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Differences in Opportunities? Wage, Unemployment and House-Price Effects on Migration

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Non-technical summary

There is a long standing interest in the determinants of migration in Britain given persistent between region differences in wages, employment and prices. In this paper we analyse the effects of wages, employment opportunities, and house prices on inter-regional migration of households in Britain, and make four contributions to the literature: (1) instead of using aggregate data on regional wage differences, we estimate individual expected wage differentials between the location of origin and location of destination to explain migration choice ; (2) we model the migration decision within the context of potential destinations rather than focusing only on origin characteristics; (3) we model the migration choice at the household level, looking at the wage and employment opportunities of both spouses within a couple; and (4) we examine how different groups of individuals respond to wage, unemployment and house price differentials.

Controlling for wage, unemployment, and house price differentials we find that unemployed individuals are more likely to migrate than other individuals. Moreover, migration of unemployed individuals is sensitive to both wage and unemployment differentials. In particular they migrate in response to higher wage opportunities in potential destinations, but are less likely to move to areas with better employment opportunities. The latter is likely to reflect the difficulty of the unemployed in high unemployment regions to make a speculative move.

Having a partner with high wage expectations impedes migration possibly because of the risk of job loss to that partner. Households in which the spouse anticipates or desires employment do not move away from relatively low unemployment regions. Therefore employment opportunities of the spouse seem to be central to family migration choice.

House price differentials strongly influence migration propensities – relatively high house prices in potential destinations deter migration which is likely to reflect credit constraints. Mortgage holders and social tenants are particularly sensitive to these differentials. The restrictions faced by council tenants in obtaining social rental in other regions may force these individuals into the private housing sector, where their lack of financial assets makes them particularly sensitive to price differentials when they migrate. These house price effects emerge very clearly, and affect most people in most housing tenures. In contrast, wage and unemployment differentials do not have such wide-ranging impacts and instead only affect particular employment groups in the population.

Large inter-regional differences in wages, employment and prices are persistent features of the British labour market. Our results based on a new modelling approach show that household migration is a consequence of complex interactions and processes, and so creating appropriate incentives to help eradicate regional differences is difficult. Unemployed individuals are found to have a relatively high propensity to migrate, particularly into higher wage regions, but have difficulties moving out of high unemployment regions, possibly because they lack the assets and/or networks to do so. Council tenants are constrained by the unavailability of social housing in potential destinations. Therefore policies aimed at helping the mobility of these groups by reducing transaction costs, particularly housing-related ones, would be a way forward. The new modelling approach we develop in this paper is flexible and can also be applied to the study of migration incentives for other population groups such as manual workers or ethnic minorities. A more complete analysis using this approach may yield further insights into appropriate policy initiatives.

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Abstract: Most empirical studies of individual migration choice analyse factors associated with out-migration from an origin location. In contrast, we model the migration decision within the context of potential destinations, combining British panel data over the period 1992–2007 with other data sources. Contrary to earlier micro studies we show that differences in house prices levels (but not growth) are important determinants of household migration. Regional differences in expected individual wages and employment opportunities affect unemployed individuals in particular. The spouse's employment risk appears to deter household migration more than wage differentials.

JEL Classification: R23; J61

Keywords: migration; BHPS; panel data.

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1. Introduction

In this paper we analyse the effects of wages, employment opportunities, and house prices on inter-regional migration of households in Britain. There is a long standing interest in the determinants of migration in Britain given persistent inter-regional differences in wages, employment and prices. Many previous studies have analyzed migration flows in the context of aggregate regional factors which might make locations more or less attractive, like wages, unemployment, and different types of amenities (e.g. Pissarides and McMaster 1990; Jackman and Savouri 1992a; Hatton and Tani 2005). Researchers have used microeconomic data to investigate how individual characteristics influence the decision to migrate (e.g. DaVanzo 1978; Pissarides and Wadsworth 1989; Gregg et al. 2004). Most individual-level studies concentrate on the reasons associated with out-migration from an origin location.

We make four contributions to this literature: (1) instead of using aggregate data on regional wage differences, we estimate *individual* expected wage differentials between origin and destination location to explain the migration choice[1]; (2) we model the migration decision within the context of potential destinations rather than focusing only on origin characteristics; (3) modelling the migration choice at the household level, looking at the wage and employment opportunities of both spouses within a couple; and (4) we examine how different groups of individuals respond to wage, unemployment and house price differentials. We define these groups in terms of both pre- and post migration characteristics.

We argue that by explicitly investigating how regional *differences* in individual wages, employment opportunities and house prices influence the migration decision, we gain new insights and offer new interpretations to existing results. In particular, and contrary to most previous microeconomic studies, our analysis confirms the importance of house price differentials for the migration choice found in aggregate analyses. We find that unemployed individuals are more likely than other individuals to migrate and that they are particularly sensitive to economic incentives. House price differences also strongly influence migration with mortgage holders and

[1] Other contributions which incorporate regional wage estimates into the analysis of migration determinants include DaVanzo (1978), Enchautegui (1997), Jacobsen and Levin (2000), and Dahl (2002).

social tenants particularly affected. This seems plausible as restricted access to social housing at a new location may push such tenants into the private housing sector.

2. Wages, employment opportunities, and house prices

The human capital approach to migration assumes that individuals are influenced in the migration choice by the income they expect to receive at alternative locations (Sjaastad 1962). Productivity of different skills, levels of education, or age groups may vary between regions, for example due to differences in natural resources or varying production technologies of local employers. This results in regional-specific returns to an individual's human capital. The values of alternative wage rates, as well as the corresponding probabilities of getting (or retaining) those wage rates will enter the migration decision. Migration is likely to depend on nominal wage differences, but also on differences in labour market tightness which affect the probability of getting a job. Furthermore, the real values of wage rates will be related to regional price levels, in particular housing costs, which typically make up the bulk of living costs.

Aggregate studies of inter-regional migration in Britain have mostly confirmed the expected effects on migration of differences in unemployment, house prices and wages (Pissarides and McMaster 1990; Jackman and Savouri 1992a; Cameron and Muellbauer 1998: Hatton and Tani 2005; Murphy et al. 2006). They have also shown that because of the possibility of commuting, wage differentials are less important for migration into contiguous regions, where housing considerations tend to dominate (Jackman and Savouri 1992b: Cameron and Muellbauer 1998). Wage differentials are also less important for older workers who benefit from the returns to migration for a shorter time. The literature has shown that the South East of England plays a unique role in migration behaviour which has evolved over time. For example, in the late 1980's house price growth was particularly buoyant in the South East, and the expectation of house price appreciation led to considerable in-migration. The South East also served as 'escalator region' that attracts potentially upwardly mobile young people and promotes them at higher rates than elsewhere in the country (Fielding 1992). There is evidence that a significant proportion of those who achieve high status and pay then 'step off' the escalator by migrating away from the region later in the life cycle. Hatton and Tani (2005) have also found large displacement effects of foreign immigration to the South East.

Microeconomic studies in Britain have focused on how individual characteristics affect migration behaviour. Previous research shows that unemployed workers in Britain have higher migration propensities than those in work, possibly because the opportunity cost of moving for them is less (Pissarides and Wadsworth 1989; Hughes and McCormick 1994; Böheim and Taylor 2002; Gregg et al. 2004). While unemployment related benefits can be claimed in the region of destination, employed individuals must be compensated for the job that they give up. However, unemployed individuals may have restricted access to job information networks in other regions or lack the assets necessary to incur the financial costs of moving (Pissarides and Wadsworth 1989). Consistent with this Böheim and Taylor (2002) find that migration propensity declines with duration of unemployment.

