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Unretirement in England: An empirical perspective.

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Abstract

Ageing populations place an increasing financial burden on governments. Retired older workers are a source of untapped economic capacity. Maestas (2010) finds 26% of Health and Retirement Study (HRS) sample respondent's 'unretire'. We estimate an unretirement rate of 5.11% and 2.70% for women using The English Longitudinal Study of Ageing (ELSA). Earlier studies using US longitudinal data include Rust (1980), Gustman and Steinmeier (1984) and Hardy (1990) estimate similar rates. Results suggest: age, education, financial planning, unanticipated increases in debt, spouse and time effects play an important role in the decision for a male to unretire.

JEL classification: J26.

Keywords: ELSA, Labour supply, Labour demand, Unretirement.

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1 Introduction.

An ageing population is a common characteristic amongst advanced economies around the world. The fact that individuals are living longer has been placing an increasing pressure on central government's resources, and in particular the Social Security system. In view of this, governments such as the UK, Germany and France have increased the Normal State Retirement Age (NSRA).

The UK coalition government has increased the age at which individuals are eligible to claim state pension, by April 2020 men and women will be eligible for state pension if they are aged 66. In addition they have abolished the compulsory retirement age which was set at age 65 for both men and women.

Retirement has traditionally marked the cessation of an individual's attachment to the labour force, and the beginning of a period in which to pursue leisurely activities. However over the past thirty years individuals have changed their labour market behaviour as they approach NSRA. A significant portion of potential retirees in the US tend to move from their career occupation to part time or 'bridge' job (see for example Honig and Hanoch (1985), Ruhm (1990) and Blau (1994)). The latter two of these studies use the Social Security Administration Retirement History Longitudinal Survey (RHLS) and find individuals actually move from retirement back in to employment, that is to say they unretire.[1] This suggests that non-traditional retirement paths have been around for at least 40 years in the US; and apply to a significant proportion of retirees in the US.

Maestas (2010) using a sample from the US HRS shows that more than one quarter (26%) of sample respondents tend to exhibit unretirement behaviour.[2] Congdon-Hohman (2009) using the HRS finds similar results to Maestas (2010) however the main focus of the former paper is the role of private health insurance and similar to this paper uses duration analysis to model unretirement. In addition Maestas finds that of the sample that unretired, eighty percent expected to work after retirement.[3] Maestas finds that for her sample individuals main motivation to unretire is that retirement does not meet their a priori expectations, and the role of financial shocks or inadequate financial planning play a smaller effect. Schlosser Zinni & Armstrong-Stassen (2012) consider the case for unretirement for a cross section of Canadian retirees. Their main results

[1] Both studies reported an identical unretirement rate of 25%. These longitudinal studies followed a random sample of men and unmarried women aged between 58 and 63 at the baseline interview in 1969, with respondents re-interviewed biennially up to and including 1979.

[2] This figure increases to 35% if analysis is restricted to those individuals who first reported being retired at age 53 or 54.

[3] Maestas (2010) specifies a pre/post retirement multinomial logit for alternative retirement paths and supplements her model with expectations data. Benítex-Silva and Dwyer (2003) formally test whether the rational expectations hypothesis hold in the HRS sample, and conclude that on average individuals do exhibit rationality, in particular with respect to forming retirement expectation. Their findings are similar to those found by Mastrogiacomo (2003), who uses non parametric methods to focus on the discrepancies between expectations and realisations for the case of the Netherlands. Mastrogiacomo (2002, 2003) finds similar results to Maestas (2010) for the case of Italy.

indicate that retirees unretire if they experience a negative financial shock, wish to upgrade their skills or miss aspects of their former job.[4] These findings are very similar to Maestas (2010) and also to our own findings.

Cahill, Giandrea & Quinn (2010) also use the HRS to analyse unretirement rates for those who in their baseline interview were in full time career jobs, and find that 15% of their sample exhibit an episode of unretirement.[5] However lower rates of male unretirement for the US have been reported in retirement studies conducted in the 1980's i.e. cohorts born between 1920-1930. Gustman and Steinmeier (1984) using the Retirement History Survey (RHS) report re-entry rates for older workers in order of 16.6%.[6] Another study by Gustman and Steinmeier (1984) using the (RHS) reported unretirement rates of 14.2%.[7] Berkovec and Stern (1991) using the National Longitudinal Survey (NSL) report re-entry rates ranging from 6.3 to 13.2% depending on age of first retirement. Hardy, Hayward & Liu (1994) using the NLS restrict attention to those who aged 55 and over when they first retire, and report an unretirement rate of 10.69%.[8] Hardy (1991) using a sample of nationally representative older workers in the US state of Florida, observes labour force re-entry rates of 6.89%.[9] Hardy (1991) finds that 11.7% of 'unretirees' stated they initially retired involuntarily. A common finding amongst the studies from the US is that younger retirees are more likely to unretire, and we too observe a similar observation in our analysis. The notion of unretirement has been highlighted in previous studies (Rust (1980), Gustman and Steinmeier (1984), Berkovec and Stern (1991), Blau (1994, 2011) and Rust and Phelan (1997)), however until recently was deemed relatively uncommon (Rust and Phelan, 1997).[10]

Peterrsson (2011) using Swedish register data models unretirement in a static framework (similar method to Cahill et al. (2010)) and finds unretirement rates similar to ours. Moreover Peterrsson's findings suggest that the drivers of unretirement for Swedish unretirees are similar to those in England. Another recent European study of unretirement is Larsen and Pederson (2012)

[4] Park (2011) reports similar results for Canada.

[5] Both studies use the same baseline (HRS respondents aged 51-61 in their first interview) Maestas (2010) includes all individuals who are observed working part time and full time. In addition she specifies a sample observation period between 1992 and 2002 (6 waves), whilst Cahill et al use a panel spanning 1992-2008 (9 waves).

[6] Ruhm (1990) notes the significant difference between his results and that of Gustman and Steinmeier (1984) who also use the RHLS. Ruhm (1990) concludes the discrepancy between their results (the first study reports unretirement rates of 24.9%, whilst the latter reports unretirement rates of 16.6%) is due to the time window of observation. Gustman and Steinmeier (1984) only use one and two year windows to observe re-entry, whereas Ruhm (1990) uses a ten year window and therefore increases the probability in observing an episode of unretirement.

[7] The reason for the discrepancy is due to Gustman and Steinmeier (1984) using all six waves of the data (1969-1979), whilst the latter study Gustman and Steinmeier uses only the first four waves of the data (1969-1975).

[8] Hayward et al define 'exposure intervals' which relates to labour force experiences for an individual for a single year, with a full set of accompanying covariates. The authors observe 6263 intervals and observe 670 episodes of unretirement.

[9] Hardy (1991) sample consisted of 2103 respondents of which 145 unretired.

[10] For a theoretical exposition of unretirement see Cremar et al (2011).

who make use of a large scale Danish panel dataset, and model unretirement using a static framework. Their results indicate unretirement jobs are more common amongst: younger retirees, men, and those who moreeducated. Their findings indicate macroeconomic factors such as the unemployment rate prior to unretirement have no clear systematic impact on the probability of paid work in retirement.[11] We are not aware of studies that analyse unretirement formally for the case of England, moreover we not aware of any studies which analyse unretirement for those who are initially in retirement.[12] In view of this we hope the evidence presented here, can go some way in analysing some aspects of retirement behaviour of British retirees. Given the cohort under analysis we focus only on a balanced sample of men who self report being in retirement in wave 1.[13]

The rest of this chapter is set out as follows: Section 2 contains detailed information regarding the datasets we have used, in particular ELSA. In addition we present a trend analysis of unretirement rates amongst older workers in the UK, Europe and the US. Section 3 presents our estimation results using a range of dynamic econometric frameworks to model the unretirement decision, and includes tests to check the robustness of our estimates.[14] Section 4 looks at typical characteristics of unretirement jobs. Section 5 concludes.

2 Data.

2.1 Sample and ELSA.

The sample used in this study is drawn from the English Longitudinal Study of Ageing (ELSA), a longitudinal study aimed to investigate ageing in the UK.[15]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 is 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 between 50 and 75 in their first interview. We use the first four

[11]Their study uses a probit model, whereby an individual is defined as unretired if they report earnings of more than €3400 per annum post retirement.

[12]Early work regarding the British retirement experience, which mentions unretirement can be found in Parker (1980), 11% of his sample respondents indicated they would consider looking for work in the future. This is despite the fact that at the time prohibitively high taper rates existed on earnings after reaching state retirement age and claiming a state pension, this has now been concequently abolished for more information see Bozio et al. (2010). Individuals were also asked to cite the main reasons about what they would miss most about work (prior to retirement), 78% of men (aged over 65) responded it would be because of not feeling useful anymore. Interestingly of the entire sample (N=960), 24% of men and women did not look forward to retirement.

[13]Estimation results for unbalanced panels were similar those presented below. Details are available on request.

[14]We also use static econometric frameworks to model unretirement, these are available on request.

