[Very Preliminary Draft]

Labour market transitions among the over-50s

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Abstract
This paper examines transitions between economic activity and inactivity in the UK among men and women aged between 50 and state pension age. Using longitudinal survey data on 26,000 individuals, we model transitions using two approaches. Modelling transitions allows examination of the issue of state dependence or 'scarring' – the extent to which past experience of an adverse labour market state influences subsequent labour market status. Importantly, we address the initial conditions problem. Duration models allow examination of duration dependence – the extent to which the length of time in a particular labour market state influences the probability of leaving that state. The results provide evidence of both state dependence and duration dependence. This implies there is the potential for any individual to become trapped in inactivity and, ideally, policy should intervene as soon as an individual experiences a period of non-participation.

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1. Introduction

The population of the UK is ageing. The 2001 Census shows that the number of people over the age of 60 outnumbered those who were under 16 for the first time. By 2020, it is expected that a third of the population will be over the age of 50 (Dean, 2003). In recognition of these trends, there is policy interest in encouraging older individuals towards paid employment. This was officially acknowledged most recently in the UK government's consultation document (DWP, 2006) which identified older workers as one of three key groups (alongside sick or disabled individuals and lone parents) targeted by policy.

The employment rate of individuals aged 50 to State Pension Age has been on an upward trend for the past 10 years and in Autumn 2004 stood at a level of 71 per cent (DWP, 2005). This is below that for those aged 25-49 (82 per cent) but higher than that for those aged 16-24 (62 per cent). The majority of those not working are economically inactive rather than unemployed. Despite the fact that there has been a decline over the past 10 years, the level of inactivity among this age group stood at 27 per cent in Autumn 2004, compared with 16 per cent for those aged 25-49 years. Slightly less than half of this inactivity is for reasons of sickness, disability or injury.

In this paper, we explore the nature of transitions between economic activity (i.e. employed, self employed or unemployed but seeking work) and economic inactivity. We focus on this dichotomy rather than the more standard employment versus non-employment distinction partly in recognition of the fact that unemployment is quite rare among this age group (only 5 and 3 per cent for men and women respectively during the period covered by the data) but mostly because it is the movement from inactivity to activity that is most difficult for these individuals.

When considering transitions, there are two concepts of particular policy relevance: state dependence and duration dependence. The importance of these issues to understanding the underlying processes governing the observed persistence in labour market states is clear. Under state dependence, or 'scarring', previous labour market status has a causal effect on later labour market status. For example, it may be that the experience of inactivity may by itself reduce the probability of later working (or searching for work). It is equally possible that state dependence can operate in a virtuous manner; having been active in the past may increase the chances of being active later. Under duration dependence, it is the length of time in a particular state that influences the probability of changing state. For example, it may be the case that a short period of inactivity has no adverse consequences on subsequent activity but a prolonged period has a negative impact. Again, it is straightforward to think of a more positive counter-example whereby duration dependence acts to increase attachment to the labour market. Arulampalam et al. (2000) provide a brief discussion of the possible causes of state dependence. It may be that the experience of a state alters preferences or constraints in such a way that later activity is affected. Another possibility is that employers use periods of inactivity as a signal of low productivity. Alternatively, human capital deterioration during inactivity may reduce the probability of finding work.

The existence of state dependence or duration dependence fundamentally alters interpretation of the determinants of economic activity or inactivity. Most obviously, it requires that labour market status be viewed, at least partly, as the outcome of a dynamic rather than static process. Appropriate policy interventions to encourage labour market participation have to be developed accordingly. In the presence of state dependence, interventions should aim to prevent the occurrence of an adverse state. In the presence of duration dependence, it would be important to focus help as soon as possible on those entering an adverse state.

The econometric challenge in examining these dynamic issues is to control for the effect of unobserved heterogeneity. If an individual has a fixed (or long-term) characteristic that influences labour market participation, not controlling for this characteristic will result in biased estimates of state or duration dependence. A more challenging (and related) problem is the so-called 'initial conditions' problem which arises when the full duration of the process governing outcomes is not observed. In this case, it is not possible to observe whether the labour market status of the individual when first observe (the initial condition) is the result of state dependence or unobserved heterogeneity. The models presented in this paper control for unobserved heterogeneity. The models of transitions also explicitly address the initial condition issue. However, in common with almost all empirical papers, the duration models do not address the initial conditions problem.

The remainder of this paper is organised as follows. In the next section, the data are described. Section 3 describes the two modelling approaches, the results of which are presented in section 4. Section 5 offers some conclusions.

2. The data

The analysis in this paper is based on the UK Labour Force Survey (LFS). The LFS is a quarterly survey of 60,000 households in the UK with a focus on those characteristics related to the labour market. It is carried out as a rotating panel with one-fifth of the respondents being replaced each quarter. Hence, each (fully-participating) household is interviewed five times over a period spanning 12 months. All adult household members at a given address are interviewed. The Longitudinal LFS (LLFS) links the quarterly surveys in the LFS so that it becomes possible to observe changes over time for households, families and individuals. The data used in this analysis include households who respond to interviews in all five quarters – a balanced panel. It should be noted that the sample is provided with weights that address the issue of nonresponse and attrition in the data; these weights are applied in all the analyses in this paper.

To maximise the estimation sample size, the dataset has been built by combining as many LLFSs as possible such that there is no overlap in the periods of time covered by any of the LLFSs.[1] The final dataset used LLFSs from Summer 1993 – Summer 1994 up until Summer 2003-Summer 2004. In view of the fact that the analysis is restricted to individuals aged 50 or over but below state pensionable age, only men who were aged 50-64 when first observed and women who were aged 50-59 when first observed were selected. The number of observations available for analysis in the resulting dataset was 26,031.

Table 1 describes the economic status of individuals when first interviewed. To concentrate on the main groups, only those accounting for at least a half of one per cent of cases are included in the table. It can be seen that about half the men and slightly more of the women were employed when first interviewed. Self-employment is much more common among men than women with the result that overall about two-thirds of men and slightly fewer women can be viewed as working. Unemployment is low in this

[1] Overlaps were avoided in order to prevent double-counting of individuals and complicating the survey weights.

population. More significant is inactivity; this accounts for about 29 per cent of men and 35 per cent of women.[2]

Table 1 draws a distinction between those inactive people who would like to work and those who would not like to work. Within each of these groupings, there is a variety of reasons for inactivity making it difficult to capture the diversity of these groups with a single label. Hence, for convenience, inactive people who would like to work are referred to as Type 1 inactive (or, simply, Inactive 1) in the remainder of this report while those who would not like to work are referred to as Type 2 inactive (or Inactive 2).

Inactive people who would like to work are less common than those who would not like to work. For the former, the reason for inactivity is health-related in about half of all cases although there are other reasons such as domestic responsibility and the belief that no jobs are available. There appear to be few sizeable differences between men and women. For inactive individuals who do not want to work, such differences are more noticeable. Again, health problems are a commonly cited reason for not wanting to work. However, women often state that they do not want to work since they are looking after the family or the home. Very few men give this reason. Another important group is made up those who are retired. This accounts for 8 per cent of men and 4 per cent of women (or 37 and 15 per cent respectively of type 2 inactive men and women). Clearly, these are people who have retired before the state pension age.

Table 1: Economic status when first observed by gender (col %)

	Male	Female
Employee	51	56
Self-employed	16	6
Unpaid family worker	0	1
ILO unemployed	5	3
Inactive but would like work		
- looking after family/ home	0	1
- long term sick or disabled	4	3
- believes no job available	1	1
- not looked	1	1
Inactive and would not like work		
- looking after family, home	1	10
- long-term sick or disabled	11	9
- not need or want job	1	3
- retired	8	4
- other reason	0	1
Base	14,857	11,174

Of those not working but who have worked in the 8 years prior to interview, the experience of employment is often distant. Table 2 shows that for nearly half the men and 60 per cent of the women their last experience of employment was more than 5 years before the time of interview.

