Explaining the Route to Owner Occupation: The Role of Transactions Costs

by

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Introduction[1]

The considerable reduction in young adult homeownership rates in Britain in the 1990s is partly attributable to demographics, partly to a switch to private renting and partly to reduced rates of household formation. These changes have been brought about by changes in the economic and demographic profiles of new cohorts of young adults. An adverse shift in the income distribution reduced the effective demand for homeownership among young adults and explains part of the fall of their homeownership rates in the early 1990s, at a time when the relative cost of homeownership was low (Andrew and Meen 2003). In the second part of the 1990s, Andrew (2005) attributes the continued decline to the increase in house prices and lender imposed credit market constraints. This paper investigates another possible factor, the role of transactions costs associated with the housing tenure choice. The empirical analysis is conducted on the British Household Panel Survey, a micro-panel, which allows us to overcome problems associated with gradual transitions to an equilibrium state in housing markets. We account for the nature of panel data in estimation.

Section two reviews the existing literature on housing transactions costs and the outlines the motivation for our study. Section three extends the standard theoretical model by generalising the housing user cost to include transactions costs. The fourth section explains the estimation method adopted and the empirical model used to examine its impact on housing tenure choices. A sequential estimation strategy is pursued whereby a duration model is first used to obtain the expected length of stay prior to modelling the housing tenure choice. The data used in our analysis is described in section five. Section six and seven report respectively the empirical results of the duration and housing tenure choice model. Conclusions are drawn at the end of the paper.

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Literature Review

While many theoretical housing choices studies take into consideration the effect of transactions costs associated with changing residences and switching housing tenures, empirical investigations tend to ignore them. Most of the empirical housing literature investigations into the impact of transactions costs on housing choices relate to the US. Work on housing and mobility in the UK has tended to concentrate on its impact on regional house price differentials and how housing tenure inhibits moves from high unemployment to low unemployment regions (Oswald 1996, Coulson and Fischer 2002).

In general, studies examining the effect of transactions costs are concerned with two issues. The first is its possible effect on the factors governing housing demand. In the presence of transactions costs, housing demand is frequently sub-optimal as a large proportion of households are deterred from moving to achieve their desired level of housing services consumption. It is the latter which is required to calculate the effect of changes in income and housing costs on housing demand. Haurin and Chung (1998), for example, find that the price elasticity is higher in models that explicitly account for transactions costs. One approach has been to use information only on a sample of recent movers on the grounds that this group are closer to their desired housing demand (Ermisch, Findley and Gibb 1996). But this has the disadvantage of being restricted to a particular group in a sample. The impact of transactions costs is also reflected in the decision to stay, which is ignored in this type of analysis. Moreover, inter and intra-transitions involving homeownership may still result in a sub-optimal level of housing services being consumed in the presence of binding credit market constraints (Linneman and Wachter 1988). Thus, it is also important to distinguish between credit and non-credit constrained households. Recently, Goodman (2002) developed and implemented a theoretical and empirical framework to incorporate both stayers and movers in assessing how income and housing costs changes affect housing demand.

The second strand in the literature examines the relationship between transactions costs and the length of stay in a residence. The expected stay is important as it is not transactions cost per se that represents the cost of switching housing tenures but the rate at which it is annualised. Of the housing tenures, homeownership incurs the

highest financial and non-financial transactions costs. But these costs can be spread out over time. The longer the planned stay in a residence, the lower the level of annualised transactions costs and the greater the incentive to choose owner occupation over renting. Haurin and Gill (2002) and Goodman (2002) present empirical evidence on the relative importance of longer planned lengths of stay on encouraging homeownership in the US.

Young adults in the 1990s may have been deterred from purchasing a home because their annualised transactions costs may have been relatively high. Young adults are more mobile in the labour and housing markets compared to older age groups. The Survey of English Housing (SEH) reports that the largest proportions of moving households are young. Empirical evidence supports this contention even after conditioning upon previous housing tenure (Boheim and Taylor 1999). The profiles of young adult households are favourable to being mobile: they tend to be single, have no children and have incomes which are rising relatively quickly. Another reason for their high mobility rates is due to the composition of young adult households being less stable than older age groups (Holmans 1999). Both anticipated and unanticipated changes in circumstances lead to the current residence becoming sub-optimal and inducing a move (Boehm and Ihlanfeldt 1986).

Housing and labour markets are closely linked, their interaction arising from changes to household incomes, budgets and wealth, but also through the commute burden. The urban economics literature reveals that the length of stay in a residence may be shortened by recent jobs changes and inadequate compensation for a commute burden (Evans 1973, Boheim and Taylor 1999, Van Ommeren, Rietveld and Nijkamp 1999). In general, it is not optimal for most households to change workplaces and jobs simultaneously (Clark and Van Lierop 1986). Zax (1994) argues that such events only occur if there are large spatial scale workplace (residence) relocations. Households however, often make spatial adjustments sequentially (Crane 1996). Thus, job changes still have an effect on reducing a residence stay, except with a lag.

Van den Berg (1992) suggests that the costs associated with job change are significantly lower for younger age groups. He shows that the transition rate to another job for younger workers (under age 30) is about twice that for older age

groups. Kidd (1994) shows that individuals in younger age groups are approximately three times more likely to quit a job compared with middle-aged groups. Campbell (1997) also shows a negative relationship between age and job quits. Of the variables he analyses, age has the quantitatively largest impact on quitting. Job quits among young adults may not be entirely voluntary. Over the period 1975 to 1995, young adults had the largest increase in the share of short-term jobs, leading to a decline in their median job tenure by 7 percentage points in the early 1990s (Gregg and Wadsworth 1999).

Previous empirical studies on transactions costs have highlighted three problems (Haurin and Gill 2002). The first concerns its measurement. Transactions costs are measured infrequently and are often not reported in survey data. Consequently, they have to be inferred, usually as some proportion of the house value (Rosenthal 1988) and/or current income (Goodman 1995). The main sources of financial transactions costs in the UK are solicitors' fees from buying and selling a house, stamp duty payable on a house purchase and estate agents fees payable for selling a house. MacLennan et al (1996) compared the relative size of financial transactions costs in the early 1990s between countries (table 1).

Table (1): Financial Transactions Costs

Country	**Transactions costs as % of house price**	**Tax as % of house price**
France	13.8	10
Germany	7.1	2
Italy	7.4	4.2
Spain	10.4	6.4
UK	2	1
USA	9	1.5

Source: MacLennan et al (1998)

Although the figures relate to the early nineties, the relativities are expected to remain unchanged. By international standards, financial transactions costs are low in the UK, implying that annualised financial transactions costs are likely to be swamped by other components of the user cost, especially from changes to expected capital gains (Andrew et al 2003).

There are elements of transaction costs which are non-pecuniary. A major type of transactions cost stressed in the literature is the psychological costs associated with

moving, which involves the loss of family, friends and social networks (Rossi and Weber 1996). Impossible to measure, they may explain why 55% of moves by owner occupiers were for less than five miles and 80% of moves less than twenty miles in England in 1997/8 (SEH). By contrast, the figures for private renters are 39% and 58% respectively. Social renters move the shortest distance, with 77% and 92% moves under five and twenty miles respectively, but this probably reflects additional restrictions in mobility arising from the availability of properties in that sector.

Psychological costs may arise from the attachment value to the existing residence. Such costs are likely to vary by housing tenure (Evans 2004). Private renters' attachment value to a residence is likely to be lower than homeowners as their housing tenure choice already reflects the decision to move again soon. Moreover, the decision of renters to remain in a residence depends upon their willingness to pay a rent whereas for homeowners it is their willingness to accept a price for a property[2]. The difference between what homeowners would have paid to remain in a residence and what they are prepared to accept to sell it can be considered as a form of psychological cost. Social renters are expected to have higher attachment values to an existing residence than private renters because of the greater reliance on social networks, for example, informal child care arrangements. These kind of psychological costs tend to be realised whilst living in a dwelling. They are more relevant to the move-stay decision. There are also non-pecuniary costs generated from the process of planning a possible move to a new residence, and it is these that tend to be more relevant to the choice of housing tenure. For example, search costs involving a property purchase tend to be higher as households put in more time and effort in locating a desirable residence. Compared to financial transactions costs, non-pecuniary transactions costs are large. For example, the attachment value of a residence in the UK has been estimated to be 50% of the market value of a house[3] (Evans 2004).

The second problem identified in the literature is that the planned length of stay is often not observed nor reported in surveys. Rosenthal (1988) used the actual length of

[2] Thanks to Alan Evans for pointing this out.
[3] Figures from the Survey of Roskill commission of householders' willingness to sell at the market price conducted in 1970.

stay as a proxy for the planned length of stay. But the ex-post length of stay is unlikely to be a good proxy as unplanned events can shorten a stay by affecting the desired house size, location and a household's ability to meet mortgage or rental payments. More recent investigations have attempted to obtain a prediction of the length of stay using a duration model as a proxy for a planned stay (Haurin and Chung 1998).