[15]We do not include additional booster samples which were made available at specific waves.

waves of data of data; the sample period is 2001-2008. In addition we restrict attention to those individuals who are aged between 50 and 74 in their wave 1 interview, moreover individuals must be in either employment, partial retirement or retirement.[16] [17] Sample respondents are interviewed every two years with nurse visits at wave 2 and 4 (2004 and 2008), and a one off life history module at wave 3 (2006). Appendix 1 details information regarding sample construction. The achieved sample size for our sample of balanced panel men across the four waves was 2025; similarly the figure for women was 2167.[18]

2.2 Definition of unretirement.

We define unretirement as a transition from retirement back into employment (at any level). We do so by tracking wave by wave transitions in the self reported labour force status and cross check these with number of hours reported in paid work. This is seen more clearly in table 1 below. In the following subsections we give detailed information on what we characterise as unretirement behaviour.

2.2.1 Self-reported labour force status.

It is difficult to characterise retirement for example it could be defined as the cessation from the labour force i.e. paid work. As we will see it is important to make the distinction from paid work and voluntary work, the latter of which is typical during retirement.[19] An alternative definition could be based on the number of hours reported working in paid employment, or if an individual is in receipt of a pension. What is important for these definitions is the opportunity set available to the individual in a particular economic state. We use a definition of retirement based on reported labour force status, in addition we cross check this with the number of hours reported working in paid employment.[20] [21] We classify individuals as being in employment if they report working strictly positive hours per week. We reclassify individuals who report being retired in wave 1 but actually report working positive hours. There is also a partial

[16] We use the employed and partial retirement groups when estimating pre/post retirement multinomial logit models. However due to sample sizes these are not reported in this paper.

[17] Despite there existing an additional wave of data known as wave 0, from which the original ELSA sample were constructed this wave of data has little socioeconomic data compared to wave 1 onwards.

[18] We choose not to use an unbalanced panel setup (unlike Maestas (2010)). This is to ensure that we have complete information at every wave and to ensure the variables we construct can be interpreted correctly.

[19] We find that approximately one fifth of our retired sample engage in voluntary work at least twice a month.

[20] Survey respondents were asked their Labour Force Status (LFS) in each wave of ELSA. Respondent's are asked 'Which one of these, would you say best describes your current situation?'. Interviewers are only allowed to code one response from the following categories: Retired, Employed, Self-employed, Unemployed, Permanently sick or disabled, Looking after home or family, Other (specify, SPONTANEOUS: Semi-retired).

[21] We also compute unretirement rates using only the LFS response without reclassifying individuals conditional on their reported number of hours of work. We find unretirement rates very similar those reported above.

retirement category, we cross check partial retirees with their number of hours worked per week and ensure their reported hours are strictly less than 16 hours, otherwise they are reclassified accordingly. The Office for National Statistics use the cut off level of 16 hours a week to distinguish between part and full time. We can think of partial retirement as being more akin to part time work rather than full time work. Similar to the ELSA sample we compute unretirement rates using BHPS, UKLFS, US HRS and EU SHARE data based on an individual's LFS.

2.3 Unretirement rates.

2.3.1 ELSA.

Self reported labour status definition. We estimate an unretirement rate in the order of 5.11% for sample of balanced panel men, using an identical method we compute an unretirement rate for the Health and Retirement Study (HRS), we estimate an unretirement rate of 22.09%. Clearly unretirement is a more common phenomenon in the US, relative to the UK at present. However the rates reported for the UK rates are similar to those documented in the US using the Retirement and Health Survey (RHS) from the 1970's and 1980's (see for example Rust (1987), Diamond and Hausman (1984), Gustman and Steinmeier (1984,1986). A similar observation is made for the case of the balanced panel sample of women. The ELSA data reports an unretirement rate of 2.70%, whilst in the case of the US using the HRS data; we find an unretirement rate of 16.08%. Unfortunately the papers aforementioned only studied reverse flows for men; as such no comparison can be made in the female case.

Given that the ELSA is a biennial study then it is possible for individuals to exhibit short-term unretirement between surveys. We cross tabulate self reported economic status and find that there are 25 individuals in our sample who over the course of four waves, report being retired in the prior and post wave, and also report doing paid work. By definition these individuals exhibit unretirement behaviour (albeit relatively short term). If we were to include them in our unretirement rate then in the case of the balanced panel of men, the ELSA unretirement rate would increase from 5.11% to 6.36%. The corresponding number of incidences for the balanced panel women is also 25, and consequently the unretirement rate increases from 2.70% to 3.86% over the sample period. Maestas (2010) computes a similar statistic for her sample observations using the HRS, and finds her unretirement rates increase by around 5% (from 26% to 31%).

Hours based definition. Similar to Maestas (2010) we also report unretirement rates based on number of hours reported in full time work. To ensure we compute accurate estimates we cross check number of hours reported with the self reported labour force status at each subsequent wave.[22] This is to ensure

[22] Maestas (2010) follows a similar method. Both the self reported and hours based definition may underestimate the rate of unretirement reported because people may return to work, but

that we do not include unemployed individuals in our estimates. For our sample of balanced panel men we find an unretirement rate of 3.062%.[23] This is substantially lower than our definition using self reported labour force status, however one should note that under the hours based definition we do not include individuals who move from semi retirement to full time work. Therefore we would expect the rate to be lower. In addition we model the unretirement decision under the self reported and hours based definition using a static framework similar to Peterrsson (2011) and Cahill et al. (2010), and find the covariates we include in the information set produce similar results, in light of this we choose to present the rest of our analysis based on self-reported labour force status.[24]

2.3.2 Retirement path choice.

Table 1 give an overview of the most common paths of retirement including those which feature unretirement.[25] The table below is an illustration for the balanced panel, where we observe individuals for all five waves or approximately ten years after their baseline interview. The first set of paths may be considered 'traditional' in the sense that they characterise retirement as an absorbing state, whilst the latter feature episodes of unretirement.

Table 1: Retirement paths for a sample of balanced panel individuals.

Wave 1	Wave 2	Wave 3	Wave 4
	Retirement paths which do not feature unretirement		
Employed→	Employed→	Partially retired→	Retired
Retired→	Retired→	Retired→	Retired
Employed→	Employed→	Looking after partner→	Looking after partner
	Retirement paths which feature unretirement		
Employed→	Employed→	Retired→	Employed
Retired→	Retired→	Employed→	Employed

Involuntary retirement. In the UK retirement legislation (up until April 2011) allowed employers to force employees to retire once they reach the age of 65.[26] Therefore an individual who wanted to continue to work past the State Retirement Age (SRA) against the will of their employer, would have to unretire by law. Despite this no longer being the case the latest ELSA data in our sample

in doing increase the probability of not responding.

[23] We find 62 individuals reporting positive working hours, whilst in the immediate prior wave self reporting being in retirement.

[24] Estimation results are available on request. In order to check the consistency of our definitions of unretirement we compare how many individuals who we classify as unretired using the hours and self reported only definition are also classified as being unretired using the self reported labour force status only definition. We find that 56% of individuals who are classified as being unretired under the hours and self reported definition are also defined as being unretired using the self reported labour force status only.

[25] Employed encompasses both part-time and full-time employed. Also note, Retirement paths are mutually exclusive.

[26] This law held for both men and women, despite their default state retirement age differing.

period only covers the period up until 2009. ELSA respondents were asked their main reason for taking retirement, and separately another question asking them their main reason for taking early retirement. Additional questions were asked to ELSA respondents to give the reason for retirement (not the main reason, i.e. 2nd and 3rd mention). More than one response was allowed to be recorded. Of these responses was 'made redundant/dismissed/had no choice', however less than 3% in total i.e. using all observations in wave 1 (which comprised of 11,050 individuals) specified this as their main reason for retirement. Taking the sample of balanced panel men we constructed as an example, we find that the proportion of the sample which stated involuntary retirement as their main reason for retirement in wave 1 was 1.09%.[27] If we look at the sample of balanced panel men who unretired over the sample period, we find that not a single individual who gave their main reason for entering retirement as involuntarily, went on to unretire. The reason cited most frequently at each wave was that individuals transition into (early) retirement was that they reached retirement age, or they were offered reasonable financial terms.

Linearity in the budget set. Current retirement legislation in the UK means that an individual is eligible to claim their State Pension once they reach normal state pension age, which was until recently 65 for men and 60 for women. The current political coalition government has scrapped the default retirement age to encourage people to work longer and reduce the preconception that reaching state retirement age means that an individual should choose to leave the labour market completely. Flexible working practices mean that an individual can choose to claim their pension and also continue working, they may also defer their pension for a later date and in return receive a considerable rate of return. In terms of the budget set, an individual who unretires does not face any extra barriers in terms of increased a marginal tax or taper rate, in this sense there is an absence of nonlinearities in the budget set.[28]

2.4 Expectations regarding paid work.

At each interview individuals are asked whether they expect to engage with paid work in the next ten years, therefore to get some idea if unretirement is anticipated we tabulate the expectation reported for balanced panel men who

[27] 22 out of a possible 2025 individuals in our sample.