Housing tenure also affects migration choice. Hughes and McCormick (1981) have emphasised how the policy of local authorities towards council tenancy impedes migration. This is because when council tenants migrate they lose their right to immediate occupation of another council property and instead have to join the end of the waiting list at their new location. For home owners, migration causes specific transaction costs such as taxes and fees on the purchasing price of new property, which can offset migration gains (Cameron and Muellbauer 1998; Van Ommeren and Van Leuvensteijn 2005). For this reason individuals and households that anticipate a move tend to select into private rented accommodation to avoid such transaction costs, and consistent with this private tenants have been found to have a higher probability of migration (e.g. Gregg et al. 2004; Andrews et al. 2008).

The literature on family migration (Mincer 1978; Sandell 1977) assumes that couples seek to maximize joint family income when making the decision to migrate. Whenever maximization of family income makes spouses stay (move) although they could individually receive higher earnings by moving (staying), these spouses are tied stayers (movers). Greater market earning power and more continuous labour force participation potentially yields higher migration returns to husbands than to wives. Wives are therefore likely to be tied movers who experience reductions in wages and working hours following the move (e.g. Rabe 2009; Taylor 2007; Boyle et al. 2009), thus reinforcing the initial differences in career prospects between the spouses. On the other hand, working wives – in particular if they contribute a large share to family income and have a stable labour force attachment – deter family mobility, making husbands likely to be tied stayers (e.g. Nivalainen 2004).

Micro-level studies have also looked at how regional economic incentives such as wages and unemployment rates influence migration in Britain, but findings are conflicting and sometimes puzzling. Higher wages in the origin location are found to deter migration (Hughes and McCormick 1994), motivate it (Pissarides and Wadsworth 1989), or have no effect (Andrews et al. 2008). Likewise high unemployment rates at origin appear to deter migration in some studies (Hughes and McCormick 1981, 1994; Henley 1998), provoke migration (Andrews et al. 2008) or have no effect (Pissarides and Wadsworth 1989; Böheim and Taylor 2002). None of these studies finds an effect on migration of house prices at origin or of the interaction of local unemployment rates with the individual's unemployment.

Individual level papers mostly study the determinants of out-migration from a given region. In contrast, we argue that the opportunities that people face through migration are best captured as differences between destination and origin characteristics. One way of doing this is to analyse differences in characteristics between the region of origin and the nation as a whole (Pissarides and Wadsworth 1989; Antolin and Bover 1997). A different approach is to model the decision to migrate and the choice of destination sequentially, which allows a distinction to be made between the push and pull factors associated with migration (Molho 1987; Hughes and McCormick 1989, 1994). However, it is unclear whether empirically these decisions can be separately identified. In this paper we explicitly model differences between origins and destinations by assigning a potential destination to households and including its characteristics in the migration equation, thus tying together the migration decision and the choice of destination (Enchautegui 1997).

Our approach allows us to study how different groups in the population react to migration incentives. In particular, we expect the importance of wage differentials for migration to differ by employment status. Job search theory predicts that the acceptable wage offer is higher for on-the-job searchers than for otherwise identical unemployed job searchers. Unemployment differentials, on the other hand, may be more important for unemployed individuals who presumably rely on more formal channels of job search than employees. Moreover, individuals may migrate in order to change their employment status, or they may change their employment status as a result of migration. If individuals move to search for a job ('speculative migration'), labour market tightness should be important both for individuals that were employed and unemployed pre-migration. In the case of contracted migration we would expect

wages to dominate the migration choice. In other words the anticipated post-migration employment status could be a factor in explaining reactions to wage and/or unemployment differentials (Van Dijk et al. 1989).[2] To account for this possibility we compare estimation results using both pre-migration and post-migration characteristics.

The effects of house price differentials are likely to differ by housing tenure, although this has not previously received much attention in the literature. Home owners are directly affected by house price differentials while renters will be affected either if house prices drive up private rents or as prospective buyers. Individuals who own their homes outright should have more flexibility in financing houses when moving to higher price regions than those whose houses are mortgaged. Council tenants could be affected by house price differentials if restrictions in social rental markets drive them into private rental or home ownership. Therefore we look at how house price differentials affect migration by housing tenure defined both pre- and post-move migration.

3. Econometric methods

We model an individual's decision to migrate as a function of differences between earnings, unemployment, and house prices at the destination and the origin, as well as of migration costs. This can be written as:

$$M_i^* \equiv \Delta Y_i + \Delta U_i + \Delta P + C_i$$

where ΔY_i is the present value of the expected lifetime earnings differentials between destination and origin location for each individual i, which captures regional differences in economic opportunities; ΔU are differences in lifetime employment opportunities which capture, say, regional variations in job offer arrival rates or the risk of job loss; ΔP is the present value of expected lifetime house price differentials between destination and origin and captures regional disparities in the cost of living as well as housing investment opportunities; C_i is the present value of individual

[2] In fact, in most cases the sequence and rationale of decisions which will include, in any order, the decision to migrate at all, the choice of destination, and the choice of employment status, are not observed and it is difficult to disentangle the direction of causality, e.g. between moving to search for a job and contracted migration (Molho 1987, Gregg et al. 2004).

migration costs, such as the cost of gathering information about alternative labour markets or of leaving networks of family and friends.

For risk neutral individuals without quantity constraints it would be feasible to examine unemployment differentials and relative wages in a single 'expected income' variable. But as these conditions are unlikely to be satisfied, we analyse wage and unemployment differentials separately (Pissarides and McMaster 1990). Also the value of the alternative wage may depend on regional price levels due to considerable disparities in costs of living and housing costs across regions within Britain. Wages are therefore often adjusted by regional house prices to make them comparable across regions.[3] However, house prices and their rate of appreciation may affect migration beyond their impact on local prices because of borrowing constraints in imperfect capital markets and the investment character of housing expenditure (McCormick 1997, Kiel 1994, Henley 1998). For these reasons we examine the impacts of house prices and wages separately.[4]

Our model compares the characteristics of the origin to all potential destinations, and these are aggregated into one so that migration is treated as a binary choice. We discuss the aggregation procedure below. The probability of migration is expected to increase with wage gains and to decrease with positive differentials in unemployment rates and house prices. An individual will decide to migrate if the discounted net gain of moving, M_i^*, is positive, that is:

$$M_i = \begin{cases} 1 \text{ if } M_i^* \geq 0 \\ 0 \text{ otherwise} \end{cases}.$$

Assuming that migration costs are determined by a vector of exogenous household and individual characteristics, Z_i, and denoting k as the destination and j as the origin, the model can be specified at time t (pre-migration) as

$$M_{it,t+1}^* = \gamma_1(W_{ikt} - W_{ijt}) + \gamma_2(U_{ikt} - U_{ijt}) + \gamma_3(P_{kt} - P_{jt}) + \gamma_4' Z_{it} + u_{it} \qquad (1)$$

[3] Regional price indices are only recently being created in Britain, and do not cover the whole time-period studied in this paper.

[4] Regional wage differences can also be seen as compensating differentials which compensate for differences in regional-specific amenities such as weather, crime, environment etc. This implies higher wages in low amenity regions. Likewise, regional amenities could influence house prices, implying lower house prices in low amenity regions (Roback 1988). Deflating regional wages by regional house prices, which make up the bulk of living costs, would then exacerbate regional differences.

where *W* are estimates of individual expected log wages, *U* are time- and region-specific log unemployment rates distinguished by the age and gender of the potential migrant, *P* are time and region-specific log house prices, *Z* is a vector of exogenous household and individual characteristics, and *u* is an error term which is given by the sum of an individual-specific unobservable effect and an idiosyncratic random error.

