Household Membership and Labour Supply Decisions in the UK

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Structure

1 Motivation
2 Literature
3 Contribution
4 Data Sample Characteristics
5 Empirical Model
6 Results
1. Motivation

- Household Formation an important but generally overlooked function of society.
- It is the point when young adults cross into independence from the parents by leaving the parental home and could be linked with the decision to enter the labour market.
- Is this decision related or affected by the decision to work for the first time?
- Legal age allowed to leave home in the UK: 16
- Average age of leaving home much higher (22 years) and at the same age most young adults are in some form of paid employment.
Other Factors

- If parents are neutral does the decision to work affect the decision to leave home?
- In order to leave home the child must work to support himself/herself
- What is the effect of parental current labour supply if separated from parental income?
- Parental ability/willingness to provide financial transfers for child’s independence.
- Importance of public goods nature of household consumption making it cheaper for child to stay home.
- Human capital investment?
2. Literature

• A brief description of main findings in the field of Household Formation follows.
• A few important papers are presented one by one.
• McElroy (1985) Pivotal paper in this field.
• Utility comparison model of family behaviour to examine joint determination of labour supply and residence for young men in the US.
• **Main result:** Family provides insurance when child faces poor market opportunities. i.e. a minimal level of utility.
• This is a first indication that having or not having work affects the household membership decision.
• The child will stay home if unsuccessful in the labour market.
Rosenzweig and Wolpin (1993)
Dynamic overlapping generations model
Choices by parents of coresidence and financial transfers
Child decides human capital investment
3 Mutually exclusive states:

1. Living apart-receiving financial transfers.
2. Coresiding.
3. Living apart with no transfers.
• Ermisch and DiSalvo (1997), Ermisch (1999)

• Effect of child and parental income
• Ermisch finds a negative effect of house prices
• Parental and child income have opposing effects.
• Parental income has a negative effect on leaving home rates.
• Personal labour income positive and significant.
• Indication of gender differences.
• Martínez-Granado and Juiz-Castillo (2002)
• Extension of McElroy: Cross-Sectional Model for joint decisions of working, leaving the parental HH and studying by young people in Spain.
• Rich pattern of interdependencies between 3 decisions:

1. Parents help child through coresidence when child has no job or in FT education (opposite effect in UK for students).
2. Living independently has a positive effect on propensity to work.
3. Housing conditions (e.g. big city vs village) significantly affect living arrangements of child.
4. Unemployment has a negative effect on propensity to work and study, but positive effect on living at home.
• Working is endogenous to the decision to leave home.
• Need for separate estimation for men and women samples.
• Young people leave earlier/in greater numbers in the UK but also have much lower unemployment rates than Spain.
• Students can be problematic in the field of household formation.
• Fogli (2004) UK families “weak” family type, parents do not interfere much in comparison to “strong” Southern European families.

• This is linked to labour market rigidities that exist in Southern Europe in comparison to Western Europe.
• Blanc and Wolff (2006) confirm gender differences across Europe in the process of living home.

• Higher probability of a woman to live independently.

• Parental income does not affect the decision to leave home.

• Personal labour income matters more but perhaps endogenous?
3. Contribution

- Explicitly modelling the joint determination of leaving home and entering paid employment.
- Model used here allows studying the decisions one in the presence of the other.
- Separating the effect of parental labour income and parental current labour supply.
- Separation of sample in Men and Women for the first time using UK data.
- Estimating the model taking into account dynamics and unobserved heterogeneity.
4. Data

• Started with sample of 5500 households, approx. 10,000 individuals.
• Information on demographics, income/financial situation, and accommodation at household level, as well as information on employment, income, education, health and satisfaction at individual level.
Sample Characteristics

- Focus on persons aged 16-32 observed with their parents at least once.
- Original BHPS sample only.
- Unbalanced compact panel.
- Single-wave observations eliminated.
- Gaps eliminated using the following decision rule. If individual not a student keep longest spell otherwise keep waves after completion of studies.
- Students are ignored until they finish studies and come back home.
Gender Differences

