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Post-retirement labour supply in England

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ABSTRACT

This paper uses data from the English Longitudinal Study of Ageing to investigate the determinants of post retirement labour supply behaviour amongst retired men in England. I find the hazard of unretirement is highest when an individual is in their mid-late 60s. Evidence suggests unretirement is more likely amongst individuals with a higher level of educational attainment, who have a spouse in the labour market and are in better health. I investigate the nature of unretirement jobs and find they tend to be part time and provide a non-trivial source of income.

Introduction

Individuals are living longer. A recent ONS report estimated a male aged 65 in the UK in 2002 was estimated to live for 16 additional years i.e. to die at 81, whereas a male aged 65 in 2010 was estimated to live until the age of 83 (ONS, 2011). Increasing life expectancy has a number of implications for society. Given that many individuals retire at or before retirement age in the UK (Banks and Smith, 2006), central government is primarily focused on reducing the detrimental effects population ageing can have on fiscal expenditure. One route by which this can be achieved is through higher rates of labour supply, in particular at older ages. Therefore research which investigates this topic is of vital importance. In a standard lifecycle framework one would expect male labour supply to be an inverse U shape over an individual's lifecourse, in particular one would expect to see a gradual (phased) decline from work to retirement. The social norm associated with retirement in the UK is the cessation of a career job, which is reflected in a sharp reduction in hours worked (Kohli et al., 1991; Banks and Smith, 2006). However, over the last thirty years empirical research (largely coming from the US) has shown a growing heterogeneity in labour supply at older ages (Hanoch and Honig, 1985; Rust, 1989; Ruhm, 1990; Blau, 1994; Gustman and Steinmeier, 2002 and Mastrogiacomo, 2003). These papers have documented the rise of early retirement, which is also relatively common in the UK and partial retirement which is less common in the UK relative to the US and selected European economies (Gielen, 2009; Jones et al., 2010; Kantarci and Van-Soest, 2008). However many studies either assume retirement is an absorbing state or note that a proportion of individuals returns to the labour market (and whose flows are non-trivial in magnitude) but choose not to investigate them.One exception here is the early study by Parker (1980) who explicitly considers retirement preferences amongst a group of retired British individuals and explicitly asks respondents about their attitudes towards working in retirement. Other notable exceptions include Gustman and Steinmeier (2002) and more recently, Congdon-Hohman (2009), Maestas (2010), Cahill et al. (2010) and Kutlu-Koc (2014) who investigate various aspects of unretirement in the US.

The focus of this paper is to understand the determinants of unretirement behaviour in England. To do this I use the English Longitudinal Survey of Ageing (ELSA) and restrict my attention to men who are initially observed to be in retirement.[1] This marks a departure from the majority of existing studies which have tended to focus on unretirement behaviour amongst individuals who are initially employed. Few studies have focused on post retirement labour supply conditional on initially being in retirement. Recent exceptions include Larsen and Pedersen (2013) who use Danish administrative register data to show that the probability of being in paid work post (normal) retirement age is higher for: Males who own their own home, have made higher pension contributions during their lifetime and are better educated. Pettersson (2011) investigates unretirement behaviour in Sweden using register data and estimates an unretirement rate in the region of 6–14 per cent depending on the definition of unretirement. Pettersson (2011) found unretirement was more common amongst: The higher educated, early retirees, males and individuals with a spouse in the labour force. These studies suggest unretirement is a lifestyle decision and not in general a response to negative financial shocks.

[1] Preliminary analysis indicated the flows from retirement back into paid work amongst females in this cohort were too low for any substantive analysis to be undertaken.

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The most recent Census estimated 16.4 per cent of the population in England was aged 65 and over in 2011, of which a significant proportion were in retirement (ONS, 2012).Therefore this group represents a sizeable pool of untapped economic capacity in England. Therefore the first question I pose in this study is: conditional on being is there duration dependence in the hazard of unretirement? Understanding this has implications for policymakers; for example current policies aim to delay entry into retirement, such policies (which have been effective) are explicitly targeting individual's currently in employment. However policymakers should also think about policies which would boost employment amongst individuals who are already in retirement. Related to this point, is unretirement a realistic labour supply path available to all individuals? If not, then it is important to understand the characteristics that might prevent or hinder an individual returning to work.

Analysis of ELSA suggests there is evidence of duration dependence in unretirement. The pattern and direction indicate the hazard of unretirement is highest for individuals in their mid-late 60s. I also find unretirement is more likely to occur amongst particular sub-groups of the retired population. Characteristics which are associated with raising the hazard of unretirement include: Being highly educated, in good health, having a spouse in employment, having always been single and prior to initial retirement occupied a relatively highly paid job. My results suggest unretirement in England is a lifestyle choice rather than due to credit constraints. These findings support existing research investigating the characteristics of individuals who work in retirement (Maestas, 2010; Pettersson, 2011; Larsen and Pedersen, 2013).

I estimate that an unretirement job involves working on average 12 hours per week and weekly gross earnings from such employment amount to £128. Putting this into context, in the financial calendar year 2014–2015 the maximum weekly state pension an individual could receive is £113. The Department for Work and Pensions, which is responsible for social security payments in the UK recently estimated nearly 1 in 5 retired individuals relied solely on their state pension and benefit income as sources of income in retirement (DWP, 2011). Therefore an unretirement job can provide a non-trivial source of additional retirement income, assuming the opportunity to secure employment is equal across all individuals.

The rest of this paper is set out as follows. Section 'Data' describes ELSA the longitudinal panel dataset used in this paper. Section 'Unretirement in a theoretical framework' considers the main developments in modelling labour supply at older ages and how unretirement behaviour can be explained in such frameworks. Section 'Specification and modelling approach' discusses the modelling approach. Section 'Estimation results' presents estimation results. Section 'Characteristics of unretirement jobs' analyses the characteristics of unretirement jobs. Section 'Conclusion and policy implications' concludes and considers policy implications.