The migration probability model is then given by

$$\Pr(M_{it,t+1} = 1 \mid X_{it}; \gamma) = \Pr(M_{it,t+1}^{*} > 0 \mid X_{it}; \gamma) = \Pr(u_{it} \leq X_{it}; \gamma) \qquad (2)$$

where *X* is the vector of explanatory variables, γ is the corresponding vector of parameters and *Pr*(.) indicates the probability of the event. We specify this model at the household level, focussing on the head of household. For couples we enter into equation (1) the wage and unemployment differentials of the head of household as well as the corresponding differentials for their spouse.

Several approaches are available to estimate equation (1). Given that we use panel data, pooled binary dependent variable models are only valid if there is no serial correlation in the error term, i.e. if all the individual heterogeneity can be captured by the observed variables. Treating the unobserved heterogeneity as time-invariant and assuming a logistic distribution for u_{it} yields a conditional fixed effects model. However, the effects of time invariant covariates cannot be retrieved in this model, they get eliminated together with the unobservable heterogeneity. Moreover, the main interest of this paper is to analyse how differences in opportunities between individuals or households affect migration decisions, rather than within individual variations over time. Therefore we estimate the model using the random effects probit estimator, assuming independence between observables and unobservables.[5] Unobserved individual-specific heterogeneity is allowed for by assuming that it is time invariant and decomposing the error term u_{it} in (1) as

$$u_{it} = \varepsilon_i + v_{it} \qquad (3)$$

[5] It is becoming increasingly common to allow for some correlation between unobservables and explanatory variables within a random effects framework by modelling the individual-specific unobserved effect as a function of the means of the time-varying covariates (Mundlak 1978; Chamberlain 1984). However in our context the main variables of interest (the earnings, unemployment and house price differentials) and those on many other time-varying covariates will change mostly as a result of migration and thus means and changes in these variables are to some extent endogenous. We therefore choose not to pursue this route.

where ε_i denotes the individual-specific unobservable effect and v_{it} is a random error.

In empirically specifying the model we take the difference in log hourly wages between destination and origin as a predictor of lifetime earnings change associated with migration. However such expected wage differentials are not observed. We therefore predict wages both in the origin and destination location for all individuals. As sample sizes in the primary data set (the British Household Panel Survey) are too small to allow precise estimation, we estimate gender-specific wage equations for eleven regions across Britain for each time period (year) using the Labour Force Survey. The coefficients from these region, gender and year-specific wage equations are then used to predict wages for each BHPS respondent in each location. As women in paid employment may not be a randomly selected sample of the population, we correct their regional wage estimates for selection into employment using a Heckman (1979) two step estimation approach. The procedure begins by modelling the selection of women into employment as follows:

$$s_{it}^{*} = \beta_t' p_{it} + \theta_{it} \tag{4}$$

where s_{it}^{*} is a latent variable, p_{it} is a vector of explanatory variables assumed to determine female labour force participation, β_t' is a vector of unknown coefficients, and θ_{it} is a random error term with zero mean and unit variance. This selection equation is estimated using a probit model. From the results we derive inverse Mills ratios, $\lambda_{it} = \dfrac{\phi(\beta_t' m_{it})}{\Phi(\beta_t' m_{it})}$, where $\phi(.)$ is the standard normal density function and $\Phi(.)$ the corresponding standard normal distribution function. These are the selection correction terms which enter into the wage equations as additional regressors to allow consistent estimation using OLS. We assume no employment selection effects for men. The selection corrected wage equation for women in any region in any year is:

$$W_{it} = \delta_t' q_{it} + \lambda_{it} + \vartheta_{it} \tag{5}$$

where W_{it} is the log hourly wage, q_{it} is a vector of personal characteristics assumed to determine wages, λ_{it} is the individual selection correction term, and ϑ_{it} is the error term which is assumed to have zero mean and variance σ^2. Identification is assured by including a set of variables in the selection equation which are not included in the

wage equations. Following common practice we employ the number of children of pre-school age and the number of children of school age as exclusion restrictions, assuming that fertility is exogenous to labour market participation. This is a strong assumption but the approach seems justifiable for the purposes of this paper. The estimated coefficients on the regional log wage equations are used to predict each individual's wage when migrating and when staying in the original location. Thus we assume that the estimated wages proxy the economic opportunities which are faced in different regions of Britain by employees, the unemployed and the economically inactive.

The predicted wage, unemployment rate and average house price in origin j for migrants and non-migrants is determined by the region of residence at time *t*. The predicted wage (unemployment rate, house price) in destination k for migrants and non-migrants is a weighted average of predicted wages (unemployment rates, house prices) in all alternative locations (with the region of origin excluded), where the weights are the observed inter-regional migration flows of the working age population in Britain (aged 16–64). This procedure assumes that migration results from optimizing behaviour and therefore that the locations chosen by British migrants represent best alternative locations.[6] It also takes into account the fact that not all destinations are equally likely from a given origin and that, for example, nearby regions are often preferred presumably because of lower transaction costs. Wage, unemployment and house price information for all potential destinations is in this way aggregated into a single weighted average destination measure. A similar approach in previous migration studies is to impute stayers' wages in alternative locations by using the coefficients of a migrants wage equation (e.g. Nakosteen and Zimmer 1980). The advantage of our procedure is that it uses explicit destinations and therefore allows us to incorporate further regional information, namely on unemployment rates and house prices, into the analysis.

We estimate the migration equation (equation 1) using predicted rather than observed wages. When using variables that have been generated through a first-stage

[6] Another intuitive choice of potential destination is to select the single best alternative for each individual. However, migration choice is presumably a function not only of wages, but also of employment opportunities, prices, and migration costs. Hence the construction of best alternatives would have to rely on assumptions about, for example, the functional form of mobility costs with respect to distance moved as in DaVanzo (1978), or the weight given to house prices relative to wages, etc. In short this method would assume values for the parameters that we ultimately want to estimate.

regression the standard errors in the second stage will be biased downwards. Corrected standard errors can be obtained by using variance estimators such as Murphy and Topel (1985). However, implementation is not straightforward in our case, as our first stage consists of 154 separate equations with corresponding variance matrices. We therefore use bootstrapping with 500 replications to derive standard errors for the second stage. Bootstrapping is a nonparametric approach for evaluating the distribution of a statistic based on random resampling with replacement. We append the estimation sample from the Labour Force Survey used for the wage equations to the sample from the British Household Panel Survey, so that resampling is from the entire set of observations. All stages of the estimation procedure are estimated using the bootstrap sample. The sample standard deviation is then calculated from the sampling distribution (Guan 2003).

4. Data and variable construction

One novel feature of our research is the way in which we combine various datasets. The main analysis of the migration decision is based on 15 waves of the British Household Panel Survey (BHPS), spanning 1993 to 2007. The BHPS is a nationally representative sample of about 5,500 households recruited in 1991, containing approximately 10,000 adults who are interviewed each successive year. Data are collected on a broad range of socioeconomic characteristics at both the individual and the household level. The use of panel data allows identification of both the pre- and post-migration characteristics. We exploit the BHPS from 1993 only as data from the Labour Force Survey used to estimate wage equations is available from that year. The 15 year panel allows us to observe 14 annual transitions from time t to t+1.

Although attrition rates among migrants are higher than among non-migrants, Buck (2000) reports that almost 75% of actual movers between 1991 and 1992 were traced compared with an overall response rate of 90%. Over the 15 years of available panel data, an interview was possible with at least one household member in almost 80% of moving households.

