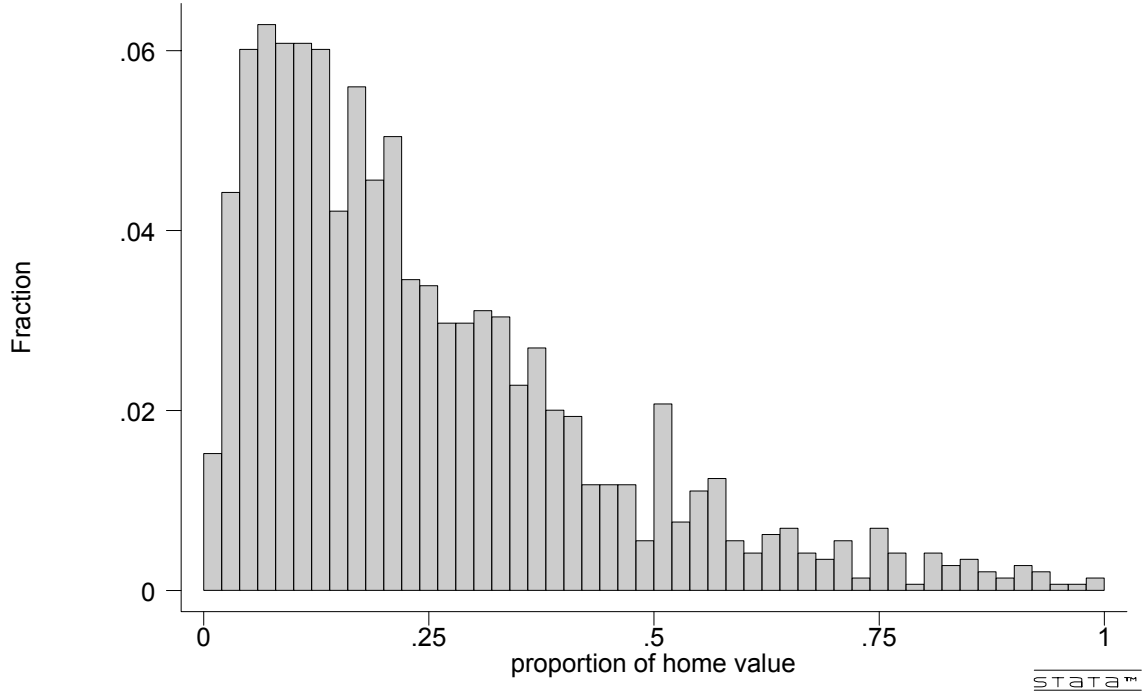
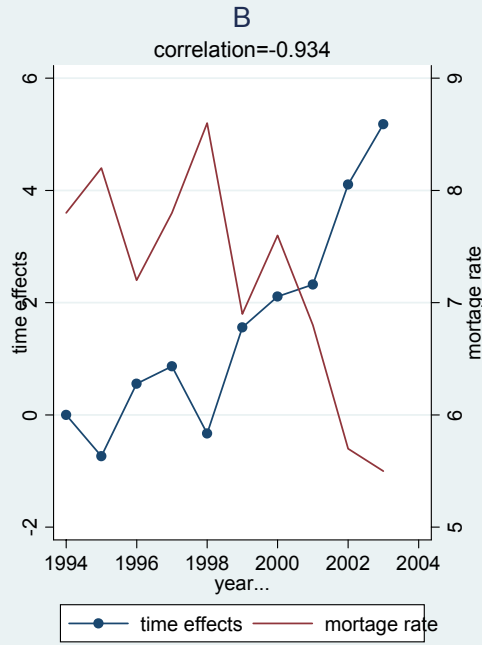


Chart 3
Distribution of proportions of home equity extracted



STATA™

Chart 4



Appendix A: Robustness checks for sample and dependent variable definitions

This appendix presents robustness checks of the main analysis. Those checks consist of cross-sectional estimates for the amount of equity withdrawn and alternative definitions of the dependent variable that try to exclude equity withdrawn when some of that is re-invested in the home.