[2] Note that the figures in the text do not exactly match those in the Table 1. The reason for this is that the table only presents those categories accounting for at least a half of one per cent of all cases. The sum of these excluded categories fully accounts for the differences between the figures quoted and those apparent from the table.

Table 2: Length of time out of work for those not working but who have previously worked (col %)

	Male	Female
less than 3 months	4	3
3 months but less than 6 months	4	3
6 months but less than 12 months	6	6
1 year but less than 2 years	13	9
2 years but less than 3 years	10	7
3 years but less than 4 years	9	7
4 years but less than 5 years	7	6
5 years or more	47	60
Base	4,665	3,908

In view of this, it is not surprising that transitions between activity and inactivity are relatively infrequent. Table 3 compare the labour market state at the start of the observation year with that at the end of the observation year. Eight per cent of active men and ten per cent of active women were inactive one year later. Moves in the other direction were less common. For both men and women, only six per cent would move from inactivity to activity over the period of a year.

Table 3: Transitions between activity and inactivity (row %)

	When last interviewed (one year later):		
when first interviewed:	Active	Inactive	Base
Men			
- Active	92	8	10,733
- Inactive	6	94	4,124
Women			
- Active	90	10	7,380
- Inactive	6	94	3,794

3. The econometric models

3.1 A model of quarterly transition probabilities

This section discusses the model used for analysing individual transitions in and out of economic activity using quarterly data from the LFS. Many models for labour market dynamics used by previous research have focussed on first order dynamics, i.e. have assumed that the process of interest can be adequately described by looking only at the dependency between labour market states at two adjacent points in time, what is known as first order dynamics.[3]

In this paper we depart from these models and explicitly consider fourth order dynamics. There are three reasons for doing so. First of all, higher order models nest lower order ones, so that estimating fourth order dynamics will enable us to test the first order assumption made by previous studies. Second, given that we use quarterly data, estimating fourth order dynamics we are able to relate individual labour market states in a given quarter to states observed to up until the same quarter of the previous year, so that we are able to fully model within year dynamics. Finally, the fourth order approach enables us to derive measures of cumulated state dependence, somehow bridging the

[3] One exception is Stewart (2006) who considers second order dynamics.

gap between dynamic random effect probits (that look at state dependence) and survival analysis (that study duration dependence).

Models of labour market dynamics face an initial conditions issue, which emerges when the process of interest is serially correlated and its starting values are not available in the data. In such circumstances, the unobserved initial condition will be embedded in current and lagged levels of the process investigated. Given that modelling transitions requires conditioning current labour market states upon the past, the unobserved initial condition generates the endogeneity issue discussed in Heckman (1981). Heckman proposed solving the issue by estimating the model of interest jointly with the distribution of the initial sample observation, and to model the latter as a function of pre-sample information and of the individual specific error component. Recently, Wooldridge (2005) has proposed an alternative solution, in the context of first order models, in which it is the individual specific error component to be modelled conditional on the first observation. While computationally attractive, the Wooldridge approach assumes that dynamics are first order, and it is not suited for our case. Therefore, we control for initial conditions by applying the Heckman approach to the case of fourth order dynamics.

Let a^*_{it} be the labour market attachment for individual i in quarter t, which –according to standard labour supply models-- depends upon the difference between the potential market wage and the reservation wage, plus a series of control factors. While a^*_{it} is unobservable, in the data we have information on a_{it}=I(a^*_{it}>0), a dichotomous indicator of whether participation takes places. As customary in this set-up, we assume that the event occurs when the latent propensity is large enough, and we fix the thresholds for participation at 0 without losing generality. Since we are interested in within-year labour market transitions, we specify a model for labour market attachment conditional on exogenous regressors x_{it} (that proxy for the potential and reservation wage, plus all the other relevant shifters) and on indicators of labour market states occupied in the four preceding quarters:

$$a^*_{it} = \beta' x_{it} + \lambda_1 a_{it-1} + \lambda_2\, a_{it-2} + \lambda_3\, a_{it-3} + \lambda_4\, a_{it-4} + \varepsilon_{it}$$

The error term ε_{it} represents the convolution of all unobservable heterogeneity (either individual specific or purely volatile) that may influence labour market participation, and is assumed to be independent from x_{it} . The problem of initial conditions emerges if ε_{it} is not independent of the indicators of past labour market states. Since such indicators may themselves be a function of individual specific attributes, independence of ε_{it} will in general be violated, inducing an endogeneity issue. The solution proposed by Heckman (in the case of first order models) consists of estimating the transition equation and the process determining lagged states jointly. Here we extend it to fourth order dynamics. We assume that past states are determined according to the following rule:

$$a_{it-s} = \mathrm{I}(\gamma_s' z_{it-s} + u_{it-s} > 0) \quad s=1,2,3,\ 4$$

and control for the initial conditions issue by letting the unobserved component of these equations freely correlate with unobserved heterogeneity in the transition equation with correlation coefficient ρ_s. In addition, we also allow for free cross-process correlations in the equations for lagged states, with correlations coefficients σ_{hk}, $k<h$=2,3,4.

By making distributional assumptions about the unobserved components of the model, the sample likelihood can be derived and the parameter of interest estimated. Specifically, we assume that the vector of errors ($\varepsilon_{it}\ u_{it-1}\ u_{it-2}\ u_{it-3}\ u_{it-4}$) follows a five-variate normal distribution with zero mean and covariance matrix Ω . The matrix Ω has extra-diagonal elements given by the correlation coefficients defined above, and, given the dichotomous nature of the observed dependent variable, diagonal elements equal to unity.

As discussed in, e.g., Arulampalam et al. (2000), lagged labour market states should be modelled as functions of pre-sample information and information on variables predating labour market entry, such as parental backgrounds. Unfortunately, the LFS does not contain information of the latter type. Therefore we use x_{it-4} to form each of the z_{it-s} vectors. This implies that we are assuming strict exogeneity of the regressors in the transition equation. We also exploit knowledge of the year in which the current spell started, and complete the z_{it-s} vectors with the national GDP growth rate measured at the start of the current spell, with the idea that initial labour market participation may depend upon the macroeconomic conditions prevailing at the time.

Estimation of transition probabilities enables assessment of the issue of state dependence, i.e. of the variation in the probability of participation induced across individuals with different participation histories over the year, holding individual heterogeneity constant. To the extent that unobserved heterogeneity has been appropriately controlled for, state dependence provides estimates of the causal impact of past history on current outcomes. The measures of state dependence typically derived from dynamic limited dependent variable models is the 'marginal effect' associated with the lagged dependent variable of interest. Given the fourth order set up of this model, we present four such measures, each given by the marginal effect associated with each indicator of lagged states. In general, these measures will take the following form:

$$SD_j = \Phi(b'x+g_j)-\Phi(b'x),\ j = 1,2,3,4$$

where x contains continuous explanatory variables evaluated at their sample mean, and dummy variables set at zero, b and g are the estimates of β and γ, while Φ represents the standard normal cumulative density function (c.d.f.).

Observing dependency with different points in the past also enables us to quantify the accumulation of state dependence as the time spent in a spell of activity increases from zero to four quarters, providing a first insight onto the extent of duration dependence that characterises the data (a canonical analysis of duration dependence is presented in the next sub-section). If the true model was first order, additional quarters spent participating should not increase current participation probabilities. We define cumulated state dependence as

$$CSD_2 = \Phi(b'x +g_1 + g_2)-\Phi(b'x)$$
$$CSD_3 = \Phi(b'x +g_1 + g_2+ g_3)-\Phi(b'x)$$
$$CSD_4 = \Phi(b'x +g_1 + g_2+ g_3+ g_4)-\Phi(b'x)$$

i.e. as the marginal effects on current participation associated with having been participating for two or three consecutive quarters, relative to non participation in the past (note: $CSD_1=SD_1$).

