

# Dissertation reading notes

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# 1 Comparing Retirement Wealth Trajectories on Both Sides of the Pond

Blundell et al. (2016)

## 1.1 Introduction

- Compare wealth decumulation in retirement in the US and the UK using HRS and ELSA data. ELSA was modelled on HRS so they are comparable. Both follow elderly people and have similar questions and methodologies. Data from 2002 to 2010.
- Median wealth at ages 70-74 is similar. But UK individuals tend to have slightly higher income. They also have lower medical expenditures because of the NHS. But UK households unexpectedly decumulate assets more slowly. This is partly due to the rise in house prices in the UK during that period.

## 1.2 Empirical facts on asset decumulation

- Wealth in the US has more of a right-skew at the start of retirement. Medians are similar.
- Primary housing wealth accounts for 2/3rds of UK retirement wealth but only 1/3 of US retirement wealth.
- Life expectancies are pretty similar. US household income is higher than the UKs but it drops with age whereas UK income rises with age – this could be down to different indexation practices between the UK and US. UK pensions are often indexed above prices.
- Median net wealth grew in the UK but fell in the US. Even once we strip out housing wealth assets are decumulated faster in America. Non-housing assets are much larger in the US so this could be because in the UK people want to keep enough assets to finance funeral costs. But this is still surprising.

## 1.3 Potential explanations of cross country differences

- Check whether the life-cycle model explains these differences.
- **Bequest motives**
  - Empirical literature in the US points to this being a channel. Less of a literature in the UK but surveys have shown that people want to pass on wealth.

- **Precautionary savings**

- De Nardi et al. (2010) have shown that pre-cautionary saving for medical expenses explain a lot of the slow decumulation of assets in America.
- There is not comparable data for late life medical expenses in the UK. And although the NHS covers some medical expenses they do not cover care home costs which can be a large proportion of medical expenses.
- *Note to self:* French and Jones (2004) estimate the stochastic process for medical expenses in retirement.
- But because there is not enough data we cannot compare the US and the UK.

- **Housing**

- Nakajima and Telyukova (2020) make a life-cycle model that takes into account the extra utility from housing and the fact that it is difficult to borrow against. Without housing assets they find that assets would be up to 55% lower. Combination of utility from housing and housing being difficult to get rid of.
- Later work has shown that housing is not a pre-cautionary saving tool.
- In the US there is a government administered equity release scheme, the UK has several private operators. In 2011 2% of homeowners had some reverse mortgage.
- Nature of housing as an asset impacts decumulation. Empirical work has not been able to distinguish mechanisms from each other – consumption value, transaction costs or risk-return matrix.

## 1.4 Conclusions

- Housing can explain difference between the UK and US. But so far there is not a satisfactory life-cycle model that can account for the difference in asset decumulation.

## 2 Savings After Retirement: A Survey

De Nardi et al. (2016)

### 2.1 Introduction

- 1/3rd of US wealth is held by those over 65. Standard life-cycle models with known time of death cannot account for the slow decumulation of these assets, particularly

for those who are wealthy.

- Two groups of mechanisms that could explain this. 1. **Risks** – uncertainty over time of death and medical expenses. 2. **Bequests**.
- Both of these have similar implications for saving in old age.

## 2.2 Facts about retired households

- Three main sources of retirement wealth – pension, social security and private savings.
- To understand how assets are decumulated across retirement De Nardi, French, and Jones use data from AHEAD and HRS. They split up the data by postretirement permanent income (PI). This is the average nonasset, non means tested social security income over retirement.
- Mortality bias – assets in the unbalanced panel are 50% of assets in the balanced panel at the start of the period.
- Show an interesting graph of decomposed medical expenses by age and by source of spending. Social spending programs make up the difference in out-of-pocket medical spending as opposed to differences in the use of medical services.
- Medical spending has a massive right skew. Top 5% of the distribution account for over a third of the total spend.
- Wealthy and the rich have significantly lower mortality and live longer.
- The literature is very mixed on bequests – some papers find that lots of people leave bequests whereas others find no bequests for a majority of the population and then large bequests for the wealthiest.

