Institute for Fiscal Studies

Cognitive function, numeracy and retirement saving trajectories

James Banks (University of Manchester and IFS),

Cormac O'Dea (University College London and IFS)

Zoe Oldfield (IFS)

Background

- Retirement saving decisions have become increasingly complex

- Substantial differences in the various dimensions of cognitive function across the population.

  - How does this translate into retirement outcomes?

- Evidence to suggest that cognitive function is an important factor in financial planning:

  - Higher ability individuals are more patient (Dohmen et al. 2007, Kirby et al. 2005)

  - Higher ability individuals less risk averse (Frederick 2005)

  - More numerate individuals less susceptible to framing effects (Peters et al. 2006, Parker and Fischhoff 2005)

  - Lower inability individuals less likely to participate in financial markets (Benjamin et al. 2006)

Institute for
Fiscal Studies

Our Aims

- Previous work (Banks & Oldfield 2007) investigated the relationship between cognitive function and:

  - *Levels* of financial wealth; Portfolio composition; Pension knowledge

- In this paper we investigate:

  1. The relationship between cognitive function and saving (*changes* in financial wealth)

  2. The implications of cognitive ability for welfare on retirement.

- Punchline:

  1. Cognitive ability is highly correlated with behaviour (even after conditioning on much else)

  2. No evidence of marginal correlation between cognitive ability and (proxies for) welfare on retirement

# Data: English Longitudinal Study of Ageing

- Very similar survey to HRS (USA), SHARE (Europe)

- 12,000+ respondents aged 50+ in 2002

- Interviewed every 2 years with nurse visit every 4 years

- Full measurement of

  - Economic circumstances: employment, income, wealth

  - Expectations and subjective attitudes to ageing

  - Health, physical functioning and disability

  - Cognitive function and mental health

  - Social participation, social support

  - Biomarkers, admin data linkages

Institute for
Fiscal Studies

Cognitive Function Questions in ELSA

- Tests of retrospective memory, prospective memory, executive function, literacy, and numeracy

- Numeracy Questions:

  - 6 questions

  - Easiest effectively asks what is (100 minus 85)

  - Most difficult requires an understanding of compound interest

- We use these questions to divide respondents into four groups:

Group	Proportion of Sample
Group I (Worst)	16.2%
Group II	46.5%
Group III	26.1%
Group IV (Best)	11.2%