Our analysis is conducted at the household level, so for couples (either married or cohabiting) we determine the head of household and merge to this the characteristics of the spouse. For singles any variables capturing spouse's characteristics are set to zero. In the BHPS the head of household is defined as the principal owner or renter of the property that a household lives in. Where there is

more than one potential head of household or neither of the spouses are the heads of households, the male takes precedence.[7] In our sample 90% of the heads of household are male.

We restrict the analysis to heads of households (and spouses) aged between 18 and 58 inclusive and not in fulltime education. This is the group most likely to migrate for work related reasons. Including older workers may capture migration associated with retirement location decisions, while including younger individuals would potentially confound education related moves with migration. We also remove those in the armed forces, who are self-employed at time *t*, and observations with missing data for any of the variables used in the analysis. We only include household heads for whom information is available at two consecutive interviews, resulting in an unbalanced panel which allows the same head of household to enter the sample several times.

Migration is defined as a change in a head of household's address in the period between two interviews which also involved crossing the boundaries of one of the eleven distinct British regions and exceeds a distance of fifty kilometres.[8] The distance constraint avoids defining as migrants households that move only a short distance across regional boundaries without entering a different labour market. In our dataset we identify 518 cases of inter-regional migration out of a total of 35,808 household-year observations. These comprise 6,321 unique single or couple households of whom 446 are migrants.[9] 7.1% of the households in the sample migrate some time over the sixteen year period which equates to 1.4% of the household-year observations.

To estimate the wage equations we use Labour Force Survey (LFS) data for the period 1993 to 2006. The LFS is a quarterly sample survey of households living at

[7] We have also tried an alternative definition of the head of household based on the total individual labour and non-labour income in the month before the interview at time *t*. The spouse that contributed the greater income was taken to be the head, with the male taking precedence in case of equal income. The results of the estimations using this alternative definition were similar to those presented here.

[8] The 11 regions are the Government Office Regions in England (North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, South West) as well as Wales and Scotland. In the case of couple households, we use pre-migration information on the characteristics of the spouse and do not constrain the analysis to the couple remaining intact post-migration.

[9] Individuals observed migrating once during the time-span covered by the BHPS (1991-2007) may be repeat migrants whose previous migration event(s) occurred prior to 1991. Hence we are not able to distinguish one time from repeat migrants and retain all migrants in the sample. An alternative would be to retain one time migrants whose migration histories are observed from the beginning of their employment, but this would lead to sufficiently small sample sizes to make analysis infeasible.

private addresses in Great Britain and covers about 60,000 households. It seeks information on each respondent's personal circumstances and their labour market status during a specific reference period, normally a period of one week or four weeks (depending on the topic) immediately prior to the interview. Information used for the selection and wage equations is compatible with BHPS variables so that the coefficients estimated with LFS data can be used to predict wages using the characteristics of individuals in the BHPS. In estimating the wage equations we restrict the sample to men and women of working age (18–64 inclusive) who are not in fulltime education or the armed forces. We also exclude the bottom and top 0.5% of the hourly wage distribution in order to eliminate extreme outliers.

The selection equations model female selection into employment as a function of age and its square, highest educational qualification attained, whether the woman has a partner (married or cohabiting) and non-white ethnic origin.[10] Being partnered generally reduces the labour force attachment of women, and education captures the economic opportunities that individuals face in the labour market. We include both the number of pre-school and school-age children in the household, as dependent children are expected to reduce a woman's involvement in market work, especially if the children are young. These two variables are used as exclusion restrictions. Separate selection models are estimated for each of fourteen years and each of eleven regions (a total of 154 regressions) to allow for time and region-specific labour force participation.

The dependent variable in the wage equations is the log of real gross hourly wages in January 2000 prices. In the LFS wages are derived from usual weekly earnings in the main job, total usual hours worked in the main job, and usual hours of paid overtime. They are modelled as a function of personal characteristics only. Job related characteristics are not included in the wage equations in order to allow the derivation of expected wages for the non-employed and avoiding the assumption that individuals have the same job characteristics pre and post-migration. We use as explanatory variables in the wage equations age and its square, highest educational qualification, whether an individual is of non-white ethnicity, and whether he/she is married/cohabiting. To account for the effects of (temporary) non-work on subsequent wages (e.g. Arulampalam 2001), we also include as an explanatory variable whether

[10] Such a variable is insufficient to adequately capture wage differences between ethnic groups, but small sample sizes prevent a more disaggregated approach.

an individual experienced an employment interruption since the last interview. For women, the wage equations also include the correction terms for selection into the labour market. The coefficients from the wage equations are used to predict a wage for each individual in each region and in each year.[11] We implicitly assume that households, in deciding whether to migrate between time t and $t+1$, take log wage levels observed at time t as a predictor of future earnings.

For the derivation of individual-specific unemployment differentials we use a non-parametric approach. Using the LFS we calculate regional unemployment rates by gender, age group and year. The log of these unemployment rates are merged to our BHPS sample and differentials derived using location of origin and weighted average destinations as described above.[12]

House prices were obtained from historical data (provided by Halifax Housing Research) on average annual house prices at the regional level. Annual house prices are averages of all houses sold in a region within a year, excluding properties worth over one million pounds and sample sizes less than fifty. We use two measures of differences in house prices between locations of origin and destination. The first captures house prices differences in levels, using differences in log real house prices (in January 2000 prices) between the average destination and location of origin. The second captures differences in house price growth – the change in the log house price differential between destination and origin region between time *t*–1 and time *t* (i.e. in the year prior to any migration).

Data on the inter-regional migration of the working age population in Britain, used for the weighting of potential destinations, is from the National Health Service Central Register, 1993–2007. This keeps records of patients registered with General Practitioners (GPs) and is used for official internal migration estimates. The migration data relies on patients re-registering with a new GP when they move to a new location. There is a well recognised undercount of young adult males in the data, as such individuals are less likely than their female counterparts to reregister with a new doctor (GP) immediately following a move (Ogilvy 1980). An associated problem occurs when males register at a new location several years after migrating, producing an over count in the older age groups. We use the sum of migration flows for all

[11] In doing so we code those not currently working as having had an employment interruption.
[12] We have also experimented using employment instead of unemployment rates in our models, as well as employment and unemployment growth, and the results from so doing are consistent with those obtained with unemployment rates.

working age migrants which should produce unbiased migration counts under the assumption that migration between any two regions does not vary in the short term. The migration weights we derive from these data are origin-specific, i.e. they measure the proportion of migrants choosing each available destination from a given origin.

These wage, house price, and unemployment differentials enter the migration equation, equation (1), which is the core equation of interest. In addition we also include personal and household characteristics. Migration is expected to decline with age because older individuals reap the benefits for a shorter time-period than younger ones. We include the age of the head of household only, as we assume this to be highly correlated with the spouse's age. Labour force status of the head of household and their spouse is included to capture different migration propensities associated with current (or, when using post-migration status, future) labour market ties. The expectation is that unemployed individuals have low market attachment and thus a high propensity to migrate while employees may find it more difficult to move to another location. We also include a binary variable indicating whether households live in the South East to capture any of the unique effects found in the previous literature, and a gender indicator to capture any gender differences in mobility behaviour.

Other variables act as proxies for the direct and indirect costs of moving. The size of the household is an indicator of the direct costs of moving and of the network attached to any individual. We distinguish between the number of children under age five and over age five in the household. Families with pre-school children are often found to migrate in search for better environments for their children while the presence of school-age children usually deters migration because of the difficulties involved in changing schools. Furthermore, a binary partnership variable is included to capture the reduced mobility of individuals with partnership ties (Mincer 1978). Housing tenure is also included to approximate the costs of migration. By assumption rental accommodation would be less costly to transfer than an owned home. Home ownership might also be an indication of the attachment a household has to a location. All of these variables are measured at t, i.e. the time when the migration decision is assumed to be made.