## 3 HOME EQUITY IN RETIREMENT

Nakajima and Telyukova (2020)

### 3.1 Overview

- Look at the role of housing equity in the retirement saving problem.
- Find, contrary to De Nardi et al. (2010), that medical expenses do not explain the decumulation problem.
- This is the closest in content to the paper that I want to write.

## 4 THE RETIREMENT-SAVINGS PUZZLE REVIEWED: THE ROLE OF HOUSING AND BEQUESTS

Suari-Andreu et al. (2019)

### 4.1 Introduction

- Three categories of explanation for the retirement saving problem (RSP) – uncertain mortality, bequests and precautionary saving.
- Parallel literature looking at housing equity in retirement (HER), find that homeowners are unlikely to draw down housing equity because they like living in their home, and partial drawdowns are costly.
- Nakajima and Telyukova (2020) augment the model from De Nardi et al. (2010). The NT model treats housing as a different asset. They find that home ownership interacts with the bequest motive.

### 4.2 The retirement-savings problem

- Three strands to the RSP literature. The first looks at the impact of lifetime uncertainty on retirement savings. Initiated by Yaari (1965) with recent contributions by De Nardi et al. (2010). The risk of outliving their wealth leads individuals to decumulate more slowly than they would if time of death was certain.
- The second set of literature studies bequest motives. Altruistic, egoistic, and strategic motives. There is also a small literature on inter-vivo.
- More recently, the impact that uncertain medical expenses can have on retirement savings has been studied. De Nardi et al. (2010) show that this can explain a large part of the savings of singles.

### 4.3 Home equity in retirement

- Housing is special because of its role as a consumption and investment good, and because it is infrequently traded due to high transaction costs.
- There is at most a modest decline in housing wealth among older people. Venti and Wise (2004) have shown that this is caused by the subset of households that experience widowhood or a nursing home event. They conclude that housing wealth is generally not used for consumption; this explains the low demand for reverse mortgages and implies we should not count housing wealth as retirement wealth.

- Less moving in the UK than the US. Higher taxes and lower variation in climate and institutional choice. Confirmed by Blundell et al. (2016).
- Few international studies. A couple of dutch papers have shown also that older people tend not to move or use reverse mortgages.

#### 4.4 Models of retirement saving with housing

- First key contribution comes from Yang (2009). She builds a model that explicitly models housing and its features. Owner occupied housing counts contributes to utility and can be used as collateral.
- Households can either be owners or renters. They can become renters exogenously or endogenously. She matches the model to parameter estimates from the literature and uses it to explain features of the life-cycle pattern of housing and non-housing consumption.
- She finds that the transaction cost associated with moving makes older households much less likely to sell their house. If transaction costs are 0 then households would sell houses at a faster rate.
- But the model leaves out key things features that are in the RSP literature; death uncertainty, medical expense uncertainty and bequests which could also explain the pattern.
- Nakajima and Telyukova (2020) adds housing consumption to the model from De Nardi et al. (2010). Quite a complicated model but I don't see why I could not copy it. Nakajima and Telyukova have a single health shock as opposed to a medical expense shock.
- NT find that bequest motives and housing are the big drivers of retirement saving. But De Nardi et al. (2010) only use singles and they do not match the housing distribution in their method of simulated moments. (Is this process, in general, robust to choosing different moments?)

##### 4.4.1 Bequest motives

- Authors consider three different motivations for bequests.
- **Altruistic** NT model bequest motive as an egoistic motive. Households just want to have positive wealth at death no matter who they are passing on the bequests to. An altruistic bequester models the utility of the heirs and seeks to maximise this. With concave utility, bequests are decreasing in the life time income of the heirs because their marginal utility from money is lower.

