Myopia, pension payments and retirement: an experimental approach

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Outline

Introduction

- The decision over when to retire is influenced by a number of factors.
  - Individual factors e.g. health, family.
  - Financial factors e.g. personal saving, pensions, state benefit entitlement
- Attention often given to incentives to retire in accumulation phase e.g. defined benefit scheme accrual rates, replacement ratios
- Standard model predicts indifference between (actuarially-fair) decumulation alternatives.

Introduction

- Behavioral economics literature have been incorporated into some retirement issues e.g. reasons for undersaving
- Much less incorporation on labour supply decision (exceptions: Diamond and Koszegi, 2003; Bassi, 2008)
- Undersaving and the timing of retirement are connected – length of retirement determines adequate post-retirement resources, and vice versa.

Introduction

- This paper considers role of discounting in retirement decision.
  - Policies designed to overcome undersaving (due to non-exponential discounting) make earlier retirement more affordable.
  - Early retirement may be anticipated or could be impulsive.
- Decumulation phase of saving scheme also may be important – large lump-sum more attractive to impulsive retirees.
- Contrast with existing literature (Fatas *et al.*, 2007) – lump-sum payments lead to delayed retirement.
  - Linked to inability to accurately compare alternatives and magnitude-dependent discounting.

Aims

- Set out a model of saving and retirement
  - Individuals are (potentially) non-exponential discounters
  - Retirement payments may be lump-sum or annuity
- Use to explain existing evidence
- Test using data collected through a new experiment

Model

- Individuals have quasi-hyperbolic discount functions to capture impulsive decision making and myopic choices:

$$D(t) = \begin{cases} 1, t = 1 \\ \beta\delta^{t}, t > 1 \end{cases} \quad (1)$$

- Individual have constant relative risk aversion utility functions: $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$

Theory

- Individual lives for three periods, retires in period R
- l_t is labour supply in each period: $l_t = 1$ if $t < R$, and $l_t = 0$ otherwise.
- Receive wage w in each period, save sw each period of work
- Leisure utility e in each period retired, 0 otherwise.
- Survival probabilities:
  - Pr(alive in period 2—alive in period 1) $= p$
  - Pr(alive in period 3—alive in period 2) $= q$.
- May receive either annuity or lump sum upon retirement.

Theory

- Planned R is determined by comparing the utility of the two alternatives from the perspective of period 1.

$$\frac{(w-s)^{1-\gamma}}{1-\gamma} + p\beta\left(\frac{(c_2)^{1-\gamma}}{1-\gamma} + q\frac{(c_3)^{1-\gamma}}{1-\gamma} + (1+q)\,e\right) >$$

$$\frac{(w-s)^{1-\gamma}}{1-\gamma} + p\beta\left(\frac{(w-s)^{1-\gamma}}{1-\gamma} + q\frac{\left(\frac{W_0+2s}{pq}\right)^{1-\gamma}}{1-\gamma} + qe\right)$$

Theory

- Actual R is determined by comparing the utility of the two alternatives from the perspective of period 2.

$$\frac{(c_2)^{1-\gamma}}{1-\gamma} + e + \beta q \left(\frac{(c_3)^{1-\gamma}}{1-\gamma} + e \right) >$$

$$\frac{(w-s)^{1-\gamma}}{1-\gamma} + \beta q \left(\frac{\left(\frac{W_0+2s}{pq}\right)^{1-\gamma}}{1-\gamma} + e \right)$$

Theory

- Planned and actual R depend on preference parameters e, β and γ.
- Some of these effects are different depending on group membership – c_2 and c_3 vary when $R = 2$ across payment groups.

Theory

- Hypotheses:
  1. Individuals with a higher utility of leisure should plan to retire earlier.
  2. Lump sum payment saving schemes are more likely to lead to later planned retirement than annuity payment schemes.
  3. Impulsiveness reduces the planned retirement timing of the annuity group, relative to the lump-sum group.
  4. Individuals with higher utility of leisure will retire earlier.
  5. More impulsive individuals will retire earlier.
  6. Lump sum payment saving schemes are likely to lead to early retirement than annuity payment schemes (when q is high).
  7. Impulsiveness drives unplanned early retirement.
  8. Lump sum payment saving schemes are more likely to lead to unplanned early retirement than annuity payment schemes

Existing approach

- Fatas *et al.* (2007):
  - Experiment to look at retirement and pension payouts
  - Experiment had 15 rounds, with declining survival probability.
  - "Pension" payment in each round grows at actuarially fair rate – E(payment) $= 100$
  - Participants received either lump-sum, annuity or hybrid.
  - Lump-sum group reported higher leaving age (decision made prior to round 1).

Existing approach

- This experiment has a number of problems:
  - No time element - single session with rounds
  - Essentially, a choice between lotteries with identical expected values
  - Therefore, not surprising individuals happier to delay lump-sum payments
  - No role of utility from leisure time
  - No saving process
  - Planned retirement ages and actual retirement are not the same thing.