5. Empirical results

Descriptives

Table 1 summarises the main characteristics of the head of household sets of household-year observations by mover status between time *t* and *t*+1, where characteristics are defined at time *t*, before any migration. Information for partners is shown if applicable. Migrants are on average 31 years old and six years younger than non-migrants. A lower proportion of migrants than non-migrants has a partner (married or cohabiting). Whereas the proportion of migrant and non-migrant heads of households that are employed before any migration is the same at 82%, the proportion of migrants that is unemployed is higher (10% compared with 6%) and the proportion that is inactive is lower (8% compared with 12%) than that of non-migrants. The differences in the employment characteristics of any partners of migrants and non-migrants are not statistically significant.

Table 1: Characteristics of migrants and non-migrants

	Migrants, *t*	Non-migrants, *t*
Age (years)	31	37
Married/cohabiting	0.38	0.53
Employed	0.82[a]	0.82[a]
Unemployed	0.10	0.06
Inactive	0.08	0.12
Partner employed, if partnered	0.71[a]	0.75[a]
Partner unemployed, if partnered	0.05[a]	0.03[a]
Partner inactive, if partnered	0.24[a]	0.22[a]
Home owner outright	0.14[a]	0.13[a]
Home owner mortgage	0.54	0.60
Social tenant	0.08	0.18
Private renter	0.23	0.09
Female head of household	0.11[a]	0.10[a]
Female single	0.56[a]	0.55[a]
Number of preschool age children	0.18[a]	0.17[a]
Number of school age children	0.32	0.53
South East	0.44	0.28
N households	6,321	
N household-years	35,808	

Notes: BHPS 1993–2006. Inactive includes, for example, family care, long-term sick or retired. Private tenant is private furnished, private unfurnished, rented from employer, and other. Social tenant is from a local authority or housing association.

[a]Except for these all differences between migrants and non-migrants are significant beyond the 5% level.

In terms of housing characteristics the proportion of outright home owners is about the same among migrant and non-migrant households (13–14%). A lower

proportion of migrants than non-migrants own their house on a mortgage (54% compared with 60%) or live in social rented accommodation (8% compared with 18%). Conversely, the proportion of migrant households living in private rented accommodation is higher than that of non-migrant households (23% compared with 9%).

The proportion of female heads of households and of female singles in the sample is about the same among migrant and non-migrant households (10–11% and 55–56% repectively). Likewise, there is no statistically significant difference in the number of preschool age children living in migrant and non-migrant households. The average number of school-age children, aged 4 to 16, living in migrant households is lower than those living in non-migrant households (0.3 compared with 0.5). Finally, a higher proportion of households that migrate between time *t* and *t*+1 live in the South East of England before migration than those who stay at their origin location.

Table 2 reports employment status (for heads of households and their partners, if any) and housing tenure (for households) transition matrices for migrants and non-migrants between two consecutive interviews, at time *t* and *t*+1 (approximately one year apart in the BHPS data). Migrant heads of households between time *t* and *t*+1 are found to change employment status more frequently than non-migrants. In particular unemployed migrants are significantly more likely to enter work than unemployed non-migrants. More than 70% of unemployed migrants enter work (either as an employee or self-employed) post-migration compared with 40% of unemployed non-migrants. Economically inactive migrants also experience more labour market mobility than economically inactive non-migrants, both in terms of entering work and entering unemployment. The proportion of heads of households that remains employed at the subsequent year differs less between migrants and non-migrants (91% compared with 96%).

Looking at partner's employment transitions for those heads of household that have a partner, there are marked differences between migrants and non-migrants. Note, however, that cell sizes in the partner's transition matrix are small for migrants. Partners in migrant households have lower retention rates in employment than those in non-migrant households (72% compared with 93%), and higher retention rates in unemployment (57% compared with 28%). A higher proportion of migrant partners move from inactivity at time *t* into employment at time *t*+1 than among non-migrant partners (27% compared with 19%).

Table 2: Employment and housing transitions by migrant status (row percentages)

	Migrants, $t+1$				Non-migrants, $t+1$			
Head of household employment status								
t	Employed	Unemployed	Inactive		Employed	Unemployed	Inactive	
Employed	91	4	5		96	2	2	
Unemployed	72	13	15		40	42	18	
Inactive	23	13	65		14	6	81	
Partner's employment status[a]								
Employed	72	5	17		93	1	6	
Unemployed	29	57	14		43	28	29	
Inactive	27	0	73		19	2	79	
Household housing tenure								
t	Own outright	Mortgage	Social tenant	Private tenant	Own outright	Mortgage	Social tenant	Private tenant
Own outright	24	29	3	44	88	9	1	2
Mortgage	8	55	3	35	3	95	1	2
Social tenant	9	27	36	27	0	4	92	3
Private tenant	9	37	7	48	2	14	6	77

Notes: BHPS 1993–2006, N=35,808. Inactive includes, for example, family care, long-term sick or retired. Private tenant is private furnished, private unfurnished, rented from employer, and other. Social tenant is from a local authority or housing association.

[a]Cell sizes for migrant partners are small.

Furthermore, Table 2 also shows that, not surprisingly, migrants are significantly more likely than non-migrants to change their housing tenure. Almost one half of migrating private tenants and 36% of social tenants move into home ownership (either with or without a mortgage), while private tenancy is the most common destination for outright owners who move. The latter may reflect that private renting is used as a stepping stone into other tenures while individuals acquaint themselves with the housing market in a new location. This group could also include individuals leaving their parental home and moving into rental accommodation. More than 50% of mortgage holders who migrate remain with a mortgage while 35% move into private tenancy. Social tenants are equally likely to move into private tenancy or take on a mortgage. It seems reasonable to assume that post migration housing tenure is temporary and to evolve over time, in which case housing tenure observed at time $t+1$ may not be an immediate reflection of migration choice. Housing tenure changes among non-migrants are related to local moves with a distance of less than 50km.

Selection and wage equations

The first step in the estimation procedure is to model women's selection into employment. The results of the 154 year and region-specific probit estimates, using data from the Labour Force Survey, are not presented separately for brevity. Instead, Table 3 summarises the results of the models with means, standard deviations, minimums and maximums of coefficients. The results are in line with expectations. The estimates show that there is a non-linear relationship between female participation in the labour market and age. Participation is higher for women holding higher educational qualifications than for those with no qualifications, but this does not emerge consistently across regions and years. Similarly marriage or cohabitation on average increases women's probability to be employed, but not consistently. The average coefficients on the identifying variables indicate that women with preschool age and school-age children are less likely to work than childless women, and this emerges consistently across regions and years. The lower panel of Table 2 shows test results for instrument relevance and hence the identification of the model. The hypothesis that the coefficients on the variables capturing the number of preschool and school-age children are jointly equal to zero can be rejected at levels of statistical significance above the 1% level. As the upper panel shows, this hypothesis can also

be rejected for each variable separately with statistical significance exceeding the 1% level.