- Sample: 49% Males and 51% Females.
- There are 3884(767) year observations men.
- There are 3897(648) year observations women.
- “Crossover age” for men 25
- “Crossover age” for women 22
- Next table shows means of main variables across all waves used.
- Graph shows the pattern of leaving the parental home for both sexes.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>767</td>
<td>648</td>
</tr>
<tr>
<td>Out of the parental home</td>
<td>0.37</td>
<td>0.50</td>
</tr>
<tr>
<td>Has Job</td>
<td>0.87</td>
<td>0.81</td>
</tr>
<tr>
<td>Age</td>
<td>23.61</td>
<td>23.50</td>
</tr>
<tr>
<td>Father’s Earnings per month</td>
<td>960.00</td>
<td>1112.00</td>
</tr>
<tr>
<td>Mother’s Earnings per month</td>
<td>640.00</td>
<td>647.00</td>
</tr>
<tr>
<td>Parental Non-Labour Income</td>
<td>290.00</td>
<td>300.00</td>
</tr>
<tr>
<td>Non Labour Income</td>
<td>40.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Lower than A levels</td>
<td>0.63</td>
<td>0.61</td>
</tr>
<tr>
<td>Race “white”</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Has child 0-2 years old</td>
<td>0.07</td>
<td>0.13</td>
</tr>
<tr>
<td>Has child 3-4 years old</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>Lives in Urban Area</td>
<td>0.78</td>
<td>0.79</td>
</tr>
<tr>
<td>House Prices ‘000</td>
<td>1.09</td>
<td>1.21</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Both Parents Work</td>
<td>0.40</td>
<td>0.46</td>
</tr>
<tr>
<td>Father Works Only</td>
<td>0.14</td>
<td>0.13</td>
</tr>
<tr>
<td>Mother Works Only</td>
<td>0.27</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Figure 1: Living outside the parental home
5. Empirical Model

• If deciding to leave the parental household and the decision to work are jointly determined then this must be taken into account.

• A Bivariate Dynamic Random Effects probit model is being employed to address the issue of simultaneity in the 2 decisions.

• Sample divided into men and women.
Dynamic Bivariate Probit

- It is actually similar to a dynamic random effects probit but here we have two equations with correlated error terms.
- The errors take the known random effects structure with a constant unobserved random effect $\alpha_i$ (e.g. ability, tastes).
  \[ \epsilon_{jit} = \alpha_{ji} + u_{jit}, \quad j = 1,2 \]
- The model assumes error terms are normally distributed.

\[
\begin{align*}
 y_{1it}^* &= x_{1it}' \beta_1 + y_{1,i,t-1} \gamma_{11} + y_{2,i,t-1} \gamma_{12} + y_{1i0} \kappa_{11} + y_{2i0} \kappa_{12} + \alpha_{1i} + u_{1it} \\
 y_{2it}^* &= x_{2it}' \beta_2 + y_{1,i,t-1} \gamma_{21} + y_{2,i,t-1} \gamma_{22} + y_{1i0} \kappa_{21} + y_{2i0} \kappa_{22} + \alpha_{2i} + u_{2it} \\
 y_{jit} &= \begin{cases} 
 1 & \text{ if } y_{jit}^* > 0 \\
 0 & \text{ otherwise} 
\end{cases} \quad j = 1,2; \quad i = 1,...N; \quad t = 1,...T.
\]
Dynamics

• The model explicitly accounts for the effect of being at a specific state in year $t-1$, namely state dependence, as well as the dependence of each decision on the previous outcome of the other decision, cross-state dependence.

• State dependence can be defined as a behavioural change due to experiencing an event in the past. This behavioural change will be due to the event itself and not due to some unobserved preference.
Initial Conditions

• Assume initial process not exogenous in dynamic discrete choice models.
• The Wooldrige (2005) specification is used to model the initial process.

\[ a_i = y_{i0} \kappa_{11} + y_{2i0} \kappa_{21} + z_{i0} \zeta + \alpha_i \]

• This means that we model the distribution of the unobserved effects conditional on the initial value and the rest exogenous covariates.
Correlations

• Error term: $\varepsilon_{jit} = \alpha_{ji} + u_{jit}, \ j = 1,2$

• We assume here that, conditional on the observed regressors, $\varepsilon_{jit}$ is bivariate normal with zero mean and covariance matrix.

\[
\begin{bmatrix}
\varepsilon_{1it} \\
\varepsilon_{2it}
\end{bmatrix} = \text{Normal}\left(0_2, \begin{bmatrix}
1 + \sigma_\alpha^2 & \sigma_{\alpha_1}\sigma_{\alpha_2}\rho_{a} + \rho_{\varepsilon} \\
\sigma_{\alpha_1}\sigma_{\alpha_2}\rho_{a} + \rho_{\varepsilon} & 1 + \sigma_{\varepsilon}^2
\end{bmatrix}\right), \quad t = 0,1,\ldots,T
\]

• with $\text{Cov}(\varepsilon_{jit}, \varepsilon_{jis}) = E(\varepsilon_{jit}\varepsilon_{jis}) = \sigma_{\alpha_j}^2/(1 + \sigma_{\alpha_j}^2), t \neq s, j = 1,2.$
• $\rho_\alpha$ captures the correlation between the time constant unobserved factors (random effect).

• This could be a taste for independence

• $\rho_\varepsilon$ captures the correlation between the time variant shocks.