This then leads to the third problem. The planned stay and housing tenure are choices and may be simultaneously determined (Ioannides 1987). The length of stay directly influences the relative cost of homeownership and subsequently, the housing tenure decision. At the same time, the planned length of stay depends upon past housing tenure choices. For example, the larger *realised* transactions costs attached to homeownership mean that households in this tenure tend to be less sensitive to changes in demographic and economic factors than private renters. Haurin and Gill (2002) were fortunate to have data reporting the planned stay and avoided the problem. An empirical solution to this problem requires complicated estimation strategies as the expected stay is a continuous variable and the housing tenure choice a categorical variable. Studies jointly modelling housing tenure choices and duration capture simultaneity but ignore dependence (Pickles and Davis 1996). Kan (2000) estimated a system comprising of four discrete dependent variables but his approach cannot explicitly examine the impact of the expected stay length on the housing tenure choice. The alternative to joint modelling is to adopt a sequential approach, whereby the expected spell length is obtained from a duration model estimated on the spell in an existing residence and then used as a regressor in the housing tenure choice model (Haurin and Chung 1998, Henderson and Ioannides 1989).

Finally, there is an aspect of transactions costs that has received less attention in the housing literature but may be pertinent for young adults. Young adults are likely to suffer from biting credit market constraints (Hendershott, Haurin and Wachter 1997, Andrew 2005). Andrew el al (2003) point out that up-front transactions cost such as stamp duty can impose an additional hurdle for households with few assets to overcome, especially if house prices are rising rapidly. Between 1998 and 2002, the average house price for first-time buyers increased by 68% compared with a rise in their average income of only 39%. In 2001, the average down-payment of a first-time

buyer was 21%, a hefty barrier to purchasing a home. Repeat purchaser deposits as a percentage of the purchase house price changed little over this period. Moreover, as the tax thresholds have fallen in real terms, the burden of stamp duty as an up-front transaction costs has risen. Up-front transactions costs raises the amount of assets households need to overcome possible lender imposed credit constraints.

Theoretical Model

The tenure choice decision faced by a household is determined by its demographic and economic characteristics and the cost of owning relative to renting. The cost of owner occupation is the housing user cost of capital, derived from the maximisation of an intertemporal utility function subject to an intertemporal budget and technical constraints (see Meen 1990). When absolute constraints on borrowing are present, Dougherty and Van Order (1982) have shown that the housing user cost of capital takes the form:

$$UCC_t = \left[(1-\theta_t) r_t + ptax_t + d_t - \pi_t^e + \frac{\lambda}{\mu_c} \right] \frac{p_{h_t}}{p_t} \qquad (1)$$

where θ is the average tenure choice tax rate, $ptax_t$ is the council tax paid in a local authority district expressed as a proportion to the price of a standardised dwelling p_h, d is the depreciation rate, π_t^e is the expected house price appreciation (assumed to be backward looking), p is the average price level, λ is the shadow price of the rationing constraint, μ_c is the marginal utility of the non-housing consumption good and the subscript t represents the time period. Thus, under credit rationing the cost of owner occupation is raised by $\left(\frac{\lambda}{\mu_C} \right)$.

Using economic theory, Hendershott and Shilling (1980) show how the standard user cost can be extended to include transactions costs and the expected length of stay. Adapting it to the above formulation, the user cost becomes:

$$UCC_{HSt} = UCC_t + \beta_t (1-\delta_{pt}) \left[(1-\theta_t) r_t + d_t - \pi_t^e \right] / \delta_{pt} \qquad (2)$$

where $\delta_{pt} = 1 - \left[\left(1 - d_t + \pi_t^e\right)^N / \left(1 + (1 - \theta_t) r_t\right)^N \right]$ and $1 > \delta_{pt} > 0$, β is transactions costs expressed as a percentage of the house value and N is the expected length of stay.

Haurin and Gill (2002) have shown that the simple version proposed by Chambers and Simonson (1987) performs equally as well.

$$UCC_{CSt} = UCC_t + \beta_t / N + c / PH.N \qquad (3)$$

where c is any element of transactions costs which are not related to property values.

Transactions costs may impose an additional burden on meeting borrowing constraints. We apply the procedure first outlined by Linneman and Wachter (1989) and later used by Haurin, Hendershott and Wachter (1997) and Andrew (2005) to examine the impact of lender imposed credit restrictions on housing tenure choices. This involves calculating the maximum house purchase allowable under a down-payment and an income constraint. Haurin et al (1997) prove formally that this is consistent with the general credit rationing term, $\left(\frac{\lambda}{\mu_C}\right)$, in the housing user cost of capital. The incorporation of transactions costs requires an adjustment to the construction of the down-payment constraint outlined in Andrew (2005). Under a down-payment constraint, the maximum house purchase in each time period becomes:

$$p_h h^W = \frac{W}{\left(1 - L^M + tc\right)} \qquad (4)$$

where W represents net financial wealth, tc is up-front financial transactions costs expressed as a proportion of the desired property value and L^M is the maximum permitted loan-to-value ratio. We assume in our analysis that up-front financial transactions costs comprises of stamp duty, the largest single up-front cost that might be payable on a house purchase.

Lenders take current household income in their assessment, and in Britain, the "golden rule" is the income multiple. Using this criterion, the maximum purchase allowable in each time period is:

$$p_h h^Y = \frac{bY}{L^M} \tag{5}$$

where b denotes the maximum income multiple permitted, Y represents current household income and L^M ensures that it is consistent with the down-payment constraint.

Households suffering from binding credit constraints are distinguished from those able to borrow what they desire by dummy indicators.

Wealth Constraint

$$WC = 0 \quad \text{if} \quad p_h h^* \leq p_h h^w$$

$$WC = 1 \quad \text{if} \quad p_h h^* > p_h h^w \tag{6}$$

where a household is deemed to be credit constrained if the desired house value $\left(p_h h^*\right)$ is greater than the maximum purchase price allowable, $\left(p_h h^w\right)$, and not otherwise.

Income Constraint

$$YC = 0 \quad \text{if} \quad p_h h^* \leq p_h h^Y$$

$$YC = 1 \quad \text{if} \quad p_h h^* > p_h h^Y \tag{7}$$

where b denotes the maximum income multiple permitted, Y represents current household income and L^M ensures that it is consistent with the down-payment constraint.

Further details on incorporating credit constraints in modelling housing tenure choices using BHPS data are available in Andrew (2005).

Estimation Method

The empirical methodology adopted to assess the impact of transactions costs on young adult housing tenure choices is a sequential approach, comprising of a bivariate probit model to account for the household formation and homeownership decision, and a duration model for estimating the planned length of stay in a residence. From the duration model, a prediction of the expected length of stay is obtained which is then incorporated into the housing tenure choice via the housing user cost of capital term.

Housing Tenure Choice Model

Let h_{it}^{*} represent the unobserved difference in utility between owning and renting. An individual is observed to own $(h_{it}=1)$ when $h_{it}^{*}>0$ and otherwise rent $(h_{it}=0)$. As young adult housing tenure choices and household formation decisions might be jointly determined, the household formation decision is accounted for using a truncated bivariate probit (Haurin, Hendershott and Kim 1994):

$$\begin{aligned} h_{it} &= 1 \quad \text{if } \left(h_{it}^{*} \middle| y_{it}^{*}>0\right)>0 \\ &= 0 \quad \text{if } \left(h_{it}^{*} \middle| y_{it}^{*}>0\right)\leq 0 \qquad (8) \\ &= \text{unobserved otherwise} \end{aligned}$$

The choice between renting and owning is only observed after young adults have established independent households[4]. A pooled bivariate probit estimator with standard errors adjusted for clustering is employed in this analysis. Pooled probits are a good approximation as a random effects estimator and in this case ease the burden of estimation quite considerably (Wooldridge 2002, Ermisch 1999, Chamberlain 1984). Two versions of the empirical models are estimated. The first ignores any

The main problem associated with this empirical model as with most previous housing tenure choices studies in the UK concerns the treatment of the social rented sector. Although this tenure should be modelled, access to it is rationed by local authorities. Except for female lone parents, it is very difficult for young adults to rent in the sector. Given that the main switch from homeownership has been to private renting, and that private renting is primarily a short-term housing tenure in the UK, the alternative option to social tenants would be owner occupation if they could afford it. Aggregating private and social tenants together to represent a single rented sector eases the estimation problems considerably[4].

potential correlation between the explanatory variables in the household formation and housing tenure choice equations with unobserved heterogeneity, implicitly assuming independence. The second version relaxes this assumption and is robust to the presence of feedback effects between the discrete choice variables. More precisely, this assumption is relaxed by the inclusion of the time means of explanatory variables, the initial observation of the lagged household formation variable and predicted potential wage rates as an instrument for real incomes (Andrew 2005, Biewen 2004)[5].