Institute for
Fiscal Studies

# Levels of numeracy by age (in cross-section)
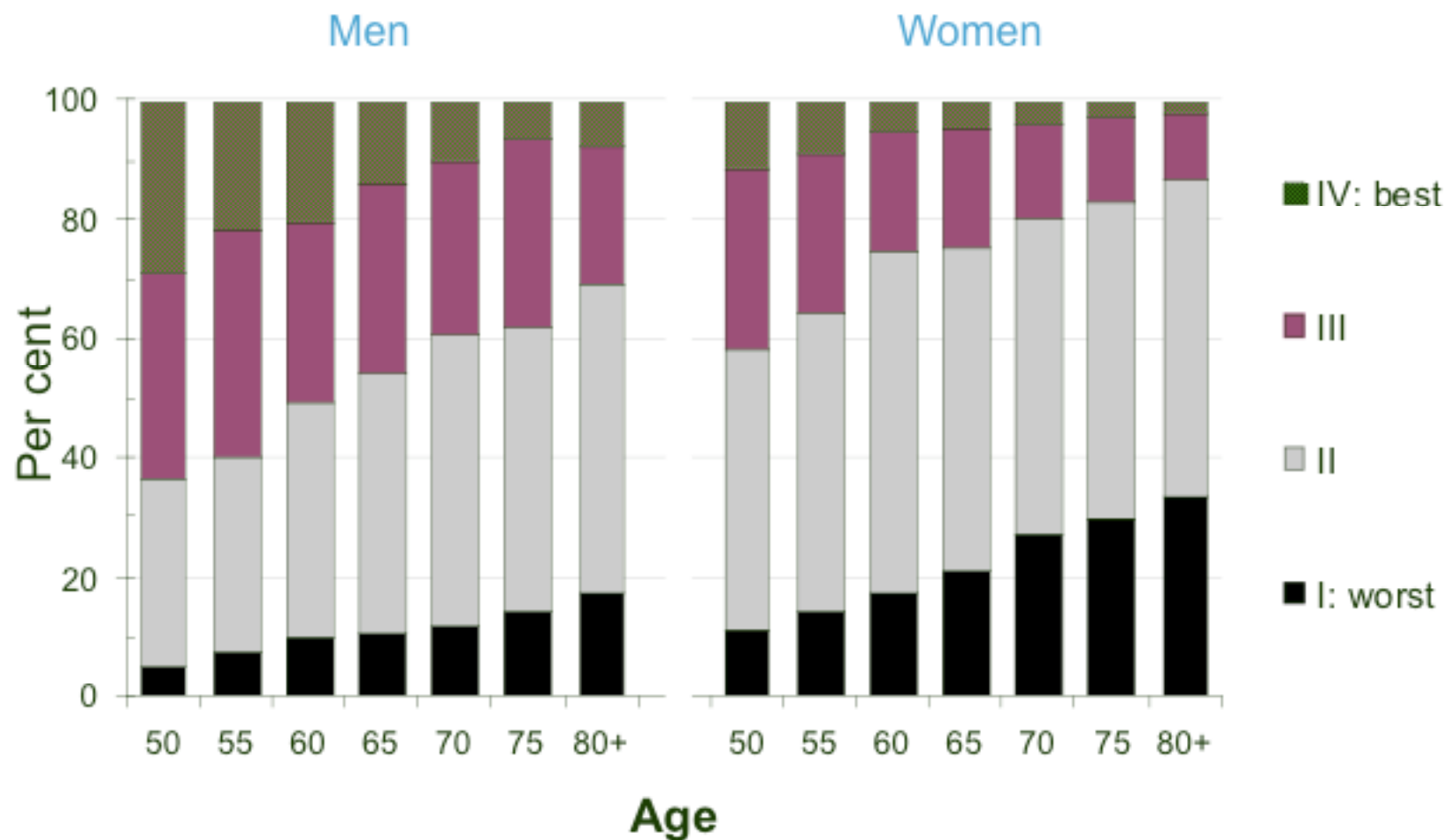
Results from First Wave of ELSA (Banks & Oldfield 2007)

- Higher levels of numeracy correlated with levels of financial wealth
  - This remains true after conditioning on education.

- After conditioning on wealth, higher levels of numeracy:
  - Are correlated with probability of holding complicated assets
  - Not correlated with probability of holding simple interest bearing deposit account

- Numeracy correlated with "financial knowledge". Most numerate are more likely to:
  - Know if they have a DB or DC pension scheme; know accrual rate, expected pension income, whether pension income is indexed-linked
  - Feel they have had enough information about their pension

- Most numerate are less likely to report a chance of having "insufficient resources to meet their needs at some point in the future"