Cross-sectional estimates

Since most observations of the amount of equity withdrawn are concentrated at zero, the estimates above are effectively driven by whether a household has withdrawn equity or not, rather than how much is withdrawn. In order to address this, equity withdrawal by a household *at any stage* over the period 1998 to 2003 is examined. In these specifications the total amount withdrawn is examined, rather than its timing. One third of households withdraw a positive sum on this definition.⁽³⁴⁾ The sample is restricted to households that are BHPS respondents in 1997, 1998 and 2003 and provide the relevant information used. The corresponding sample is significantly smaller than that used above.

For the most part, these results shown in Table A.1, are similar to those above. The amount of equity withdrawn responds positively to the experience of an adverse financial shock and household income. In these regressions, there is no evidence that those that had more equity in 1997 withdrew any more equity over the subsequent six years. But that is perhaps not very surprising since households would be withdrawing the large gains in equity they saw over that subsequent period when house price inflation was high; their equity position in 1997 would have relatively little to do with that. To test that, a term is added for the average house price inflation experienced in the region over the six-year period.⁽³⁵⁾ The term is highly significant with a ‘t-ratio’ of over 6.0. Quantitatively, the most interesting result concerns the amount of equity

(34) For those dummy variables that refer to the experience of some shock, either financial, marital or a house move, the regressors are dated according to whether the household experiences that event *at any stage* over the period 1998 to 2003. For the variables where it makes more sense to exploit cross-sectional variation across households the variable is dated as of 1997, making the outcome predetermined relative to their home equity extraction behaviour over the 1998 to 2003 period.

(35) Using the district-level house price growth provides very similar results.

(conditional on withdrawing equity) in response to an adverse financial shock. The estimates suggest that an average household extracted around £18,000 over the six-year period if it experiences an adverse financial shock.

In these models there is no evidence that those households that are in areas with greater house price volatility or those that were more likely to be liquidity constrained, withdraw larger amounts of equity.⁽³⁶⁾ Small sample issues may partly account for differences from the main results reported above.

Net equity withdrawal

An alternative to the gross definition of equity withdrawal used above attempts to identify only net withdrawals. There are three issues here. First, the data do not allow us to distinguish between withdrawals made for consumption purposes and those made for home improvements cleanly. That is because in practice withdrawals are likely to be made for a combination of reasons and also because the BHPS asks whether withdrawals were made for ‘home improvements *or repairs*’ (italics added). Whereas the former are classified as home improvements, the latter are formally (ie in the National Accounts) consumer spending. Households may also be unaware of the subtleties of the distinction. Second, excluding withdrawals made for these reasons leads to a very small number (less than 3%) of withdrawals. There might be concerns in estimating probit models with such a small sample proportion of ones. Third, much of the aggregate demand impact comes through housing investment rather than consumer spending and this is likely to be of interest.

Table A.2 reports results for two preferred specifications of random effects probit models. The dependent variable refers to withdrawals not made for home extensions and withdrawals not made for either a home extension or home improvements/repairs. The results are shown to be largely robust to this, following a similar pattern to those presented earlier. Some of the results, such as the role for the adverse financial shock variable and regional house price volatility, depend on which of the two alternative definitions of equity withdrawal are used. Having no liquid assets and the amount of home equity held before extraction are significant as before.

(36) This is also true if we replace the probability of being liquidity constrained variable with a dummy for whether the household had any interest-bearing liquid assets in 1997.