Duration Model

A duration model is used to obtain the expected spell length for each household in each time period. Following Haurin and Chung (1998), the model includes covariates to capture shocks, which are set to zero when predicting the expected stay length. We calculate the spell length when a household first moved into the dwelling, adjusting for truncation when there was no information because that date was before the survey commenced. In other words, we model a household's stay in a dwelling from the Opening Wave[6]. Traditional duration models assume that event times are independent. Observing multiple spells in different residences could violate this assumption as most recently moved households are unlikely to want to move again for a while. Ignoring the correlation may yield misleading variance estimates and possibly biased estimates of the coefficients (Greene 1997). Box-Steffensmeier and Jones (2004) present two general solutions to this problem, variance corrected models and frailty models. Due to the drawbacks associated with frailty approach, we use a variance corrected model[7]. Among the class of variance corrected models, we apply the Conditional Gap Time Model as the risk of an event (move) occurring is sequential, that is, the risk of another move does not begin until the first move has occurred. To implement this approach, the number of events (moves) each household has made must be accounted for in estimation. Estimation is undertaken by clustering

[5]This is equivalent to treating unobservable individual heterogeneity as being time invariant.

[6] Thus, compared to the time varying covariates in the housing tenure choice model, most of those in the duration model are lagged by one period.

[7] A frailty model does not permit any endogeneity in the time varying covariates. Any estimates obtained are badly biased and inconsistent (Hausman 1978). A second problem is that neither the data nor economic theory provides guidance for imposing a specific distribution on the frailty parameter. Previous studies have shown that estimates have been very sensitive to the assumed parametric form of the error term (Blossfeld and Rohwer 1995). In many applications, the distribution of the frailty parameter is chosen from a class of positive distributions for it to be plausible.

on the household identifier and stratified by the event number. Each strata therefore has its own baseline hazard but the coefficients are restricted to be the same across the strata.

The review of the housing literature highlighted the problem of the planned length of stay and the housing tenure choice being jointly determined. Using a predicted value for the planned length of stay is a possible solution to this problem in the housing tenure choice equation. Once a move has been made into a housing tenure, the planned length of stay in the residence is likely to be determined by *realised* financial transactions costs and psychological costs, both of which vary by housing tenure. Haurin and Gill (2002) make the point that it is only after having made a move that households recognise the greater transactions costs of relocations involving homeownership. If suitable proxies can be found for the realised financial and psychological transactions costs, then the endogeneity problem is lessened and a sequential estimation strategy may be pursued.

The largest element of realised transactions costs is likely to be the attachment value to a residence. In the duration model, we follow Boehm (1981) and adopt a proxy for attachment value, an indicator variable depicting whether the head and spouse liked the neighbourhood at the start of each time interval. Identification between the housing tenure choice model and the duration model is further enhanced by including variables found to be important in the urban economics literature in determining a residence move and excluding them from the housing tenure choice equation, for example, the length of a commute, a job change in the previous year and acquiring a new job. In addition, many of the time varying variables in the duration model take values at the start of each interval, that is, lagged values.

Data

The British Household Panel Survey (BHPS) is a panel originally surveying more than 10,000 adults in over 5,000 households. At the time of our study, twelve waves were in the public domain, covering the period 1991-2002/3. Respondents were included in our sample if they satisfied two criteria: (i) they were aged 16 or over but under 35 on 1 December in the Opening Wave; (ii) responded to a full interview; and (iii) were observed throughout the sample period from the Opening Wave. The last criterion permits us to observe their transition into homeownership without any distortions caused by sample attrition.

Respondents fulfilling the above were considered to have a choice of forming an independent household. The BHPS definition of the head of the household is the principal owner or renter of the property, with the male or the eldest male taking precedence when there is more than one potential head of the household. Households headed by full-time students are re-categorised as not having formed an independent household. The selection procedure resulted in 2,419 individuals in Britain, with an average initial age of 26 years. 47% of our sample is male.

Table (2) displays the possible financial transactions costs households incur in our selected sample, disaggregated by current and previous housing tenure. Financial transactions costs include solicitors' fees set at 0.005% of value of current and previous residence, stamp duty at the appropriate rate and estate agents' fees set at 1.5% of house value of the previous residence. Previous non-homeowners do not pay agent's fees and incur only one set of solicitors' fees. Financial costs of current non-homeowners reflect what they would have paid if they had chosen homeownership[8]. For non-moving homeowners, the figures represent the transactions costs if they had moved and purchased a property.

Table (2): Financial Transactions Costs

Current Housing Tenure	Previous Housing Tenure							
	Not Formed		Private Renters		Social Renters		Owning Occupation	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Owner Occupation: Financial Transactions Costs (£)	726	1083	836	749	419	519	1874	1325
Owner Occupation: Financial transactions costs as % of house value	0.9	0.5	1.0	0.5	0.7	0.4	3.8	1.3

[8] Current non-homeowners have an imputed value for desired housing. Current homeowners who are non-movers also have an imputed value for desired housing.

Social Renters: Financial Transactions Costs (£)**	146	113	173	185	172	193	1313	356
Social Renters: Financial transactions costs as % of house value	0.5	0.1	0.5	0.2	0.53	0.2	4.3	1.4
Private Renters: Financial Transactions Costs (£)	201	225	212	217	159	181	1449	501
Private Renters: Financial transactions costs as % of house value	0.6	0.2	0.6	0.2	0.5	0.2	3.7	1.1

**very small sample size

The calculations show that financial transactions costs are relatively small, in most cases being under one percent of the house value. Repeat homeowners incur the largest financial transactions costs, averaging about 3.8 percent as they face the added burden of having to pay estate agent fees. They suggest that the user cost component of financial transactions costs is likely to be swamped by its other elements. Rather than adopting an explicit measure for transactions costs in the housing user cost, its impact is examined by including the expected spell length in the housing tenure choice model. This avoids the problem of having to estimate the size of financial and psychological transactions costs for each household in our sample.

The hypothesis of homeowners staying longer in a residence appears to be confirmed in the BHPS data shown in table (3). Homeowners live on average 5.8 years in a residence compared to 5 years and 2.8 years for social and private renters respectively.

Table (3): Actual Spells by Previous Housing Tenure

	Originating Housing Tenure					
	Private Renters		Social Renters		Homeowners	
	Mean	SD	Mean	SD	Mean	SD
All households: Actual Spell Length (years)	2.8	2.6	5.0	3.8	5.8	4.2
Moving households: Actual Spell Length (years)	1.8	1.7	3.6	3.1	5.3	3.5

As censoring is not taken into account in the actual spell lengths for all households, we also report completed spells from moving households. They reveal the same pattern, except that the average lengths are shorter for private and social renters.

Empirical Results

A household moving is considered to be an "event failure" in a duration model. The results of the hazard rate estimation of the length of stay are reported in table (4) in accelerated failure-time metric. A negative sign indicates that the variable leads to a shorter spell in a residence. Functional form and goodness of fits tests reveal that the generalised gamma distribution duration model fits the data the best. The Wald tests find that κ is insignificantly different from zero and that κ and σ are jointly insignificant, thus rejecting respectively the lognormal and exponential distributions for the shape of the hazard rate. But the Wald test for $\kappa = 1$ cannot be rejected at the 5% level, implying that failure times follow a Weibull distribution.

The variables included in the model to explain spell length in a residence are drawn from previous findings in the literature. Most of the time varying covariates in the duration model take values at the onset of risk in each observed time interval. The exceptions are predicted potential wage rates[9], relative regional housing costs, regional unemployment rates, change in marital status, change in job and becoming unemployed as they take values in the current period. All financial variables are deflated using the consumer expenditure deflator.

[9] This is the preferred measure of permanent income for young adult households (Haurin, Hendershott and Kim 1992).