Institute for Fiscal Studies

Using Waves 1 to 3 of ELSA
Net real financial wealth profiles by numeracy and cohort
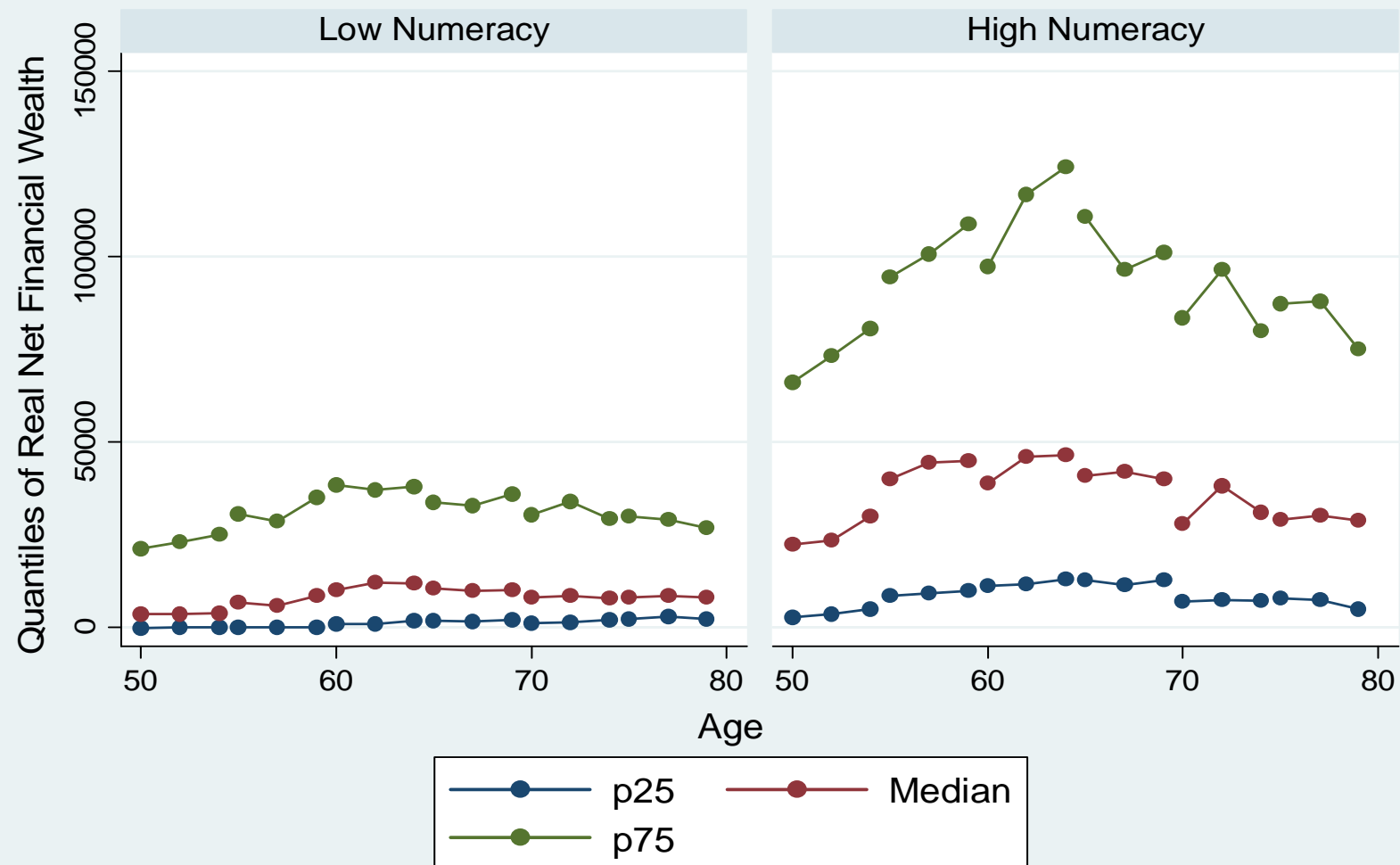
Graphs by Broad Numeracy Type

Institute for Fiscal Studies

Numeracy and changes in financial wealth: pre- and post-retirement

Numeracy Group	Age 50-61			Age 65+		
	p25	p50	p75	p25	p50	p75
1						
2 (reference)	-	-	-	-	-	-
3						
4						

Dependent Variable: Change in wealth / Average income as a function of numeracy

Age dummies, female dummy and couple dummy also included as well as controls for education, cognitive function, memory and literacy

Institute for Fiscal Studies

Numeracy and changes in financial wealth: pre- and post-retirement

Numeracy Group	Age 50-61			Age 65+		
	p25	p50	p75	p25	p50	p75
1	0.16 (0.17)	0.03 (0.06)	-0.08 (0.30)			
2 (reference)	-	-	-	-	-	-
3	-0.11 (0.07)	**0.07 (0.03)**	**0.41 (0.12)**			
4	-0.14 (0.08)	**0.16 (0.03)**	**0.70 (0.14)**			