Data

Sample

The sample used in this study is drawn from ELSA. ELSA is a biennial longitudinal survey specifically aimed at investigating the lives of individuals aged 50 and over in England. The survey is a joint collaboration between the Institute for Fiscal Studies (IFS), University College London (UCL), National Centre for Social Research (NCSR) and The University of Manchester. The survey sample was drawn from the Health Survey for England (HSE), with individuals and their spouses being eligible to take part in the survey if they live in private households in England and were aged 50 and above on 1st March 2002. The initial sample consisted of 11,391 core members, for a detailed description of the data see Appendix A.

I follow individuals between wave 1 and wave 6 of the study which corresponds to the time period 2002–2013. The stock sample is restricted to individuals who report being in retirement in the first wave of observation (wave 1) and are between 50 and 75 years of age at the time of their wave 1 interview.[2] The median age of sample members in wave 1 is 68 and the median age at which they retired is 60. Sample distributions of these characteristics can be found in Fig. A1 in Appendix A. These figures highlight the extent of early retirement in England, which has been well documented in the literature (Jones et al., 2010; Banks and Smith, 2006). Appendix B also highlights that a large number of retirement episodes occur at ages 59/60 and 65; this coincides with the age at which females and males are eligible to claim their state pension age, this finding mirrors existing studies using British longitudinal panel data to analyse retirement from the labour market (Jones et al., 2010; Banks and Smith, 2006).

After placing the sample restrictions and cleaning the data I am left with an unbalanced panel of 941 individuals. I do not allow for re-entry after an individual has attrited from the survey.

Definition of unretirement

My definition of unretirement relies on observing: (1) the re-entry date to the labour market *or* (2) a change in a respondent's economic status between any two consecutive waves of the survey. Consider (1) first, at wave one individuals who reported themselves as retired were asked to provide the month and year in which they retired. At each wave of ELSA respondents are asked whether they consider themselves to be in paid work. If a respondent answers yes then they are asked the month and year they started working. This allows me to derive information regarding the number of years spent in retirement prior returning to work. One important consideration is how to account for unretirement episodes which occurred before the sample period but after initial retirement; this would lead to an underestimation of the true extent of unretirement. This is commonly referred to as 'delayed entry' or 'left truncation'. In Section 'Discrete time hazard model' I discuss how the modelling approach deals with this problem to ensure my estimates are not downward biased.

The second way an individual can be classified as unretired is if they report a change in their economic status, for example if an individual makes the transition from retirement to employment across any two consecutive waves of the survey (this approach has been used in previous studies of unretirement see inter alia Maestas, 2010). I cross check both definitions to ensure I do not double count unretirement episodes and also to ensure I only investigate the first episode of unretirement. Individuals who unretire under definition (2) and are not captured under definition (1) are assumed to have returned to the labour market at the midpoint between the two (survey) waves in question.

Under my definition of unretirement 5.31 per cent of the sample exhibit such behaviour.An alternative definition of unretirement could be based on the number of hours reported working in paid employment. The aim of this paper is to focus on the pattern and direction of duration dependence of unretirement and therefore I choose a definition of unretirement which captures this. Moreover, I would argue it is preferable to use a combination of measures that captures an individual's own perception of their attachment to the labour market, given the existence of social norms in retirement. For example, an individual may not consider himself being in employment even if he is engaged in paid work post retirement (Kohli et al., 1991).

[2] I also estimate a version of our model including those aged up to 89 in wave 1 but our results do not change. Moreover many of these individuals die over the sample period and given their life stage do not exhibit unretirement behaviour.

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Work environment for older workers in England

In order to understand more about the unretirement decision one should consider the reason behind the initial decision to retire. This is important to ensure that unretirement is not simply an artefact of the data, for example if an individual was forced to retire by their employer and subsequently returned to work.

Involuntary retirement. Until April 2011 UK retirement legislation meant employers had the power to force their workers to retire once they became eligible to claim a state pension (BIS, 2010).[3] The sample period in this study spans 2001 and 2013 therefore for a significant proportion of the sample period an individual who wanted to continue to work past the State Pension Age (SPA) against the will of their employer would exhibit unretirement behaviour. Dorn and Sousa-Poza (2010) investigate the extent of voluntary and involuntary retirement in 19 (mostly advanced) economies. Their study found that amongst individuals who retired early in Great Britain one third did so involuntarily. The ELSA survey asks respondents if they retired early and if this was the case then what the main reason was for early retirement. I investigate the main reason for early retirement (if applicable) for sample members at wave 1 i.e. when in retirement, analysis indicates 12.57 per cent of the sample who retired early did so involuntarily. Whilst this figure is not as high as that found in Dorn and Sousa-Poza (2010) this still highlights the extent of involuntary retirement in England.[4] What is important for this study is the proportion of the *unretired* sample that were forced to retire early. I find that none of the unretired sample reported they were forced to take involuntary early retirement. Therefore unretirement flows are not due to individuals being forced to retire and then simply returning to work.

The budget set. In the option value approach of Stock and Wise (1990) the decision to stay in work or retire involves comparing the present value of working an extra day versus retiring today. In evaluating future income streams part of the decision to unretire is therefore likely to be related to the marginal tax rate an individual faces if they return to work. As of April 1989 the UK government abolished the so called 'earnings rule' which charged prohibitively high tax rates on labour market income earned by individuals who chose to work past SPA (Bozio et al., 2010).[5,6] Disney et al. (2002) show strong income effects in operation in response to the abolishment of the earnings rule, male weekly hours in employment increased by on average 4 hours.

Unretirement in a theoretical framework

Traditional models of labour supply, including many versions of the lifecycle model assume retirement is an absorbing state; this largely reflected the behaviour observed in empirical data when these models were first developed. However beginning in the 1970s studies using US individual-level survey data showed males exhibiting unretirement or 'reverse flow' behaviour. Subsequently models such as those proposed by Gustman and Steinmeier (1984), Gustman and Steinmeier (1984) and Rust (1989) were developed to account for such a phenomenon.[7] These frameworks predict unretirement takes place only if it was optimal to do so i.e. the individual derives higher utility by returning to work. This is similar to the option value approach developed by Stock and Wise (1990) except in their framework they model the initial decision to retire and unretirement in their framework is not possible.[8]

Previous country-level studies using longitudinal survey data to investigate unretirement have found such behaviour is in general not due to financial shocks but is either planned or a lifestyle decision. This would suggest that for these individuals the utility of being in work was higher than staying in retirement. Whilst there are some differences in the institutional framework in the countries where these studies have been carried out, it is unlikely they are significant; for example even in the US basic healthcare becomes free for individuals once they turn 65.[9]

The estimation strategy allows me to determine which factors are important in raising the hazard of unretirement. It is likely these factors are correlated with how individuals rank alternative situations such as being in work or retirement and is therefore related to the underlying utility of each regime. It is also possible to investigate the speed at which unretirement takes place following initial retirement, economic theory would predict that if unretirement did not conform to preretirement expectations (although existing evidence suggests this is not the case) then an individual would return to work soon after initial retirement. Alternatively a slow return to work may suggest individuals gradually make this decision as they receive more information, or require a break before returning to work.