- **Strategic.** Bequests should be seen in the context of inter-generational transfers where parents care about what their children do for them in old age. Re-write utility with a parameter which increases parents utility but decreases the heirs. Some evidence for this channel but I think it is a bit shaky. There is also some evidence that inter-vivo transfers increase if someone is a caregiver.

## 4.5 Government policy timeline

- Freedom and choice in pensions announced in March HMT (2014a). Gains royal assent in December becoming the Taxation of Pensions Act. HMT (2014b)
- What other reforms were there? 2010 budget annuitisation

## 5 The Cost of Annuities: Implications for Saving Behavior and Bequests

Friedman and Warshawsky (1990)

- Interesting point re annuities being low because of state pension. I could test consumption response to forced annuitisation if that is the case as well. I think it would just mean increased spending?
- Make a good point that other explanations for the AP are to do with unfairly priced annuities. This could be subjectively or not and it would have the same impact (or a mixture of the two). So I don't think there is massive need in estimating subjective survival curves.
- I think there has been some work by cannon and tokes on estimating this in the early 2010s so I am not sure whether there is point me trying to do this again using the CMI annuitants tables.
- Also test model with both bequests and unfair annuities. This seems most obvious tbh. Maybe whole idea is rubbish because of this.
- Could I compare how a mixture of load factors vs a mixture of subjective death probs vs a mixture of adverse selection interacts. Disentangling the extent to which each causes people not to annuitise would be difficult though. But can use evidence from ELSA and CMI for subjective and adverse selection amounts respectively.
- 

$$\mathbb{E}(U) = \sum_0^{w-x-1} [p_t U_t(c_t) + p_t q_t V_{t+1}(G_{t+1})]$$



Where  $V_{t+1}(G_{t+1})$  is the utility from bequests next period and  $q_t$  is the probability of death.

- Does some simulations showing how bequests and actuarial unfairness interact with each other. This type of table could be a good thing to include in my paper. Then a section showing implied consumption changes and then the data work. I think I am kinda close to being able to make that anyway.
- What is expected yield differential? D
- *" but investigating it seriously would require data on the degree of actuarial unfairness in the pricing of annuities not just for individuals but for double or even multiple lives."* This is interesting. Could I compare annuitisation decisions of couples and singles? Singles should be more likely to buy annuities if this is true.
- Couples should also have a larger consumption response. Can we solve two person models? Probably? But I think joint annuities would face more than double the problem with actuarially unfair annuities worse – impact would be multiplied and not summed.
- Have not seen this before? Could be interesting. I think Eric solved a life-cycle model with a couple in so I could try and look at that paper. (No I think it was another paper from S130)

## 6 Annuity Prices and Saving Behavior in the United States

- Solve life cycle models again. The variable of interest they use is the loading factor.
- Need bequest motives to get annuity rates that are observed.
- "See Friedman and Warshawsky (1985) for a brief discussion of several of these other possible explanations." that is for other explanations for lack of annuitisation. Had a look at this and it wasn't super useful. Just seemed like a first draft of the paper.

## 7 Bequest motives and the annuity puzzle

- Literature (Abel 2004?? Find when landed) claims that bequest motives can only explain part of the AP. But Lockwood shows that it can explain why people annuitise no wealth given loading factors (prices etc) of annuities.
- (Davidoff et al., 2005??) is another paper on annuities I should read.

item

## 8 Personal notes

### 8.1 Saturday before due date

- Thistlethwaite and Campbell, 1960 – RD literature
- Regression Discontinuity Inference with Specification Error – Lee and Card. Seems like an interesting paper
- Should I use financial wealth variables at retirement instead of at interview? I guess in a lot of cases I won't know this. I could check the differences for the people that I have pre and post for.
- I also need to see what happens if I include family size.
- Ok data work is done. Now I should need to work on julia data. I think I need to run some more subjectives

### 8.2 ELSA notes

### 8.3 20-07

- What other ELSA variables to use?
- What will home ownership change?
- How to deal with top wealth deciles? - at the moment they are excluded because of the grid.
- Include other sources of income i.e. Got Dc pension
- Run model just with pension wealth and not financial wealth
- We could probably generate non annuitisation by adding some fixed cost.
- OK, the financial wealth variable I use is quite comprehensive including all non-housing wealth which is good.
- Deflator?
- 
- Pension wealth is what I need to look at now **DONE**
- What

- Do we look at just individuals? Or just households or both?