Table 3: Female labour force participation, LFS 1993–2006

	Coefficient			
	Mean	Standard dev	Minimum	Maximum
Age	0.095 **	0.022	0.024	0.158
$Age^2/100$	–0.147 **	0.029	–0.225	–0.053
Degree	0.680	0.371	–0.817	1.188
Other higher qualification	0.751 **	0.392	–0.774	1.218
A-Levels or equivalent	0.449	0.467	–1.222	0.988
GCSE or equivalent	0.474 **	0.295	–0.644	0.945
Partner	0.190	0.083	–0.004	0.370
Non-white	–0.332	0.248	–1.046	0.180
Number of preschool children	–0.639 **	0.068	–0.811	–0.441
Number of school-age children	–0.189 **	0.029	–0.269	–0.118
Constant	–0.989	0.763	–2.318	1.609
Log likelihood			–14574.55	–2057.83
Observations per wave and region			5,896	24,828
H_0: number of preschool children = number of school children = 0				
χ^2	184.70	2125.70		
p-value	0.000	0.000		

Notes: ** significant at 1% or higher in each of the 154 equations. Table summarises estimation results of 154 models, 1993–2006. Dependent variable is women's employment at time *t*. All regressors measured at time t.

These estimates are used to derive selection correction terms which enter as regressors in the female log hourly wage equations. The log hourly wage models are again time and region-specific and thus comprise 154 sets of estimates each for men and women. In any year and region the estimation sample size is higher than 700 for both for men and women. The results are again presented in summary form, in Table 4, with means, standard deviations, minimums, and maximums of coefficients. The results show that there are non-linear returns to age for both men and women. As expected, there are higher wage returns to higher levels of education than to lower ones for both men and women, particularly to having a university degree or other tertiary qualifications relative to no qualifications. Consistent with the literature partnered men earn more than single men, but this has no consistent impact for women. Non-white ethnicity also has no consistent impact on wages across regions and over time, while there is a consistent wage penalty associated with an employment interruption (which varies in statistical significance across regions and over time). The coefficient on lambda which corrects for selectivity in women's

labour force participation has no consistent sign and is not statistically significant in most models, giving little evidence of selection effects.

Table 4: Regional wage equations, LFS 1993–2006

	Coefficient				
	Mean		Standard dev.	Minimum	Maximum
MEN					
Age	0.078	**	0.009	0.052	0.099
$Age^2/100$	–0.088	**	0.011	–0.115	–0.056
Degree	0.634	**	0.069	0.422	0.785
Other higher qualification	0.416	**	0.073	0.189	0.554
A-Levels or equivalent	0.209		0.055	0.037	0.323
GCSE or equivalent	0.155		0.069	–0.041	0.330
Partner	0.125	*	0.028	0.067	0.194
Non-white	–0.119		0.099	–0.347	0.242
Work interruption	–0.161		0.040	–0.301	–0.063
Constant	2.173		1.447	0.042	5.907
R^2				0.22	0.43
Observations				711	5076
WOMEN					
Age	0.046	**	0.009	0.025	0.078
$Age^2/100$	–0.052	*	0.012	–0.094	–0.024
Degree	0.704	**	0.107	0.355	0.917
Other higher qualification	0.491	**	0.117	0.117	0.724
A-Levels or equivalent	0.204		0.072	–0.001	0.343
GCSE or equivalent	0.135		0.073	–0.086	0.286
Partner	0.013		0.026	–0.056	0.092
Non-white	–0.016		0.102	–0.477	0.209
Work interruption	–0.159		0.033	–0.248	–0.012
Lambda	0.056		0.095	–0.145	0.440
Constant	0.717		0.212	0.166	1.200
R^2				0.20	0.43
Observations				744	5086

Notes: ** significant at 1% or higher, * significant at 5% or higher in each of the 154 equations. Table summarises estimation results of 154 wage equations (11 regions, years 1993–2006), separately for men and women. Dependent variable is log hourly real wage at time *t*. All regressors measured at time t. Work interruption is a binary variable coding working individuals with an employment break since the last interview.

Migration models

The coefficients on the time and region-specific log wage equations are used to construct wage differentials between potential destination and origin region for each head of household and their spouse (if married or cohabiting), using the BHPS. Log wages in destination are a weighted average of log hourly wages in all available destinations (with the origin excluded), using observed origin-specific migration flows from the National Health Service Central Register as weights. The same

weights are used to aggregate log unemployment rates for each head of household and their spouse (if partnered) as well as a household's log house prices and log house price growth in potential destinations. The differentials between destination and origin enter as regressors in the random effects probit model. Table 5 displays estimation results from such estimation using pre-migration employment status and housing tenure as explanatory variables. This base model constrains all employment status and housing tenure groups to have the same response to wage, unemployment, and house price differentials, an assumption we relax in later specifications.

Table 5: Migration equation, BHPS 1993–2006

	Base model	
Log wage differential	–0.265	(0.77)
Partner's log wage differential	–0.677	(1.49)
Log unemployment rate differential	0.045	(0.53)
Partner's log unemployment rate differential	–0.218	(1.47)
Log house price differential	–0.468	(2.53)*
$\Delta_{t-1,t}$ log house price differential	0.072	(0.11)
Employed	–0.008	(0.10)
Unemployed	0.260	(2.50)*
Partner employed	–0.120	(1.07)
Partner unemployed	0.075	(0.19)
Home owner mortgage	–0.074	(1.04)
Social tenant	–0.443	(4.71)**
Private renter	0.182	(2.36)*
Number preschool age children in household	–0.010	(0.17)
Number school age children in household	–0.077	(2.18)*
Age	–0.020	(8.09)**
Female	0.116	(2.08)*
Partner	0.061	(0.54)
South East	0.044	(0.49)
Constant	–1.881	(10.25)**
Year indicators	yes	
ρ	0.230	
Log likelihood	–2,496.03	
N households	6,321	
N household-years	35,808	

Notes: Estimates from random effects probit model. Dependent variable takes value 1 if head of household moves across a regional boundary and travels at least 50km, and 0 otherwise. Bootstrapping was used to derive standard errors (500 replications). ** significant at 1% or higher, * significant at 5%, + significant at 10% level.

The estimates show that contrary to expectation the log wage differentials enter the migration equation negatively – those predicted a higher wage from migrating are less likely to move all else equal. However these are not statistically significant. The unemployment rate differential also has little impact on the migration

propensity, although higher unemployment in destination than origin region for the spouse seems to deter migration (not statistically significant). Thus the employment opportunities of the spouse may be a more important determinant of migration than those of the head of household. We explore this further later in the paper. The weak impact of the unemployment rate differentials in determining migration is consistent with previous research based on micro-data that use unemployment rates in the location of origin (Hughes and McCormick 1994; Böheim and Taylor 2002; Gregg et al. 2004) or origin unemployment rate relative to a national average (Pissarides and Wadsworth 1989).

The house price differential has a large negative and statistically significant impact on the migration propensity. This indicates that relatively high house prices in potential destinations deter migration, presumably because of credit constraints. This is consistent with previous aggregate studies of migration that generally find flows from relatively high to lower house price regions. Previous microeconomic studies which focus solely on house prices at origin rarely find such an effect. However the contemporaneous annual change in housing price differences has no effect – relative house price levels rather than changes influence migration decisions. This is in contrast to findings in some earlier papers that expected capital gains in housing motivate migration (e.g. Murphy et al. 2006). Instead, the consumption aspect of housing demand seems to dominate the investment aspect.