Table (4): Duration Model of Residence Spell

Variables	Coefficients	t-values
Head age (t-1)	0.1309	*3.95*
Head age square (t-1)	-0.0013	*-2.59*
Head female (t-1)	0.0189	*0.29*
Head Black (t-1)	-0.5240	*-2.37*
Head Asian (t-1)	-0.2600	*-1.72*
Head other non-white (t-1)	0.4892	*1.59*
Spouse (t-1)	0.4271	*3.83*
Married (t-1)	0.1522	*2.61*
No. of children aged 0 to 4 (t-1)	0.1658	*3.63*
No. of children aged 5 to 11 (t-1)	0.1956	*4.75*
No. of children aged 12 to 18 (t-1)	0.3221	*4.07*
Partnership acquisition (t)	-1.0138	*-6.79*
Partnership separation (t)	-0.4954	*-3.65*
Commute burden (t-1)	-0.0007	*-0.77*
Two earner household (t-1)	0.1159	*1.86*
Rooms per person (t-1)	0.2183	*5.15*
Head changed job (t-1)	-0.2014	*-4.21*
Head changed job (t)	-0.2017	*-4.43*
Head unemployed (t-1)	-0.2198	*-1.71*
Head became unemployed (t)	-0.4093	*-2.73*
Head employed (t-1)	0.0837	*0.9*
Permanent income (t)	-0.0232	*-3.65*
Gross liquid wealth (t-1)	-0.0010	*-3.31*
Negative equity (t-1)	0.3538	*2.69*
Relative housing tenure costs (t)	-0.0308	*-2.32*
Like neighbourhood (t-1)	0.5820	*8.95*
Regional unemployment rate (%) (t)	0.0804	*1.98*
constant	-2.3106	*-3*
Strata = 2	-0.0103	-0.11
Strata = 3	-0.3411	-2.86
ln σ		
Strata = 2	-0.1986	-1.17
Strata = 3	-0.2142	-0.62
constant	-0.2747	-2.81
κ		
Strata = 2	0.2422	1.06
Strata = 3	0.4312	0.87
constant	0.8274	7.23

*** includes time and regional dummies**

(1) [kappa]_cons = 0	chi2(1) = 52.33
(2) [kappa]_cons = 1	chi2(1) = 2.28
(3) [kappa]_cons = 1 & [ln_sig]_cons = 0.0;	chi2(2) = 151.38

The results are in line with existing UK and US empirical studies on residential mobility (Andrew and Meen *forthcoming*, Henley 1998, Haurin and Chung 1998). Households headed by an older person stay longer in a dwelling, but as indicated by the significance of the square of head's age, this effect is non-linear. Couple and married households, and families with children are less likely to move, probably due to their stronger attachment to the local area, for example, through schooling and establishment of social ties. Families with older children are less likely to move than those with younger children, suggesting that such ties are stronger for this group. Black and Asian household appear to have lower propensities to move.

Households on higher permanent incomes are relatively mobile. Possible credit market constraints preventing a move are captured by gross liquid wealth and proxies for current income in the form of employment status of the head. The default is household heads who do not participate in the labour market (non-employed). Households with employed heads are as likely to move as those with heads in non-employment. On the other hand, the moving probability increases if the household head is unemployed, albeit this is only significant at the 10% level. Their moves are could be related to the job search. Families residing in regions with higher unemployment rates have a lower propensity to move. We also include a dummy indicator for negative housing equity. Similarly to Henley (1998), negative equity discourages a move.

The model also captures the possibility of a change in residence generated by changes in relative housing tenure costs, excluding the transactions cost element. For homeowners at the start of the spell, it is the housing user cost of capital relative to private renting; and for tenants it is rent relative to the housing user cost. The negative sign implies that the higher the housing cost relative to the alternative the shorter the duration in a residence. Transactions costs arsing from attachment value are proxied by a dummy variable indicating whether the head and spouse likes the neighbourhood. Moves are less likely to occur if household members like the neighbourhood. Overcrowding, represented by rooms per person, encourages a move.

The urban economics literature finds that spatial disequilibrium may arise from an excessive commute burden to a job. In our study, the estimate of the commute burden faced by the household head, the time it takes to travel to work, is negative but insignificant, and may be due to our sample not being restricted to just working households and a proportion of households in self-employment report that they do not have regular commuting times (set equal to zero). The literature also suggests that two earner household are less likely to move in response to spatial disequilibrium because it becomes more difficult to reconcile their commuting burdens by changing residences. Instead, household members adjust by changing jobs (Van Ommeren, Rietveld and Nijkamp 1998). The indicator for two earner households has the expected sign but it is only significant at the 10% level. In line with the literature (Andrew 2001, Crane 1996), we find evidence supporting lagged spatial adjustment arising from employment change – households with heads who had acquired a new job one year ago are more likely to switch residences.

The shock variables are the acquisition of a new job by the head between Waves, separating from or acquiring a partner, and becoming unemployed. Shocks do not just lead to changes in residences. Ermisch and Di Salvo (1996) find that employment and demographic shocks can lead to switches in housing tenure. All our shock variables are significantly different from zero and shorten the spell length in the existing residence.

Predictions are taken from the model to obtain a proxy for the expected length of stay, given a household's characteristics. They are obtained by updating the values of lagged variables and setting the like neighbourhood dummy to zero. Intuitively, a household is constantly revising its planned spell in a dwelling in light of changes to its financial and demographic profile. The first set of calculations of expected spell lengths set the shock variables to zero and the second set uses probit estimators to make predictions on the probability of acquiring a new job and the probability of acquiring a spouse. This is designed to acknowledge that some current job changes and changes in marital status are planned. The problem is that as our data do not distinguish between planned and unplanned job changes or household composition, they have to be predicted. The likelihood of a household head planning to obtain a new job is predicted using a probit equation containing as regressors indicators of

being satisfied with existing job, having a permanent contract, sex, qualifications, being unemployed and not employed in the previous period, the regional unemployment rate, living with a spouse and having children, as well as regional and time dummies. Because the data are unbalanced, the dummy variable depicting a change in job is set equal to one if the predicted probability from this equation is greater than 0.4 and zero otherwise (Greene 2004). All regressors are significant at the 5% level except for race of the head, sex and the previous presence of a spouse. We also find that younger household head with higher skills have a higher probability of changing jobs. Thus, the predicted length of stay in this version captures plans concerning future job changes. A similar attempt is made to capture young adults' plans to live together. Acquiring a partner is modelled using as covariates age, sex, living with children in the previous period, previous marital status, qualifications, previously heading a household, and regional and time dummies. Unlike job change, this model performs poorly. As less than 3% of the sample acquires a new spouse, and the threshold for predicting an "acquisition" is adjusted accordingly. The remaining shock variables, becoming unemployed and separating from a partner, are set equal to zero as these are unlikely to be planned events.

The mean and standard deviation (SD) of the predicted spell lengths, disaggregated by current and previous housing tenure are reported in table (5).

Table (5): Predicted Spell Lengths

	Previous Housing Tenure							
	Not Formed		Private Renters		Social Renters		Homeowners	
Current Housing Tenure	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Homeowner: shocks set to zero								
Expected spell length (years)	4.9	2.6	5.2	3.0	8.6	5.6	6.7	3.4
Social Renter: shocks set to zero								
Expected spell length (years)	4	2.1	4.7	2.9	6.9	4.6	4.7	2.4
Private Renter: shocks set to zero								
Expected spell length (years)	3.9	2.4	4.5	2.6	5.7	2.5	4.6	3.0
Homeowner:								
Expected Spell (years)	4.1	2.6	4.1	3.0	7.6	5.6	5.4	3.3
Social Renter:								
Expected spell length (years)	3.7	2.0	3.8	2.7	6.0	4.5	4.4	2.5
Private Renter:								
Expected spell length (years)	3.2	2.3	3.6	2.5	5.1	3.0	3.4	25

As expected, households selecting owner occupation have the longest expected stays and those choosing private rented accommodation the shortest. Expected stays for social renters are in between the two. The predictions are consistent with the argument

that households choosing owner occupation have longer planned stays to reduce the relatively higher transactions costs attached to moving into or within that housing tenure. The expected stays for current homeowners tend to be higher if they were former homeowners or social tenants. Expected spell lengths for social tenants and private renters conditioned upon the previous housing tenure are more similar when the shock variables are set to zero.

Empirical Results (Household Formation and Tenure Choice)

Tables (6) report the household formation results and table (7) the housing tenure choice results of the bivariate probit estimation. The t-statistics are in italics and calculated using bootstrapped standard errors. A bivariate probit estimator permits the housing tenure choice to affect the household formation decision through the correlation in the error terms.

The empirical methodology used in estimating models one to six ignore possible correlation between the observed explanatory variables and unobserved heterogeneity while that adopted in estimating models six to twelve relax the independence assumption and are robust to possible feedback effects (Andrew 2005). The most restrictive models are one and seven. They assume that past household formation outcomes do not impact on current household formation and housing tenure decisions and omit terms to capture possible effects of transactions costs and credit market constraints. Models two and eight include past household formation outcomes. The expected length of stay in the housing tenure choice equation in models three and nine assume that there are no future plans to change jobs or live with a partner, whereas these assumptions are relaxed in models four and ten. The remainder of the reported models are the most general, capturing the possible impacts of transactions costs and credit market constraints. Again, they are distinguished by the assumptions concerning future job and partnership plans – models five and eleven assume that there are no such plans in contrast to six and twelve. In the discussion on the results, we concentrate on those generated from the most general versions of the models, that is, models including the expected spell length and dummies depicting binding credit constraints. As there are hardly any differences between the results from models where expected stays reflect and do not reflect planned changes to jobs and household composition, the discussion focuses on models six and twelve.