Specification and modelling approach

Covariate information set

Table 1 lists the covariates used in the discrete time hazard model. The specification combines a mixture of economic and sociodemographic covariates which have been cited as important in determining labour supply behaviour at older ages (Jones et al., 2010; Banks et al., 2005).[10]

The importance of health in modelling the retirement decision of British men has been well documented (Jones et al., 2010). I control for individuals baseline self-reported health status and also the number of limiting illnesses. One would expect an individual who was in poorer health to be less likely to be able to unretire even if he had a strong preference for work or was credit constrained.

I control for household characteristics such as baseline marital status which is largely time invariant for this sample, with the exception of becoming widowed. I also control for the baseline labour force status of the spouse. Various studies have documented

[3] This law held for both men and women despite their state retirement age being five years apart.

[4] The differences may well be due to cohort and sample composition effects.

[5] Of course pension income is taxable and any labour market income may push an individual over a particular threshold which means they face a higher tax rate on part of their (total) income.

[6] Between 1948 and 1989, if an individual wanted to claim their state pension within five years of retiring they had to terminate regular employment. Specifically, an individual was not allowed to claim state pension if they worked more than 12 hours per week. If the number of hours an individual worked was less than this threshold and earned above a certain higher limit (similar to the Higher Earnings Limit), their state pension was reduced accordingly. Between 1948 and 1958 the taper rate was 100%, between 1958 and 1989 it was reduced to 50%, and increased to 100% for earnings over the HEL. This was seen as very detrimental to work incentives for older people. In 1989 the earnings rules described above were abolished. Pension income and earnings from employment whilst in retirement are now taxed at a rate similar to that of the general working age population (there are some earnings rules still in place but these refer to dependents additions, pensions may also be available to increase their tax free allowance). For more information see Bozio et al. (2010).

[7] Such frameworks have also attempted to include additional features such as pensions, uncertainty and spousal effects which have been shown to be important in determining labour supply behaviour at older ages (Schirle, 2008; Gustman and Steinmeier, 2009).

[8] The authors argue unretirement is very unlikely in the US in terms of an individual returning to work at the same firm. The basis for their argument relates to social security rules in operation at the time.

[9] Contrary to Maestas (2010) other studies have found evidence which suggests health insurance plays an important role in the unretirement decision (Congdon-Hohman, 2009).

[10] In guiding the specification described in Table 1 I tested alternative specifications using BIC/AIC. Appendix B provides a formal description of how each of the variables in Table 1 was coded for estimation purposes. The information was provided by respondents at the time of their wave 1 interview (2002/2003).

Table 1
Covariate information set used in discrete time hazard model.

Sociodemographic variables
Marital status
Labour force status of spouse
Self reported health status
Whether has a limiting illness
Holds a degree (equivalent to 16 years f/t education)
Holds an A level (equivalent to 13 years f/t education)
Opportunity to work past retirement age
Whether respondent feels they do not have enough income
Short term financial planning horizon: 1 day–3 months (base group)
Medium term financial planning horizon: 1–3 years
Long term financial planning horizon: 5 years+
Self reported social class by preretirement job occupation
Economic variables
Log of total pension wealth *(IFS)*
Non pension financial wealth quintile

empirical evidence which suggests joint complementarities in leisure amongst British couples and hence the co-ordination of the timing of retirement (Disney et al., 2010; Cribb et al., 2014). Schirle (2008) estimates 25 per cent of labour supply behaviour of older British married men can be attributed to the labour force status of his wife.

I also control for background characteristics such as an individual's highest level of educational attainment, this is likely to be strongly correlated with earnings over the lifecycle and pension wealth and has been shown to important in determining an individual's standard of living in retirement (Bozio et al., 2010). Education may also affect the chances of securing paid work post retirement; consider the case where only highly educated individuals have the necessary skill set to return to work. I also control for the social class of the final job prior to retirement, which is likely to be correlated with lifetime labour market factors.

Individuals amass wealth over the lifetime. If unretirement is due to financial constraints such as inadequate wealth holdings in retirement then it is important to control for this, although recent empirical evidence suggests this is not the case (Crawford and O'Dea, 2014). I control for this by including a dummy variable corresponding to an individual's quintile position in the non-pension financial wealth distribution in 2002.

The stock sample consists of individuals who are in retirement. Maestas (2010) emphasises the role of retirement expectations and finds evidence to support the view that unretirement in the US is a largely planned event (made prior to initial retirement). Expectations data it is not available for our stock sample, however ELSA contains information on an individual's stock of pension wealth in their first wave of observation. This variable summarises an individual's lifetime labour force attachment by capturing the contributions made to private and public pensions.[11]

One reason for unretirement to take place is if individuals are not financially prepared for retirement. Empirical evidence from the US suggests there is widespread financial illiteracy amongst individuals approaching retirement (Lusardi et al., 2007). One proxy for financial literacy is to control for individual's subjective financial planning horizon. This is defined by three categories which reflect different time horizons. I investigate whether there is any difference in unretirement behaviour conditional on how forward looking individuals are in their financial planning. It is likely an individual's financial planning horizon is correlated with their financial literacy and therefore any differences by group provides me with some insight as to whether those individuals who are forward looking in certain (important) aspects of their life are more likely to unretire.