• This could be losing your job because of labour market conditions.
Estimation

• The model is estimated with maximum simulated likelihood (MSL) based on Halton draws.
• In practice MSL works by drawing R values from the distribution of the unobserved heterogeneity per individual $i$.
• R bivariate normal random variables are generated and the individual likelihood is the average of the R draws, 200 in this work.
• Train (2003) shows that MSL is equivalent to the classical maximum likelihood as $\sqrt{N}/R \rightarrow 0$

\[
\tilde{\ell}_i(\theta) = \frac{1}{R} \sum_{a_i^{(r)}_1}^{R} \sum_{a_i^{(r)}_2}^{R} \left\{ \prod_{t=1}^{T} \Phi[ q_{1it}(\xi_{1it}\theta_1 + \alpha_{1i}'), q_{2it}(\xi_{2it}\theta_1 + \alpha_{2i}'); q_{1it}q_{2it}\rho_{\varepsilon}] \right\}
\]
• Cross-state dependence terms not significant for men.
• We confirm the finding of Blanc & Wolff (2007) that parental incomes do not seem to matter.
• A working mother increases the possibility her son will live independently.
• Both parents working has the opposite effect for men.
• Working parents increase the chances a young man is in paid employment.
• In men both correlations are positive but unobserved heterogeneity is not highly correlated in the two decisions.
• Women are not affected by parental characteristics in any of the two decisions.
• Living in an urban area increases the probability of living outside the home for both sexes; increases the chances of working for women only.
• Having left home the previous year decreases the chances of working this year for young women
• Correlation of unobserved factors stronger for women.
• An unobserved factor (e.g. ability) that positively affects the living alone decision affects the decision to work in the same way.
• The time-variant shocks have a negative correlation for women, perhaps an event such as pregnancy in a young age would increase the probability of living at home but reduce chances of working.
<table>
<thead>
<tr>
<th></th>
<th>Leaving Home</th>
<th>Work</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimates</td>
<td>Z-Score</td>
<td>Estimates</td>
</tr>
<tr>
<td><strong>Left Home$_{t-1}$</strong></td>
<td>2.252***</td>
<td>22.98</td>
<td>0.032</td>
</tr>
<tr>
<td><strong>Has a Job$_{t-1}$</strong></td>
<td>0.041</td>
<td>0.37</td>
<td>0.408***</td>
</tr>
<tr>
<td><strong>House Prices</strong></td>
<td>-0.316**</td>
<td>-2.22</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>0.366***</td>
<td>3.61</td>
<td>-0.003</td>
</tr>
<tr>
<td><strong>Age Squared</strong></td>
<td>-0.006***</td>
<td>-2.89</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Father's Income</strong></td>
<td>0.064</td>
<td>1.57</td>
<td>0.064</td>
</tr>
<tr>
<td><strong>Mother's Income</strong></td>
<td>0.078</td>
<td>1.58</td>
<td>-0.018</td>
</tr>
<tr>
<td><strong>Father Works</strong></td>
<td>-0.023</td>
<td>-0.17</td>
<td>0.505**</td>
</tr>
<tr>
<td><strong>Mother Works</strong></td>
<td>0.199*</td>
<td>1.67</td>
<td>0.529***</td>
</tr>
<tr>
<td><strong>Both Parents Work</strong></td>
<td>-0.242*</td>
<td>-1.84</td>
<td>0.489**</td>
</tr>
<tr>
<td><strong>Urban</strong></td>
<td>0.466***</td>
<td>4.82</td>
<td>-0.034</td>
</tr>
<tr>
<td><strong>Low Education</strong></td>
<td>-0.172**</td>
<td>-2.23</td>
<td>-0.496***</td>
</tr>
<tr>
<td><strong>Left Home at t=1</strong></td>
<td>0.328**</td>
<td>1.97</td>
<td>0.055</td>
</tr>
<tr>
<td><strong>Has a Job at t=1</strong></td>
<td>0.060</td>
<td>0.60</td>
<td>1.414***</td>
</tr>
</tbody>
</table>

Corr $\rho_d=0.18$  $\rho_e=0.25$  $\sigma_{dH}=0.40$  $\sigma_{aw}=1.21$

Number of obs = 3884 (767)  
*p<0.10, ** p<0.05, *** p<0.01

Time, Region, Unemployment, Non-Labour Incomes, Race, Children controls incl

Log-likelihood = -1886.32  Avg Periods = 6.06  Halton Draws = 200
<table>
<thead>
<tr>
<th>Women Leaving Home</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Home&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>Estimates</td>
</tr>
<tr>
<td></td>
<td>2.104***</td>
</tr>
<tr>
<td>Has a Job&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.015</td>
</tr>
<tr>
<td>House Prices</td>
<td>-0.307*</td>
</tr>
<tr>
<td>Age</td>
<td>0.342***</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-0.005**</td>
</tr>
<tr>
<td>Father’s Income</td>
<td>0.041</td>
</tr>
<tr>
<td>Mother’s Income</td>
<td>-0.059</td>
</tr>
<tr>
<td>Father Works</td>
<td>-0.127</td>
</tr>
<tr>
<td>Mother Works</td>
<td>-0.089</td>
</tr>
<tr>
<td>Both Parents Work</td>
<td>0.044</td>
</tr>
<tr>
<td>Urban</td>
<td>0.408***</td>
</tr>
<tr>
<td>Low Education</td>
<td>-0.168*</td>
</tr>
<tr>
<td>Left Home at t=1</td>
<td>0.639***</td>
</tr>
<tr>
<td>Has a Job at t=1</td>
<td>-0.006</td>
</tr>
</tbody>
</table>