Table (6): Household Formation Models

Household Formation	Model One	Model Two	Model Three	Model Five	Model Four	Model Six
Age (t)	0.6704	0.4146	0.4139	0.4137	0.4198	0.4199
	8.94	6.79	6.78	6.77	6.85	6.57
Age square (t)	-0.0103	-0.0070	-0.0070	-0.0070	-0.0071	-0.0071
	-7.55	-6.44	-6.42	-6.41	-6.53	-5.8
Spouse (t)	2.0789	1.7029	1.6990	1.6980	1.7086	1.7083
	23.55	18.78	18.76	18.77	18.97	21.71
Kid present (t)	0.6157	0.0881	0.0937	0.0944	0.1056	0.1057
	5.16	0.81	0.86	0.87	0.96	1.01
Potential Individual Wage Rate	0.0555	0.0673	0.0676	0.0682	0.0743	0.0744
	2.02	2.92	2.93	2.96	3.22	3.07
Real notional housing costs (t)	-0.1809	-0.1441	-0.1451	-0.1444	-0.1286	-0.1285
	-3.53	-3	-3.03	-3.01	-2.66	-2.44
Formed household (t-1)	n.a.	2.2691	2.2682	2.2694	2.2676	2.2688
	n.a.	27.25	27.19	27.25	26.83	27.46
Male	-0.5466	-0.4190	-0.4195	-0.4200	-0.4187	-0.4187
	-6.08	-5.91	-5.92	-5.93	-6	-5.8
Black	0.1069	-0.2057	-0.2063	-0.2089	-0.2252	-0.2256
	0.48	-1.01	-1.01	-1.03	-1.14	-1.38
Asian	-0.7379	-0.4740	-0.4760	-0.4764	-0.4761	-0.4761
	-2.22	-1.96	-1.98	-1.98	-1.96	-2.3
Other non-white	0.1436	0.0606	0.0568	0.0565	0.0326	0.0330
	0.32	0.17	0.15	0.15	0.09	0.1
Regional Unemployment Rate (t)	-0.1146	-0.1042	-0.1054	-0.1063	-0.1091	-0.1092
	-2.36	-2.12	-2.15	-2.16	-2.24	-2.42
Constant	-7.1628	-4.5820	-4.5527	-4.5475	-4.7683	-4.7673
	-5.41	-3.51	-3.5	-3.48	-3.61	-4.38
Formed household (t = 0)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Age (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Age Square (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spouse Present (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Kid Present (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Real notional housing costs (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Regional unemployment rate (%) (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
rho	-0.2694	-0.2517	-0.2628	-0.2622	-0.0603	-0.0591
_cons	-2.8	-3.39	-3.51	-3.49	-0.8	-0.8
LR test: rho = 0						
chi2(1)	6.49	15.93	17.2		0.74	
Statistics						
N	8897	8897	8897	8897	8897	8897
ll	-4251.57	-3472.00	-3448.13	-3446.89	-3062.35	-3064.46

***includes time and regional dummies**

Table (6): Household Formation Models (continued)

Household Formation	Model Seven	Model Eight	Model Nine	Model Ten	Model Eleven	Model Twelve
Age (t)	0.6651	0.5194	0.5201	0.5214	0.5338	0.5339
	9.61	6.64	6.64	6.65	6.76	6.76
Age square (t)	-0.0099	-0.0079	-0.0078	-0.0079	-0.0083	-0.0083
	-8.56	-5.83	-5.81	-5.83	-6.13	-6.13
Spouse (t)	1.9512	2.1121	2.1076	2.1075	2.1322	2.1321
	24.47	21.05	20.99	21	21.42	21.42
Kid present (t)	0.1618	-0.3132	-0.3110	-0.3099	-0.3109	-0.3107
	1.74	-2.34	-2.32	-2.31	-2.34	-2.34
Potential Individual Wage Rate	0.0995	0.0888	0.0892	0.0895	0.0891	0.0891
	5.92	5.64	5.66	5.67	5.62	5.62
Real notional housing costs (t)	-0.1386	-0.1068	-0.1063	-0.1062	-0.1036	-0.1036
	-3.41	-1.93	-1.92	-1.92	-1.84	-1.84
Formed household (t-1)	n.a	2.0488	2.0479	2.0481	2.0426	2.0426
	n.a	34.66	34.58	34.6	34.22	34.22
Male	-0.6173	-0.4309	-0.4313	-0.4310	-0.4209	-0.4209
	-9.55	-7.12	-7.12	-7.12	-6.93	-6.93
Black	0.1212	-0.3035	-0.3034	-0.3058	-0.3237	-0.3237
	0.63	-1.3900	-1.3900	-1.4	-1.47	-1.47
Asian	-0.7591	-0.3800	-0.3825	-0.3831	-0.3960	-0.3959
	-3.46	-1.9	-1.92	-1.93	-2.03	-2.03
Other non-white	0.0780	0.2090	0.2042	0.2057	0.1900	0.1904
	0.22	0.68	0.66	0.67	0.61	0.61
Regional Unemployment Rate (t)	-0.0803	-0.0811	-0.0813	-0.0826	-0.0888	-0.0890
	-2.72	-1.87	-1.87	-1.9	-2.05	-2.06
Constant	-5.8368	-3.0560	-2.9917	-2.9795	-3.3852	-3.3834
	-4.07	-2.37	-2.32	-2.31	-2.6	-2.6
Formed household (t = 0)	n.a	0.4371	0.4370	0.4383	0.4418	0.4419
	n.a	5.5500	5.5400	5.56	5.56	5.56
Age (time mean)	-0.0508	-0.1258	-0.1284	-0.1306	-0.1337	-0.1339
	-0.51	-1.19	-1.21	-1.23	-1.25	-1.25
Age Square (time mean)	0.0005	0.0009	0.0009	0.0009	0.0012	0.0012
	0.28	0.45	0.47	0.49	0.61	0.61
Spouse Present (time mean)	0.0615	-0.6292	-0.6296	-0.6309	-0.6406	-0.6408
	0.56	-5.31	-5.31	-5.33	-5.41	-5.41
Kid Present (time mean)	0.6677	0.5557	0.5610	0.5602	0.5633	0.5632
	5.65	3.83	3.86	3.85	3.89	3.89
Real notional housing costs (time mean)	-0.1052	-0.0760	-0.0785	-0.0776	-0.0442	-0.0441
	-1.34	-0.9	-0.93	-0.91	-0.53	-0.52
Regional unemployment rate (%) (time mean)	-0.0608	-0.0776	-0.0801	-0.0795	-0.0774	-0.0773
	-0.97	-1.15	-1.18	-1.17	-1.15	-1.15
rho	-0.2515	-0.2591	-0.2680	-0.2638	-0.0413	-0.0430
_cons	-2.19	-3.9	-4	-3.98	-0.52	-0.55
LR test: rho = 0						
chi2(1)	4.78	15.23	15.97	15.86	0.27	0.3
Statistics						
N	8897	8897	8897	8897	8897	8897
ll	-4089.40	-3313.56	-3285.23	-3283.02	-2823.38	-2826.71

includes regional and time dummies

Household Formation Equation

The results for household formation are similar to those reported previously in Andrew and Meen (2003) and Andrew (2005). The magnitude a variable has on the household formation decision at mean values is displayed in table (6a) as an average partial or marginal effect.

Table (6a): Average Partial and Marginal Effects for Household Formation

	Model One	Model Two	Model Three	Model Four	Model Five	Model Six
Prob (Formed = 1)	0.87	0.91	0.91	0.91	0.91	0.91
			Marginal Effects			
Age	0.1392	0.0646	0.0645	0.0645	0.0650	0.0650
Spouse	0.5242	0.3496	0.3487	0.3486	0.3494	0.3494
Kid	0.1222	0	0	0	0	0
Wage +£1	0.0119	0.0109	0.0109	0.0110	0.0119	0.0119
Real notional housing costs +£1,000	-0.0388	-0.0232	-0.0234	-0.0233	-0.0206	-0.0206
Formed (t-1)	n.a.	0.5578	0.5577	0.5581	0.5557	0.5558
Male	-0.1167	-0.0676	-0.0677	-0.0678	-0.0671	-0.0671
Asian	-0.2186	-0.1016	-0.1021	-0.1023	-0.1016	-0.1016
Regional	-0.0245	-0.0168	-0.0170	-0.0172	-0.0175	-0.0175