Model specification

Previous research has focused on a static or sequential method such as a probit or multinomial logit framework to analyse the unretirement decision (Cahill et al., 2010; Pettersson, 2011; Maestas, 2010; Larsen and Pedersen, 2013). The approach of this paper is to consider how the hazard of unretirement varies with age.[12,13] A natural way to consider this is in a duration framework; this type of modelling strategy goes beyond static or sequential frameworks in terms of allowing the reader to understand the dynamics of labour supply behaviour post retirement.

Discrete time hazard model

Imodel unretirement using a discrete time hazard model with a complementary log–log link function, which has been extended to account for individual level unobserved heterogeneity (Meyer, 1990).[14,15] I assume unobserved heterogeneity is suitably captured by a gamma distribution. To implement this model I use the pgmhaz8 package in Stata written by Stephen Jenkins. A condition for being eligible in the stock sample (and hence suitable for estimation purposes) is that an individual self-reports being in retirement in wave 1. To facilitate estimation data must be reorganised such that each individual has a corresponding number of rows representing how many periods he is at risk (for more information see inter alia Jenkins, 1997 and Jones et al., 2010).[16] As noted in Section 'Definiti on of unretirement' the estimation strategy must be adapted to the control for the fact that I do not observe unretirement episodes between the calendar year in which an individual retired and the year in which they were first observed in ELSA. Following Cleves et al. (2002) left truncation in semi-parametric models requires one to omit the subject from all analysis during the truncation period. In my specific case this means that when I define the time at which an individual becomes 'at risk' I explicitly account for the period they have already been in retirement.[17]

[11] For individuals aged over state pension age (assuming no deferral) one can observe an individual's income stream, a large proportion of this stream is from private and state pension. By combining this with information about the number of pensions and how much each pension is worth (both reported) it is possible to derive a measure of the net present value of pension wealth in 2002. For individuals aged below SPA the pension wealth measure assumes the individual retired in 2002 chose to not make any more pension contributions. For more information regarding the construction of the pension wealth variables see Appendix A and Banks et al. (2005).

[12] In deciding an appropriate modelling strategy I estimated static and sequential models following the lines of Cahill et al. (2010), Pettersson (2011) and Maestas (2010), however due to the main aim of the paper and sample size restrictions these avenues were not explored further.

[13] More precisely our baseline hazard is a function of age which has been adjusted to account for the issue of left truncation caused by individuals who have retired prior to entry into the study.

[14] This is the analogous discrete time version to the continuous proportional hazard model and is particularly suitable given the relatively low probability of observing an episode of unretirement (Jenkins, 1997).

[15] One trade off in accounting for unobserved heterogeneity in a random effects framework is that survey weights cannot be accounted for in estimation.

[16] I restrict our sample to those individual who first retire between 50 and 75 and therefore assume the baseline hazard is zero for ages below 50.

[17] The method described in Cleves et al. (2002) is equivalent to assuming that individuals could not have unretired in the period between initial retirement and the first time I observe them in the study because if this is the case, then an individual would be in employment in 2002 and therefore not at risk (and would not be included in the stock sample). This potentially ignores the scenario that an individual unretired and subsequently transitioned back into retirement before the first wave of the study. This individual would contribute to the likelihood but only from the time he entered the study onwards (as he is at risk from this point onwards). I can (partially) investigate the extent to which unretirement took place between the year of retirement and the study period using the retrospective employment history data collected at wave 3 of survey. It turns out 12 individuals in our sample unretired in this period. However this itself may be an underestimate because the life history survey is only available for individuals who remained in the survey up to wave 3 and gave consent to take part in the additional retrospective life history survey. It also only contains information on jobs which were at least 6 months in duration.

I define the baseline hazard as a function of age and sort individuals into six groups: 51–55, 56–60, 61–65, 66–70, 71–75, 76–80 and 81–84. The reason for specifying a piecewise-constant specification is that it is only possible to identify the hazard of unretirement at a particular age if and only if an unretirement episode is observed in the data. Given the relatively low number of episodes observed in our sample additional grouping is required; which implies that the unretirement hazard is constant within each of the six groups. A fully non-parametric version of the model was estimated (for ages at which unretirement was observed) and showed a very similar trend to the piecewise-constant specification presented in Section 'Estimation results'. Therefore by grouping individuals into age bands I am not ignoring any specific changes occurring at particular ages in terms of duration dependence.

The exposition of the modelling strategy presented below draws heavily on Jenkins (1997), Jenkins (2004). The approach assumes a proportional hazard: this implies the hazard ratio is constant with respect to time. The starting values required for the estimation of the initial values of the vector of parameters βin the extended version of the model are taken from a version of the model which assumes a Gaussian error term.

The proportional hazard is defined as:

$$\lambda_{i,t} = \lambda_0(t)e^{[x'_{i,t}\beta + \log(v_i)]} \quad (1)$$

where $\lambda_0(t)$ is the baseline hazard, $x'_{i,t}$ is the value of individual's characteristics and β is the coefficient vector. Here v_i is a random variable which follows a gamma distribution such that $v_i \sim (1, \sigma^2)$. β_k describes the proportional (time invariant) effect on the hazard of a change in the corresponding covariate from zero to one.[18]

The discrete time hazard of unretirement in the j^{th} interval for an individual who has survived up to that point is given by:

$$h_j(X_{i,j}) = 1 - e\{-e^{[X'_{i,j}\beta + \tau_j]}\} \quad (2)$$

where:

$$\tau_j = \log \int_{f_{j-1}}^{f_j} \lambda_0(\tau)d\tau \quad (3)$$

where τ_j is the log of the difference between the integrated baseline hazard$\lambda_0(t)$ evaluated at the end of the interval $(f_{j-1}, f_j]$ and the beginning of the interval. This can be used to derive the discrete time interval hazard function (Jenkins, 2004 pp. 41). More precisely, τ_j highlights the pattern of duration dependence in the interval hazard. I specify a semi-parametric piecewise-constant baseline hazard to allow for flexibility in the hazard function (Jenkins, 1997).

