

## EXPERIMENTAL ANALYSIS OF RETIREMENT

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*Defining the Characteristics of the 21<sup>st</sup> Century Retirement System*

## Motivation (I)

- Pension systems may create incentives to leave the labour force too early
  - ▣ Costs of postponing retirement are higher than the gains
- This drop in pension wealth acts as *an implicit tax on income*
- An increase in participation rates could have substantial positive effects on the financial viability of SS

## Motivation (II)

- Positive effects of delaying the retirement age due...
- ... introducing changes in actuarially fair pension systems
  - ▣ *A fair actuarial pension system is neutral with respect to the retirement age ONLY when agents have well-defined preferences and use all available information efficiently*
- A standard theoretical assumption, but a non-trivial behavioral issue

## Motivation

- Some marginally actuarially fair pension systems may be better received than others: lump-sum payments
  - ▣ Preferred and popular alternative to annuity payments
- Drawback: increases in poverty rates if LS payments are mostly consumed rather than saved
  - ▣ How these reforms would affect consumption patterns?

## Experimental methodology

- Experiments in economics
  - ▣ “Induced valuation”
  - ▣ No deception
- Economics experiments and retirement decisions
  - ▣ Experiments are not “realistic” simulations
  - ▣ Data control
- We test the theory ‘on its own domain’
  - ▣ *If a model is true in the field, it should also be true in the lab*

## Experimental methodology

- Limitations: external validity
- We focus on ‘comparative statics’
  - ▣ How behavior changes when the conditions change
  
- How does behavior deviate from predictions?
  - ▣ EE improves our decision-making by de-biasing our own behavior.
  - ▣ Better predictions mean we can better anticipate actions, and choose better responses.

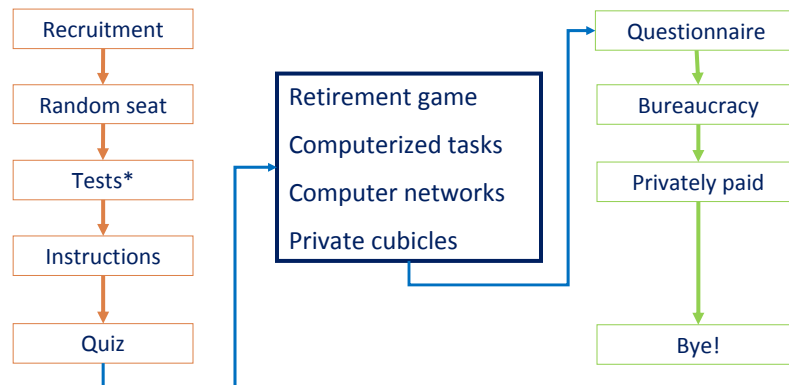
## Experimental design

- Our work is the first experimental approach to retirement decisions
  - ▣ RQ 1: Do the distribution of retirement income benefits across time delay retirement decisions?
  - ▣ RQ 2: Do marginally actuarially fair pension systems distort retirement decisions?
- Three different *treatments*: three different payoff sequences with identical expected value
- The only difference is timing of payoffs (annuity, lump-sum or a combination)

## Experimental design

- Second stage: we analyze consumption paths in an experimental design with two central features:
  - ▣ There exists a decreasing probability of surviving which implies an uncertain future income
  - ▣ There are two sequences of income, one when individual works and another when she is retired

# Experimental design



# Experimental design

Table 1: Experimental Design

Rounds	Chance	Survival Chance	Expected Payoffs	Payoffs-TR1 Annuity	Payoffs-TR2 Combination	Payoffs-TR3 Lump-sum
1	-	1	100	13	13	100
2	14/15	14/15	100	14	14	107
3	13/14	13/15	100	16	16	115
4	12/13	12/15	100	19	19	125
5	11/12	11/15	100	23	23	136
6	10/11	10/15	100	27	23 + 25	150
7	9/10	9/15	100	33	23 + 53	167
8	8/9	8/15	100	42	23 + 85	188
9	7/8	7/15	100	54	23 + 123	214
10	6/7	6/15	100	71	23 + 170	250
11	5/6	5/15	100	100	23 + 232	300
12	4/5	4/15	100	150	23 + 318	375
13	3/4	3/15	100	250	23 + 455	500
14	2/3	2/15	100	500	23 + 716	750
15	1/2	1/15	100	1500	23 + 1477	1500

# Experimental design

Table 2: Second Experimental Design

Rounds	P of surviving	LS10 Income	LS15 Income	Avail. Cash	Consumption	Savings	Points
1	1	85	85	85	---	---	---
2	29/30	85	85				
...	...	...	...				
10	21/22	85	85				
11	20/21	191,25	85				
12	19/20		85				
...	...		...				
15	16/17		85				
16	15/16		345				
17	14/15						
...	...						
30	1/2						