## 8.4 14-07

- Pension wealth variables from IFS – I could illustrate the method with just financial wealth and then use pension wealth calculations as well. Pension wealth gives us retirement income. This leaves financial wealth to be invested in annuities.
- Apparently there are pension wealth variables for DC pensions? Cant find in harmonized but perhaps they are in the pension files?
- Could subjective survival probs also explain slow asset decumulation. And then by the time they are old they have medical risks.
- "Allowing individuals to solve optimisation problems using hueristics"

## 8.5 12-07

- Got CMI access.
- To do:
  1. Start regression work - done
  2. Finish making subjective survival curves - on their way
  3. Finish lit review - done
  4. Start methodology section - need to do
  5. Write couple code - need to do
  6. Write behaviourel model code need to do
  7. Run lifecycle models with different starting points - this is to do. Do we have size of pension though? No. Only size of income.
  8. Do I want to add defined pension income to the model? Yes I think so.
  9. Can also check the consumption responses of individuals who think they are going to leave a bequest.

## 8.6 11-07

- Good idea about couples. Good idea about table showing % of annuitants with param values and then also consumption changes.

- How to split consumption? Guess have more grids? – Don't need to since only one continuation value and there is no heterogeneity between partners.
- How do behavioural models change the DP problem. Could present bias be part of the explanation.
- Also introduction of lifetime cap in care costs could be interesting hypothetical policy issue to mention.
- 

## 8.7 08-07

- Trying to understand the weibull code from O'Dea and Sturrock (2023). Non-linear least squares
- Big docs have questions in that we can use.

## 8.8 06-07

- Do I have death data? check UKDS. Harmonized data does have year of death but only for very few people. It doesn't have it for the majority of exits.
- I can change pension for individuals and asset levels and subjective life expectancy.
- 

## 8.9 04-07

- How to make a consumption floor? Is it a question of giving income?
- Also check
- should think about the impact of housing on the effects of the change – will there be heterogeneity
- To do
  1. Make julia module
  2. add gender into life cycle
  3. get subjective life expectancies – have got the code from david and cormac but I think they have birth dates and death dates which aren't included in the normal elsa data.
  4. generate correct rates of annuitisation

## 8.10 30-06

- Continue working on retirement lifecycle code. Once we have a working version of a simple model we can then attempt to add the extensions.
- I think I should also check the O’Dea and Sturrock (2023) paper, I think they just use a simple model without bequests.
- Simple model is working. Now we want to add medical risk?
- First clean up code, put it into a function where we can change everything easily.
- Plot consumption - done. Also sorted out some problems with the code.
- Then I need to augment with annuity products - I should be able to do this. At age 65 they can make a decision to buy an annuity or not. Check expected utility from consumption path. Then do the same with bequests. Shall I asked ODea and Sturrock for codes?
- Lockwood makes a discrete space that is exponential. Seems a bit strange tbh. I’d like to look at Odea’s code. How to draft the email?
- So the grid of assets is created from the consumption choices? – Yes I think that is how it works and then consumption should always be in the grid.
- Also should compare to income drawdown. Most pensioners have income below the taxable amount, and therefore the optimal amount of drawdown should not be impacted by taxes.
- And state pension?
- I guess in it’s current

## 8.11 28-06

- Not sure what I should work ok. I could do more data work or work on the simulation part. I think simulation part. Data is probably not far from being done tbh.
- Aim is to get a small working version just with risky retirement life expectancy.
- 

## 8.12 27-06

- Pretty bad week of work. Understand the data a bit better. But have made little progress elsewhere. I want to work on my Julia code to replicate the analysis in O’Dea and Sturrock (2023) and Lockwood (2012).