Existing approach

- Hypothesis 2 is similar to results of Fatas *et al.* (2007) – represents model where $\beta = 1$ and $q < 1$
- Model predicts later mean retirement ages under the lump-sum scheme providing they exhibit some risk aversion.
- Hence, their experiment only confirms that individual exhibit some degree of risk aversion.

Experiment design

- The introduction of time and leisure and the implications of preference reversal can not be assessed in the Fatas *et al.*, (2007) experiment.
- Experiment replaces lottery with set of choices over time and looks at actual retirement decisions.
- Aims of experiment:
  - Identify inconsistencies in plans over leisure
  - Test hypotheses
- Model assumes a degree of credit constraint, so that payment types alter consumption paths.
- However, small reward experiment may not recreate this – anticipate little support for Hypothesis 6 and 8.

Experiment design

- 8 week experiment
- Participants are allocated to either lump-sum or annuity group upon arrival
- First session collects information of discounting (Delayed Reward) and risk aversion (Preferred Lottery), and make "retirement" plan.
- Follow-up six sessions – returning is "work", not returning is "retired".
- Once retired, can not return to future sessions.
- No session in week 8.

Experiment design

- Delayed Reward:
  - Preference between £x today and £y after a delay of t weeks.
  - $x = \{1, \ldots, 15\}, y = 15, t = \{1, 2, 3, 4, 8, 24\}$
  - Begin with smallest delay ($z = 1$ week) and the smallest immediate reward ($x =$£1)
  - Increase x by £1 increments. At some point, the individual will shift to preferring the immediate reward.
  - Move to next smallest delay ($z = 2$ days), and repeat.
  - Once complete, repeat in reverse: $x =$£15, decrease by £1.
- Three choices chosen for payment.

Experiment design

- Preferred Lottery:
  - Respondents asked to report preference between £x for certain and £y paid with a probability of z
  - $x = 0.50, \ldots, 10, y = 10, z = \{0.2, 0.5, 0.8\}$
  - Probability is explained as a random draw from a bag of ten balls, where $10z$ of the balls are red, and the remainder are black.
  - Begin with the smallest certain payment ($x = 0.50$) and the simplest lottery ($z = 0.5$).
  - Increase x until individual prefers certain payment.
  - Repeat for other two lotteries.
- Two choices chosen for payment.

Experiment design

- Retirement game:
  - Wage = £4. Half taken away at the end of the session. The remaining half is saved.
  - Participants are told that they can stop coming to the lab any week.
  - When they do, they are considered to be retired, and they will begin to receive their savings.
  - Saving received either lump-sum or as annuity over remaining weeks.
  - The saving pot earns a 0% interest rate.
  - Savings are paid directly to the participants at their university pigeon holes.

Experiment design

Table: Retirement game Payouts

R	Lump-sum	Annuity
1	0.00	0.00
2	2.00	0.29
3	4.00	0.67
4	6.00	1.20
5	8.00	2.00
6	10.00	3.33
7	12.00	6.00
8	14.00	14.00

Experiment design

Table: Follow-up experiments

Week	Game	Variation
2	Delayed Reward	Larger rewards
3	Delayed Reward	Rewards were a 'holiday' from a hypothetical time commitment
4	Delayed Reward	Larger rewards
5	Retirement Game	Hypothetical, shorter periods
6	Delayed Reward	None
7	No game	Individuals were told they had no tasks upon arrival

Experiment design

- Short questionnaire at end of each session:
  - Username – to link responses across weeks.
  - Age, gender
  - Student status
  - Two measures of cost of giving up time – money cost and time needed

Experiment design

- Aside from the introduction of time and the possibility of preference reversal, the design had several other differences compared to Fatas *et al.* (2007):
    - Less rounds
    - No survival probabilities
    - Explicit accumulation process

Data

- 30 University of Oxford student volunteers.
- Participant was informed of the time requirements – asked to volunteer only if they believed the time of each session was available
- First session: 90 minutes, £6 participation payment and a further £2 first week "wage".
- Return sessions: approx 10 minutes, £2 "wage".
- Retirement payments made to college pigeon holes after each return session.
- Remaining participants emailed each week with reminder of experiment time and potential payments.
- Asked to email reply if they could not return for external reason (e.g. illness) – 3 participants.

Variables

Table: Data

Variable	Notes
Planned retirement age, R	Week number
Gender	Male or female
Student status	Undergraduate or postgraduate
Age	Years
Time given up to come to lab	Reported in minutes
Cost of coming to lab	Reported in pounds
Actual retirement age, R^*	Week number, derived from first week of no return
Retirement inconsistency gap	$R - R^*$

Estimation of preference parameters

- Quasi-hyperbolic discount function from utility indifference points:

$$u_i(x_t) = \beta_i \delta_i^t u_i(15) \tag{2}$$

- Assume linear utility, estimated via OLS:

$$\ln X_t = \ln(15\beta_t) + t \ln \delta_t + e_t \tag{3}$$

Estimation of preference parameters

- Similar estimation using certainty equivalents in lotteries (and linear approximation of CARA utility function)
- Leisure preference from time cost
  - Mean reported time costs after week 1
  - Obvious misunderstanding of question (e.g. time cost of 105 minutes in week 1, 5 minutes in week 2)
- Assumes similar leisure utility across participants – are students a homogeneous group in this respect?