Corr $\rho_a = 0.69***$, $\rho_e = -0.19**$, $\sigma_{ah} = 0.51***$, $\sigma_{aw} = 0.90***$

Number of obs = 3897 (648)  * p<0.10, ** p<0.05, *** p<0.01
Time, Region, Unemployment, Non-Labour Incomes, Race, Children controls incl
Log-likelihood = -1808.5  Avg Periods = 6.01  Halton Draws = 200
Age Interactions

- A model with age interactions was estimated as well.
- The reason for this was to investigate the effect of growing up on the two decisions.
- Surely it must be different taking these decisions at 18 than at 28 years old.
- Model is the same except cross-state dependence*age variable added in both equations.
- Results are presented next, only state-dependence & cross-state dependence terms are included;
- The rest of the results were the same as before.
<table>
<thead>
<tr>
<th>Men</th>
<th>Leaving Home</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimates</td>
<td>Z-Score</td>
</tr>
<tr>
<td>Left Home$_{t-1}$</td>
<td>2.218***</td>
<td>22.07</td>
</tr>
<tr>
<td>Has a Job$_{t-1}$</td>
<td>-1.821***</td>
<td>-3.38</td>
</tr>
<tr>
<td>Has a Job$_{t-1}$*Age</td>
<td>0.084***</td>
<td>3.52</td>
</tr>
<tr>
<td>Left Home$_{t-1}$*Age</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Left Home at t=1</td>
<td>0.377**</td>
<td>2.21</td>
</tr>
<tr>
<td>Has a Job at t=1</td>
<td>0.065</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Corr $\rho_\alpha = 0.16^{*}$, $\rho_\epsilon = 0.21^{**}$, $\sigma_{\alpha H} = 0.44^{***}$, $\sigma_{\alpha w} = 1.21^{***}$

Number of obs = 3884 (767), * p<0.10, ** p<0.05, *** p<0.01

Time, Region, Unemployment, Non-Labour Incomes, Race, Children and all the other controls included

Log-likelihood = -1873.98, Avg Periods = 6.01, Halton Draws = 200

- Effect of 0->1 = $\gamma_1$ home$_{t-1}$+$\gamma_2$ home$_{t-1}$*age => age = $\gamma_1$/-$\gamma_2$
- Effect of having a job becomes positive after 22 years old
- Effect of leaving home becomes positive after 24
<table>
<thead>
<tr>
<th>Women</th>
<th>Leaving Home</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimates</td>
<td>Z-Score</td>
</tr>
<tr>
<td>Left Home&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>2.104***</td>
<td>18.97</td>
</tr>
<tr>
<td>Has a Job&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.050</td>
<td>-0.09</td>
</tr>
<tr>
<td>Has a Job&lt;sub&gt;t-1&lt;/sub&gt;*Age</td>
<td>0.002</td>
<td>0.07</td>
</tr>
<tr>
<td>Left Home&lt;sub&gt;t-1&lt;/sub&gt;*Age</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Left Home at t=1</td>
<td>0.641**</td>
<td>3.36</td>
</tr>
<tr>
<td>Has a Job at t=1</td>
<td>-0.008</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

Corr $\rho_a = 0.68***$ $\rho_\epsilon = -0.18**$ $\sigma_{aH} = 0.51***$ $\sigma_{aw} = 0.89***$

Number of obs = 3897 (648) * p<0.10, ** p<0.05, *** p<0.01
Time, Region, Unemployment, Non-Labour Incomes, Race, Children and all the other controls included
Log-likelihood = -1808.37 Avg Periods = 6.01 Halton Draws = 200

- Effect of 0->1 = $\gamma_1home_{t-1} + \gamma_2home_{t-1}*age$ => age = $\gamma_1/-\gamma_2$
- Interaction terms not different than 0
Main Points

• Parental characteristics affect men more.
• Parental Incomes don’t matter.
• Unobservables more important for women than men.
• Indication young men are affected by mother’s labour status more than dad’s.
• Ageing changes the process for men more than women, perhaps due to differences in the two genders in this respect.
• E.g. Women mature sooner than men and this is captured by the age interactions.