[28] This has not always been the case. 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. Even if they worked less than this threshold, and earned above a certain higher limit (similar to the Higher Earnings Limit), their state pension was reduced accordingly. Between 1948-1958 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).

report being in retirement. We find that the majority of respodents answer not applicable, or that they have a zero expectation of working in the next ten years. Conditional on reporting a positive expectation individuals tended to report a 10%, 25% 50% or 100% chance of return to work post retirement. We can also cross tabulate these with those individuals who subsequently unretired, we find some evidence that unretirement is an anticipated event- those individuals who were in retirement in wave 1 who felt they expected to unretire did so.

Duration in retirement before moving back into employment. The ELSA questionnaire asks individuals to report the age they entered retirement, and also the year and month they entered paid employment. Using this information it is possible to determine the length of time the individual was in the state of retirement before they moved back into employment. In a latter part of this chapter we formally use this information to estimate a range of duration models. Note that Maestas (2010) reports unretirement estimates as a proportion of the sample over 6 years, i.e. unretirement could be at any time.[29] She also estimates Kaplin-Maeier survival curves and finds there is a spike in the probability of unretirement in the first 2 years following initial retirement. We believe thinking about unretirement in a duration framework is important if we wish to establish whether the decision to unretire is made immediate following initial retirement, or otherwise. More formally, we wish to investigate how quickly individuals reoptimise their behaviour. Duration analysis therefore goes beyond what we can infer from static sequential estimates in terms of when an individual becomes 'at risk'. Figure 1 indicates a significant majority of our sample who unretired returned to work within 6 years of initial retirement.[30] A priori we would expect individuals to return to work relatively quickly if they found retirement less enjoyable than anticipated. Human capital theory would suggest a swift return to work given that an individual's stock of skills depreciates the longer they stay in retirement.

2.5 Other longitudinal Datasets.

Following a similar strategy we implemented to construct our sample data using ELSA we estimate unretirement rates using a range of longitudinal datasets from the UK, Europe and US:

[29] Maestas (2010), pp.6 footnote 6.

[30] There is a problem of missing information because not all individuals who unretired reported their month and year of return to work. In the case of our balanced panel sample of men of the 103 individuals who unretired, only 66 reported a return date and year to work.

Table 1.			
Sample	Sample (N)	# Episodes (E)	% Rate (E/N)
BHPS ('99-'07)			
Balanced panel men	1314	66	5.022
BHPS ('91-'08)			
Balanced panel men	481	100	20.79
Understanding Society ('09-'10)			
Balanced panel men	1728	40	2.31
SHARE ('04-'06)			
Balanced panel men	1706	24	1.39
SHARELIFE ('04-'08)			
Balanced panel men	505	30	5.85
US HRS ('00-'08)			
Balanced panel men	2082	648	31.12
US HRS ('92-'08)			
Balanced panel men	2017	462	22.90

We find a consistent rate of unretirement of around 5% for British men in the BHPS sample, we find a lower rate using the Understanding Society dataset due to the shorter span of the dataset. We also compute unretirement rates for France and Germany using the SHARE dataset. It is clear from table 1 that unretirement is much more common the US, relative to the UK or France and Germany. We estimate unretirement rates in the US which are six times the size of those in the UK and Europe. However one should note that the BHPS does indicate that a longer sample period increases the rate of unretirement, however in terms of magnitude and the fact it is an annual dataset the magnitude of the flow is still relatively low compared to the US.

3 Specification and Modelling approach.

3.1 Information set.

We use a range of economic and sociodemographic variables available in the ELSA dataset, in addition we use financial derived variables specially constructed from the ELSA dataset by the IFS, which we describe in more detail below. In the modelling approach subsection the information set is are the X_i variables, and we estimate the coefficients i.e. $\beta' s$.[31]:

[31] The education level and social class variables use impute information from wave 1. The social class is on a 7 point system in wave 1, from professional through the unskilled. We estimate logit models using robust standard errors. We do not include self reported health status because almost half of the final sample for estimation report their SRH to be not applicable, however we do cross tabulate self reported health in wave 1 with our unretired sample. We find a positive correlation, that is to say unretirement episodes were concentrated amongst those reported they were in very good or excellent health. ELSA also has information regarding if an individual was in receipt of their state pension at the time of taking retirement, however half the estimation sample responded with not applicable.

Table 3: Information set
Sociodemographic variables
Age at wave 1
Married at wave 1
Whether first retired between the age of 50 and 55
Whether first retired between the age of 56 and 60
Spouse in employment at wave 1
Whether has private health insurance
Whether has a limiting illness
Economic variables
Whether holds a degree
Whether has a qualification below degree but above A level
Whether holds an O-level or CSE
No/foreign qualification (base group)
Log value of benefit income *(IFS)*
Log value of asset income *(IFS)*
Unanticipated debt shock *(IFS)*
Unanticipated wealth shock *(IFS)*
Opportunity to work past retirement age
Whether respondent feels they do not have enough income
1 day -1 year (short term) financial planning horizon (base group)
1-3 year (medium term) financial planning horizon
3+ year (long term) financial planning horizon
log value of private pension income *(IFS)*
log value of state pension income *(IFS)*
Self reported social class by job occupation

3.1.1 Financial derived variables.

Each wave of the ELSA has been supplemented by Financial Derived Variables (FDV) which have been constructed by the IFS. These variables essentially summarise more detailed lower level financial variables, and can be either individual of couple level. Variables in table 3 which were used from the FDV dataset are highlighted by the *(IFS)* label. Specifically to construct the unanticipated wealth and debt shocks, we follow Maestas (2010) and construct a dummy variable which asigns the value one if there is a 25% change in the non housing net financial wealth or non housing net financial debt, in any two consecutive quarters. We also use the log value of benefit and asset income, both of these variables are stock variables and made up of sub components.[32] Finally given that our interest in retired individuals we also include the log value of state and private pension income.

[32] For more detailed information regarding the IFS FDVs see the release notes for the ELSa dataset: (5050_Wave_1_Financial_Derived_Variables_Relationships).

3.2 Modelling approach.

We model the unretirement decision using a range of econometric frameworks, in order to infer different aspects of the decision to unretire. In light of this we choose to model unretirement using a 1. static 2.sequential and 3. duration framework. To inform model specification we first followed along the lines of Cahill et al. (2010) and Pettersson (2011) and modeled the unretirement decision using a static logit model.[33] We also followed along the lines of Maestas (2010) and estimated a multinomial logit model with three retirement paths: (1) unretirement, (2) partially retirement and (3) full retirement. Similar to Maestas (2010) we only use individuals who report being in employment in wave 1, therefore these results whilst interesting are not comparable to those individuals who are used in the duration framework, who by definition must be retired in wave 1.[34] Given the focus of this paper is retired individuals and the time since they became at risk we use duration analysis.

3.2.1 Cox proportional hazards model.

Previous studies which used duration analysis to estimate the hazard of unretirement include Maestas & Li (2007) and Congdon-Homan (2009).[35] Given that we use balanced panel setup then we avoid the problem of right censoring or attrition for example. We initially model unretirement using a Cox proportional hazards model using fixed covariates.[36] We separately estimate an uncensored Cox proportional hazards model as we have information on the date of retirement, and similarly on the return to work. Although this model is not efficient relative to modelling using the exact likelihood function with a parametric hazard, the Cox model does not require us to make any assumptions on the form of the baseline hazard.[37] The baseline hazard $\alpha(t) = \log h_0(t)$ is left unspecified and is given by:

$$\log h_i(t) = \alpha(t) + \beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_k x_{ik}$$

In terms of the hazard function we have:

$$h_i(t) = h_0(t) \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_k x_{ik})$$

Taking two different individuals (who have different covariate values) then the hazard ratio for these two individuals is given by:

[33] We find a number of interesting results, interested readers should contact the author.

[34] Maestas (2010) also notes that these two groups cannot be compared directly as their retirement behaviour may be somewhat different. Unfortunately due to issues related to sample size we choose not to present estimation results for the MNL, however they are available on request.

[35] Maestas & Li (2007) use a discrete time framework using a random effects logit estimator and an ordered logit model. Whilst Congdon-Homan (2009) uses a discrete time framework assuming a weibull distribution to model the duration dependence.

[36] The Cox model leaves the baseline hazard unspecified, covariates enter linearly and therefore the model is semi parametric.

[37] Fox (2002) pp.3

$$\begin{aligned}\frac{h_i(t)}{h_{i'}(t)} &= \frac{h_0(t)e^{\gamma}}{h_0(t)e^{\gamma i}} \\ &= \frac{e^{\gamma}}{e^{\gamma i}}\end{aligned}$$

Where γ is the linear prediction for each individual. Notice that the hazard ratio is independent of time and therefore the Cox regression assumes proportional hazards, that is, the hazard of unretirement is identical between any two periods t_1 and t_2.