Turning to the impacts of other controls, the effect of the employment status of the head of household on migration is in line with expectations. In particular we find that unemployment pre-migration increases the migration propensity, consistent with previous research.[13] However the labour market status of the spouse of the head of household has no significant impact. The coefficients on housing tenure variables confirm previous findings that social tenants are least likely to migrate while private tenants have the highest migration propensities. It is difficult to put a causal interpretation on this however as more mobile households are likely to select into private tenancy due to its low transaction costs, on the expectation of subsequent migration. The propensity to migrate also falls with the number of school-aged (but not pre-school) children. This suggests that parents are unwilling to disrupt the

[13] We have also tested whether the migration propensity declines with the duration of unemployment, as shown in earlier papers, but found unemployment duration to have no statistically significant effect on migration.

schooling of their children when considering location decisions, or parents select into suitable neighbourhoods prior to children starting school. The propensity to migrate also falls with age, consistent with previous research that indicates young adults are most geographically mobile, typically because of relatively low mobility costs. Women are found to be more mobile than men, and as most of the partnered heads of households are men, this result will reflect the mobility decisions of single women. After controlling for the partner's expected log wage and unemployment differentials as well as their employment status we find no effect of being partnered on migration. This suggests that these variables capture the main mobility deterrents of being partnered found in previous papers. Moreover, we find no evidence that mobility behaviour in the South East is different to that elsewhere in the country. Finally, the estimate of ρ suggests that 23% of the total variance in migration is explained by the individual-specific unobserved effect.

Extensions

In extensions to this base model, we introduce interactions between the wage differentials and labour market status (in Table 6), the unemployment differentials and labour market status (in Table 7) and house price differentials and housing tenure (Table 8).[14]

In Table 6 we investigate whether the effects on migration of the wage differentials vary by employment status prior to and following any move. This exercise proves revealing – the interactions with labour market status prior to any move reveal that the unemployed are most sensitive to predicted individual wage differentials. The propensity of the unemployed to migrate increases with the individuals predicted relative wage gain – those predicted higher wages in potential destinations are more likely to migrate. Furthermore this effect seems to be concentrated among those who simultaneously entered work, as the interaction between the wage differential and being employed post-migration increases in size relative to that pre-migration while that with unemployment falls in size relative to pre-migration. This supports the hypothesis that many moves among the unemployed are contracted and that the unemployed follow migration incentives. The coefficient

[14] Separate estimates for age-groups 20-30, 31-40, 41-50 show that the younger age-group is more sensitive to wage than to unemployment and house-price differentials. This is consistent with results obtained for East Germany (Hunt 2006). In contrast, the two older age-groups place more importance on unemployment and house-price differentials.

on the unemployed indicator remains positive and statistically significant when including these interaction terms. Therefore consistent with previous research, we find that being unemployed increases an individual's migration propensity and in addition our results show that the unemployed react to wage incentives. Previous UK papers have not incorporated measures of individual wage gains through migration into analysis and so could not identify these effects.

Table 6: Wage interactions, BHPS 1993–2006

	Base model	Status at *t*	Status at *t*+1	Partner's status *t*	Partner's status *t*+1
Log wage differential	–0.265			–0.269	–0.263
	(0.77)			(0.78)	(0.77)
WD * employed		–0.298	0.574		
		(0.78)	(0.73)		
WD * unemployed		1.628 *	0.072		
		(2.55)	(0.19)		
WD * inactive		–1.200 *	–1.056 *		
		(2.26)	(2.03)		
Partner's log wage diff.	–0.677	–0.688	–0.693		
	(1.49)	(1.58)	(1.58)		
PWD * employed				–0.839 +	–0.134
				(1.63)	(0.27)
PWD * unemployed				0.723	–1.649
				(0.12)	(0.62)
PWD * inactive				–0.482	–1.062
				(0.56)	(1.38)
Employed	–0.008	–0.004	–0.007	–0.007	–0.010
	(0.10)	(0.05)	(0.08)	(0.08)	(0.12)
Unemployed	0.260 *	0.225 *	0.260 *	0.262 *	0.260 *
	(2.50)	(2.08)	(2.46)	(2.50)	(2.45)
Partner employed	–0.120	–0.118	–0.119	–0.119	–0.121
	(1.07)	(1.11)	(1.12)	(1.08)	(1.06)
Partner unemployed	0.075	0.086	0.083	0.054	0.081
	(0.19)	(0.17)	(0.13)	(0.04)	(0.12)
Other controls	yes	yes	yes	yes	yes
Year indicators	yes	yes	yes	yes	yes
ρ	0.230 **	0.231 **	0.230 **	0.231 **	0.228 **
Log likelihood	–2,496.03	–2,489.87	–2493.56	–2495.38	–2495.44
N households			6,321		
N household-years			35,808		

Notes: Estimates from random effects probit model. Dependent variable takes value 1 if head of household moves across a regional boundary and travels at least 50km, and 0 otherwise. Bootstrapping was used to derive standard errors (500 replications). ** significant at 1% or higher, * significant at 5%, + significant at 10% level.

The interaction with being employed (both pre- and post-migration) is not statistically significant. This result is consistent with a number of previous

microeconomic studies, and suggests that the choice of destination for the employed is driven by factors other than wages. In subsequent models we investigate the impact on migration propensities of unemployment and regional price differences, which suggest that factors other than wages drive such decisions.

The interaction with economic inactivity (both pre- and post-migration) is negative and statistically significant, indicating that the migration propensity falls with the predicted wage differential for the economically inactive. This possibly reflects life-cycle mobility patterns in choosing a new location which are not driven by economic incentives. Rather the economically inactive move away from high wage regions possibly for quality of life reasons not captured in wages.

The final two columns in Table 6 explore the impacts of interacting the head of household's partner's wage differential with their employment status both pre- and post-move. The sample sizes for these interaction terms are quite small, and hence the effects are generally not well determined. However, they indicate that the migration propensity of those with an employed partner falls with their partner's predicted wage differential. Those whose partner is predicted to gain in wages from a move are less likely to migrate. The partner of the head of household is likely to be a tied mover, in the sense that they would face a considerable risk of non-employment post migration. Those with higher predicted wage gains from migration may also have a stronger attachment to work and the labour market, and so have a lower incentive to migrate and put their continued employment at potential risk. As such, it is likely to be their anticipated employment status that drives the negative sign. This is supported to some extent by the post-migration interactions which suggest that the negative association is with the unemployed and economically inactive post-migration.

Table 7 presents the estimates from entering interactions between the unemployment rate differential and labour market status (both pre- and post-move) for the head of household and their spouse. The first observation to make is that for the head of household only the interaction with being unemployed prior to any migration is statistically significant. Furthermore, the coefficient is positive, indicating that the unemployed in relatively low unemployment regions (for whom the differential will be positive) are more likely to migrate than the unemployed in relatively high unemployment regions. How can this be explained? It is possible that the unemployed in low unemployment regions are more able than those in high unemployment regions to make a speculative move in search of a job, and are also more likely to make a

contracted move as a result of the job search process. Relatively high unemployment at origin is likely to make it harder to, for example, sell a house (Henley 1998) or to find suitable living accommodation in a low unemployment destination. Gregg et al (2004) have argued that unemployed individuals are constrained in speculative migration by low assets and a reluctance of private landlords to accept unemployed individuals as tenants.