- Lets have a look at the matlab code from Lockwood. Is actually kinda hard but I think doable. That would be the bit I enjoy the most. Why do people keep on coming up with new life-cycle models though.
- 
- What are the implications for the reason no annuities being the returns in the stockmarket. - could someone look at actual returns that retirees get. Presumably many switch to portfolios with bonds.
- I think the implication would be increased
- Inkmann et al. (2011) – reading this now. Say that there is an annuity question in the Income and Assets section of the ELSA data set. "IAAIM" this variable. Makes sense now how they got such a small amount. No way to tell whether people are using income drawdown products or not. Guess we could see if non-annuity income increases after. "IAPPEN" then this variable is the amount of pension income which includes annuity income. Not sure whether we should see this go up or down around 2013.

### 8.13 19-06

- Get familiar with the pension data and the different pension variables. O'Dea and Sturrock (2023) – in this paper they calculate money's worth using subjective mortality risk as opposed to normal life tables. No simulations, just
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### 8.14 18-06

- Dear Eric, thanks for your advice – I'll stay clear of trying to estimate a savings model. That paper looks very comprehensive so I am not sure what I could add to the topic in four weeks.

I've come back to the ideas around the reform to annuities and how it fits with the implications that different models of retirement saving would predict. Models that have been estimated, such as the Lockwood paper, give quite sharp predictions about what should happen to savings and consumption in retirement when the annuity constraint is lifted.

My analysis could take several of the most recent models in the lifecycle literature that explain retirement saving and estimate the expected changes in consumption of retirees in the first few years of retirement conditional on not being forced to annuitise pension wealth

- If Lockwood paper is correct and bequests are the driver of retirement savings then we should see a decrease in savings from income. If individuals don't buy annuities because they aren't priced fairly for them then we should see a rise in consumption when annuities are no longer compulsory. One section of the paper could fit these two simple models of non-annuitisation using the drop in demand for annuities.
- ok found quite an interesting new paper Inkmann et al. (2011). Look at annuity demand and characteristics that are associated with it. Also, estimate a life-cycle model that can explain the portfolio choices of individuals in the data.
- Mmm could I also compare those with a DB pension and those with a DC pension. Nothing changed for DB pension pots. Could I do a diff in diff using the DB pension group as the control? I think that would work.
- Have a look at the pension data today. Can we distinguish the point at which individuals retire? When they convert pension to annuity income? Or when they keep on running it down as normal?
- I also need to let Eric know and just run this past him as well.
- Does consumption increase with bequest motive as well? Only if people under forced bequests were saving more at the start of retirement to regain what they were forced to annuitise.

### 8.15 16-06

- Have a better understanding of the data.
- But I still need a better idea. Read Lee Lockwood RED paper.
- Also figure out pre-retirement pension DC pots. i.e. what they can spend on annuities.
- I think a basic easier question would be what impact has the change had on consumption profiles.
- Could I estimate a small model somehow?
- New idea is to estimate reduced form estimates of the impact compulsory annuitisation had on wealth.

### 8.16 13-06

- There is data on consumption and spending in ELSA. The technical reports have good information on what is available in the data sets.