	Model Seven	Model Eight	Model Nine	Model Ten	Model Eleven	Model Twelve
Prob (Formed = 1)	0.87	0.92	0.92	0.92	0.92	0.92
			Average Partial Effects			
Age	0.1361	0.0780	0.0781	0.0784	0.0798	0.0798
Spouse	0.4863	0.4409	0.4399	0.4400	0.4449	0.4449
Kid	0.0334	-0.0512	-0.0508	-0.0506	-0.0506	-0.0506
Wage +£1	0.0210	0.0138	0.0138	0.0139	0.0137	0.0138
Real notional housing costs +£1,000	-0.0293	-0.0165	-0.0165	-0.0165	-0.0160	-0.0160
Formed (t-1)	n.a	0.4848	0.4846	0.4848	0.4820	0.4820
Male	-0.1299	-0.0668	-0.0669	-0.0669	-0.0650	-0.0650
Asian	-0.2242	-0.0747	-0.0753	-0.0755	-0.0783	-0.0783
Regional	-0.0169	-0.0126	-0.0126	-0.0128	-0.0137	-0.0137

Previously heading a household has large impact on the current household formation decision, raising its probability by between 56 and 48 percent. Excluding this variable affects the size of the impact other variables have on current household formation decisions dramatically. Note that the presence of child is only positive and significant in empirical specifications excluding the lagged variable and that the relative magnitude of the impact of living with a spouse is also much greater. When permitting possible correlation between the explanatory variables and unobserved heterogeneity, a perverse sign is obtained for living with a child, that is, a child

discourages household formation. But this result is sensitive to the data used. If estimation is undertaken for a sample where the head age is less than thirty-four, it becomes insignificant (not reported). These discrepancies are likely to reflect interactions between previous household formation outcomes, children and living with a partner, implying that one should control for possible feedback effects.

Living with a partner has a big influence in establishing and maintaining an independent household, increasing it by between 44 and 35 percent, the effect being larger when feedback effects are allowed. As expected, older adults are more likely to live independently, though the effect is non-linear. Each additional birthday increases the probability by 7 to 8 percent. Males transit to housing independence more slowly than females by 7 percent. This may be explained by females forming ties with older men who have established labour and housing market careers. Asians tend to depart the parental home later compared to other races (between 10 to 8 percent).

As in Ermisch (1999), financial factors are important. Higher permanent incomes and lower housing costs raise the probability of achieving independence (Haurin, Hendershott and Kim 1992, Meen and Andrew 2003). A £1 increase in the potential wage rate commanded increases the likelihood by 1.1 to 1.3 percentage points, whereas a £1,000 rise in real notional housing costs[10] reduces it by 1.6 to 2 percentage points. Individuals living in regions with high unemployment rates are deterred from forming a household early.

[10] Real notional housing costs are obtained by multiplying the nominal mortgage interest rate by the real house price of a standardised dwelling.

Table (7): Housing Tenure Equation

Tenure Choice	Model One	Model Two	Model Three	Model Four	Model Five	Model Six
Head age (t)	0.3361	0.3331	0.3592	0.3839	0.2833	0.3028
	3.43	3.3	3.5	3.67	2.59	2.29
Head age square (t)	-0.0050	-0.0049	-0.0058	-0.0062	-0.0046	-0.0048
	-2.8	-2.72	-3.08	-3.24	-2.28	-2.05
Married (t)	0.6642	0.6720	0.5865	0.6366	0.5293	0.5865
	6.81	6.92	6.4	6.65	6.33	7.36
No. of children (t)	-0.2473	-0.2317	-0.2878	-0.2925	-0.2174	-0.2184
	-5.89	-5.54	-6.07	-6.17	-4.47	-5.3
UCC (t)	-0.2234	-0.2282	-0.2463	-0.2521	-0.2040	-0.2082
	-3.21	-3.27	-3.55	-3.62	-3.03	-2.64
Expected length of stay	n.a.	n.a.	0.0712	0.0690	0.0758	0.0686
	n.a.	n.a.	3.9	4.42	4.2	4.68
Real rent (t)	0.5101	0.5130	0.5305	0.5316	0.4074	0.4083
	17.14	17.28	17.41	17.33	11.74	13.77
Real Combined Potential Wage Rate	0.0538	0.0609	0.0608	0.0621	0.0447	0.0459
	5.5	6.03	6.08	6.32	4.54	4.81
Female head (t)	-0.2759	-0.2683	-0.2644	-0.2598	-0.2625	-0.2578
	-3.28	-3.14	-3.07	-3.01	-2.84	-3.47
Head Black (t)	-0.1341	-0.0868	0.0558	0.0427	0.5283	0.5100
	-0.19	-0.12	0.08	0.06	0.79	1.18
Head Asian (t)	-0.4778	-0.5030	-0.3869	-0.3788	-0.3741	-0.3754
	-2.13	-2.25	-1.73	-1.7	-1.52	-1.61
Head other non-white (t)	0.6517	0.6587	0.4720	0.5702	0.8469	0.9425
	0	0.25	0.1	0.24	0.18	1.1
Down-payment constraint (t)	n.a.	n.a.	n.a.	n.a.	-1.3958	-1.3870
	n.a.	n.a.	n.a.	n.a.	-17.9	-19.49
Income Constraint (t)	n.a.	n.a.	n.a.	n.a.	-0.3881	-0.3844
	n.a.	n.a.	n.a.	n.a.	-3.33	-2.69
Constant	-8.5972	-8.6729	-9.0879	-9.3696	-6.3997	-6.6243
	-5.86	-5.68	-5.76	-5.85	-3.83	-3.44
Head age (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Head age square (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
married (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
No. of children (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
UCC (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
real rent (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Income Constraint (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wealth Constraint (time mean)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

***includes regional and time dummies**

Table (7): Housing Tenure Equation (continued)

Tenure Choice	Model Seven	Model Eight	Model Nine	Model Ten	Model Eleven	Model Twelve
Head age (t)	0.3633	0.3466	0.3760	0.4102	0.3290	0.3567
	3.39	3.25	3.42	3.7	2.57	2.76
Head age square (t)	-0.0044	-0.0042	-0.0053	-0.0058	-0.0045	-0.0048
	-2.44	-2.35	-2.8	-3.05	-2.03	-2.16
Married (t)	0.1939	0.1830	0.1342	0.1714	0.2353	0.2769
	2.01	1.91	1.36	1.74	2.07	2.45
No. of children (t)	0.0009	0.0053	-0.0170	-0.0258	-0.0348	-0.0412
	0.02	0.1	-0.32	-0.48	-0.53	-0.62
UCC (t)	-0.2376	-0.2414	-0.2537	-0.2603	-0.1947	-0.2013
	-3.43	-3.5	-3.69	-3.78	-2.55	-2.62
Expected length of stay	n.a.	n.a.	0.0807	0.0790	0.0863	0.07644
	n.a.	n.a.	4.71	5.14	4.85	4.72
Real rent (t)	0.2267	0.2275	0.2387	0.2366	0.2055	0.2023
	6.86	6.93	7.21	7.24	4.96	4.95
Real Combined Potential Wage Rate	0.0592	0.0646	0.0669	0.0674	0.0367	0.0370
	5.47	6.74	6.97	7.09	3.71	3.76
Female head (t)	-0.1921	-0.1835	-0.1754	-0.1679	-0.1901	-0.1846
	-2.23	-2.11	-2	-1.91	-1.99	-1.93
Head Black (t)	-0.0781	-0.0300	0.1169	0.1121	0.8775	0.8643
	-0.17	-0.06	0.24	0.24	1.56	1.57
Head Asian (t)	-0.4411	-0.4782	-0.3168	-0.3078	-0.3374	-0.3481
	-1.82	-1.97	-1.33	-1.29	-1.34	-1.37
Head other non-white (t)	0.7858	0.7842	0.5845	0.6955	0.8742	0.9956
	1.35	1.31	1.05	1.25	2.34	2.64
Down-payment constraint (t)	n.a.	n.a.	n.a.	n.a.	-0.3150	-0.3631
	n.a.	n.a.	n.a.	n.a.	-2.37	-5.03
Income Constraint (t)	n.a.	n.a.	n.a.	n.a.	-0.3601	-0.3150
	n.a.	n.a.	n.a.	n.a.	-4.96	-2.37
Constant	-8.4808	-8.4550	-8.8276	-9.1836	-5.8010	-6.1006
	-5.17	-5.16	-5.24	-5.41	-2.95	-3.08
Head age (time mean)	-0.0747	-0.0691	-0.0663	-0.0682	-0.0764	-0.0803
	-2.37	-2.21	-2.11	-2.15	-2.14	-2.23
Head age square (time mean)	0.0002	0.0002	0.0002	0.0001	0.0003	0.0002
	0.76	0.74	0.62	0.46	0.9	0.78
married (time mean)	0.6154	0.6423	0.5620	0.5907	0.3642	0.4024
	4.03	4.21	3.65	3.83	2.33	2.59
No. of children (time mean)	-0.2353	-0.2226	-0.2687	-0.2657	-0.1371	-0.1300
	-3.31	-3.18	-3.65	-3.62	-1.67	-1.58
UCC (time mean)	-0.0403	-0.0394	-0.0613	-0.0644	0.0093	0.0116
	-0.4	-0.39	-0.6	-0.63	0.08	0.1
real rent (time mean)	0.3882	0.3896	0.3994	0.4062	0.2304	0.2395
	7.78	7.84	7.99	8.09	3.87	3.99
Income Constraint (time mean)	n.a.	n.a.	n.a.	n.a.	0.2280	0.2305
	n.a.	n.a.	n.a.	n.a.	0.88	0.89
Wealth Constraint (time mean)	n.a.	n.a.	n.a.	n.a.	-1.9428	-1.9194
	n.a.	n.a.	n.a.	n.a.	-12.74	-12.65

***includes regional and time dummies**

Tenure Choice Equation

The average partial and marginal effects of the variables in the housing tenure equation are reported in table (7b). Note that the predicted probabilities for homeownership reduce in size as the housing user cost is generalised to include transactions costs and credit market constraints[11].