Nicoletti and Rondinelli (2010) show that by allowing for unobserved heterogeneity and not assuming a parametric baseline hazard, this mitigates the effects of potential bias in the duration dependence and covariates. Moreover, such a specification provides better validation for the detection and true extent of unobserved heterogeneity relative to a tightly constrained parametric model (Dolton and Van der Klaauw, 1995). Ignoring this would lead to bias in the estimates of the duration dependence and time invariant covariates due to the so called 'weeding effect' i.e. those individuals who are less likely to unretire continue being observed in the data for longer. The null hypothesis 'H_0: No evidence of unobserved heterogeneity' cannot be rejected at conventional levels of significance. Therefore the estimation results presented in Section 'Estimation results' are based on the preferred specification controlling for unobserved heterogeneity.

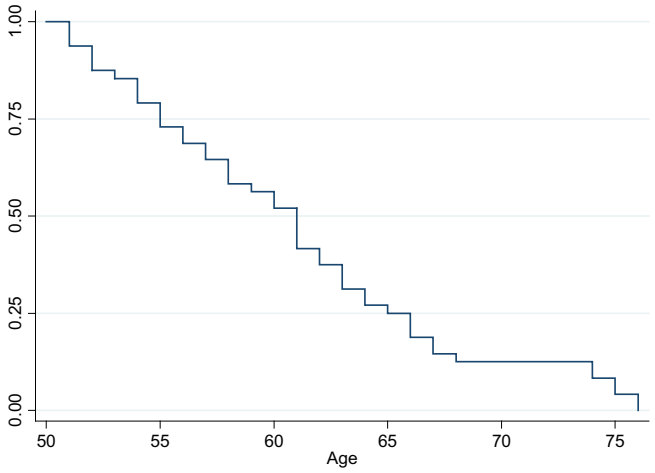

Fig. 1. Unretirement hazard curve.

Estimation results

Non-parametric retirement survival curves

Fig. 1 depicts the relationship between an individual's age and the hazard of unretirement, restricted to individuals who exhibit unretirement behaviour. The Kaplan–Meier plot has been adjusted to account for the fact that individuals can only exhibit unretirement behaviour once they entered the study.

Fig. 1 indicates three quarters of unretirement episodes occurred before SPA. The gradient of the hazard curve suggests the likelihood of unretirement is relatively constant between ages 50 and 67. Further analysis indicates the median age at which initial retirement took place amongst the sample of individuals who subsequently unretired was at 56 years of age, which suggests unretirees tend to retire early. The absence of preretirement expectations data means it is not possible to investigate whether unretirement is a planned event (as in Maestas, 2010); however it is possible to investigate which individual characteristics are important in raising the hazard of unretirement; this in turn has implications for future policies aimed to boost labour supply in retirement.

Discrete time hazard model

Table 2 describes the shape of the baseline hazard. The interpretation of the coefficient is defined as the effect of a unit change on the underlying (instantaneous) hazard of unretirement; the results in Table 2 indicate the hazard of unretirement is low; however the estimates are all statistically significant.[19] Moreover the pattern on the duration dummies in the piecewise constant specification implies the baseline hazard of unretirement rises with age and is highest for individuals in their late 60s after which point it generally declines. Table 2 also indicates the presence of unobserved heterogeneity and hence the importance of controlling for it when estimating the baseline hazard and covariate effects.

I separate covariates into two categories: economic and sociodemographic. Turning to the economic covariates first, Table 2 indicates that pension wealth does not have an effect on the hazard of unretirement. This suggests unretirement is unlikely to be due to credit constraints or sub-optimal retirement saving. This is consistent with a recent paper by Crawford and O'Dea (2014) who using administrative data linked to ELSA, show households born in the 1940s reach retirement with a level of wealth

[18] In the case where β_k is a dummy variable.

[19] The duration dummies are also highly statistically different from one another.

Table 2
Discrete time hazard model of unretirement: ELSA male sample.

	Hazard : $\exp(\beta)$	β	σ[a]
Age bands			
51–55	4.21e−06**	−12.37**	5.17
56–60	8.04e−06**	−11.73**	5.02
61–65	8.03e−06**	−11.73**	4.92
66–70	14.8e−05**	−11.12**	4.85
71–75	8.78e−06**	−11.64**	4.78
76–80	5.25e−05**	−9.85**	4.69
81–84	9.6e−05*	−9.25*	4.77
Economic controls			
Log value of pension wealth in 2002	1.49	.39	.387
Non-pen pension wealth in 2002: Bottom quintile	0.59	−.51	1.01
Non-pen pension wealth in 2002: 2^{nd} quintile	0.89	−.11	0.68
Non-pen pension wealth in 2002: 3^{rd} quintile	0.62	−.46	0.60
Non-pen pension wealth in 2002: 4^{th} quintile	1.09	.08	0.47
Socio-demographic controls			
Single	6.06*	1.80*	1.06
Married	1.22	0.20	0.88
Divorced	.68	−.38	1.45
Spouse in employment in 2002	10.45***	2.34***	0.49
Degree	5.16***	1.64	0.66
A-level	3.35**	1.20	0.58
GCSE or CSE	2.17	0.77	0.62
Poor or fair health in 2002	.279**	−1.27	0.62
Limiting illness in 2002	0.85	−.162	0.38
Pre-retirement occupation			
Professional/managerial	.504	−.68	0.70
Skilled non-manual/manual	.86	−.14	0.65
Opportunity to work past retirement age	.29*	−1.23*	0.72
Subjective controls			
Not enough income	2.61	.96	0.72
Financial planning horizon			
1< Medium<3 years	.83	−.18	0.56
Long: >5 years	1.58	.45	0.55
Test for individual specific unobserved heterogeneity		Implication:	
H_0: No evidence of individual specific unobserved heterogeneity		Reject H_0^{**}	
Person-year observations		13,331	
Number of unretirement episodes		48	

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Base categories excluded for estimation purposes: 5th quintile in non-pen pension wealth distribution in 2002; widowed; GCSE or below (including foreign qualification); semi-skilled or unskilled occupation; short-term financial planning horizon (<1 year); no intercept model (in order to estimate all duration groups).
[a] Standard errors refer to estimates corresponding to β.

which is in excess of the optimal amount (in a lifecycle sense) which is required to sustain their standard of living in and through retirement. Their result holds even after accounting for the large increase observed in the value of housing wealth over the past 30 years in England.