3.2 A model of time to exit activity or inactivity

As well as modelling transition probabilities, we model the time it takes older workers to exit activity or inactivity on the basis of proportional hazards specification. The duration variable of interest to this paper is measured to the nearest quarter, making discrete-time duration analysis the preferred approach to model the labour market transition behaviour of older workers. Thus, the hazard, for an individual *i* with a vector of covariates $\mathbf{x}_i$, of exiting the state of interest in the *j*th quarter having spent *t* quarters in the state and given that transition has not occurred before t_j can be given by

$$h_{ij}(t_j \mid \mathbf{x}_i) = h_0(t_j)\exp(\mathbf{x}_i'\boldsymbol{\beta})$$

where $\lambda_o(t)$ is the baseline hazard (Cox, 1972; Prentice and Gloecker, 1978).

It is well established in the literature that not accounting for unobserved heterogeneity in modelling labour market transitions leads to biased estimates of the baseline hazard as well as the covariate effects on the hazard of exit from the sate of interest (Heckman and Singer, 1984; Lancaster, 1990). The standard practice is to account for unobserved heterogeneity by introducing a positive-valued random variable (mixture), *v*, into the hazard specification to get

$$h_{ij}(t_j, \mathbf{x}_i \mid v_i) = h_0(t_j)\exp(\mathbf{x}_i'\boldsymbol{\beta})\, v_i$$

The complementary log-log version of this is then given as

$$h_{ij}(t_j, \mathbf{x}_i \mid v_i) = 1 - \exp(-\exp(\mathbf{x}_i'\boldsymbol{\beta} + \gamma_j(t) + u_i))$$

where, $u_i = \log v_i$ and $\gamma_{\mathrm{j}}(t) = \int_{t_{j-1}}^{t_j} h_0(u)du.$

The mixing distribution can be solved either parametrically or non-parametrically. The parametric approach involves specifying a particular functional form for the mixing distribution while the non-parametric approach uses the mass point approach, following Heckman and Singer (1984), to approximate the mixing distribution with a finite discrete distribution of unrestricted form. The Gamma distribution is the most commonly used distribution in the literature for it is analytically tractable and gives closed form solution for the relevant likelihood function (Lancaster 1990; Meyer 1990; Stewart 1996). The log-likelihood function for gamma mixing function relating to a sample of *N* individuals, assuming a Gamma distribution for unobserved heterogeneity with mean one and variance σ^2, can be given by

$$\ln \mathrm{L}(\beta,\gamma,\sigma) = \sum_{\mathrm{i}=1}^{\mathrm{N}} \log\left\{ \left[1+\sigma^2 \sum_{\mathrm{t}=1}^{\mathrm{k_i}-1} \exp\{\mathrm{x_i}'\beta + \gamma(\mathrm{t})\}\right]^{-\sigma^2} - \sigma_{\mathrm{i}}\left[1+\sigma^2 \sum_{\mathrm{t}=1}^{\mathrm{k_i}} \exp\{\mathrm{x_i}'\beta + \gamma(\mathrm{t})\}\right]^{-\sigma^{-2}} \right\}$$

(Meyer, 1990; 1995a; Stewart, 1996; Jenkins, 1995)

That the Gamma mixing assumes Gamma distribution for the unobserved heterogeneity term may not be justified strongly in the absence of theoretical justification for the same. Taking this into account, we also estimate a non-parametric mixing distribution (Heckman and Singer, 1984b; Meyer, 1990; 1995a; Han and Hausman, 1990) where the unknown distribution of the unobserved heterogeneity term is approximated as discrete mass points and associated probabilities that are estimated jointly with other parameters of the model. Han and Hausman (1990) and Seuyoshi (1992) show that estimating the baseline hazard as flexibly as possible gives rise to comparable estimates for the baseline hazard and covariate effects, making issues pertaining to distributional assumptions for unobserved heterogeneity less relevant. In this study we model the baseline hazard flexibly as well as employing alternative mixing distribution.

4. Results

4.1 Results of modelling quarterly transition probabilities

The model laid out in the last section has been estimated on the longitudinal component of the LFS for the years 1993-2004. Separate models for women and men have been estimated. The set of control variables included in the transition equation is composed of age group indicators, indicators for educational qualifications and apprenticeships, indicators for the industry and type of occupation in which the individual works/may work, indicators for the presence of dependent children and partner and for the economic status of the latter, regional indicators, year and quarter dummies.

Table 4 reports the estimated covariance structure of unobservables for men and women. Estimated coefficients in the first four lines refer to correlations between unobservables in the transition and initial condition equations. For both men and women, these coefficients are statistically significant at usual confidence levels, implying that initial conditions exogeneity can be rejected. The formal test of exogeneity reported at the bottom of the table indicates that the hypothesis can be rejected at the 10% level of significance for men, whereas for women the hypothesis is overwhelmingly rejected. The positive sign of the coefficients means that the unobserved factors that are associated to economic activity at a point in time also play a role in keeping individuals active over time. One example of such factors could be unobserved labour market attachment.
For women, unobserved heterogeneity appears to be more relevant than it is for men, since some of the relevant correlations are larger, and rejection of the null of exogeneity is neater.

The other estimated coefficients in the table refer to ‘reduced form’ correlations across initial condition equations. These are larger than estimates in the top part of the table, since those equations are unconditional on lagged indicators of labour market states. Overall, the estimated correlation structure indicates that there is some heterogeneity that is not captured by the regressors included in the model, justifying the adoption of the multi-equation set-up of the model.

Table 5 reports the estimates of the measures of state dependence defined in the previous section. For men, it appears that dynamics are of an order larger than the first; in particular, the effect associated with the second order lag is significant, while the ones for the third and fourth order are not, at usual levels of confidence. Therefore, this evidence suggests that the dynamic process of labour market participation is best described by a second order Markov chain. The contribution of the second lag is substantial: comparing someone that was active only two quarters ago with someone who was never active in the past year, the probability of being active today rises by 39%. For women, instead, dynamics appear to be closer to a first order model compared with men, even though the marginal effect for the t-2 activity indicator is still significant at conventional levels. In the case of women, a larger part of the dependence upon the past emerges after the first quarter spent in activity (+ 74% versus +68% in the case of men) and the contribution of the quarter prior to the last is roughly half compared with men(19% versus 39%). These estimates impact on the accumulation of state dependence over the year observed. The behaviour of cumulated state dependence is similar across gender, while the levels are not. In both cases, state dependence stabilises after the second quarter spent in activity. In both cases, the estimates are consistent with the presence of positive duration dependence effects over the first two quarters spent in an activity spell, i.e. the probability of being active increases as spell duration lengthens.

Considering the evidence about unobserved heterogeneity and state dependence in conjunction, it appears that both are more relevant for women than for men. In the case of unobserved heterogeneity, this means that unobserved attributes that influence labour market participation (say innate motivation towards employment) are more dispersed in the population of women compared with men. Also, state dependence effects are more persistent for women then for men. For example, if state dependence is due to motivational effects that impact on labour market attachment, our estimate indicates that for women the memory of good or bad shocks, that influence motivations, is larger. In turn, this implies that policies that prevent episodes of inactivity, irrespective to some extent of individual attributes, may have a longer lasting impact on male labour market trajectories relative to male ones. On the other hand, the prevalence of heterogeneity (relative to men) as explanatory factor for overall persistence, suggests that in their case policies should aim at endowing individuals with the attributes relevant in affecting participation.

Table 6 reports estimated coefficients for all the equation of the model. For both men and women there are few factors that significantly influence participation transitions. For example, having high level qualifications is associated with a probability of retention into the labour market that is lower compared to that of someone who has no qualifications, e.g. because highly educated individuals have had non-intermittent job histories in the past, and are therefore more likely to exit to inactivity at older age relative to less qualified individuals. Many of the regional controls included into the regression attract a precisely estimated coefficient. Also industry and occupations appear to be relevant in shifting transitions into and out from economic activity. On the other hand, indicators for marital status and the presence of dependent children are not associated with statistically significant estimates of the associated coefficients. The coefficients associated with the indicator of GDP growth at the start of the spell (included in the initial condition equations) present a positive sign for men and women.
The bottom part of the table reports results of specification tests. The first group of tests assesses the adopted specification of labour market dynamics. In both the male and female case, it appears that the correct order for the Markov model is the second one. The second group of tests looks at the appropriateness of GDP growth at the start of the spell as ‘instrument’ for initial conditions, using functional form as the identifying restriction. In each case, the specification adopted is supported by the data at conventional levels of confidence.