Table (7b): Average and Marginal Partial Effects

Housing Tenure Choice	Model One	Model Two	Model Three	Model Four	Model Five	Model Six
Prob (h = 1)	0.71	0.70	0.70	0.69	0.65	0.65
Head age	0.1115	0.1125	0.1217	0.1302	0.1017	0.1087
Married	0.2154	0.2221	0.1966	0.2126	0.1902	0.2095
No. of children	-0.0845	-0.0806	-0.1007	-0.1024	-0.0807	-0.0810
Head Female	-0.0972	-0.0959	-0.0950	-0.0933	-0.0992	-0.0973
Wage +£1	0.0184	0.0212	0.0213	0.0217	0.0166	0.0170
UCC +£1,000	-0.0764	-0.0794	-0.0862	-0.0883	-0.0757	-0.0772
Real rent +£1,000	0.1744	0.1785	0.1857	0.1862	0.1512	0.1514
Expected Stay	n.a.	n.a.	0.0249	0.0242	0.0281	0.0254
Wealth constraint	n.a.	n.a.	n.a.	n.a.	-0.5106	-0.5076
Income constraint	n.a.	n.a.	n.a.	n.a.	-0.1494	-0.1478

Housing Tenure Choice	Model Seven	Model Eight	Model Nine	Model Ten	Model Eleven	Model Twelve
Prob (h = 1)	0.64	0.64	0.63	0.63	0.63	0.63
Head age	0.1319	0.1263	0.1382	0.1509	0.1206	0.1308
Married	0.0715	0.0678	0.0505	0.0644	0.0877	0.1030
No. of children	0	0	0	0	0	0
Head Female	-0.0725	-0.0695	-0.0671	-0.0642	-0.0725	-0.0704
Wage +£1	0.0220	0.0241	0.0253	0.0255	0.0138	0.0139
UCC +£1,000	-0.0885	-0.0902	-0.0959	-0.0985	-0.0734	-0.0758
Real rent +£1,000	0.0844	0.0850	0.0902	0.0896	0.0774	0.0762
Expected Stay	n.a.	n.a.	0.0305	0.0299	0.0325	0.0288
Wealth constraint	n.a.	n.a.	n.a.	n.a.	-0.1376	-0.1388
Income constraint	n.a.	n.a.	n.a.	n.a.	-0.1219	-0.1219

As young adults age they are more likely to become homeowners, each additional year raising the likelihood by 11 to 13 percentage points. After controlling for household incomes, married households have a higher probability of being homeowners than single or cohabiting households. Its impact is much greater in the restrictive models, implying that they suffer from endogeneity or omitted variable problems (10 percentage points). Children only have a negative impact on the probability of homeownership in models assuming strict exogeneity with unobserved

[11]Taken at mean values

heterogeneity, a finding similar to that reported in Ermisch and Di Salvo (1996) and Meen and Andrew (2003), and interpreted as capturing the non-price rationing mechanism in the social rented sector. When this assumption is relaxed[12], they become insignificant. Female headed households less likely to be in owner occupation, and again, this may be capturing the rationing mechanism applied in the social rented sector. Permanent incomes are important. Households with higher permanent incomes are more likely to be homeowners by 1.7 to 1.4 percentage points. It is also notable that the impact of many of variables associated with financial factors change in size as the housing tenure choice model is generalised. For example, the more restrictive models imply that permanent incomes have a larger effect on encouraging homeownership.

The relative housing tenure costs represented by the standard housing user cost, credit constraint dummies, the length of expected stay and real rents are significant with the expected a priori signs. Higher housing user costs and real rents respectively discourage and encourage homeownership. A £1,000 increase in the annual rent raises the probability by between 8 to 15 percentage points, the effect being smaller in model specifications with time means. Credit constrained households are deterred from purchasing a home. Wealth and income constrained households are 14 and 12 percentage points less likely to be in homeownership and are in line with that reported by Andrew (2005). Up-front financial transactions costs can lead to households experiencing a down-payment constraint. It is noticeable that the impact of an income constraint in models relaxing the independence assumption and robust to feedback effects is the same as models that assume independence. But the impact of the wealth constraint is very much larger in the latter, reducing the probability of homeownership by 50%. Previously, Haurin, Hendershott and Wacther (1997) argued wealth is likely to be endogenous because of savings decisions, although descriptive evidence for the UK shows that few households save for a deposit (Andrew 2005). However, repeat purchasers have housing equity which helps them to overcome lender imposed restrictions on borrowing, a feedback effect.

[12] The procedure adopted is equivalent to a proxy for a fixed effect and is reflected in the time mean of the number of children being negative and significant.

The expected spell length variables are positive and significant in all models. The expected length of stay in the models three, five, eight and eleven are calculated under the assumption that there are no planned changes in living with a partner or a new job but this assumption is relaxed in models four, six, nine and twelve. As in Haurin and Gill (2002) households intending to stay in a residence for a longer duration have a higher probability of being homeowners, a finding consistent with the hypothesis of the importance of annualising financial and non-financial transactions costs[13]. Each additional planned year in a dwelling increases the likelihood of homeownership by 3 percentage points.

[13] We tried to include a measure of annualised financial transactions costs but the estimator failed to converge. Note that although annualised financial transactions costs is relatively small component of the housing user cost, they are higher for previous homeowners than other groups due to estate agents fees.

Conclusion

We extended the housing tenure choice model to examine the possible role transactions costs play in determining whether a household chooses to buy or rent a home. Longer planned stays reduce the higher financial and non-financial transactions costs incurred from choosing homeownership as these are spread over a longer period. The expected length of stay, obtained from a Generalized Gamma duration model, has the hypothesised impact on the housing tenure choice, and implies that the standard housing user cost term does not adequately capture the cost of homeownership. The greater the rate at which transactions costs are annualised, the higher the probability of homeownership.

The results from the duration model indicate that younger households move more frequently. Another important factor in generating moves is recent job changes. As young adults change jobs more frequently in the labour market, it implies that their residence spells are likely to be shorter relative to older age groups. Thus, the relatively high transactions costs associated with homeownership and lesser opportunities afforded to young people in amortising them is a deterrent to them to purchasing a home. In addition to the direct influence of transactions costs on young adult homeownership decisions, up-front transactions costs can impose an additional hurdle for them to overcome in the down-payment constraint, especially if they have little wealth.

References

Andrew (2005), "The Changing Route to Owner Occupation: Household Formation and the Impact of Borrowing Constraints on Young Adult Homeownership in Britain", Mimeo.

Andrew M, Evans A, Koundouri P and Meen G (2003), Residential Stamp Duty: Time for a Change, *CML Research Report.*

Andrew, M. and Meen, G. (2003). "Housing Transactions and the Changing Decisions of Young Households in Britain: The Microeconomic Evidence", *Real Estate Economics*, 31(1): 117-138

Biewen, M. (2004), "Measuring State dependence in Individual Poverty Status: Are There Feedback Effects to employment Decisions and Household Composition?", IZA Discussion paper No. 1138, Bonn.

Boehm T.P. (1981), "Tenure Choice and Expected Mobility: A Synthesis", *Journal of Urban Economics*, 10. pp. 375 – 389.

Boehm, T.P. and Ihlanfeldt, K.R. (1986), "Residential Mobility and Neighbourhood Quality", *Journal of Regional Science*, Vol. 26, No. 2, pp. 411-424.

Böheim, R. and Taylor M.P. (1999) 'Residential Mobility, Housing Tenure and the Labour Market in Britain'. *Discussion Paper of Institute for Labour Research*, paper 99-35. Colchester: University of Essex.

Box-Steffensmeir J.M. and Jones B (2004), *Event History Modelling: A Guide for Social Scientists*, Cambridge University Press.

Burgess, S. and Rees, H. (1998) A disaggregate analysis of the evolution of job tenure in Britain, 1975-1993. *British Journal of Industrial Relations*, 36(4), 629-655.