Table 2 indicates individuals who self-reported having poorer health were significantly less likely to unretire. The magnitude of the effect was large; conditional on other controls the hazard of unretirement for an individual with fair or poor health was 72 per cent lower than that of a person who reported good, very good or excellent health. Jones et al. (2010) using the British Household Panel Survey show a deterioration in health significantly raises the hazard of early retirement. The results in Table 2 support the view that in addition to health playing an important role in affecting initial entry into retirement; it also affects the likelihood of post retirement labour supply.

Table 2 shows the hazard of unretirement was 416 per cent higher amongst individuals with a degree and 235 per cent for those with an A-level, relative to individuals whose highest level of educational attainment is an O or CSE-level qualification. Further investigation showed 65 per cent of the unretired sample were educated to at least an A-level standard, which suggests the individuals who unretired.in the sample were relatively well educated given their age cohort.

Household level information relating to baseline spousal employment status indicates having a spouse in employment raises the hazard of unretirement more than ninefold. The magnitude of this effect is twice that of having a degree. Existing research has highlighted the importance of joint complementarities in leisure in determining labour force participation (Banks et al., 2005; Cribb et al., 2014). The results in Table 2 suggest such forces extend into retirement and are also important in affecting unretirement behaviour. Of course joint complementarities in leisure can only exist if a partner is present. Table 2 also shows that (conditional on other characteristics) relative to a widowed male an individual who has always been single is significantly more likely to unretire; this could be capturing differences in the age composition of these groups or lifestyle/social choices.[20]

I also control for subjective measures relating to an individual's financial planning horizon and separately whether individuals felt they did not have enough income. None of these were statistically significant, suggesting that if we are to believe financial planning is a proxy for financial literacy then unretirement is not correlated with such aspects of individual behaviour. Intuitively those

[20] Indeed the mean age at wave 1 amongst individuals who reported themselves as widowers is 3 years older than those who are single.

individuals who were given the opportunity to work past retirement age prior to retirement were 79 per cent less likely to unretire relative to those who were not. Inspection of the data revealed that the median age of initial retirement for those who were given the opportunity to work past retirement age was 3 years higher than those who were not.[21]

Test for attrition bias I test for attrition bias using a variable addition test first proposed by Nijman and Verbeek (1992). This is carried out by including a covariate in the information set which corresponds to the number of survey waves an individual responds to. Statistical significance of this covariate would indicate evidence of non-random attrition. I find no evidence of this particular type of attrition bias and the coefficient estimates (not reported) changed only marginally relative to those reported in Table 2 below.

Characteristics of unretirement jobs

At each wave of ELSA respondents are asked to give details about their employment (conditional on reporting being in employment) such as occupation, number of hours worked per week and also their annual employment income. Analysing this information based on our unretired sample indicates that an unretirement job is largely standing or sedentary in nature, few individuals engage in post-retirement employment which involves a physical aspect.[22]

The intensity of work effort is important if we are to understand the lifestyle and economic impact of unretirement jobs. The estimates show the unretirement jobs typically entail an individual working 12 h per week and earning a pre-tax weekly income of £128.16 (2007 prices).[23] Maestas (2010) finds a similar result in that unretirement jobs are similar to partial retirement jobs in terms of hours worked and amount earned, however it is worth noting the prevalence of partial retirement is much lower in England than it is in the US (Banks and Smith, 2006).

Another way to assess the importance of an unretirement job is by comparing it to an individual's main job prior to retirement. I use retrospective employment history data collected at wave 3 of ELSA. The median (pre-tax) salary earned by an unretiree was £40,000 (2007 prices) in their main job prior to retirement. Therefore, an unretirement job replaces 16.6 per cent of pre-tax preretirement annual labour market income. This is a non-trivial amount. A recent report by the Pensions Policy Institute (2013) showed state pension (social security) income in the UK replaced around 17.6 per cent of median earnings in 2013. Indeed, the weekly state pension in the financial calendar year April 2014-April 2015 for a single individual is £113.10 (DWP, 2015). A report by the DWP (2011) highlighted 18 per cent of single pensioners rely solely on state pension and benefit income as sources of income in retirement, therefore it is clear that an unretirement job has the ability to provide an important source of additional income.

The estimate of the preretirement median salary income amongst the unretired sample highlights that these individuals were unlikely to be concentrated in jobs in the lower end of the income distribution. For example, median earnings amongst UK male full time workers in 2007 were £26,300 (ONS, 2007). This is only two thirds of the salary earned in the main preretirement career job for the sample of unretirees. This is consistent with the conclusions drawn from Table 2 which implied that characteristics correlated with unretirement suggest such behaviour is a lifestyle choice and not a consequence of sub-optimal saving for retirement.

Voluntary work

Voluntary work is another important aspect of retirement. Individuals may choose to spend part of their time in the voluntary sector in order to feel they are contributing to society or perhaps to give an individual the opportunity to establish social networks (Okun, 1994; Griffin and Hesketh, 2008).

The ELSA survey asks individuals about the frequency at which they carry out voluntary work. At wave 1 26 per cent of the sample undertake voluntary work at least twice a month. This is in line with a recent report by a national voluntary organisation nfp Synergy, who using data from the UK Citizenship Survey estimate 30 per cent of individuals aged between 50 and 65 did informal or formal volunteering at least once a month (Saxton, 2011).[24] Therefore whilst the prevalence of unretirement in England is relatively low compared to the US, this does not imply retired English men withdraw from the labour market completely.

Conclusion and policy implications

The main focus of this study has been to establish the prevalence of unretirement amongst a sample of initially retired English men, and understand how such behaviour varies with an individual's age and their economic and sociodemographic characteristics. The results suggest the hazard of unretirement is highest for individuals in their mid-late 60's and that unretirement is a type of behaviour more likely to be exhibited by individuals who retired relatively early. The analysis suggests unretirement is not in general a response to sub-optimal retirement saving, but instead likely to be a lifestyle choice. This finding is in line with other studies investigating such behaviour in advanced economies (Maestas, 2010; Pettersson, 2011; Larsen and Pedersen, 2013).