3.2.2 Discrete time hazards model.

Having both the retirement date and the return to paid employment information we are able to identify the exact interval in which unretirement occurred, conditional on being in retirement for a number of years.[38] We use a novel approach to modelling unretirement by estimating a discrete time Prentice-Gloeckler (1978) complementary log-log model. This is the analogous discrete time version of the continuos proportional hazards model. Similar to the Cox regression we are interested in modelling the relationship between the survival time and our information set. Jenkins (1997) and Stewart (1996) present a detailed discussion of these estimators, we present only a brief description. In the discrete case the proportional hazard is given as:

$$\lambda_{i,t} = \lambda_0(t)e^{[x_{i',t}\beta]}$$

Where $\lambda_0(t)$ is the baseline hazard. The discrete time hazard in the jth interval is given by:

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

Where:

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

We specify a non parametric piece wise constant baseline hazard, given the relatively low number of unretirement episodes to allow for additional grouping, as suggested by Jenkins (1997). We reorganise our data such that we may also estimate the extension assuming a gamma mixture distributed error to summarise individual level unobserved heterogeneity.[39]

[38] We use the xtclogclog and pgmhaz8 package in Stata (the latter) written by Stephen Jenkins. Our sample is such that we have a stock sample of individuals who self report being in retirement at wave 1. To account for this we reorganise our data such that it accounts for such event history data, where each individual has a corresponding number of rows representing how many periods he is at risk (for more information see for example Jones et al. (2010) and Jenkins (1997)). Given that we have detailed information regarding the time period since individuals have entered the state of retirement, we use this to organise our data and to ensure the duration dependence is defined correctly.

[39] The description presented here draws heavily from Jenkins (1997). The starting values for the estimation of the vector of parameters β in model 2, are taken from (1). The proportional

3.2.3 Competing risks regression.

We also model unretirement within a competing risks regression framework. We estimate the subdistribution of the competing risk developed by Fine and Gray (1999). We can think of this type of modelling approach as lying between the static/sequential and duration analysis. Conditional on being in retirement individuals are at risk of either unretiring or staying in full retirement.[40] The advantage of modeling unretirement using a competing risks regression is that unlike the Kaplin-Meier or Cox regression, we are able to estimate the sub hazard of unretirement in the face of competing risks such as staying in retirement.

If we assume a proportional hazard (for the subdistribution) then the hazard of the subdistribution λ_1 is given by:

$$\begin{aligned}\lambda_1(t;Z) &= \lim_{\triangle t\to 0}\tfrac{1}{\triangle t}\Pr\{t \leq T \leq t+\triangle t, \varepsilon = 1 | T \geq t \bigcup (T \leq t \bigcap \varepsilon \neq 1), Z\} \\ &= \frac{\left\{\frac{dF_1(t;Z)}{dt}\right\}}{\{1-F_1(t;Z)\}} \\ &= -\frac{d\log\{1-F_1(t;Z)\}}{dt}.\end{aligned}$$

Where t is time, T is the time of failure. ε_i is the cause of failure (unretirement), Z is our information set. Similar to the Cox regression we can compare individuals with different covariate values and estimate the Cumulative Incidence Function (CIF) is measured as the distance from the baseline marginal probability distribution, for which covariates are set to zero.[41] Assuming proportional hazards similar to the Cox regression means we do not encounter the problem of concenptualising a risk set, without the PH assumption the usual interpretation of h_1 would be difficult to conceptualise.[42]

4 Estimation results.

4.1 Duration models.

4.1.1 Kaplin-Meier survivor function.

We find that the unretirement hazard peaks in the first five years following initial retirement, then steadily declines as the number of years in retirement

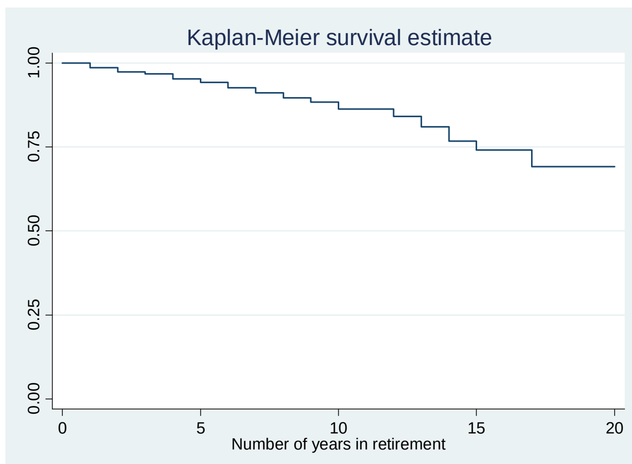
hazard in this case is: $\lambda_{i,t} = \lambda_0(t)e^{[x_{i'},_t\beta+\log(v_i)]}$. Where v_i is a random variable which follows a gamma distribution such that $v_i \sim (1,\sigma^2)$. The hazard rate changes accordingly for more information see Jenkins (1997).

[40] Only a very small number of individuals are initially in partial retirement and we drop these individuals for the purposes of estimation. Note that given the balanced panel setup, death is not a competing risk in this particular case. Also in ELSA self reported status does not distinguish between employed (part time) and employed (full time), these are therefore equivalent although we cross checked these with number of hours worked.

[41] We assume a known function g(.) such that g$\{\mathrm{F}_1(t;Z) = h_0(t) + Z^T\beta_0)$, where h_0 is left unspecified, invertiable and monotonic increasing function (Fine and Gray, (1999), pp.2 & 3).

[42] Namely, the hazard λ_1 does not consider cases where individuls may have failed from causes other than $\varepsilon = 1$ before time t, are therefore not at risk at time t (Fine and Gray, (1999), pp.3).

increases.[43] Maestas (2010) also estimates non parametric survivor curves for her samples of balanced men and women, we find that the shape of the survivor function is similar albeit the unretirement hazard declines more slowly given the lower number and speed at which individuals return to work in our sample. There are important differences between our own and Maestas (2010) sample, namely she observes individuals only up to a maximum of 8 years from first retirement, her sample includes both men and women in her sample and moreover she starts with individuals who are in employment in their wave of observation.[44] A priori there is no reason for these two groups to behave similarly regarding unretirement.



4.1.2 Cox proportional hazards model men retired in wave 1.

To infer more detailed information about the time since retirement we estimate a multivariate Cox proportional hazards model using the number of years in retirement and observing an unretirement episode.[45] Interestingly we find under this framework an individual who had a spouse in employment was significantly more likely to unretire.[46] In addition because we have detailed income informa-

[43] By construction we assume the hazard between observed unretirement episodes is constant. Given we have a balanced panel and there is no loss of observations we do not encounter any truncation or right censoring problems. In this instance the Kaplin Meier survivor function is equivalent to the empirical distribution function.

[44] Therefore the first wave in which they are observed to be in retirement would be in 1994 (wave 2), and her sample period ends in 2002.

[45] Note 33 individuals report being in retirement for zero years (i.e. retired in the year of their interview). We do not include these individuals for estimation purposes. We use the same information set as we did for our balanced panel logits and pre/post retirement multinomial logit models reporting coefficients, assume fixed covariates and clustered standard errors. We do not face the problem of non informative censoring because we have balanced panels and therefore observe individuals at each wave.

[46] Schirle (2008) finds one quarter of older husband's labour force supply decision in the UK can be explained by the labour force supply of his wife. Another assesment of British retirement coordination is Disney, R. Ratcliffe, A. Smith, S. (2010).

tion, we observe that individuals with benefit income are less likely to unretire. We also find that the log value of the state pension increases the likelihood of observing unretirement, we know the value of an individual's state pension is a function of previous earnings made in the labour market. Similar to our logit estimates we find the presence of education effects, those individuals with above A and below a degree were significantly more likely to unretire. We should note that whilst the degree variable was not statistically significant for our sample of retired individuals, fewer individuals held a degree relative to the sample we used to construct our two wave logits.

Table 3: Cox proportional hazards model.	(1)
VARIABLES	hazard
Spouse in employment at wave 1	3.210***
	(1.307)
Log value of benefit income	0.507**
	(0.136)
Log value of asset income	0.876
	(0.0983)
Log value of private pension income	1.133
	(0.122)
Log value of state pension income	1.270*
	(0.164)
Professional job occupation	0.599
	(0.458)
Managerial job occupation	0.434
	(0.261)
Skillednonmanual job occupation	0.612
	(0.394)
Skilled/ manual job occupation	0.528
	(0.344)
Whether has private health insurance	1.833
	(0.723)
Opportunity to work past retirement age	2.277*
	(1.095)
First retired between the age of 50 and 55	0.244***
	(0.116)
First retired between the age of 56 and 60	0.605
	(0.243)
1-3 year (medium term) financial planning horizon	3.137**
	(1.434)
Observations	592

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3: Cox proportional hazards model (continued). VARIABLES	(1) hazard
3+ year (long term) financial planning horizon	2.633**
	(1.184)
Age at wave 1	0.793***
	(0.0359)
Married at wave 1	1.712
	(0.816)
Whether has a limiting illness	0.769
	(0.228)
Whether respondent feels they do not have enough income	2.407
	(1.693)
Whether holds a degree	1.648
	(1.060)
Whether has a qualification below degree but above A level	2.858**
	(1.240)
Whether holds an O-level or CSE	1.129
	(0.558)
Unanticipated wealth shock (between wave 1 and 2)	1.352
	(0.418)
Unanticipated wealth shock (between wave 2 and 3)	0.939
	(0.343)
Unanticipated wealth shock (between wave 3 and 4)	0.984
	(0.334)
Unanticipated debt shock (between wave 1 and 2)	0.809
	(0.640)
Unanticipated debt shock (between wave 2 and 3)	1.016
	(0.663)
Unanticipated debt shock (between wave 3 and 4)	2.212
	(1.274)
Observations	592