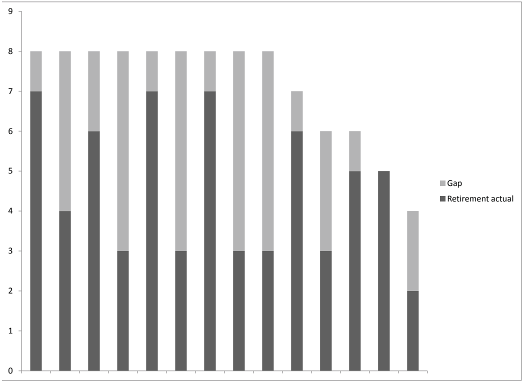
Estimation of preference parameters

- Dummies from continuous variables.

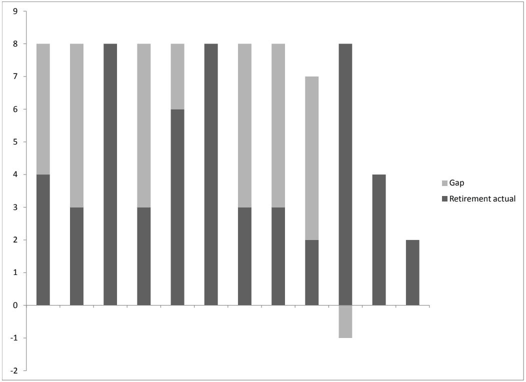
Table: Dummy variables

Variable	$= 1$	$= 0$
Impulsive	$\beta \leq 0.94$	$\beta > 0.94$
Risk averse	$\gamma \leq 0.03$	$\gamma > 0.03$
Consistent	$-1 \leq Gap \leq 1$	$Gap > 1$

Planned and actual retirement: lump sum group



Planned and actual retirement: annuity group



Planned retirement

- Large proportion of participants (17/26) report planned $R = 8$
- Two types of responses ($R = 8$ and $R < 8$) - some individuals reporting on other basis than true preferences
- No significant differences by e, β, γ or payment group.
- Significantly smaller inconsistencies for latter.

Table: Mean values

Variable	$R = 8$	$R < 8$	Difference
Gap	3.235	1.222	2.013** *(0.010)*
Consistent	0.294	0.667	-0.373** *(0.036)*

Planned retirement

- Given that, unsurprising that planned retirement hard to predict.

Table: Regression analysis - planned R

	$R < 8$	All	All
TIME COST	-0.054*	0-.032*	-0.039*
IMPULSIVE			0.814
RISK AVERSE	2.020*		0.873
LUMP SUM			0.184
CONSTANT	5.600**	7.799**	7.065**
N	7	25	23
R^2	0.749	0.132	0.212

Actual retirement

- Actual retirement should reflect actual preferences
- Impulsiveness strong and consistent predictor of actual retirement
- Little evidence of a significant role played by payment type
- Planned retirement weak predictor of actual retirement when controlled for discounting

Actual retirement

Table: Regression analysis - actual R

	1	2	3	4
IMPULSIVE	-2.012***	-1.805**	-1.868**	-1.900**
TIME COST		-0.006	-0.100*	
PLANNED R				0.315
LUMP SUM		0.364		
UNDERGRAD			-3.247*	
CONSTANT	5.312***		8.317***	3.029*
N	26	25	25	26
R^2	0.243	0.221	0.330	0.310

Inconsistency

- Gap between planned and actual retirement caused by either:
  - Genuine time-inconsistencies
  - Meaningless initial plans
- Impulsiveness significantly different between time-consistent and time-inconsistent groups.

Inconsistency

Table: Mean inconsistency

	$R < 8$	$R = 8$	All
Impulsive	0.667	0.857	0.800
Not Impulsive	0.166	0.600	0.438
Difference	0.500	0.257	0.363**

Conclusion

1. Impulsiveness is strongly associated with the decision to leave the experiment, but has no relationship with the reported planned retirement. Consequently, impulsiveness may explain inconsistency in the leaving decision.
2. Possibility that many participants do not report accurate plans – issue for experimental design?
3. Some evidence that time costs are relevant in this experiment.
4. Contrary to the predictions of the model and existing evidence, payment type have no significant effect on any part of the leaving decision.

Possible issues

- Alternative explanation: individuals learn about their true preferences as time progresses.
- Not the same as changing discounting preferences e.g. underestimate effort that is required for them to return to the laboratory each week
- How sophisticated are participants?

Contribution of experiment

- Test of time inconsistency over leisure choices
- Novel design
- Experiment captures longitudinal inconsistencies
- Adds to small number of studies combining behavioral and labour economics.