0,00

# Experimental design

Risk Aversion Test

Decision	Lottery A				Lottery B				Option	
	High Payoff	Low Payoff	High Payoff	Low Payoff	High Payoff	Low Payoff	High Payoff	Low Payoff	A	B
1	1/10	200	9/10	160	1/10	385	9/10	10	A	B
2	2/10	200	8/10	160	2/10	385	8/10	10	A	B
3	3/10	200	7/10	160	3/10	385	7/10	10	A	B
4	4/10	200	6/10	160	4/10	385	6/10	10	A	B
5	5/10	200	5/10	160	5/10	385	5/10	10	A	B
6	6/10	200	4/10	160	6/10	385	4/10	10	A	B
7	7/10	200	3/10	160	7/10	385	3/10	10	A	B
8	8/10	200	2/10	160	8/10	385	2/10	10	A	B
9	9/10	200	1/10	160	9/10	385	1/10	10	A	B
10	1	200	0	160	1	385	0	10	A	B

# Experimental design

## Discount Rate Test

Decision	Option A	Option B	Option	
	Payment (in 1 week)	Payment (in 7 weeks)		
1	180 €	181.04 €	A	B
2	180 €	185.26 €	A	B
3	180 €	190.64 €	A	B
4	180 €	196.15 €	A	B
5	180 €	201.79 €	A	B
6	180 €	207.57 €	A	B
7	180 €	213.49 €	A	B
8	180 €	219.54 €	A	B
9	180 €	225.74 €	A	B
10	180 €	252.02 €	A	B

# Results

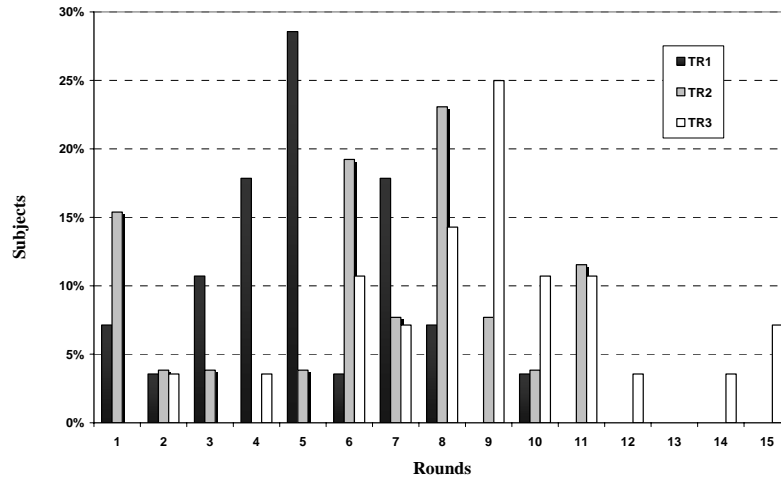
Table 3

Percentage of subjects making each choice

Rounds	TR1	TR2	TR3
1	7	15	0
2	4	4	4
3	11	4	0
4	18	0	4
5	29	4	0
6	4	19	11
7	18	8	7
8	7	23	14
9	0	8	25
10	4	4	11
11	0	12	11
12	0	0	4
13	0	0	0
14	0	0	4
15	0	0	7
	100%	100%	100%

# Results

Figure 1  
Treatments TR1-TR2-TR3



# Results

Table 4

Descriptive Statistics

	TR1	TR2	TR3
Mean	5.00	6.42	9.00
Median	5.00	7.00	9.00
Mode	5.00	8.00	9.00
Standard Deviation	2.13	3.20	2.94



# Results

Table 4bis  
OLS regressions (relative to TR3)

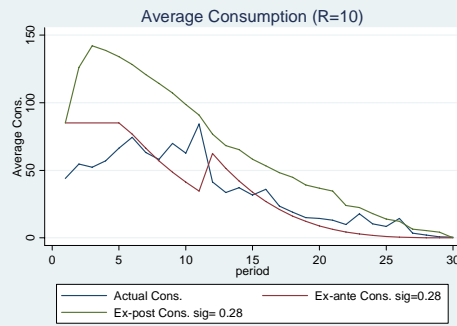
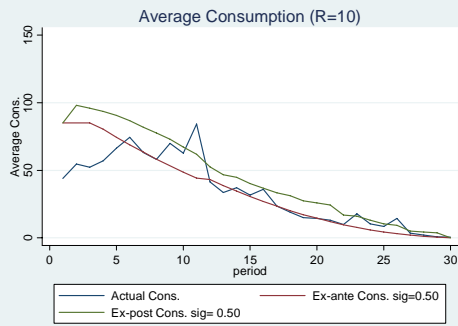
Model	1	2	3	4	5
Constant	9.872*** (1.632)	8.131*** (.882)	13.392*** (2.338)	13.945*** (2.413)	11.954*** (1.446)
TA	-.508** (.264)	--	-.687** (.339)	-.682** (.340)	-.504** (.230)
TD	--	-.312* (.185)	-.347** (.168)	-.343** (.169)	--
TR1	--	--	-2.660*** (.941)	-3.253*** (1.130)	-4.095*** (.739)
TR2	--	--	--	-1.069 (1.126)	-2.326*** (0.765)
TR1-TR2	--	--	--	-2.183** (1.068)	-1.769** (.773)
R-squared	0.045	0.066	0.274	0.291	0.321
Prob > F	0.058	0.100	0.006	0.010	0.000