Campbell, C. (1997) The determinants of dismissals, quits and lay-offs: A multinominal logit approach. *Southern Economic Journal*, 63(4), 1066-1073.

Chamberlain, G. (1984). "Panel Data", in S. Griliches and M. Intriligator (eds), Handbook of Econometrics, Amsterdam, North-Holland, pp. 1247-318.

Clark, W.A.V. and Van Lierop, W.F.J. (1986), *Residential Mobility and Household Location Modelling*, in P. Nijkamp (ed.), Handbook of Regional and Urban Economics, Vol. 1, North-Holland, New York.

Coulson, N.E., and L.M. Fisher. (2002). "Tenure Choice and Labour Market Outcomes". *Housing Studies*. 17(1): 35-50.

Crane, R. (1996), "The Influence of Uncertain Job Location on Urban Form and the Journey to Work", *Journal of Urban Economics*, Vol. 39, pp. 342-356.

Dougherty A and Van Order R (1982), "Inflation, housing costs, and the consumer price index", *American Economic Review,* No. 72, pp. 154-164.

Ermisch, J. (1999). "Prices, Parents and Young People's Household Formation", *Journal of Urban Economics*, 45: 47-71.

Ermisch, J.F. and Di Salvo, P. (1996). "Surprises and Housing Tenure Decisions in Great Britain", *Journal of Housing Economics*, 5: 247-273.

Ermisch, J.F., Findlay, J. and Gibb, K. (1996) "The Price Elasticity of Housing Demand in Britain: Issues of Sample Selection", *Journal of Housing Economics*, 5: 64-86.

Evans, A.W. (1973), *The Economics of Residential Location*, Macmillan, London.

Evans, A.W. (2004), *Economics, Real Estate and the Supply of Land*, Blackwell, Bucks.

Gregg, P. and Wadsworth, J. (1999), "Job Tenure, 1975-98" in P. Gregg and J. Wadsworth (eds.), *The State of Working Britain*, Manchester University Press. Manchester.

Goodman A.C. (1995), "A Dynamic equilibrium Model of Housing Demand and Mobility with Transactions costs", *Journal of Housing Economics*, 4 pp. 307-327.

Goodman A.C. (2003), "Following a Panel of Stayers: Length of Stay, Tenure Choice, and Housing Demand", *Journal of Housing Economics*, 12, pp. 106-133.

Greene, W.H. (2002), *Econometric Analysis*, Fifth Edition, Prentice-Hall, New Jersey.

Harmon, O.R., and M.J. Potepan (1988). "Housing Adjustment Costs: Their Impact on Mobility and Housing Demand Elasticities", *AREUEA Journal*, 16(4): 459-492.

Haurin, D.R. and E.C.Chung. (1998). "The Demand for Owner-Occupied Housing: Implications from Intertemporal Analysis", *Journal of Housing Economics*, 7: 49-68

Haurin, D.R. and H.L.Gill. (2002). "The Impact of Transaction Costs and the Expected Length of Stay on Homeownership", *Journal of Urban Economics*, 51: 563-584.

Haurin, D.R., Hendershott, P.H. and Kim, D. (1994). "Housing Decisions of American Youth", *Journal of Urban Economics* 35: 28-44.

Haurin, D.R, Hendershott, P.H and Kim, D (1992) "The Impact of Real Rents and Wages on Household Formation", *Review of Economics and Statistics*, 75: 284-293.

Haurin, D.R., Hendershott, P.H. and S. Wachter. (1997). "Borrowing Constraints and the Tenure Choice of Young Households", *Journal of Housing Research* 8(2): 137-154.

Hendershott P.H. and Shilling J.D. (1982), "The Economcis of Tenure Choice, 1955-1979", in Research in Real Estate", (C.F. Sirmans, Ed), JAI Press, Greenwich CT.

Henderson J.V. and Ioannides Y.M. (1989), "Dynamic Aspects of Consumer Decisions in Housing Markets", *Journal of Urban Economics*, No. 26, pp. 212 2-30.

Henley, A. (1998) "Residential Mobility, Housing Equity and the Labour Market", *Economic Journal*, Vol. 91, No. 447, pp. 910-939.

Holmans, A. (1999), "Household Formation by Young Men and Women and their Housing Tenure" in H. Green, R. Bumpstead and H. Thomas (eds.), *Housing in England 1997/98*, pp. 89-97, The Stationary Office, London.

Kan, K. (2000), "Dynamic Modelling of Housing Tenure Choice", *Journal of Urban Economics*, 48: 46-69.

Kidd, M. (1994) Some Canadian evidence on the quit/lay-off decision. *Canadian Journal of Economics*, 27, 709-733.

Linneman, P and Wachter, S. (1989). "The Impact of Borrowing Constraints on Homeownership", AREUEA, 17(4): 389-402.

Maclennan, D., J. Muellbauer, and M. Stephens. (1998). "Asymmetries in Housing and Financial Market Institutions and EMU." *Oxford Review of Economic Policy* 14(3): 54-80.

Oswald, A. (1996). "A Conjecture on the Explanation for High Unemployment in the Industrialised Nations: Part 1". *Warwick University Economic Research Papers No. 475.*

Pickles, A. and Davis, R. (1985), "The Longitudinal Analysis of Housing Careers", *Journal of Regional Science*, 25(1): 85-111.

Rosenthal S (1988), "A Residence Time Model of Housing Markets", *Journal of Public Economics*, Vol. 36, pp. 98-109.

Rossi P H and Weber E (1996), "The Social Benefits of Homeownership: empirical Evidence from National Surveys", Housing Policy Debate, Vol. 7(1) pp. 1-33.

van den Berg, G. (1992) "A structural dynamic analysis of job turnover and the costs associated with moving to another job". *Economic Journal*, 102, 1116-1133.

Van Ommeren, J.N., Rietveld, P. and Nijkamp, P. (1998), "Spatial Moving Behaviour of Two-Earner Households", *Journal of Regional Science*, Vol. 38, No. 1, pp. 23-41

Van Ommeren, J.N., Rietveld, P. and Nijkamp, P. (1999), "Job Moving, Residence Moving, and Commuting: A Search Perspective", *Journal of Urban Economics*, Vol. 46, pp. 230-253.

Wooldridge, J.M. (2000), "A Framework for Estimating Dynamic, Unobserved Effects Panel data Models with Possible Feedback to Future Explanatory Variables, *Economics Letters*, 68: 245-250.

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data*, The MIT Press, Cambridge, Maasachusetts, USA.

Zax, J.S. (1994), "When is a Move a Migration?", *Regional Science and Urban Economics*, Vol. 24, pp. 341-360.

Appendix A: Variables

Housing Tenure Equation	
Financial Variables	
Predicted Combined Real Wage Rate (£)	Sum of individual predicted real wage rate and spouse predicted real wage rate. The predicted values are obtained from a reduced form wage equation using a Heckman selection corrected regression, taking into account the panel nature of the data (Wooldridge 1995). This variable has also been used in the past by Andrew and Meen (2003b) and Hendershott, Haurin and Kim (1992).
Real Household Income (£000)	Sum of individual and spouse real incomes (excludes investment income).
User Cost (£000)	See text
Real Rent (£000)	Obtained from JRF Private Regional Rent Index for 1995 to 2000. Values for earlier and later years are calculated by using relative changes of average regional rents reported by DETR/ODPM. For respondents observed in social housing the rent is the reported average local authority social rents.
Dummies for Binding Income and Wealth Constraints	See text
Demographic Variables	
Head Age (t)	Age of household head in years
Head Age Square (t)	Head age x head age
Head Female	Indicator for a household headed by a female
Head Black	Indicator for a household headed by an African or Caribbean
Head Asian	Indicator for a household headed by an Asian
Head Other Non-White	Indicator for a household headed by other Non-White race
Married (t)	Indicator for a being already married in the previous Wave
Regional and Time dummies	
Household Formation Equation	
Financial Variables	
Real Individual Income (£000)	Individual real income (excludes investment income)
Real Predicted Wage Rate	Predicted values taken from a reduced form wage equation as described above. Using a potential wage rate abstracts from the labour supply decision (Hendershott, Haurin and Kim 1992).
Real Notional Housing Costs (£000)	Nominal mortgage interest rate multiplied by real price of standardised dwelling. It is arguably more representative than private rents as the latter comprises less than 10% of the total dwelling stock in Britain (Andrew and Meen 2003b).
Demographic Variables	
Age (t)	Age in years
Age Square (t)	Age multiplied by age
Male	Indicator for being male
Black	Indicator for African or Caribbean
Asian	Indicator for Asian
Other	Indicator for other Non-White race
Child Present (t)	Indicator for living with own child
Spouse Present (t)	Indicator for living with spouse
Regional Unemployment Rate (%)	Obtained from ONS
Household Formation (t-1)	Indicator for heading a household in the previous Wave
Regional and Time Dummies	