4.2 Results of modelling duration of spells[4]

Results from the duration analysis are given in Tables 7-10 below. As can be seen from Tables 9 and 10, our finding shows that the null hypothesis of zero gamma variance term is rejected decisively with a near zero probability supporting our modelling approach which accounts for unobserved heterogeneity. We also observe some evidence of duration dependence as can be seen from coefficient estimates for the baseline hazard reported in Tables 7 and 8. For both men and women, the baseline hazard coefficient estimates of transition from activity to inactivity are significantly different from zero and, crucially, decline more or less continuously after the 3rd quarter suggesting some evidence of negative duration dependence. The baseline hazard coefficient estimates relating to transition from inactivity to activity are significantly different from zero only for later quarters, particularly for women. Nevertheless, there is still some evidence of negative duration dependence in those later quarters. In both types of transitions, our findings indicate that the longer older men and women stay in a particular labour market state, the more likely that they remain in those states. From the view point of labour market policy-making, therefore, encouraging active workers to remain active during their initial period of activity while encouraging inactive workers to leave the state of inactivity earlier on seems the sort of intervention required.

Tables 9 and 10 report estimated coefficients of the hazard models for both types of transitions. We find some significant and intuitive effects of covariates on the hazards of transition we have estimated. For example, compared with younger (50-53 years of age) workers, being older significantly increases the speed of exit via inactivity but has significant and the opposite effect on the hazard of exit via activity. Both having a mortgage and rented accommodation are found to significantly reduce the speed of exit via inactivity and significantly increase the speed of exit via activity. We find a similar and significant effect of having a mortgage on the speed of exit via inactivity for women. These findings are more or less consistent with the expectation that not owning once house necessitates being active for longer.

Having a partner and the economic status of the same are the other attributes of interest in characterising the exit behaviour of older workers. Accordingly, having a working partner is found to significantly increase the speed of exit via inactivity and reduce that of exit via activity for men. For women, having a partner significantly reduces the speed of exit via inactivity but the same is found to significantly increase if the partner is in employment. Occupationally, being in clerical and secretarial occupation significantly increases the speed of exit via inactivity for men while it is being in crafts and protective occupations that are found to have similar effect for women on the other hand. In terms of industry of employment, being in agriculture is found to significantly reduce the speed of exit via inactivity for both men and women. In addition, being in the public administration, education and health and social work industries are found to have similar effects for women. In contrast, occupation and industry are found to have no significant effect on the hazard of exit via activity. Region of residence wise; being in Tyne and Wear, South Yorkshire and Strathclyde is found to significantly increase the speed of exit via inactivity for men while being in the South West and West Midlands is found to significantly reduce the speed of exit via inactivity for women. In contrast, being in East Anglia, Rest of West Midlands, Wales and Northern Ireland reduces the speed of exit via

[4] The results discussed in this section are those relating to the Gamma mixing distribution only. The ones from the non-parametric (Heckman-Singer) mixing are yet to be reported in the full paper). Jenkins (1995)'s PGMHAZ program has been used to estimate the gamma mixing model.

activity for men while it is being in the Rest of Northern region and outer London that has a similar effect on the hazard of exit via activity for women.

5. Conclusion

In this paper we have modelled labour market transitions allowing for higher-order state dependence. In doing so, marked differences between men and women were apparent. For men, third-order terms were significant whereas for women state dependence appeared to operate purely through the labour market status in the previous quarter. A fuller insight into the issue of duration dependence is provided by the results of the duration analysis. For both men and women, negative duration dependence was evident for both types of transitions but even more so for transitions from activity to inactivity.

The existence of both state dependence and duration dependence means there is the potential for any individual experiencing inactivity to become trapped in inactivity. This may be for a number of reasons such as skill deterioration, reduced morale or the establishment of a pattern of daily life that does not accommodate paid work. The appropriate policy response should help individuals avoid periods of inactivity while offering early help to those who experience a period of inactivity.

A more optimistic implication of the findings is that the combination of state dependence and duration dependence can also work to beneficial effect. In particular, if it is possible to intervene such that an individual moves into employment, the chances of being in employment at a later point in time are greatly increased the longer the period of employment. The longer the period of employment, the less likely it is for older workers to return to inactivity. Hence, there is a positive role for policy both in encouraging movements into work and supporting individuals who have entered work.

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Tables

Table 4: Correlation structure of unobservables

	Men		Women	
	coeff.	s.e.	coeff.	s.e.
ρ_1	0.142	(0.076)	0,196	(0,087)
ρ_2	0.145	(0.084)	0,197	(0,074)
ρ_3	0.169	(0.084)	0,221	(0,067)
ρ_4	0.185	(0.086)	0,245	(0,061)
σ_{32}	0.988	(0.001)	0,989	(0,001)
σ_{42}	0.974	(0.002)	0,972	(0,003)
σ_{52}	0.960	(0.003)	0,956	(0,004)
σ_{43}	0.986	(0.001)	0,984	(0,002)
σ_{53}	0.970	(0.002)	0,965	(0,003)
σ_{54}	0.982	(0.002)	0,982	(0,002)
	$\chi^2_{(4)}$	p-value	$\chi^2_{(4)}$	p-value
Exogenous initial conditions	7.80	0.0992	22.43	0.0002

Table 5: Measures of state dependence

	Men		Women	
	coeff.	s.e.	coeff.	s.e.
SD_1	0.680	(0.145)	0,742	(0,075)
SD_2	0.389	(0.087)	0,194	(0,103)
SD_3	0.086	(0.073)	0,074	(0,060)
SD_4	0.040	(0.061)	0,069	(0,072)
CSD_2	0.727	(0.202)	0,824	(0,073)
CSD_3	0.729	(0.205)	0,840	(0,083)
CSD_4	0.729	(0.206)	0,848	(0,089)