# Results

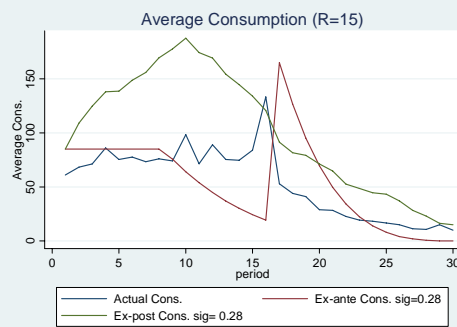
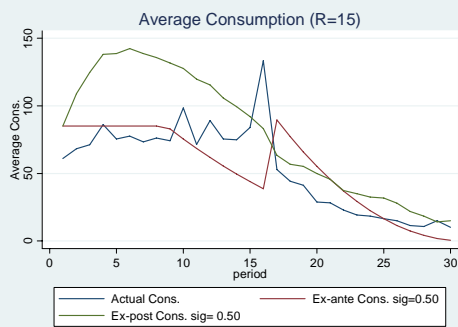
TABLE 5: DESCRIPTIVE STATISTICS

Averages	LS10				LS15			
	Total	Seq = 1	Seq = 2	Seq = 3	Total	Seq = 1	Seq = 2	Seq = 3
Cons.	43,82 [44,20]	49,32 [50,51]	40,27 [44,61]	43,74 [36,62]	66,22 [44,65]	65,89 [50,35]	68,11 [44,18]	65,11 [40,47]
Cum. Sav.	152,8 [187,35]	148,0 [198,69]	149,6 [187,81]	161,4 [176,36]	101,4 [135,31]	111,8 [144,99]	89,4 [128,05]	102,5 [132,75]
Cash	196,6 [191,28]	197,3 [197,28]	189,9 [196,21]	205,2 [179,00]	167,6 [135,89]	177,7 [144,09]	157,5 [127,74]	167,6 [135,25]
# Sur. R	21,96 [7,12]	19,76 [8,04]	24,37 [5,95]	20,64 [6,75]	21,31 [7,08]	20,91 [7,96]	19,13 [7,50]	23,18 [5,43]
# Obs.	1002	275	418	309	945	281	278	386

# Results



# Results



# Results

TABLE 5BIS: REGRESSION ANALYSIS

	SIGMA=0.50		SIGMA=0.28	
	LD-EAOC	LD-EPOC	LD-EAOC	LD-EPOC
Dumbreak	-0.553*** [0.117]	-0.079 [0.071]	-0.538*** [0.129]	-0.139* [0.067]
Seq 1	0.057 [0.193]	0.050 [0.117]	0.150 [0.212]	0.048 [0.109]
Seq 2	-0.162 [0.181]	0.066 [0.109]	-0.075 [0.198]	-0.032 [0.102]
Period	0.445*** [0.037]	0.195*** [0.022]	0.545*** [0.041]	0.243*** [0.021]
Period Squared	-0.015*** [0.001]	-0.008*** [0.001]	-0.018*** [0.001]	-0.011*** [0.001]
Risk	-0.061 [0.054]	-0.089*** [0.032]	-0.126** [0.059]	-0.055* [0.031]
Raven Test	0.201*** [0.032]	0.009 [0.019]	0.182*** [0.035]	0.031* [0.018]
Sex	0.664*** [0.168]	0.179* [0.101]	0.743*** [0.184]	0.223** [0.099]
Constant	5.784*** [1.267]	3.203*** [0.766]	5.072*** [1.391]	4.171*** [0.720]
Observations	1361	1361	1361	1361
R-squared	0.18	0.09	0.16	0.15

# Concluding remarks

- Actuarially fair pension systems are not neutral in terms of retirement decisions
  - ▣ Identical expected payoffs generate different behaviours
  
- A unique lump-sum payment generates a behavioral overreaction: subjects show a persistent precautionary saving behavior
  
- We identify behavioral patterns based on individual features (and make accurate predictions)