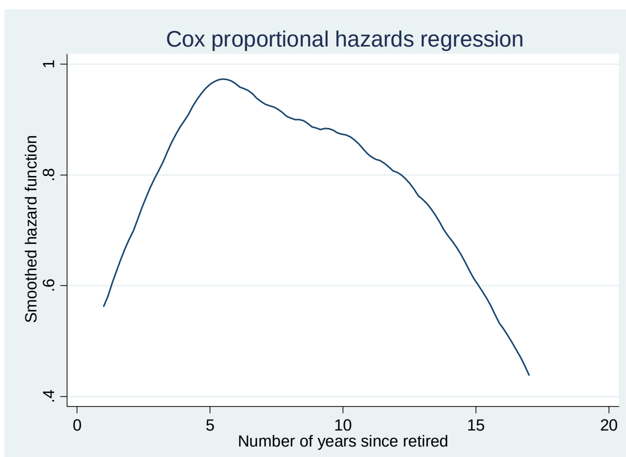
Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

No. of subjects = 592, Number of obs = 592
No. of failures = 59, Time at risk = 4125
Log pseudolikelihood = -278.79449,Wald chi2(28) = 209.96
Prob > chi2 = 0.0000

We find individuals who stated they were given the opportunity to work past normal state retirement age were more likely to unretire. These individuals may have had a preference for work and in some sense anticipated their unretirement. We find that individuals who stated they had a medium or long term financial planning horizon which was defined as anything more than one year (when planning their consumption and spending needs), were significantly more likely to unretire. Our estimates of age effects on the unretirement decision are somewhat inconclusive, our results suggest that those individuals who took first retirement between the age of 50 and 55 were significantly less likely to unretire. Whilst the higher the age in wave 1 the less likely an individual was to unretire.

We find that the role of unanticipated shocks to wealth and debt do not play an important role in the Cox framework for our whole sample, indeed the signs of the coefficient for each of these types of shocks take on values which are both positive and negative. A priori we may expect individuals do return to the labour market if they experience such shocks, or they may prefer to stay in retirement particularly if they are able to return to the labour market conditional on their skills set. The social class variables indicate that relative to base group (unskilled) then all other groups were less likely to unretire. We find that those individuals who reported limiting health conditions were also less likely to unretire.[47]

Hazard curve. We estimate the predicted hazard function using the estimates from our Cox regression.[48] We find that the hazard of unretirement increases following initial retirement and peaks at around 6 years following initial retirement, it then decreases from this point. This suggests individuals return to the labour market relatively soon following initial retirement, for example if they found retirement did not match their expectations, or if for example they wanted a break or had some form of career burnout and wished to return to work.[49]



Diagnostic tests. We estimate a range of diagnostic tests in order to test the validity of our model. We first estimate a linktest in order to test the specification of the regression equation, the null hypothesis that there is no evidence

[47] We do cannot include measures to control for self reported health because around half our estimation sample answered the questionnaire with 'not applicable'.

[48] We also estimate a cumulative hazard function, contact the author for more information.

[49] See for example Maestas & Li (2007), who consider career burnout and unretirement for HRS respondents.

of misspecification cannot be rejected at any conventional levels of significance. In addition we also estimate Harrell's Concordance statistic to test how well our model correctly identifies the order of survival times for paired individuals in our sample, the estimated Concordance statistic is 0.8424. we also estimate Somers' D rank correlation which is equal 0.6848, these indicate our model has substancial predictive power. Next we proceed to test the proportional hazards assumption. The null hypothesis is that we have proportional hazards at all time periods or constant relative hazard. We test the proportional hazards assumption using the Schoenfeld Residuals, we reject the null hypothesis of a proportional hazard at standard conventional significance levels.[50] This suggests the hazard of unretirement is not equal across all periods, we investigate this in more detail below.

Proportional Hazards assumption. We inspect the PH assumption for each covariate, to determine which covariates have an underlying relationship with (linear) time. Results suggest the PH assumption fails for the following variables: (1) Log benefit income, (2) Log state pension income, (3) All occupational categories[51], (4) Opportunity to work past retirement age, (5) First retired between 50 and 55, (6) First retired between 56 and 60, (7) Limiting illness, (8) Not enough income, (9) Wealth shock between wave 1 and 2 and (10) Debt shock between wave 1 and 2. To investigate this in more detail we undertake a battery of diagnostic tests.[52]

We estimate scaled Schoenfeld residuals, lowess curves, log-log curves and compare predictions from our regression estimates with those of the Kaplin-Meier estimator. Of these only the log-log curves indicates there is some evidence of the PH assumption being violated. In addition to the link test we also test for model fit and functional form respectively estimating Cox-Snell and Martingale residuals. The Cox-Snell residuals suggested some evidence that model fit was compromised, however in addition to the link test (which indicated there was no evidence of mispecification) formal tests using Martingale residuals supported the same conclusion.[53]

To summarise the diagnostic tests suggest our model has substantial predictive capabilities, despite failing a minority of specification tests for the proportional hazards assumption.[54] To infer more information about our unretired

[50] Our information set does not contain suitable time varying covariates, in order to estimate an alternative Cox regression to include these. In this paper we do not consider stratification explicitly.

[51] With the exception of the skilled manual group.

[52] More detailed information (including graphs) for each of the PH assumption tests below is available on request.

[53] We also test for influential points on key variables, in order for us to graphically inspect how the relative hazard is affected by outliers. We find there are some outliers in our sample, and this is inherit given the final position on assets for example, however the majority of our sample suggest the covariate value is spread relatively evenly.

[54] We also estimate a univariate log rank test to test for equality of the hazard function across the two different groups, the null hypothesis that the survivor functions are the same is rejected at conventional significance levels.

sample we estimate an uncensored Cox regression (see appendix 2) on our unretired sample only, in this case we find no evidence of the PH assumption being violated. Moreover to investigate in more detail the role of time effects we also estimate a discrete time version of the Cox regression, to investigate if the is a shape in the hazard of unretirement, and importantly to account for individual level unobserved heterogeneity.

4.1.3 Discrete time hazard model men retired in wave 1.

The Kaplin-Meier hazard curve in the uncensored regression highlighted that individuals were at highest risk of unretiring in the first 3-8 years following initial retirement. To infer more detailed information about the time to unretirement we estimate a discrete time proportional hazards model.[55] The is the Prentice-Gloeckler (1978) (model 1) and its extension assuming a gamma mixture distributed error (see Meyer (1990)) (model 2) to account for individual level unobserved heterogeneity.The Prentice-Gloeckler model is a discrete time equivalent to the Cox Proportional Hazards model. We estimate a piecewise constant non parametric baseline hazard for our sample of retired individuals, which has the advantage of having a degree of non parametric flexibility in the duration dependence but facilitates estimation given the relatively low number of unretirement episodes in our sample. We construct the time an individual has spent in retirement using the retirement and job start date information (thus we are estimating on the same sample of individuals as we did for the uncensored Cox regression), which we show graphically in the figure 1 below:

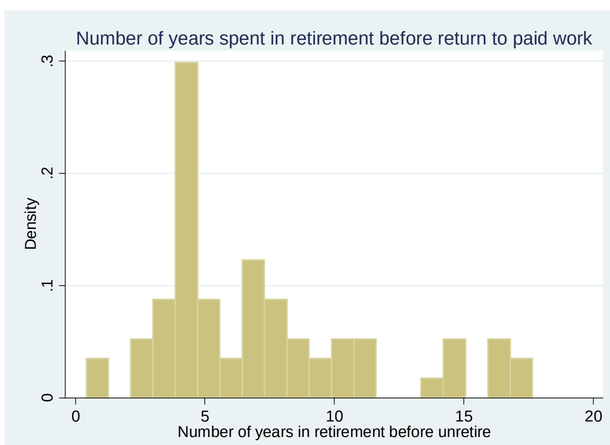


Figure 1

[55] We use the Jenkins module pgmhaz8 available for Stata.

Model 1: Gaussian distributed error. Our estimation results for model 1 suggest that time since initial retirement in the unretirement is important when modeled using a discrete time framework. Our estimation results indicate individuals are more likely to unretire between 3-8 years following initial retirement. Interestingly duration 1 which covers the period from initial retirement up to 3 years following initial retirement, is not significant at conventional levels and moreover is close to one. This seems to suggest individuals response to unretirement is not instant once entering initial retirement. Instead individuals may spend some time in retirement and realise that it does not meet their a priori expectation and then choose to unretire, conditional on being able to find paid employment.