This paper contributes to a scare and important literature concerned with labour supply behaviour post retirement. I am aware of no other studies that have investigated unretirement in the context of England. The findings are of relevance to policymakers who wish to minimise the detrimental effects of an ageing population. Indeed, central governments have committed substantial resources to develop or amend policies which aim to address this issue. The UK government is no exception; various significant reforms have been introduced in the past decade. These include changes to the age at which individuals can access their occupational pension and the extent to which they can consume from such savings.[25,26] There has also been a shift to focus on retirement saving through the introduction of auto-enrolment in 2012. The idea is that individuals are automatically enrolled into a workplace pension. Other measures have focused on changing the UK social security system. This includes an overhaul of the existing two-tier system to a single tier system set to roll out in 2016, in addition to planned increases in the age at which individuals are eligible to first claim their state pension. Finally, the generosity of state pension deferral which is currently in

[21] The routing of this question is such that it is asked of all individuals who were retired because they reached retirement age and were not made redundant.

[22] It is worth keeping in mind that the analysis in this section is derived from information provided by the 48 sample respondents who exhibited unretirement behaviour.

[23] Pension income is taxable therefore by engaging in paid employment implies individuals will be making some contribution to fiscal revenues. The total amount of additional tax contributions made depends on other sources of income in retirement such as occupational and private pension, annuity and property income.

[24] Estimates were obtained using data from the Citizenship Survey, National Statistics April-September 2010. Sample size: 10,000 individuals with minimum participation age of 16.

[25] In order to reduce the incidence of early retirement observed in the 1990s the Pensions Green Paper 2002 proposed a rise in the age at which an individual could claim their occupational pension from 50 to 55 by 2010 (Blundell et al., 2002; Thurley, 2011).

[26] As of April 2015 individuals are free to consume their pension pots as they wish instead of purchasing an annuity.

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excess of 10 per cent per annum is being slashed from April 2016 by one-half. These measures have been introduced with two core aims in mind: To extend the working lives of citizens and/or reduce the burden of increasing life expectancy on the state.

The policies outlined above are all generally aimed at cohorts who are still of working age and have yet to reach retirement. This is intuitive given the long term nature of pensions and the effects of lifecycle labour supply on the standard of living in retirement (Bozio et al., 2010; Bozio et al., 2011; Crawford and O'Dea, 2014). However the most recent Census highlighted that 1 in 6 individuals living in the UK in 2011 is aged over 65. This paper has shown that unretirement is another potential route policymakers can explore in order to extend working lives. Unretirement also addresses the key issue of boosting income in retirement and reducing pensioner poverty. The estimates indicate the weekly income an individual can earn from an unretirement job is greater than that received from a full state pension.

The results show unretirement behaviour in England is not concentrated amongst individuals who were in low paying jobs prior to retirement. In fact prior to retirement, unretirees earned one third more than male median earnings in 2007. It is likely these individuals had a strong attachment to the labour force prior to retirement. This is also supported by the fact that (given the cohort) their spouse is still in the labour market. If these characteristics are linked to how an individual evaluates his leisure, then unretirement is consistent with a theoretical framework where individuals are maximising their utility.

Looking ahead, it is likely that future cohorts of individuals entering retirement will be in better health, be more highly educated and have a spouse in the labour market. The findings from this paper imply that Ceteris paribus this should increase the prevalence of unretirement in the future. However, other changes in legislation relating to increases in the statutory retirement age, improvements in age discrimination legislation and permitting flexible working hours at older ages mean individuals may delay initial entry to retirement. However, what is inevitable is that life expectancy will continue to rise and retirement policies must be designed to facilitate labour supply paths at older ages.

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Appendix A. Data and sample construction: The English Longitudinal Study of Ageing

The data utilised in this paper is drawn from the English Longitudinal Study of Ageing (ELSA). ELSA is a biennial longitudinal survey which is representative of the English household population aged 50 and over. The first wave of data was collected between April 2002 and March 2003, and was drawn from multiple samples (1998, 1999 and 2001) of the Health Survey for England (HSE). HSE is a study conducted on behalf of the Department of Health by the Department of Epidemiology and Public Health, UCL and the National Centre for Social Research. The wave 1 sample consisted of 12,099 individuals of whom 11,391 were core sample members, these comprised of 7,894 benefit units (i.e. an individual or couple with dependents). Due to non-response and sample attrition refreshment samples of individuals aged between 50 and 74 were

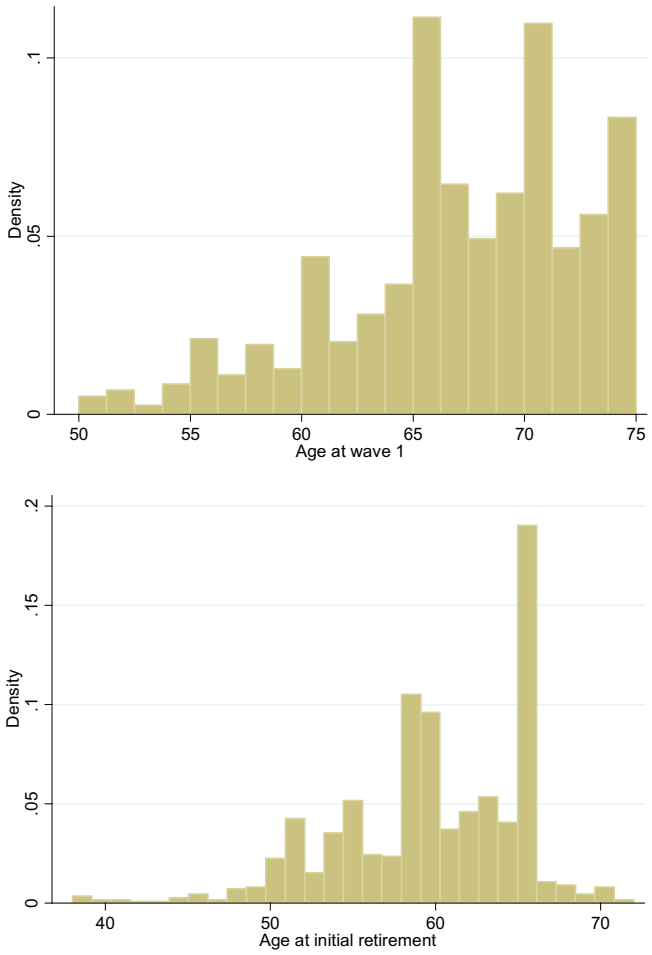

Fig. A1. Age at wave 1 and retirement age distributions.