Table 6: Estimates from third order transitions model, Men

	Transition		Initial condition t-1		Initial condition t-2		Initial condition t-3		Initial condition t-4	
	coeff	s.e.	coeff	s.e.	coeff	s.e.	coeff	s.e.	coeff	s.e.
Active t-1	2.257	(0.211)								
Active t-2	1.022	(0.234)								
Active t-3	0.244	(0.186)								
Active t-4	0.117	(0.172)								
Age 54-56	-0.215	(0.077)	-0.240	(0.042)	-0.190	(0.042)	-0.189	(0.041)	-0.241	(0.043)
Age 57-60	-0.265	(0.077)	-0.539	(0.039)	-0.475	(0.039)	-0.471	(0.040)	-0.499	(0.040)
Age 61-63	-0.490	(0.090)	-0.909	(0.043)	-0.864	(0.043)	-0.840	(0.043)	-0.874	(0.044)
Age 64-65	-0.980	(0.105)	-1.532	(0.062)	-1.413	(0.060)	-1.334	(0.061)	-1.220	(0.059)
Has apprenticeship	0.219	(0.094)	0.065	(0.053)	0.067	(0.050)	0.066	(0.050)	0.091	(0.049)
Has partner	-0.067	(0.077)	-0.074	(0.046)	-0.035	(0.047)	-0.048	(0.047)	-0.044	(0.048)
Partner active	0.231	(0.060)	0.374	(0.036)	0.380	(0.036)	0.391	(0.036)	0.383	(0.036)
Dependent children	0.086	(0.088)	0.188	(0.046)	0.184	(0.045)	0.167	(0.045)	0.196	(0.046)
Mortgage	0.165	(0.059)	0.417	(0.031)	0.441	(0.031)	0.426	(0.030)	0.431	(0.031)
Rent/rent free accom.	-0.091	(0.068)	0.000	(0.040)	0.038	(0.040)	0.010	(0.040)	-0.012	(0.040)
Qualification : Other	0.040	(0.092)	0.098	(0.047)	0.114	(0.048)	0.109	(0.048)	0.100	(0.048)
Qualification : Nvq1	0.352	(0.185)	0.157	(0.156)	0.147	(0.164)	-0.059	(0.174)	0.259	(0.178)
Qualification : Nvq2	0.082	(0.097)	0.129	(0.057)	0.085	(0.056)	0.101	(0.057)	0.078	(0.058)
Qualification : Nvq3	-0.135	(0.108)	0.092	(0.058)	0.103	(0.056)	0.089	(0.056)	0.074	(0.055)
Qualification : Nvq4	-0.066	(0.135)	0.079	(0.069)	0.076	(0.067)	0.105	(0.067)	0.053	(0.068)
Qualification: Nvq5/6	-0.226	(0.109)	0.183	(0.061)	0.165	(0.060)	0.148	(0.061)	0.135	(0.060)
Qualification: Missing	-0.770	(0.552)	0.063	(0.191)	0.280	(0.201)	0.161	(0.195)	0.277	(0.214)
Tyne & Wear	-0.479	(0.210)	-0.429	(0.134)	-0.502	(0.138)	-0.468	(0.138)	-0.429	(0.144)
Rest of northern region	-0.607	(0.178)	-0.254	(0.114)	-0.282	(0.116)	-0.286	(0.117)	-0.234	(0.121)
South Yorkshire	-0.435	(0.208)	-0.316	(0.125)	-0.424	(0.123)	-0.404	(0.129)	-0.307	(0.138)
West Yorkshire	-0.279	(0.183)	-0.067	(0.115)	-0.074	(0.114)	-0.092	(0.118)	-0.057	(0.123)
Rest of Yorks &	-0.217	(0.210)	-0.049	(0.117)	-0.138	(0.115)	-0.149	(0.119)	-0.129	(0.126)
East Midlands	-0.260	(0.166)	0.017	(0.104)	-0.019	(0.104)	-0.021	(0.109)	0.017	(0.114)
East Anglia	-0.301	(0.187)	0.062	(0.113)	0.027	(0.113)	0.054	(0.119)	0.118	(0.121)
Outer London	-0.302	(0.169)	0.090	(0.106)	0.086	(0.107)	0.012	(0.112)	0.041	(0.116)
Rest of South East	-0.258	(0.148)	0.159	(0.095)	0.084	(0.096)	0.095	(0.102)	0.135	(0.106)
South West	-0.203	(0.165)	0.064	(0.101)	-0.019	(0.102)	-0.056	(0.107)	0.039	(0.111)
West Midlands (Met)	-0.396	(0.190)	0.050	(0.112)	0.030	(0.114)	-0.032	(0.119)	0.050	(0.126)
Rest of West Midlands	-0.186	(0.174)	0.114	(0.108)	0.044	(0.110)	0.038	(0.114)	0.151	(0.119)
Greater Manchester	-0.362	(0.189)	-0.123	(0.112)	-0.138	(0.115)	-0.211	(0.119)	-0.140	(0.122)
Merseyside	-0.457	(0.221)	-0.226	(0.124)	-0.296	(0.126)	-0.320	(0.131)	-0.238	(0.130)

Rest of North West	-0.447	(0.176)	-0.117	(0.114)	-0.167	(0.115)	-0.198	(0.122)	-0.197	(0.125)
Wales	-0.411	(0.175)	-0.301	(0.109)	-0.397	(0.109)	-0.360	(0.114)	-0.309	(0.118)
Strathclyde	-0.288	(0.181)	-0.244	(0.114)	-0.295	(0.117)	-0.210	(0.121)	-0.147	(0.127)
Rest of Scotland	-0.369	(0.167)	0.048	(0.106)	-0.047	(0.107)	-0.017	(0.113)	0.027	(0.117)
Northern Ireland	-0.521	(0.193)	-0.049	(0.127)	-0.164	(0.127)	-0.129	(0.133)	0.012	(0.140)
Agriculture	0.696	(0.172)	0.500	(0.111)	0.581	(0.108)	0.546	(0.107)	0.486	(0.110)
Electricity gas &water	-0.320	(0.217)	-0.635	(0.113)	-0.572	(0.118)	-0.516	(0.115)	-0.576	(0.114)
Construction	0.182	(0.083)	0.012	(0.051)	0.025	(0.051)	0.031	(0.051)	0.021	(0.052)
Wholesale, retail, trade	0.268	(0.091)	0.193	(0.056)	0.228	(0.056)	0.225	(0.056)	0.259	(0.057)
Hotels & restaurants	-0.105	(0.149)	-0.100	(0.106)	-0.095	(0.106)	-0.041	(0.114)	-0.108	(0.106)
Transport& communication	0.130	(0.100)	-0.132	(0.056)	-0.116	(0.056)	-0.114	(0.056)	-0.092	(0.056)
Financial intermediation	-0.106	(0.160)	-0.296	(0.091)	-0.351	(0.091)	-0.405	(0.091)	-0.442	(0.092)
Real estate	0.331	(0.106)	0.384	(0.068)	0.349	(0.069)	0.346	(0.069)	0.419	(0.070)
Public administration	0.060	(0.112)	-0.247	(0.066)	-0.203	(0.065)	-0.227	(0.066)	-0.218	(0.066)
Education	0.223	(0.130)	0.094	(0.072)	0.121	(0.072)	0.127	(0.073)	0.150	(0.072)
Health & social work	0.119	(0.136)	0.096	(0.088)	0.200	(0.086)	0.238	(0.086)	0.236	(0.085)
Other community, social	0.218	(0.143)	0.295	(0.082)	0.282	(0.082)	0.245	(0.082)	0.238	(0.081)
Industry missing	0.831	(0.432)	-0.478	(0.167)	-0.630	(0.166)	-0.590	(0.168)	-0.541	(0.169)
Professional	0.090	(0.108)	-0.136	(0.059)	-0.116	(0.058)	-0.119	(0.059)	-0.087	(0.057)
Associate prof. & tech	0.041	(0.114)	0.011	(0.063)	0.007	(0.061)	0.078	(0.061)	0.067	(0.061)
Clerical, secretarial	-0.207	(0.121)	0.010	(0.064)	0.024	(0.066)	0.109	(0.067)	0.136	(0.066)
Craft and related	-0.038	(0.082)	0.018	(0.048)	-0.008	(0.048)	0.023	(0.048)	0.058	(0.048)
Personal, protective	-0.046	(0.132)	-0.005	(0.077)	-0.050	(0.078)	-0.045	(0.079)	-0.062	(0.077)
Sales occupations	0.199	(0.159)	0.066	(0.086)	0.034	(0.084)	0.102	(0.085)	0.169	(0.092)
Plant and machine	-0.052	(0.095)	0.015	(0.051)	0.001	(0.051)	-0.002	(0.051)	0.041	(0.052)
Other occupations	-0.035	(0.105)	-0.039	(0.060)	-0.028	(0.060)	-0.010	(0.060)	0.026	(0.059)
Occupation missing	-1.303	(0.426)	-1.388	(0.158)	-1.210	(0.157)	-1.251	(0.158)	-1.322	(0.158)
Gdp growth at spell start			5.568	(0.605)	5.724	(0.587)	5.993	(0.603)	7.054	(0.597)
Intercept	-0.614	(0.631)	1.077	(0.205)	1.258	(0.204)	1.307	(0.207)	1.213	(0.206)
$H_0: \lambda_4=0$	$\chi^2_{(1)}= 0.46$		p-value= 0.4959							
$H_0: \lambda_4= \lambda_3=0$	$\chi^2_{(2)} = 2.67$		p-value= 0.2632							
$H_0: \lambda_4= \lambda_3= \lambda_2=0$	$\chi^2_{(3)} = 26.36$		p-value= 0.0000							
$H_0: \lambda_4= \lambda_3= \lambda_2= \lambda_1=0$	$\chi^2_{(4)} = 426.57$		p-value= 0.0000							
Exclusion of Gdp growth from										
From initial condition eqns	$\chi^2_{(4)} = 140.60$		p-value= 0.0000							
From transition eqn	$\chi^2_{(1)}= 1.87$		p-value= 0.1717							