Turning to our economic and sociodemographic information set, we find that again log benefit income has a negative effect on the likelihood of unretirement. Similar to the results from the Cox regression on the full sample, we find that those individuals with a medium or long term financial planning horizon are significantly more likely to unretire. We also find an age effect, those individuals who are older in wave 1 are less likely to unretire. Similar to the benchmark Cox regression we find the log value of the state pension is positively signed and raises the likelihood of unretiring. We also find a spouse effect, those individuals who have a spouse in paid employment in wave 1 are more likely to unretire. Education effects are also at work, our estimation results indicate those individuals who have a level of education which is above A-level and below degree level are statistically more likely to unretire. Those individuals who hold a degree are also more likely to unretire, whilst those individuals who have an O-level or CSE are less likely to unretire.[56]

Similar to the Cox regression we find that unanticipated shocks to wealth and debt have mixed effects depending on which wave they are experienced. Our results suggest those individuals who experience a 25% unanticipated increase in their net debt between wave 3 and 4 are significantly more likely to unretire.

Model 2: Gamma distributed error. Model 2 estimates look very similar to those of model 1 except the coefficient of the hazard ratio for each of the dummy variables was substantially larger, and importantly the hazard of unretirement was highest 3-6 years following retirement and statistically significant at conventional levels. Both the model 1 and model 2 formally test for evidence of individual level unobserved heterogeneity using a likelihood ratio test, in neither test was the null hypothesis of no evidence of unobserved heterogeneity rejected at conventional levels of significance.[57]

[56] These covariates were not significant at conventional levels.
[57] Estimation results are available on request.

Table 5: Discrete time hazard model with Gaussian frailty. VARIABLES	(1) hazard
0< years in retirement <3	0.954
	(2.249)
3< years in retirement <6	5.894
	(13.69)
6< years in retirement <8	3.663
	(8.555)
8< years in retirement <10	2.469
	(5.800)
10< years in retirement <12.5	1.454
	(3.436)
12.5< years in retirement <15	1.189
	(2.823)
15< years in retirement <17.5	0.913
	(2.184)
17.5< years in retirement <20	0.627
	(1.523)
Log value of benefit income	0.747**
	(0.106)
Log value of asset income	0.904
	(0.0840)
Professional job occupation	0.783
	(0.468)
Managerial job occupation	0.777
	(0.379)
Skilled / nonmanual job occupation	1.653
	(0.837)
Skilled / manual job occupation	0.530
	(0.295)
Whether has private health insurance	1.311
	(0.416)
Opportunity to work past retirement age	1.024
	(0.427)
Whether first retired between the age of 50 and 55	0.610
	(0.222)
Whether first retired between the age of 56 and 60	0.778
	(0.248)
1-3 year (medium term) financial planning horizon	2.854**
	(1.299)
1-3 year (medium term) financial planning horizon	2.752**
	(1.277)
Observations	23,622

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

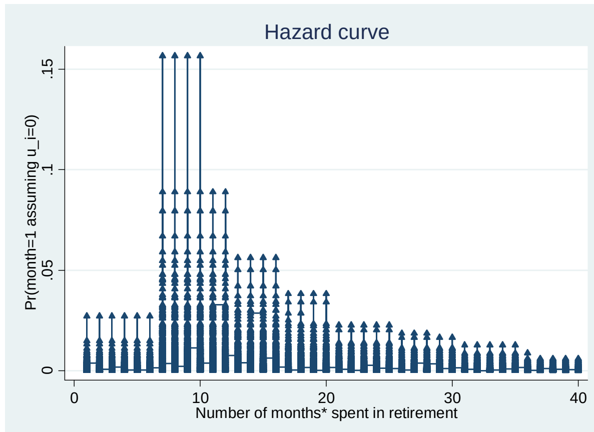
Table 5: Discrete time hazard model with Gaussian frailty (continued). VARIABLES	(1) hazard
Age at wave 1	0.881***
	(0.0326)
Whether married at wave 1	1.380
	(0.549)
Whether has a limiting illness	0.976
	(0.257)
Whether respondent feels they do not have enough income	1.524
	(0.858)
log value of private pension income	1.026
	(0.0761)
log value of state pension income	1.184
	(0.124)
Spouse in employment at wave 1	2.459***
	(0.789)
Whether holds a degree	1.745
	(0.805)
Whether has a qualification below degree but above A level	2.034*
	(0.780)
Whether holds an O-level or CSE	0.761
	(0.329)
Unanticipated wealth shock (between wave 1 and 2)	1.497
	(0.394)
Unanticipated wealth shock (between wave 2 and 3)	0.909
	(0.269)
Unanticipated wealth shock (between wave 3 and 4)	0.799
	(0.225)
Unanticipated debt shock (between wave 1 and 2)	0.444
	(0.276)
Unanticipated debt shock (between wave 2 and 3)	0.743
	(0.554)
Unanticipated debt shock (between wave 3 and 4)	3.148**
	(1.615)
Observations	23,622

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Discrete time hazard curve. Given the absence of unobserved heterogeneity model 1 is preferred, we graph the hazard curve below.[58] Note in the curves below, the x-axis corresponds to the number of months in retirement where one month is equal to six months in retirement, so for example the peak between 7 and 10 'months' actually indicates that the hazard for unretirement is highest

[58] For each individual using their own covariate information set.

approximately 3.5 to 6 years after initial retirement.[59]



4.1.4 Competing risks regression men retired in wave 1.

Thus far we have focused on the time to unretirement conditional on an individual being in unretirement. We can also consider unretirement as a competing event.[60] We find individuals who have a spouse in employment in wave 1 are significantly more likely to unretire. We also find that higher levels of the log value of the state pension (which suggest a more complete employment history during an individuals working life) increase the hazard of unretirement. Individuals with a medium or long term financial planning horizon were more likely to unretire, relative to the base group of short term financial planners. Education effects also play a role in the unretirement, similar to our previous results we find those individuals with a degree or at least an A-level or above, were more likely to unretire. Finally those individuals who experience an unanticipated debt shock between wave 3 and wave 4 are significantly more likely to unretire. The remaining wealth and debt shocks have mixed effects in terms of raising or lower the hazard of unretirement, however these were not significant at conventional significance levels. Our estimation results suggest there is a range of factors which reduce the likelihood of an individual unretiring. Similar to previous results the higher the value of log benefit income the less likely an individual is to unretire. In addition, similar to Cox estimates for the full sample individuals who first retire between the age of 50 and 55 are significantly less likely to unretire.

[59] We also estimate the survival curve, this available on request.

[60] We thank Pravin. K. Trivedi for suggesting modeling unretirement within a competing risks framework. Given that we have a balanced panel, none of our sample die over sample period therefore we do not include death as a competing event. Estimates reported in sub hazard ratio form. Time is modeled as a linear function.

Table 7: Competing risks regression. VARIABLES	(1) subhazard
Spouse in employment at wave 1	2.821***
	(1.086)
Log value of benefit income	0.724*
	(0.134)
Log value of asset income	0.876
	(0.935)
Log value of private pension income	1.046
	(0.875)
Log value of state pension income	1.249*
	(0.154)
Professional job occupation	0.800
	(0.547)
Managerial job occupation	0.645
	(0.357)
Skilled / nonmanual job occupation	1.656
	(0.9239)
Skilled / manual job occupation	0.639
	(0.380)
Whether has private health insurance	1.386
	(0.572)
Opportunity to work past retirement age	1.092
	(0.526)
Whether first retired between the age of 50 and 55	0.497*
	(0.186)
Whether first retired between the age of 56 and 60	0.675
	(0.227)
1-3 year (medium term) financial planning horizon	2.999**
	(1.42)
3+ year (long term) financial planning horizon	2.54**
	(1.20)
Age at wave 1	0.838***
	(0.037)
Whether married at wave 1	1.328
	(0.601)
Whether has a limiting illness	0.932
	(0.254)
Whether respondent feels they do not have enough income	2.067
	(1.453)
Observations	526

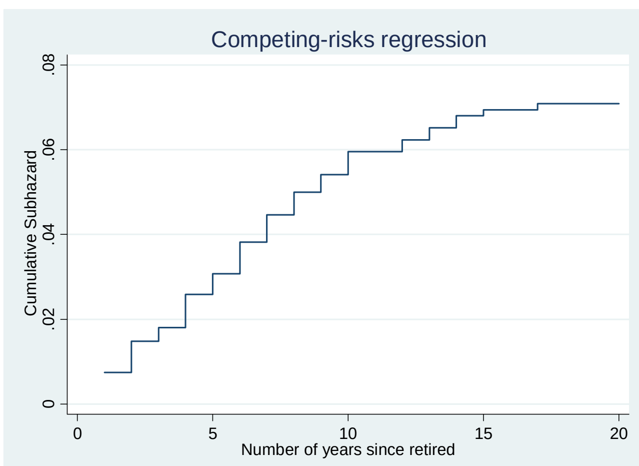
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Competing risks regression (continued). VARIABLES	(1) subhazard
Whether holds a degree	1.797
	(0.942)
Whether has a qualification below degree but above A level	2.084*
	(0.794)
Whether holds an O-level or CSE	1.104
	(0.470)
Unanticipated wealth shock (between wave 1 and 2)	1.345
	(0.396)
Unanticipated wealth shock (between wave 2 and 3)	0.906
	(0.327)
Unanticipated wealth shock (between wave 3 and 4)	1.023
	(0.345)
Unanticipated debt shock (between wave 1 and 2)	0.535
	(0.393)
Unanticipated debt shock (between wave 2 and 3)	1.017
	(0.734)
Unanticipated debt shock (between wave 3 and 4)	3.282**
	(1.788)
Observations	526

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Diagnostics. A Wald test statistic with the null hypothesis that all coefficient estimates are jointly equal to zero is rejected at conventional significance levels. We are interested in the cumulative subhazard, which indicates the cause specific hazard increases the longer an individual has been in retirement.