Table 3
Descriptive statistics: ELSA male sample.

Variable	Obs (N).	Mean proportion
Economic variables		
Log present value of pension income	941	11.9
Bottom non-pension net financial wealth quintile	941	0.105
2^{nd} non-pension net financial wealth quintile	941	0.14
3^{rd} non-pension net financial wealth quintile	941	0.19
4^{th} non-pension net financial wealth quintile	941	0.24
Top non-pension net financial wealth	941	0.325
Sociodemographic variables		
Age	941	67
Married	941	0.79
Single	941	0.07
Divorced/separated	941	0.07
Widowed	941	0.07
Spouse in employment	941	0.125
Whether has a limiting illness	941	0.59
Whether holds a degree	941	0.18
Whether holds an A-level or above	941	0.19
Whether holds an O-level or CSE	941	0.23
Opportunity to work past retirement age	941	0.12
Whether respondent feels they do not have enough income	941	0.07
<1 year (short term) financial planning horizon	941	0.30
3–5 years (medium term) financial planning horizon	941	0.40
5+ years (long term) financial planning horizon	941	0.30
Self reported social class: professional/managerial	941	0.46
Self reported social class: skilled non-manual/ skilled manual	941	0.40
Self reported social class: semi-skilled or unskilled	941	0.14

Table 4
Coding definitions used in estimation of discrete time hazard model.

Variable	Definition
Single	1 if true, zero otherwise
Married	1 if true, zero otherwise
Divorced/separated	1 if true, zero otherwise
Spouse in employment	1 if true, zero otherwise
Whether has private health insurance	1 if true, zero otherwise
Whether has a limiting illness	1 if true, zero otherwise
Highest qualification: Degree	1 if true, zero otherwise
Highest qualification: A-level (but below degree)	1 if true, zero otherwise
Highest qualification: O-level/CSE	1 if true, zero otherwise
Highest qualification: Below O-level/CSE qualification	1 if true, zero otherwise
Log pension wealth at wave 1 interview	log(*pension wealth*)
2nd non-pension net financial wealth	1 if true, zero otherwise
3rd non-pension net financial wealth	1 if true, zero otherwise
4th non-pension net financial wealth	1 if true, zero otherwise
4th non-pension net financial wealth (base group)	1 if true, zero otherwise
Opportunity to work past retirement age	1 if true, zero otherwise
Whether respondent feels they do not have enough income	1 if true, zero otherwise
1 day– 3 months (short term) financial planning horizon (base group)	1 if true, zero otherwise
1–3 years (medium term) financial planning horizon	1 if true, zero otherwise
5+ years (long term) financial planning horizon	1 if true, zero otherwise
Self reported social class: professional/managerial	1 if true, zero otherwise
Self reported social class: skilled non manual/manual	1 if true, zero otherwise
Self reported social class: non skilled/foreign qualification (base group)	1 if true, zero otherwise

introduced to the main survey at wave 3 (2006/7), wave 4 (2008/9) and wave 6 (2012/3). I do not make use of the refreshment sample given the stock sampling approach used in this paper. At the time of writing there were six waves of ELSA available (in addition there is also a wave 0 file however this contains limited economic and sociodemographic information).

ELSA collects a variety of information relating to an individual's circumstances at the time of survey. This ranges from detailed information regarding income, assets, employment, pensions and also information relating to an individual's health status and medical conditions. Finally there is also a module relating to future (subjective) expectations of paid work, health and life expectancy. However, the routing of the questionnaire means I do not have data on retirement expectations for the stock sample of interest.

For the purpose of this paper it is the age at which unretirement takes place which is of central importance. This is determined from the following variables which are collected at wave 1 of ELSA:

1. Year of birth.
2. Age at wave 1 interview.
3. Calender month and year of retirement.
4. Calender month and year individual took up employment.
5. Calender month and year of wave 1 interview.

The difference between 4. and 3. denotes the period between retiring and going back to work (if unretirement takes place). Otherwise the difference between an individual's age at the most recent wave of observation and the age of retirement defines the period spent in retirement. This is then combined with the age at initial retirement. One remaining issue is to deal the fact that individuals become 'at risk' prior to observation in the study, in order to ensure the estimates are not biased I follow Cleves et al., 2002 and drop all periods between initial retirement and the first time an individual is observed in the study (using 3. and 5. above).[27] I round this number to the nearest whole integer to facilitate estimation of the discrete time hazard model.

I make use of the pension wealth variable constructed by the IFS provided in the pension wealth variable dataset which accompanies each release of the ELSA dataset. The exact measure is defined as the (log) of the sum of variables 'pripenw1_2002' and 'state penw1_2002'.[28] For individual's aged above SPA this is the sum of the net present value of private and public pension income. Therefore it does not include pension income which has been deferred; however it is unlikely a large proportion of the sample defers their pension or at least their state pension (Coleman et al., 2008).For individuals aged below SPA their total pension wealth is calculated using the information they have provided relating to the worth of their pension pot(s) and the type(s) of pension scheme(s) they are a member of. It is assumed that these individuals do not make any further additional contributions to their pensions.

Finally it worth noting the use of the Financial Derived Variables (FDV) dataset released with each wave of ELSA. Specifically I use a measure of total non-pension household wealth (by quintile) derived by the IFS. Total non-pension financial wealth is the sum of total net housing wealth and total net non-housing wealth, this then gives a distribution across all benefits units (weighted to include sample members only and unequivalised) in a given calendar year.

A.1. Sample characteristics

The final sample is comprised of 941 individuals for whom there is complete information suitable for estimation purposes. Covariates used in Table 2 correspond to information reported by respondents at their wave 1 interview (2002/2003). Table 3 summarises their average characteristics:

Appendix B. Coding of variables used in discrete time hazard model

Table 4 describes how each of the covariates in the information set is coded for estimation purposes.

[27] To ensure the baseline hazard is specified as a function of age, using the language of Jenkins, 2008 the sequence variable is adjusted to account for an individual's age when they first entered the study.

[28] Various assumptions are made regarding the annuity and discount rate see Table 2 in Banks et al., 2005.

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