Note: Huber-White standard errors in parentheses, N= 13807, maximised likelihood= -12313.472, fifth order normal integrals evaluated using a GHK simulator with 50 Halton draws. Regression includes year and quarter dummies

Table 6 (ctnd.): Estimates from third order transitions model, Women

	Transition		Initial condition t-1		Initial condition t-2		Initial condition t-3		Initial condition t-4	
	coeff	s.e.	coeff	s.e.	coeff	s.e.	coeff	s.e.	coeff	s.e.
Active t-1	2.266	(0.374)								
Active t-2	0.645	(0.240)								
Active t-3	0.283	(0.188)								
Active t-4	0.267	(0.219)								
Age 54-56	-0.112	(0.070)	-0.200	(0.037)	-0.218	(0.036)	-0.199	(0.037)	-0.206	(0.037)
Age 57-60	-0.394	(0.084)	-0.377	(0.044)	-0.399	(0.044)	-0.367	(0.045)	-0.398	(0.045)
Age 61-63	-0.560	(0.089)	-0.708	(0.057)	-0.606	(0.058)	-0.516	(0.061)	-0.450	(0.059)
Has apprenticeship	0.093	(0.151)	-0.091	(0.082)	-0.034	(0.081)	0.046	(0.082)	0.018	(0.084)
Has partner	-0.088	(0.088)	-0.176	(0.050)	-0.191	(0.050)	-0.193	(0.052)	-0.234	(0.052)
Partner active	0.123	(0.067)	0.319	(0.040)	0.313	(0.040)	0.290	(0.041)	0.374	(0.040)
Dependent children	0.235	(0.131)	0.132	(0.053)	0.118	(0.053)	0.092	(0.052)	0.104	(0.054)
Mortgage	0.073	(0.063)	0.295	(0.034)	0.297	(0.034)	0.303	(0.034)	0.274	(0.034)
Rent/rent free accom.	-0.136	(0.091)	-0.062	(0.047)	-0.048	(0.047)	-0.097	(0.049)	-0.068	(0.049)
Qualification : Other	0.209	(0.095)	0.131	(0.052)	0.122	(0.053)	0.125	(0.054)	0.132	(0.053)
Qualification : Nvq1	0.269	(0.138)	0.237	(0.068)	0.187	(0.071)	0.196	(0.070)	0.173	(0.073)
Qualification : Nvq2	0.076	(0.087)	0.130	(0.049)	0.079	(0.049)	0.126	(0.049)	0.097	(0.049)
Qualification : Nvq3	0.000	(0.124)	0.145	(0.069)	0.082	(0.068)	0.066	(0.069)	0.124	(0.070)
Qualification : Nvq4	-0.102	(0.114)	0.044	(0.064)	-0.048	(0.062)	-0.004	(0.065)	0.005	(0.065)
Qualification: Nvq5/6	-0.405	(0.132)	0.170	(0.080)	0.112	(0.076)	0.191	(0.080)	0.228	(0.080)
Qualification: Missing	-0.116	(0.203)	-0.067	(0.205)	0.269	(0.179)	0.201	(0.207)	0.014	(0.170)
Tyne & Wear	-0.661	(0.297)	-0.194	(0.138)	-0.057	(0.137)	-0.299	(0.150)	-0.287	(0.141)
Rest of northern region	-0.420	(0.299)	-0.304	(0.126)	-0.209	(0.127)	-0.246	(0.137)	-0.155	(0.137)
South Yorkshire	-0.358	(0.284)	-0.231	(0.137)	-0.094	(0.135)	-0.317	(0.143)	-0.251	(0.141)
West Yorkshire	-0.636	(0.266)	-0.066	(0.124)	0.025	(0.122)	-0.124	(0.131)	-0.038	(0.128)
Rest of Yorks & Humberside	-0.144	(0.293)	-0.041	(0.133)	0.077	(0.127)	-0.118	(0.132)	-0.048	(0.131)
East Midlands	-0.393	(0.267)	-0.062	(0.113)	0.047	(0.114)	-0.141	(0.124)	-0.139	(0.118)
East Anglia	-0.439	(0.267)	-0.057	(0.122)	0.040	(0.122)	-0.113	(0.130)	-0.155	(0.126)
Outer London	-0.430	(0.272)	-0.038	(0.114)	-0.005	(0.116)	-0.118	(0.124)	-0.001	(0.120)
Rest of South East	-0.323	(0.254)	0.037	(0.104)	0.100	(0.104)	-0.009	(0.112)	0.021	(0.107)
South West	-0.332	(0.265)	0.048	(0.112)	0.082	(0.111)	-0.065	(0.119)	-0.059	(0.114)
West Midlands (Met)	-0.318	(0.286)	0.055	(0.130)	0.160	(0.128)	0.044	(0.142)	-0.013	(0.139)
Rest of West Midlands	-0.478	(0.262)	-0.015	(0.119)	0.066	(0.118)	-0.038	(0.127)	-0.059	(0.120)
Greater Manchester	-0.417	(0.289)	-0.078	(0.122)	-0.059	(0.123)	-0.109	(0.130)	-0.162	(0.125)
Merseyside	-0.788	(0.291)	-0.214	(0.137)	-0.165	(0.135)	-0.379	(0.140)	-0.333	(0.143)

Rest of North West	-0.417	(0.272)	-0.178	(0.123)	-0.112	(0.124)	-0.206	(0.132)	-0.164	(0.128)
Wales	-0.384	(0.267)	-0.277	(0.120)	-0.230	(0.119)	-0.431	(0.127)	-0.379	(0.121)
Strathclyde	-0.337	(0.278)	-0.324	(0.124)	-0.254	(0.122)	-0.309	(0.129)	-0.323	(0.127)
Rest of Scotland	-0.569	(0.267)	0.027	(0.118)	0.031	(0.117)	-0.106	(0.125)	-0.012	(0.120)
Northern Ireland	-0.611	(0.285)	-0.290	(0.155)	-0.181	(0.153)	-0.285	(0.159)	-0.268	(0.164)
Agriculture	0.659	(0.302)	0.478	(0.176)	0.483	(0.169)	0.509	(0.190)	0.396	(0.204)
Electricity gas &water	-0.226	(0.210)	-0.676	(0.267)	-0.537	(0.264)	-0.680	(0.255)	-0.740	(0.264)
Construction	0.656	(0.263)	-0.064	(0.139)	-0.056	(0.145)	0.033	(0.147)	-0.005	(0.144)
Wholesale, retail, trade	0.120	(0.143)	0.040	(0.077)	0.129	(0.078)	0.077	(0.078)	0.066	(0.080)
Hotels & restaurants	-0.078	(0.178)	-0.092	(0.097)	0.027	(0.098)	0.066	(0.101)	0.045	(0.102)
Transport& communication	0.141	(0.221)	-0.018	(0.116)	0.098	(0.122)	0.072	(0.118)	0.007	(0.116)
Financial intermediation	-0.063	(0.231)	-0.088	(0.113)	0.032	(0.113)	0.056	(0.115)	-0.038	(0.116)
Real estate	0.222	(0.148)	0.065	(0.087)	0.182	(0.087)	0.181	(0.088)	0.175	(0.089)
Public administration	0.141	(0.154)	0.140	(0.095)	0.240	(0.095)	0.235	(0.096)	0.138	(0.097)
Education	0.049	(0.148)	0.090	(0.081)	0.173	(0.081)	0.168	(0.085)	0.122	(0.084)
Health & social work	0.174	(0.137)	0.101	(0.076)	0.176	(0.076)	0.151	(0.079)	0.130	(0.078)
Other community, social	0.122	(0.168)	0.033	(0.092)	0.127	(0.091)	0.186	(0.096)	0.104	(0.094)
Industry missing	0.571	(0.503)	-0.438	(0.159)	-0.268	(0.158)	-0.254	(0.163)	-0.442	(0.171)
Professional	0.302	(0.154)	-0.186	(0.090)	-0.169	(0.089)	-0.186	(0.093)	-0.198	(0.092)
Associate prof. & tech	0.158	(0.149)	0.011	(0.083)	0.004	(0.082)	0.025	(0.084)	-0.030	(0.085)
Clerical, secretarial	0.012	(0.114)	-0.043	(0.064)	-0.040	(0.063)	0.005	(0.064)	-0.023	(0.065)
Craft and related occupations	0.002	(0.220)	-0.293	(0.109)	-0.310	(0.107)	-0.282	(0.111)	-0.278	(0.114)
Personal, protective	-0.028	(0.129)	-0.255	(0.073)	-0.259	(0.074)	-0.271	(0.075)	-0.260	(0.075)
Sales occupations	-0.153	(0.144)	-0.221	(0.079)	-0.288	(0.079)	-0.222	(0.079)	-0.270	(0.080)
Plant and machine operatives	-0.051	(0.201)	-0.170	(0.099)	-0.203	(0.099)	-0.166	(0.099)	-0.222	(0.099)
Other occupations	0.002	(0.131)	-0.161	(0.071)	-0.232	(0.071)	-0.196	(0.072)	-0.199	(0.073)
Occupation missing	-1.518	(0.475)	-1.892	(0.149)	-2.049	(0.148)	-2.097	(0.151)	-2.245	(0.159)
Gdp growth at spell start			3.421	(0.677)	3.222	(0.680)	3.397	(0.703)	3.504	(0.688)
Intercept	-1.063	(0.431)	0.988	(0.208)	0.828	(0.208)	0.976	(0.215)	1.229	(0.222)
H_0: λ_4=0	$\chi^2_{(1)}$= 1.49		p-value=0.2225							
H_0: λ_4= λ_3=0	$\chi^2_{(2)}$ = 5.34		p-value= 0.0691							
H_0: λ_4= λ_3= λ_2=0	$\chi^2_{(3)}$ = 12.33		p-value= 0.0063							
H_0: λ_4= λ_3= λ_2= λ_1=0	$\chi^2_{(4)}$ = 402.42		p-value= 0.0000							
Exclusion of Gdp growth from										
From initial condition	$\chi^2_{(4)}$ = 30.23		p-value= 0.0000							
From transition eqn	$\chi^2_{(1)}$= 0.03		p-value= 0.8536							