The plot supports our earlier results, namely that the subhazard of unretirement is around 6% after ten years following initial retirement, after which point it increases but a slower pace. After twenty years following initial retirement the cumulative subhazard is approximately 7%. Note that within the competing risks framework the cumulative subhazard (CS) plot above includes all individuals who may be at risk at each time point, that is, all retirees. We also estimate the cumulative incidence function (CIF), which the probability of unretirement before a certain number of years in retirement. The shape is very similar to the cumulative subhazard.

5 Characteristics of unretirement jobs.

We present stylised characteristics of unretirement jobs we find; (1) unretirement jobs typical entail an individual working on average 20 hours per week, (2) average monthly income earned from an unretirement job is £470 per month or £5650 per annum, (3) the majority of unretirement jobs are reported as being higher managerial or supervisory, with only a small proportion of unretirees reporting unretirement jobs which they consider lower supervisory (4) the majority of individuals who unretire self report themselves to be in the top three deciles of the social class ladder and (5) in terms of job activity the majority of individuals who unretire are in sedentary jobs, with a small proportion engaging themselves with work which involves standing or some physical aspect. [61] [62] All of these findings support our previous observation, namely that unretirement in England is concentrated amongst those who are relatively high skilled, and given their preferences and personal attributes are likely engage in paid employment post initial retirement. We also check for similarities between unretirement and partial retirement jobs, we find that the characteristics above also hold true for partial retirement jobs, the only exception being that on average unretirement jobs were (self) perceived higher on the social ladder and also more senior.

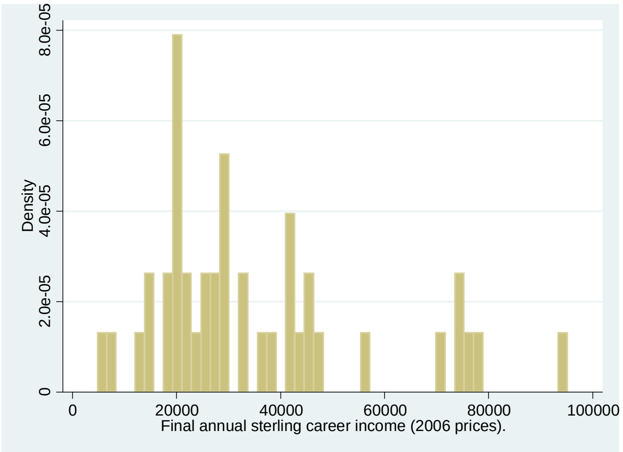
The ELSA dataset has a one off life history file which contains detailed information regarding the lifetime labour force attachment. In particular it contains information regarding the income from final lifetime career job (but not the occupation), we can use this information to compare the preretirement job with the unretirement job in terms of income.[63] We estimate a mean salary

[61] (4) is not supported by all the estimation results directly, the social occupation variables were not statistically significant in either direction.

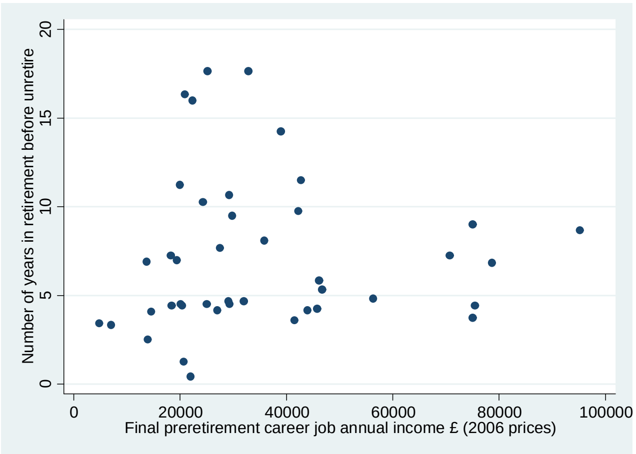
[62] The income figure for unretirement jobs is not inflation adjusted, however given that in wave 1 all individuals are retired, the earliest they can unretire is by 2004, and the latest is 2008. Therefore the inflation adjusted figures would not be too dissimilar to those reported.

[63] Note, the majority of our sample (circa 98%+ were paid in New English currency (decimalisation took place on the 15^{th} February 1972), for our sample of unretired individuals only one individual was paid in Old English money for these reasons we do not include for the this particualar section of analysis. We adjust final career incomes to 2006 prices (the year of the wave 3 history survey), using the Bank of England Inflation calculator. Note that 3 individuals had final career income of more than £100,000 however we choose not to includes these in the histogram, to give a better representation of the final income distribution for the

income (2006 prices) from the final career job of £50821.63, thus re-enforcing our earlier conclusions that unretirement jobs are not generally sought by those in poverty, but those who (given the cohort) had a relatively high final income occupation and were likely to have tastes for work. We can show this more clearly in the following histogram which plots the final income of the career jobs conditional on the individual unretiring:



We can inspect if there is any correlation between inflation adjusted final career job income and time spent in retirement before unretirement, our results suggest there is no clear correlation.



However we can see that the majority of unretirement episodes occur in the first 10 years following initial retirement.

majoirty of our unretirees.

5.1 Voluntary work.

We have established that unretirement is currently not a common retirement path in the UK, however this does not mean when individuals fully retire they are completely seperated from the labour market. ELSA has information regarding the activities individuals undertake, in particular, whether an individual engages in voluntary work. A recent report by nfpSynergy (2011) estimated around 30% of individuals aged between 50 and 65 did informal or formal volunteering at least once a month.[64] Using our sample of balanced panel men we find that approximately 21.76% of those individuals (self) reporting being in full retirement, undertake voluntary work at least twice a month.[65] We also note that voluntary work is not restricted to just the retired, we also find 13.82% of the balanced panel employed men at wave 1 undertake voluntary work. Whilst the rate of voluntary work is approximately 7% lower for those individuals who are employed, there is still represents a high incidence of voluntary work reported amongst the elderly.[66] It is clear that despite the relatively low rate of unretirement, or a transition from retirement to paid employment, retirees maintain some attachment to the labour force, albeit at the voluntary level.

6 Conclusion.

This paper has estimated the rate of unretirement in England for sample of men aged between 50 and 74 in 2002, moreover we establish the determinants of unretirement behaviour. By modelling the unretirement decision using a variety of econometric frameworks, we find there are common factors which seem to be linked to the transition from retirement back into employment. In the case of our sample of men we find that there are four common and statistically significant factors which increase the hazard of unretirement: (1) having a wife in the labour force, (2) having at least an A-level, (3) having medium or long term financial planning horizon and (4) experiencing a 25% unanticipated negative debt shock between wave 3 and wave 4. The final point may suggests there was a role for macro effects such as the recent financial crisis on increasing the hazard of unretirement between 2006/7 and 2008/9. We find a range of factors which reduce the likelihood of observing an unretirement episode, in particular the log value of the benefit income, and there was a clear age effect with those individuals who were older were less likely to unretire. This is likely to be linked with health and appropriate skill or education factors. We supplement our models with financial planning horizon variables and contrary to economic theory, we find (similar to Maestas (2010)) that individuals who report having

[64] Estimates were obtained using data from the Citizenship Survey, National Statistics April-September 2010. Sample size: 10,000 with minimum participation age of 16. For more information see Saxton (2011).

[65] We take the mean of the percentage of individuals who reported doing voluntary work (and report being in retirement) at least twice a month across waves one to four.

[66] Unfortunately there is no information on the number of hours worked in the voluntary sector.

a medium or long financial planning horizon (>1 year) were more likely to unretire, suggesting that unretirement is likely to be related to lifestyle and preference factors and at the very least is not linked to poor financial planning.

We suspect that both demand and supply side forces are at work. On the supply side our results indicate individuals who have at least an A-level education are more likely to unretire, for example through preferences such as tastes for work. Moreover given the changing labour market conditions in England (and more generally in all advanced economies) over the past thirty years, high skill individuals embody a skill set such that it can allow them to secure paid employment. On the demand side employers seek individuals who have an advanced specialised skill set, which cannot be substituted for by younger less skilled individuals. The same cannot be said for low skilled retired workers who wish to return to paid employment.