Table A.1: Cross-sectional estimates for equity withdrawn 1998 to 2003

	Probit (any withdrawal 1998 to 2003)		Tobit (total equity withdrawn 1998 to 2003)	
shock $^-_{i(98-03)}$	0.094** (3.29)	0.076** (2.60)	18,489.44** (3.10)	14,461.08** (2.40)
shock $^+_{i(98-03)}$	0.004 (0.18)	-0.022 (-0.89)	3,005.00 (0.68)	-671.85 (-0.15)
liquidity constrained $_{i97}$	0.080 (1.03)	0.063 (0.82)	17,072.45 (0.84)	11,482.39 (0.80)
log home equity $_{i97}$	-0.013 (-1.13)	-0.026** (-2.25)	-479.69 (-0.23)	-2,332.02 (-1.10)
average regional house price growth $_{j(98-03)}$		2.439** (7.20)		3,998.15** (6.10)
house price volatility $_{j97}$	0.823 (0.70)	0.048 (0.04)	306.76 (1.41)	200.34 (0.90)
<i>Other controls:</i>				
log household income $_{i97}$	0.053** (2.66)	0.041** (2.09)	13,263.12** (3.49)	12,106.01** (3.18)
endowment mortgage $_{i97}$	0.044* (1.95)	0.046** (2.06)	4,435.17 (1.05)	4,878.35 (1.15)
get divorced $_{i(98-03)}$	0.028 (0.81)	0.015 (0.44)	7,905.86 (1.24)	6,458.82 (1.02)
get married $_{i(98-03)}$	0.029 (1.15)	0.029 (1.17)	4,589.22 (1.00)	4,778.71 (1.04)
moved home $_{i(98-03)}$	0.029 (1.28)	0.012 (0.54)	6,264 (1.49)	3,859.00 (0.91)
number of children $_{i97}$	0.056** (5.31)	0.052** (5.02)	8,975.43** (4.55)	8,680.91** (4.40)
log-likelihood	-905.728	-874.387	-5,791.160	-5,770.681
Actual / Predicted proportion	0.248 / 0.231	0.248 / 0.220		
Left / Uncensored observations			1,299 / 428	1,299 / 428
Observations	1,727	1,727	1,727	1,727

Notes: Marginal effects with t-statistics in parentheses. The Tobit coefficient for regional house price growth refers to a 1pp rise in house price growth. The coefficient for regional house price volatility has been divided by 1000.

Table A.2: Alternative definitions of equity withdrawn – Random effects probit estimates

	Equity withdrawn, not spent on home extension		Equity withdrawn, not spent on home (incl. repairs)	
shock $_{it}^-$	0.063 (1.60)	0.059 (1.50)	0.133** (2.58)	0.128** (2.49)
shock $_{it}^+$	-0.001 (-0.03)	0.001 (-0.02)	-0.046 (-0.72)	-0.043 (-0.68)
no liquid assets $_{it}$	0.168** (2.91)	0.170** (2.95)	0.140* (1.85)	0.141* (1.87)
log home equity $_{it-1}$	0.072** (3.51)	0.063** (3.08)	0.150** (5.50)	0.131** (4.80)
house price volatility $_j$	-3.130** (-1.97)	-3.512** (-2.20)	1.731 (0.91)	1.030 (0.54)
<i>Other controls:</i>				
log household income $_{it}$	0.054 (1.58)	0.029 (0.83)	0.020 (0.46)	-0.021 (-0.47)
endowment mortgage $_{it}$	0.025 (0.63)	0.033 (0.85)	0.062 (1.23)	0.076 (1.50)
get divorced $_{it}$	0.443** (3.47)	0.431** (3.38)	0.609** (4.16)	0.592** (4.06)
get married $_{it}$	0.265** (2.66)	0.261** (2.62)	0.268** (2.07)	0.259** (2.00)
moved home $_{it}$	-0.434** (-5.23)	-0.424** (-5.12)	-0.365** (-3.33)	-0.350** (-3.20)
age $_{it}$	0.032** (2.13)	0.032** (2.13)	0.004 (0.20)	0.005 (0.24)
age-squared $_{it}$	-0.478** (-2.78)	-0.463** (-2.70)	-0.178 (-0.81)	-0.165 (-0.75)
outstanding mortgage $_{it-1}$		0.014** (2.77)		0.022** (3.80)
log-likelihood	-3,812.745	-3,809.089	-1,974.428	-1,967.754
κ (standard error)	0.196** (0.023)	0.192** (0.022)	0.190** (0.035)	0.182** (0.035)
households	4,744	4,744	4,744	4,744
Observations	18,514	18,514	18,514	18,514

Notes: As for Table D.

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