Dependent Variable: Change in wealth / Average income as a function of numeracy

Age dummies, female dummy and couple dummy also included as well as controls for education, cognitive function, memory and literacy

Institute for Fiscal Studies

Numeracy and changes in financial wealth: pre- and post-retirement

Numeracy Group	Age 50-61			Age 65+		
	p25	p50	p75	p25	p50	p75
1	0.16 (0.17)	0.03 (0.06)	-0.08 (0.30)	0.13 (0.15)	0.01 (0.04)	-0.01 (0.12)
2 (reference)	-	-	-	-	-	-
3	-0.11 (0.07)	**0.07** (0.03)	**0.41** (0.12)	**-0.19** (0.09)	-0.01 (0.03)	0.05 (0.08)
4	-0.14 (0.08)	**0.16** (0.03)	**0.70** (0.14)	**-0.80** (0.13)	**-0.17** (0.04)	**0.32** (0.18)

Dependent Variable: Change in wealth / Average income as a function of numeracy

Age dummies, female dummy and couple dummy also included as well as controls for education, cognitive function, memory and literacy

Institute for Fiscal Studies

So what?
(Or does any of this matter?)

- These results reinforce previous findings that numeracy is correlated with savings *behaviour*

- This is not to say that any group is necessarily behaving less optimally

  - Retirement outcomes may be driven largely by state provision

- Can we find an association between numeracy and:

  - more fundamental outcomes which might affect welfare?

  - "sub-optimal" behaviour

- Two broad approaches that can be taken:

  1. Structural model – with enough structure to define "welfare" and "optimality"

  2. Investigation of reduced form (conditional) correlation of numeracy with outcomes that could plausibly correlate with welfare

     - In this paper we take this approach

Institute for
Fiscal Studies

Numeracy and Welfare

- We then turn to other measures which have an effect on *welfare*

  - Replacement Ratios (Income and Food Spending)

  - Realisations of expectations with regard to time of retirement

  - Stability of expectations with regard to future financial insecurity

  - Subjective measures of life satisfaction

- For each of these we look at the:

  - Unconditional relationship between our measure of numeracy and

  - The outcome conditional on income, education, etc.

- Summary:

  - A few interesting correlations (will show some)

  - No robust, consistent story found linking numeracy to welfare

  - Is this evidence that numeracy doesn't matter for welfare or simply reflecting that power of tests is low?