This has important implications for retired individuals who are considering re-entering the labour force in search of paid employment in England. Despite the incidence of unretirement being lower in England than the US, our research suggests that the opportunity to work is not equal across older individuals in England. Low skilled retired workers face greater barriers to work relative to their high skilled counterparts. This may go some way in explaining the difference in unretirement rates, given the average educational attainment in the US is higher than that in the UK, and particularly given the cohort and sample used in this study. In addition the importance of lower labour market regulation and of private health insurance in the US should not understated, these factors make it not only easier but more important for all working age individuals in the US to be in employment.[67] Given the cohort and the education effects we have found we know future generations will have on average higher educational attainment, and prior to retirement are more likely to be in sedentary career occupations. It is likely these sedentary career occupations will better facilitate work at older ages or post retirement. Recent changes to UK retirement legislation in 2011 mean employers can no longer lay off individuals because they have reached State Retirement Age (SRA), moreover in the UK individuals can choose to claim their State Pension and also continue to work.[68] This will affect how individuals plan their retirement, if they plan to retire at all. Individuals who have strong preferences for work no longer need to unretire, instead they may simply reduce hours and continue to work.[69] Flexible retirement options are becoming increasing common in advanced economies. This will clearly affect the extent to which we observe unretirement in the future in England, it will also change the level of labour market activity amongst older workers in the UK which until recently had been in decline.

[67] Not only is there higher levels of labour market regulation in England but there is universal access to healthcare.

[68] They may also choose to defer their State Pension, we plan to investigate the deferral decision in more detail in future work.

[69] They may also take a short career break due to 'burnout' see Maestas and Li (2007).

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7 Appendix.

7.1 Appendix 1: Data and sample construction: ELSA.

Using the IDAUNIQ variable we created a balanced panel of all individuals who are aged between 50 and 75 in wave 1, who report being in some level of employment or are retired.[70] The final sample at wave 1 contained 2025 (balanced panel) men of which 920 were in (self reported) retirement, 1,078 in

[70] An individual's labour force status (LFS) was then cross checked with their reported hours of employment. Individuals were reclassified if they reported hours of work which were not in line with their reported LFS.

employment and 27 in partial retirement. After cleaning data we had 625 retired wave 1 individuals who could be used for estimation purposes, below we detail their sample characteristics[71]:

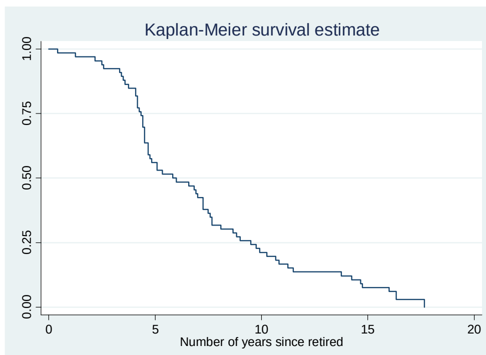
Sample characteristics.

Variable	Obs.	Mean
Age at wave 1	625	66.35
Married at wave 1	625	.80
Whether first retired between the age of 50 and 55	625	.21
Whether first retired between the age of 56 and 60	625	.30
Spouse in employment at wave 1	625	.10
Whether has private health insurance	625	.17
Whether has a limiting illness	625	.58
Whether holds a degree	625	.20
Whether has a qualification below degree but above A level	625	.21
Whether holds an O-level or CSE	625	.24
No/foreign qualification (base group)	625	.35
Log value of benefit income *(IFS)*	625	.68
Log value of asset income *(IFS)*	625	2.40
Unanticipated debt shock wave 1-wave 2 *(IFS)*	625	.06
Unanticipated debt shock wave 2-wave 3 *(IFS)*	625	.04
Unanticipated debt shock wave 3-wave 4 *(IFS)*	625	.03
Unanticipated wealth shock 1-wave 2 *(IFS)*	625	.36
Unanticipated wealth shock 2-wave 3 *(IFS)*	625	.27
Unanticipated wealth shock 3-wave 4 *(IFS)*	625	.33
Opportunity to work past retirement age	625	.13
Whether respondent feels they do not have enough income	625	.07
1 day -1 year (short term) financial planning horizon (base group)	625	.27
1-3 year (medium term) financial planning horizon	625	.41
3+ year (long term) financial planning horizon	625	.32
log value of private pension income *(IFS)*	625	3.58
log value of state pension income *(IFS)*	625	3.35
Self reported social class: professional	625	.11
Self reported social class: managerial	625	.39
Self reported social class: skilled non manual	625	.12
Self reported social class: skilled manual	625	.25
Self reported social class: non skilled/foreign qualification (base group)	625	.13

[71] A similar approach was used for the BHPS, UKLFS, Understanding Society, SHARE and US HRS. A seperate appendix is available on request from the author detailing specific sample construction information.

7.2 Appendix 2: Uncensored cox regression for unretired sample.

ELSA respondents were asked to state the year and month of their retirement and when they started a job. Therefore we have the exact length of time before unretirement occurs, we use this information to estimate an uncensored Cox regression restricted to our unretired sample. We find that the unretirement hazard peaks in the first five years post initial retirement. The Kaplin-Meier estimator indicates that the majority of unretirement episodes take place in the first 10 years following initial retirement.



7.2.1 Estimation results

Our estimation results suggest that for our unretired sample, the covariates which significantly affect the hazard of unretirement are quite different to those of the whole sample.[72] Interestingly we find that higher levels of the log value of private pension income reduce the hazard of unretirement, however this variable was only significant at the ten percent level. We find that there is no age effect for our sample of unretired individuals, which was previously highly significant when estimating over our whole sample. The role of an individual's financial planning horizon does not seem to play an important role in the hazard of unretired for our uncensored sample. We also find there was no spousal or education effect. Importantly, there is a role for unanticipated shocks to wealth and debt. Our estimations suggest an unanticipated wealth shock experienced between wave 1 and wave 2, and again between 2 and wave 3 both have the same effect, namely they raise the hazard of unretirement. Similarly those individuals who experience an unanticipated shock (increase) to their debt position are significantly less likely to unretire. We also find that those individuals who report being married are significantly more likely to unretire.

[72] The exception is the log value of benefit income, which has a negative effect on the hazard of unretirement. The social class variables also have a similar effect as before. There are 7 more failures in this model than in the full sample regression because we could include individuals who had retired less than one year.

Table 8: Uncensored Cox proportional hazards regression.	(1)
VARIABLES	hazard
Spouse in employment at wave 1	0.410
	(0.233)
Log value of benefit income	0.700**
	(0.122)
Log value of asset income	0.871
	(0.170)
Log value of private pension income	0.785*
	(0.115)
Log value of state pension income	0.878
	(0.210)
Professional job occupation	0.272
	(0.239)
Managerial job occupation	0.336
	(0.264)
Skilled / nonmanual job occupation	1.080
	(0.730)
Skilled/ Manual job occupation	0.269
	(0.240)
Whether has private health insurance	1.847
	(0.918)
Opportunity to work past retirement age	2.877
	(2.083)
Whether first retired between the age of 50 and 55	0.969
	(0.543)
Whether first retired between the age of 56 and 60	2.250
	(1.292)
1-3 year (medium term) financial planning horizon	0.373
	(0.310)
3+ year (long term) financial planning horizon	0.816
	(0.719)
Age at wave 1	1.058
	(0.0673)
Married at wave 1	4.421**
	(3.133)
Whether has a limiting illness	1.569
	(0.669)
Whether respondent feels they do not have enough income	1.155
	(0.942)
Whether holds a degree	1.012
	(0.638)
Observations	66

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Uncensored Cox proportional hazards regression (continued).	(1)
VARIABLES	hazard
Whether has a qualification below degree but above A level	0.718
	(0.620)
Whether holds an O-level or CSE	0.397
	(0.248)
Unanticipated wealth shock between wave 1 and 2	2.894**
	(1.228)
Unanticipated wealth shock between wave 2 and 3	3.739**
	(1.954)
Unanticipated wealth shock between wave 3 and 4	1.697
	(0.719)
Unanticipated debt shock between wave 1 and 2	0.596
	(0.512)
Unanticipated debt shock between wave 2 and 3	0.0967*
	(0.120)
Unanticipated debt shock between wave 3 and 4	0.200**
	(0.155)
Observations	66

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

No. of subjects = 66, Number of obs = 66,No. of failures = 66
Time at risk = 476.9229974, Log pseudolikelihood = -188.66599
Wald chi2(28) = 182.15, Prob > chi2 = 0.0000

Diagnostics. We estimate a range of diagnostic tests to establish proportional hazards, and find the PH assumption is maintained and is not rejected at conventional significance levels. We estimate a Harrells' C concordance statistic of 0.7686 which suggests our model correctly predicts the majority of the order of survival times for paired individuals in our sample. We also estimate a Somers' D rank correlation of 0.5372 which suggests that this particular model lacks predictive power. On balance the uncensored Cox regression is preferred over the standard Cox regression in terms of the PH assumption but it does lack predictive power, most likely due to small sample size. However by using detailed information on time in retirement focusing on the unretired sample only, our results suggests some of the covariates which raised the hazard of unretirement for our full sample do not have the same effect for the restricted unretired sample, in particular we find there is role for unanticipated shocks to wealth and debt.