Note: Huber-White standard errors in parentheses, N= 10416, maximised likelihood= -9534.6794 , fifth order normal integrals evaluated using a GHK simulator with 50 Halton draws. Regression includes year and quarter dummies

Table 7: Baseline hazard estimates of transition from Activity to Inactivity

	Men		Women	
Quarter	Coefficient	Std. error	Coefficient	Std. error
1	-3.521	(0.473)	-2.057	(0.531)
2	-3.676	(0.432)	-2.148	(0.478)
3	-3.542	(0.406)	-1.577	(0.445)
4	-3.938	(0.422)	-1.880	(0.457)
5	-4.136	(0.420)	-1.935	(0.457)
6	-4.515	(0.453)	-2.030	(0.473)
7	-4.246	(0.435)	-2.036	(0.463)
8	-4.671	(0.487)	-2.357	(0.478)
9 - 12	-4.322	(0.375)	-2.509	(0.422)
13 - 20	-4.541	(0.364)	-2.679	(0.410)
21 - 40	-4.672	(0.355)	-3.428	(0.400)
41 - 225	-4.203	(0.332)	-3.137	(0.386)

Table 8: Baseline hazard estimates of transition from Inactivity to Activity

	Men		Women	
Quarter	Coefficient	Std. error	Coefficient	Std. error
1	0.040	(0.631)	0.618	(0.874)
2	-0.148	(0.571)	0.164	(0.799)
3	-0.462	(0.564)	-0.142	(0.813)
4	-0.670	(0.562)	-0.672	(0.810)
5	-0.756	(0.568)	-0.415	(0.802)
6	-0.911	(0.570)	-1.388	(0.851)
7	-1.666	(0.617)	-0.785	(0.823)
8	-1.483	(0.590)	-1.092	(0.835)
9 - 12	-1.532	(0.520)	-1.238	(0.762)
13 - 20	-1.991	(0.525)	-1.653	(0.757)
21 - 40	-2.391	(0.531)	-2.626	(0.753)
41 - 225	-2.317	(0.636)	-2.614	(0.843)

Table 9: Hazard model estimates of transition from activity to inactivity

	Men		Women	
	Coefficient	Std. error	Coefficient	Std. error
Age 54-56	0.161	(0.130)	0.222	(0.121)
Age 57-60	0.631	(0.121)	0.617	(0.147)
Age 61-63	1.164	(0.139)	1.747	(0.168)
Age 64-65	2.728	(0.171)	--	--
Other	0.018	(0.138)	-0.212	(0.165)
Nvq1/2	-0.322	(0.168)	-0.087	(0.149)
Nvq3	-0.049	(0.172)	0.327	(0.214)
Nvq4	0.063	(0.200)	0.306	(0.208)
Nvq5/6	-0.159	(0.181)	0.149	(0.245)
Has recognised trade/apprenticeship	-0.033	(0.145)	-0.400	(0.247)
Mortgage	-0.450	(0.092)	-0.545	(0.115)
Rent/rent free accommodation	-0.312	(0.124)	-0.079	(0.158)
Dependent children	-0.322	(0.145)	-0.090	(0.185)
Has partner	0.037	(0.136)	-0.338	(0.161)
Partner working	0.582	(0.111)	0.482	(0.153)
Missing partner status	0.360	(0.107)	-0.412	(0.143)
Professional	0.109	(0.172)	0.638	(0.282)
Associate professional & technical	-0.190	(0.177)	-0.186	(0.256)
Clerical, secretarial	0.443	(0.177)	0.002	(0.196)
Craft and related	0.019	(0.143)	0.956	(0.350)
Personal, protective	-0.010	(0.234)	0.586	(0.234)
Sales	-0.003	(0.258)	0.275	(0.249)
Plant and machine operatives	0.045	(0.150)	0.167	(0.318)
Other occupations	0.293	(0.166)	0.487	(0.228)
Missing occupation	0.216	(1.258)	1.789	(0.653)
Agriculture, fishery	-1.064	(0.486)	-1.967	(0.776)
Manufacturing	-0.192	(0.399)	-0.783	(0.572)
Electricity, gas	0.748	(0.497)	0.042	(1.482)
Construction	-0.320	(0.414)	-1.201	(0.722)
Wholesale, retail trade	-0.238	(0.410)	-0.975	(0.566)
Hotels, restaurants	0.576	(0.468)	-0.367	(0.589)
Transport and communication	-0.025	(0.413)	-0.951	(0.631)
Financial intermediation	0.434	(0.478)	-0.687	(0.624)
Real estate	-0.079	(0.415)	-0.714	(0.573)
Public admin.	0.190	(0.429)	-1.337	(0.586)
Education	0.247	(0.426)	-1.130	(0.565)
Health & social work	-0.014	(0.437)	-1.176	(0.558)
Other	-0.305	(0.436)	-0.776	(0.579)
Tyne & wear	0.987	(0.387)	-0.229	(0.488)
Rest of northern region	0.465	(0.325)	0.200	(0.375)
South Yorkshire	0.954	(0.337)	-0.445	(0.467)
West Yorkshire	0.350	(0.315)	-0.219	(0.378)
Rest of York S & Humberside	0.425	(0.335)	-0.172	(0.410)
East midlands	0.251	(0.280)	-0.597	(0.331)
East Anglia	0.217	(0.319)	-0.657	(0.372)
Outer London	0.043	(0.286)	0.159	(0.317)
Rest of south east	0.070	(0.253)	-0.611	(0.287)
South west	0.267	(0.274)	-0.261	(0.317)
West midlands (met county)	0.037	(0.327)	-0.992	(0.386)
Rest of west midlands	0.055	(0.292)	-0.414	(0.344)
Greater Manchester	0.215	(0.315)	-0.107	(0.371)
Merseyside	0.649	(0.361)	-0.413	(0.469)
Rest of north west	-0.056	(0.322)	-0.115	(0.361)