- Questions: Is health expenditure data available? There is some social care cost data but there is not any medical expense data. Or I cannot find it at least.
- *Questions/to do:*
  1. Minimum distance estimation and method of simulated moments in Julia?  
Solving the model in Julia?
    - (a) Minimum distance theory vs method of simulated moments – check Hansen.
    - (b) Perhaps get a small working example going and then play around with it.  
There are some on quant econ that I can use [tps://github.com/fediskhakov/CompEcon](https://github.com/fediskhakov/CompEcon) – this has some nice python notebooks that I could try and replicate. I do not know how to start this though? Should I just start trying to bang away at it? Do I even understand how the method works? Do I solve for optimal policy functions for a given
    - (c) Good textbook treatments of SMM are found in Adda and Cooper (2003, pp. 87-100) and Davidson and MacKinnon (2004, pp. 383-394).
  - 2.
  3. Medical expense data?
  4. Read Banks et al. (2019) – this looks at differences in consumption across retirement in the US and the UK.
  5. Read Gourinchas and Parker (2002) – big contribution to the field it seems.
  6. **Scrap this idea. Eric advised against it.**
- I am back to the annuity idea. I could document changes in annuities in ELSA and FES and also see if consumption changed because of this. I like the idea of fitting a bequests model to the change in annuitisation rates like Lee Lockwood did but I do not know if that is possible. What moments would I match it to?
- I have just broken my version of R annoyingly. I want to have a separate set of packages downloaded for my thesis. Done and it is working again nicely now.

## References

- Banks, J., R. Blundell, P. Levell, and J. P. Smith (2019). Life-cycle consumption patterns at older ages in the united states and the united kingdom: Can medical expenditures explain the difference? *American Economic Journal: Economic Policy* 11(3), 27–54.
- Blundell, R., R. Crawford, E. French, and G. Tetlow (2016). Comparing retirement wealth trajectories on both sides of the pond. *Fiscal Studies* 37(1), 105–130.



- De Nardi, M., E. French, and J. B. Jones (2016). Savings after retirement: A survey. *Annual Review of Economics* 8(1), 177–204.
- De Nardi, M., E. French, and J. Jones (2010). Why do the elderly save? the role of medical expenses. *Journal of Political Economy* 118(1), 39–75.
- French, E. and J. B. Jones (2004). On the distribution and dynamics of health care costs. *Journal of Applied Econometrics* 19(6), 705–721.
- Friedman, B. M. and M. Warshawsky (1985, August). Annuity prices and saving behavior in the united states. Working Paper 1683, National Bureau of Economic Research.
- Friedman, B. M. and M. J. Warshawsky (1990). The cost of annuities: Implications for saving behavior and bequests. *The Quarterly Journal of Economics* 105(1), 135–154.
- Gourinchas, P.-O. and J. A. Parker (2002). Consumption over the life cycle. *Econometrica* 70(1), 47–89.
- HMT (2014a, March). Freedom and choice in pensions. Technical report, Her Majesty’s Treasury, London. Cm 8835.
- HMT (2014b, December). Taxation of pensions act. Technical report, House of Commons, London.
- Inkmann, J., P. Lopes, and A. Michaelides (2011). How deep is the annuity market participation puzzle? *Review of Financial Studies* 24(1), 279–319.
- Lockwood, L. M. (2012). Bequest motives and the annuity puzzle. *Review of Economic Dynamics* 15(2), 226–243.
- Nakajima, M. and I. A. Telyukova (2020). Home equity in retirement. *International Economic Review* 61(2), 573–616.
- O’Dea, C. and D. Sturrock (2023, 03). Survival pessimism and the demand for annuities. *The Review of Economics and Statistics* 105(2), 442–457.
- Suari-Andreu, E., R. Alessie, and V. Angelini (2019). The retirement-savings puzzle reviewed: The role of housing and bequests. *Journal of Economic Surveys* 33(1), 195–225.
- Venti, S. F. and D. A. Wise (2004, June). Aging and Housing Equity: Another Look. In *Perspectives on the Economics of Aging*, NBER Chapters, pp. 127–180. National Bureau of Economic Research, Inc.
- Yaari, M. E. (1965). Uncertain lifetime, life insurance, and the theory of the consumer. *The Review of Economic Studies* 32(2), 137–150.

Yang, F. (2009). Consumption over the life cycle: How different is housing? *Review of Economic Dynamics* 12(3), 423–443.