Table 7: Unemployment interactions, BHPS 1993–2006

	Base model	status at *t*	status at *t*+1	Partner's status *t*	Partner's status *t*+1
Log unemployment rate	0.045			0.046	0.029
differential	(0.53)			(0.53)	(0.33)
UD * employed		0.006	0.014		
		(0.07)	(0.15)		
UD * unemployed		0.671 **	0.333		
		(2.81)	(1.09)		
UD * inactive		–0.022	0.212		
		(0.08)	(0.76)		
Partner's log unemployment	–0.218	–0.211	–0.216		
rate differential	(1.47)	(1.48)	(1.48)		
PUD * employed				–0.246	–0.227
				(0.37)	(1.41)
PUD * unemployed				–0.281	–0.027
				(1.49)	(0.02)
PUD * inactive				–0.111	0.112
				(0.40)	(0.36)
Employed	–0.008	–0.003	–0.013	–0.009	–0.011
	(0.10)	(0.03)	(0.15)	(0.11)	(0.14)
Unemployed	0.260 *	0.265 *	0.262 *	0.261 *	0.260 *
	(2.50)	(2.47)	(2.51)	(2.48)	(2.47)
Partner employed	–0.120	–0.118	–0.121	–0.122	–0.123
	(1.07)	(1.06)	(1.13)	(1.08)	(1.09)
Partner unemployed	0.075	0.065	0.071	0.070	0.083
	(0.19)	(0.11)	(0.12)	(0.11)	(0.13)
Other controls	yes	yes	yes	yes	yes
Year indicators	yes	yes	yes	yes	yes
ρ	0.230 **	0.231 **	0.230 **	0.230 **	0.231 **
Log likelihood	–2,496.03	–2492.90	–2495.24	–2495.90	–2496.00
N households			6,321		
N household-years			35,808		

Notes: Estimates from random effects probit model. Dependent variable takes value 1 if head of household moves across a regional boundary and travels at least 50km, and 0 otherwise. Bootstrapping was used to derive standard errors (500 replications, 200 replications for partner's status at time t+1). ** significant at 1% or higher, * significant at 5%, + significant at 10% level.

The positive and statistically significant effect of being unemployed on migration remains even when including the unemployment rate differential. Therefore

the unemployed are more likely to migrate than the economically inactive, and in addition our results show that the unemployed react to unemployment differentials.

For partners we find that the unemployment rate differential has a negative effect for all employment statuses prior to migration – partners have lower migration rates from regions with relatively high unemployment rates. However only the coefficient for those in unemployment approaches statistical significance. Households in which the head's spouse is unemployed and faces a relatively low unemployment rate and hence better employment opportunities at origin have a lower migration propensity than those facing a relatively high unemployment rate. This is reflected in the spouse's post-migration employment status, where the employed post-migration who faced a relatively low unemployment rate in origin are less likely to migrate. Therefore households in which the spouse anticipates or desires employment do not move away from relatively low unemployment regions. Revealing these family and labour market interactions on a household's migration propensity has not been possible in the previous literature.

Table 8 shows the results of estimating the migration model with interactions between house price differentials and housing tenure. These indicate that house price differentials have large, negative and statistically significant effects for homeowners, with an impact of almost equal size but on the margins of statistical significance for social tenants. As expected, homeowners in relatively low price regions are deterred from migration because of credit constraints, while those in relatively high house price regions face less of a constraint. This reveals that it is not just housing tenure but the relative cost of housing between regions that is particularly important in determining migration opportunities for home owners. Social tenants that migrate will also face considerable credit constraints, as the restrictions faced in obtaining social rented accommodation in other regions make them particularly sensitive to market prices. Compared to private tenants, social tenants are likely to face higher financial constraints when entering the private housing sector. These house price effects emerge very clearly, and affect most people in most housing tenures. The size and strength of these effects are consistent with the base model, which indicates that house price differentials (and hence expected housing costs) are a major factor in determining migration. In contrast, wage and unemployment differentials do not have such wide-ranging impacts and instead only affect particular employment groups in the population.

Table 8: Housing interactions, BHPS 1993–2006

	Base model	Housing tenure *t*	Housing tenure *t*+1
Log house price differential	–0.468 *		
	(2.53)		
HD * owner outright		–0.837 **	–0.882 **
		(2.81)	(3.15)
HD * owner mortgage		–0.452 *	–0.617 **
		(2.18)	(3.17)
HD * social housing		–0.600 +	–0.432
		(1.76)	(1.44)
HD * private rental		–0.173	0.210
		(0.64)	(0.63)
$\Delta_{t-1,t}$ log house price differential	0.072	0.060	0.114
	(0.11)	(0.09)	(0.17)
Home owner mortgage	–0.074	–0.065	–0.064
	(1.04)	(0.90)	(0.90)
Social tenant	–0.443 **	–0.435 **	–0.434 **
	(4.71)	(4.42)	(4.51)
Private renter	0.182 *	0.198 *	0.198 *
	(2.36)	(2.54)	(2.55)
Other controls	yes	yes	yes
Year indicators	yes	yes	yes
ρ	0.230 **	0.230 **	0.229 **
Log likelihood	–2,496.03	–2,493.55	–2487.85
N households		6,321	
N household-years		35,808	

Notes: Estimates from random effects probit model. Dependent variable takes value 1 if head of household moves across a regional boundary and travels at least 50km, and 0 otherwise. Bootstrapping was used to derive standard errors (500 replications). ** significant at 1% or higher, * significant at 5%, + significant at 10% level.

6. Conclusions

Migration in order to improve expected income is an important investment in human capital. While much is known about the impact of aggregate wage, unemployment and house price differentials on migration flows, some inconsistencies and open questions evolve from individual-specific analysis of these factors. In this paper we claim that these are partly due to the fact that many previous papers model out-migration as a function of origin characteristics. Introducing explicit destinations into the analysis, we come closer to the conventional results of aggregate studies than previous microeconomic analyses, and thus infer that analysis of differentials between origin and potential destinations captures the migration decision more precisely than origin-only models. The impact of house price differentials on migration propensities is an example. Furthermore, we estimate expected wages in origin and destination and

are thus able to account for individual-specific costs and opportunities that arise in migration. This is important because it allows us to identify differences in reactions to opportunities and incentives across population subgroups.

Controlling for wage, unemployment, and house price differentials we find that unemployed individuals are more likely to migrate than other individuals. Moreover, migration of unemployed individuals is sensitive to both wage and unemployment differentials. In particular they migrate in response to higher wage opportunities in potential destinations, but are less likely to move to areas with better employment opportunities. The latter is likely to reflect the difficulty of the unemployed in high unemployment regions to make a speculative move. Such wage and unemployment differentials have little impact on migration propensities of employed heads of households.

Having a partner with high wage expectations impedes migration possibly because of the risk of job loss to that partner. Furthermore households in which the spouse anticipates or desires employment do not move away from relatively low unemployment regions. Therefore employment opportunities of the spouse seem to be central to family migration choice. Being able to assess the impact of migration opportunities on both spouses in a couple provides additional insights into the determinants of family migration that cannot be identified in aggregate studies and which are lacking in many microeconomic studies.

House price differentials strongly influence migration propensities – relatively high house prices in potential destinations deter migration which is likely to reflect credit constraints. Furthermore this effect is found for all tenure types except private tenants, with mortgage holders and social tenants particularly sensitive to these differentials. The restrictions faced by council tenants in obtaining social rental in other regions may force these individuals into the private housing sector, where their lack of financial assets make them particularly sensitive to price differentials when they migrate. These house price effects emerge very clearly, and affect most people in most housing tenures. In contrast, wage and unemployment differentials do not have such wide-ranging impacts and instead only affect particular employment groups in the population.

Large inter-regional differences in wages, employment and prices are persistent features of the British labour market. Our results based on a new modelling approach show that household migration is a consequence of complex interactions and

processes, and so creating appropriate incentives to help eradicate regional differences is difficult. However the behaviour of the unemployed and of council tenants stands out. Unemployed individuals are found to have a relatively high propensity to migrate, particularly into higher wage regions, but have difficulties moving out of high unemployment regions, possibly because they lack the assets and/or networks to do so. Council tenants are constrained by the unavailability of social housing in potential destinations. Therefore policies aimed at helping the mobility of these groups by reducing transaction costs, particularly housing-related ones, would be a way forward. The new modelling approach we develop in this paper is flexible and can also be applied to the study of migration incentives for other population groups such as manual workers or ethnic minorities. A more complete analysis using this approach may yield further insights into appropriate policy initiatives.

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