Institute for
Fiscal Studies

Replacement Rates (Median)
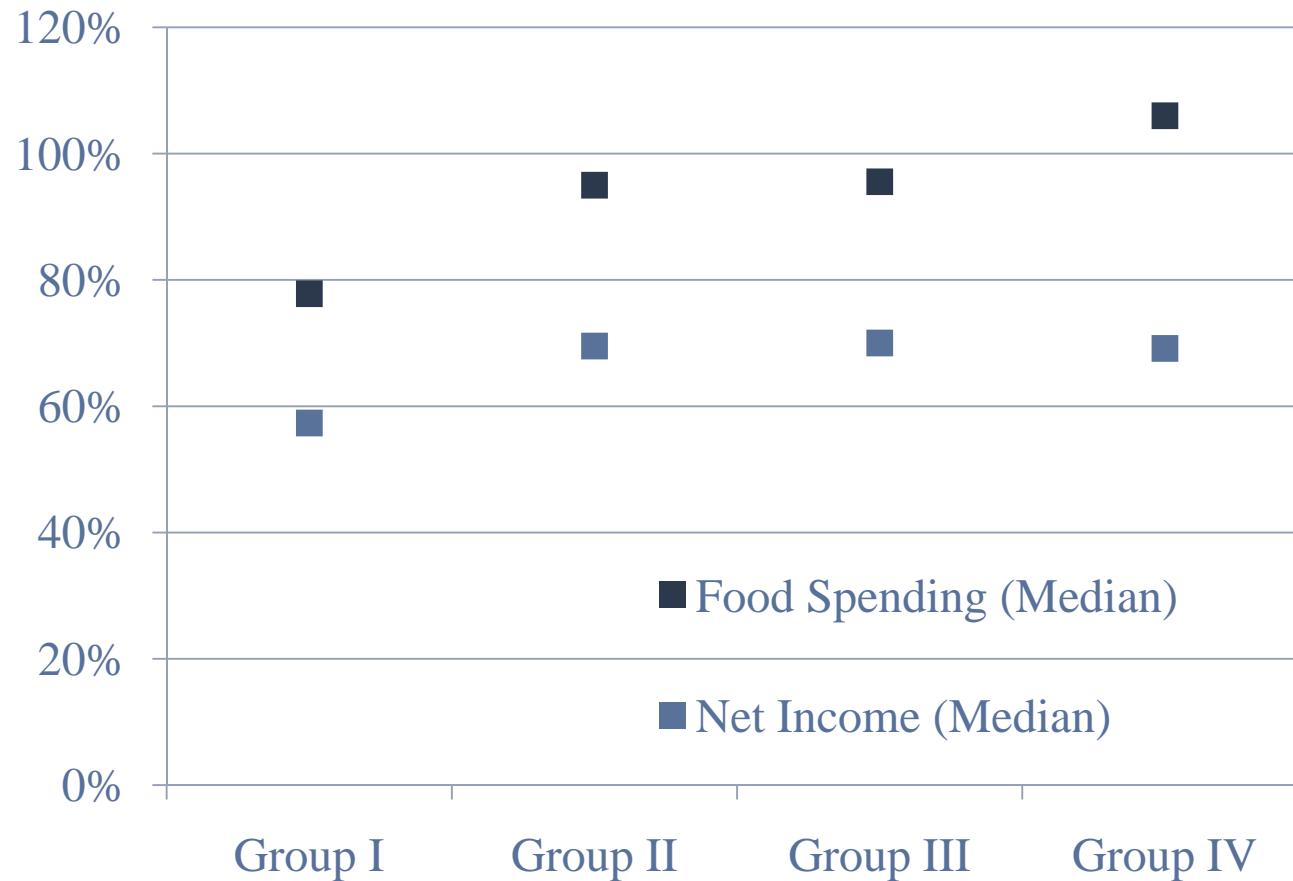
Expectations over future inadequacy of resources

Dep. Var.: % chance of inadequate resources for future (reported in 2006)	Everyone	Retirees
Wealth quintile 2	**-4.69**	-4.13
Wealth quintile 3	**-5.65**	**-8.32**
Wealth quintile 4	**-10.02**	**-8.54**
Wealth quintile 5	**-12.58**	**-17.00**
Num group 1	1.80	7.55
Num group 3	**-4.67**	-2.29
Num group 4	**-5.75**	-6.03
% chance of inadequate resources (2002)	**0.24**	**0.26**
Num group 1 * Expectations 2002	-0.07	-0.22
Num group 3 * Expectations 2002	**0.10**	0.04
Num group 4 * Expectations 2002	**0.11**	0.08

Age dummies, female dummy and couple dummy also included as well as controls for education, cognitive function, memory and literacy

Institute for Fiscal Studies

Numeracy and life satisfaction

- ELSA contains a number of questions on subjective well-being.

- We looked at two:

    1. "How often do you feel satisfied with the way your life has turned out?"

    2. "How often have you recently been feeling happy, all things considered?"

- Answers to both tend to be more stable over time for higher numeracy individuals

- Though no consistent story with regard to correlation with levels

Institute for
Fiscal Studies

Summary

- Strong correlations between numeracy and financial *behaviour*

    - Remains true after conditioning on education, age, demographic factors

- Link between numeracy and *welfare* in retirement remains an open question

    - Variation in behaviour could be a rational response to variation in expectations, risks, earnings processes

    - Preference primitives could well differ too across numeracy groups

- Some tentative correlations identified between numeracy and welfare proxies

- No robust, consistent story found linking numeracy to welfare

    - Tests are likely to be of low power so I would characterise this as "no evidence of a link" rather than "evidence of no link".

Institute for
Fiscal Studies