Wales	0.429	(0.302)	-0.226	(0.377)
Strathclyde	0.724	(0.320)	-0.394	(0.393)
Rest of Scotland	0.212	(0.295)	0.106	(0.339)
Northern Ireland	0.049	(0.390)	-0.524	(0.495)
Quarter1: Jan-Mar	0.159	(0.100)	0.169	(0.106)
Quarter2: Apr-Jun	-0.002	(0.102)	0.011	(0.108)
Quarter3: Jul-Sep	-0.083	(0.101)	0.109	(0.101)
1994	-0.432	(0.391)	0.676	(0.540)
1995	-0.653	(0.412)	0.861	(0.566)
1996	-0.232	(0.413)	1.447	(0.576)
1997	-0.408	(0.412)	0.788	(0.566)
1998	-0.434	(0.411)	0.704	(0.567)
1999	-0.331	(0.408)	1.177	(0.562)
2000	-0.515	(0.414)	0.869	(0.578)
2001	-0.241	(0.409)	0.831	(0.572)
2002	-0.647	(0.414)	0.611	(0.563)
2003	-0.553	(0.411)	0.770	(0.565)
2004	-0.617	(0.427)	0.801	(0.594)
Ln_varg_cons	0.765	(0.300)	1.894	(0.141)
Gamma variance(σ^2)	2.149	(0.644)	6.644	(0.937)
LR test of Gamma variance=0	15.725		96.619	
Prob.>=chibar2	0.000037		4.20E-23	
Log likelihood	-3905.631		-3889.086	
No. of Observations	48269		34517	

Note: The reference categories used are the following: age, 50-53; qualification, none; accommodation, outright ownership; working partner; occupation: manager and administrator; Industry: missing industry; region: Inner London; quarter: quarter4 (October-December); year: 1993. For unemployed and inactive older workers labour market characteristics relate to previous employment.

Table 10: Hazard estimates of transition from inactivity to activity

	Men		Women	
	Coefficient	Std. error	Coefficient	Std. error
Age 54-56	-0.038	(0.222)	-0.621	(0.210)
Age 57-60	-0.474	(0.215)	-0.714	(0.236)
Age 61-63	-1.107	(0.230)	-1.049	(0.298)
Age 64-65	-1.835	(0.313)	--	--
Other	0.330	(0.232)	0.158	(0.300)
Nvq1/2	0.268	(0.267)	0.200	(0.243)
Nvq3	0.802	(0.290)	0.488	(0.395)
Nvq4	0.704	(0.349)	-0.090	(0.362)
Nvq5/6	0.727	(0.316)	0.449	(0.460)
Has recognised trade/apprenticeship	-0.352	(0.254)	-0.038	(0.465)
Temporary disability	0.786	(0.287)	0.511	(0.390)
Permanent disability	-1.629	(0.173)	-1.772	(0.240)
Mortgage	0.549	(0.177)	0.341	(0.205)
Rent/rent free accommodation	0.630	(0.197)	-0.406	(0.253)
Dependent children	0.420	(0.249)	0.505	(0.280)
Has partner	-0.197	(0.203)	-0.331	(0.261)
Partner working	-0.457	(0.198)	-0.584	(0.235)
Missing partner status	-0.079	(0.203)	-0.302	(0.236)
Professional	-0.591	(0.334)	1.191	(0.637)
Associate professional & technical	-0.018	(0.313)	0.376	(0.607)
Clerical, secretarial	-0.027	(0.349)	0.322	(0.467)
Craft and related	-0.063	(0.265)	-0.155	(0.769)
Personal, protective	0.043	(0.394)	0.666	(0.530)
Sales	-0.415	(0.519)	-0.269	(0.556)
Plant and machine operatives	-0.214	(0.283)	0.394	(0.685)
Other occupations	0.121	(0.321)	0.132	(0.505)
Missing occupation	0.026	(0.593)	0.259	(0.753)
Agriculture, fishery	0.551	(0.701)	0.886	(1.247)
Manufacturing	0.399	(0.495)	0.104	(0.626)
Electricity, gas	-0.429	(0.745)	-0.554	(1.394)
Construction	0.580	(0.523)	-0.387	(1.031)
Wholesale, retail trade	0.326	(0.559)	0.098	(0.601)
Hotels, restaurants	1.160	(0.635)	0.500	(0.686)
Transport and communication	0.220	(0.529)	-0.351	(0.920)
Financial intermediation	0.005	(0.599)	0.056	(0.892)
Real estate	1.084	(0.555)	-0.491	(0.712)
Public admin.	0.164	(0.552)	0.190	(0.725)
Education	0.657	(0.592)	-0.071	(0.602)
Health & social work	0.435	(0.661)	-0.241	(0.583)
Other	-0.052	(0.616)	0.975	(0.657)
Tyne & wear	-1.032	(0.554)	-0.724	(0.799)
Rest of northern region	-0.245	(0.435)	-1.356	(0.659)
South Yorkshire	-0.679	(0.490)	-1.341	(0.756)
West Yorkshire	-0.517	(0.473)	-0.722	(0.666)
Rest of York S & Humberside	-0.431	(0.458)	0.191	(0.600)
East midlands	-0.753	(0.384)	-0.303	(0.513)
East Anglia	-1.266	(0.545)	-0.813	(0.598)
Outer London	-0.185	(0.371)	-1.650	(0.585)
Rest of south east	-0.515	(0.324)	-0.516	(0.462)
South west	-0.664	(0.381)	-0.367	(0.511)
West midlands (met county)	-0.612	(0.435)	-0.856	(0.597)
Rest of west midlands	-1.228	(0.448)	-0.021	(0.567)
Greater Manchester	-0.771	(0.432)	-0.621	(0.604)

Merseyside	-0.793	(0.490)	-1.281	(0.711)
Rest of north west	-0.690	(0.451)	-1.092	(0.618)
Wales	-1.012	(0.421)	-0.779	(0.571)
Strathclyde	-0.594	(0.418)	-0.834	(0.615)
Rest of Scotland	-0.514	(0.417)	-0.233	(0.554)
Northern Ireland	-1.906	(0.711)	-1.112	(0.745)
Quarter1: Jan-Mar	0.138	(0.170)	0.143	(0.188)
Quarter2: Apr-Jun	0.085	(0.166)	0.170	(0.186)
Quarter3: Jul-Sep	0.112	(0.158)	-0.006	(0.186)
1994	-0.824	(0.467)	-0.284	(0.439)
1995	-0.627	(0.499)	0.010	(0.505)
1996	-0.670	(0.509)	0.267	(0.527)
1997	-0.319	(0.491)	-0.006	(0.520)
1998	-0.355	(0.489)	-0.417	(0.528)
1999	-0.776	(0.499)	-0.134	(0.518)
2000	-0.524	(0.498)	0.217	(0.521)
2001	-0.483	(0.501)	-0.338	(0.538)
2002	-0.689	(0.499)	-0.783	(0.549)
2003	-0.501	(0.492)	-0.420	(0.529)
2004	-2.332	(0.785)	-0.667	(0.652)
Ln_varg_cons	1.156	(0.263)	1.877	(0.230)
Gamma variance(σ^2)	3.178	(0.835)	6.531	(1.505)
LR test of Gamma variance=0	29.798		38.1661	
Prob.>=chibar2	2.40E-08		3.20E-10	
Log likelihood	-1518.049		-1302.250	
No. of Observations	17824		16552	

Note: The reference categories used are the following: age, 50-53; qualification, none; accommodation, outright ownership; working partner; occupation: manager and administrator; Industry: missing industry; region: Inner London; quarter: quarter4 (October-December); year: 1993. For unemployed and inactive older workers labour market characteristics relate to previous employment.