

Policy Uncertainty in Old Age Social Security: Do expectations relate to savings?



Network for Studies on Pensions, Aging and Retirement

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1. Introduction





- Literature
 - Social security and savings
 - ‘Crowding-out’: Feldstein (JPE, 1974)
 - Social security expectations
 - Expectations conditional on eligibility: Dominitz, Manski and Heinz (2003)
 - Expectations and savings
 - Expectations and behavior: Stephens (REStat, 2004)

Background Dutch Old Age Social Security (AOW)

- Pay-As-You-Go system
- Eligible at the age of 65 on the basis of years of residence in the Netherlands
 - Full benefit in 2007: €945 for singles and € 648 times two for couples
- Financed partly by mandatory contributions through income tax (2006: 70%)
 - 17.9% on first €30,000 of income
 - Those over 64 do not contribute
- Policy uncertainty – ‘fiscalization’



Outline

- 1. Introduction 
- 2. Theoretical Model 
 - With correct perception of eligibility age
 - Without correct perception of eligibility age
- 3. Empirical analysis 
 - Data
 - Research Methodology
 - Results
- 4. Conclusions and suggestions for further research 



2. Theoretical model

- Three period model with PAYG-pension scheme
 - People care for consumption, but experience disutility from labor

$$\underset{S,x,z}{\text{Max}} \ln(C_1, e_1) + \ln(C_2, e_2) + \ln(C_3, e_3)$$

- People always pay consumption tax, τ

$$e \begin{cases} = 0 & \text{if } t = 1 \\ \in \mathfrak{R}_+ & \text{if } t = 2 \\ \rightarrow \infty & \text{if } t = 3 \end{cases}$$

- People work if $(1 - \tau)I - e > 0$

Theoretical model

- 1st period
 - Everybody works
 - Consumption tax, τ , PAYG pension premium, θ
 - Savings decision is made, S

$$u_1 = \ln((1 - (\tau + \theta))(I - S))$$

- 2nd period
 - Working if $(1 - \tau)I - e_2 > 0$
 - Consumption tax, τ , **No** PAYG pension premium, θ
- 3rd period
 - Nobody is working
 - Consumption tax, τ , **No** PAYG pension premium, θ

Policy options

Four policy options regarding PAYG-benefit P in 2nd and 3rd period:

Option	Title	2 nd period	3 rd period
A	Status quo	P	P
B	Lower benefits, $0 < \lambda < 1$	$(1-\lambda)P$	$(1-\lambda)P$
C	Later benefits	nothing	P
D	Contributions by the elderly	P , but paying θ	P , but paying θ

Deterministic world with correct perception of eligibility age (I)

If one receives P in 2nd period one is allowed to work too

Option	Title	Optimal saving
A ●	Status quo	$S^* = \frac{2}{3}I - \frac{2}{3}P - \frac{1}{3}\max(0, I - \frac{e_2}{1-\tau})$
B ↑	Lower benefits	$S^* = \frac{2}{3}I - \frac{2}{3}(1-\lambda)P - \frac{1}{3}\max(0, I - \frac{e_2}{1-\tau})$
C ↑	Later benefits	$S^* = \frac{2}{3}I - \frac{1}{3}P - \frac{1}{3}\max(0, I - \frac{e_2}{1-\tau})$
D ● ↑	Contributions by the elderly	$S^* = \frac{2}{3}I - \frac{2}{3}P - \frac{1}{3}\max(0, I - \frac{e_2}{1-(\tau+\theta)})$

Deterministic world with incorrect perception of eligibility age (II)

If one receives P in 2nd period one is obliged to retire

Option	Title	Optimal saving
A ●	Status quo	$S^* = \frac{2}{3}I - \frac{2}{3}P$
B ↑	Lower benefits	$S^* = \frac{2}{3}I - \frac{2}{3}(1 - \lambda)P$
C ↑↓	Later benefits	$S^* = \frac{2}{3}I - \frac{1}{3}P - \frac{1}{3}\max(0, I - \frac{e_2}{1 - \tau})$
D ●	Contributions by the elderly	$S^* = \frac{2}{3}I - \frac{2}{3}P$

Stochastic world

- Savings decision is taken under uncertainty over which option the policy-maker will choose.
- **Subjective** probabilities are taken into account

Option	Title	Subjective probability
A	Status quo	α
B	Lower benefits	β
C	Later benefits	γ
D	Contributions by the elderly	$\delta (=1-\alpha-\beta-\gamma)$

- No analytical solution



Hypotheses theoretical model

1. Probability of lower benefits (β) is related to higher savings
2. Probability of later benefits (γ) is related to higher savings
 - when one doesn't want to work in 2nd period
 - when one works in 2nd period
3. Probability of later benefits (γ) is related to lower savings
 - when one wants to work in 2nd period but one doesn't (because of misperception eligibility age)
4. Probability of paying contributions (δ) is related to higher savings
 - when one doesn't want to work in 2nd period
5. Probability of paying contributions (δ) is not related to savings
 - when one wants to work in 2nd period

3. Empirical analysis

- Dependent variables
 - From DHS
 - Dummy participation in voluntary second and/or third pillar pension scheme (2003-2005)
 - Private pension savings: Sum of individual wealth components (2001-2006)
 - Balance savings accounts, investments, *housing wealth* and designated third pillar pension savings, debt etc.

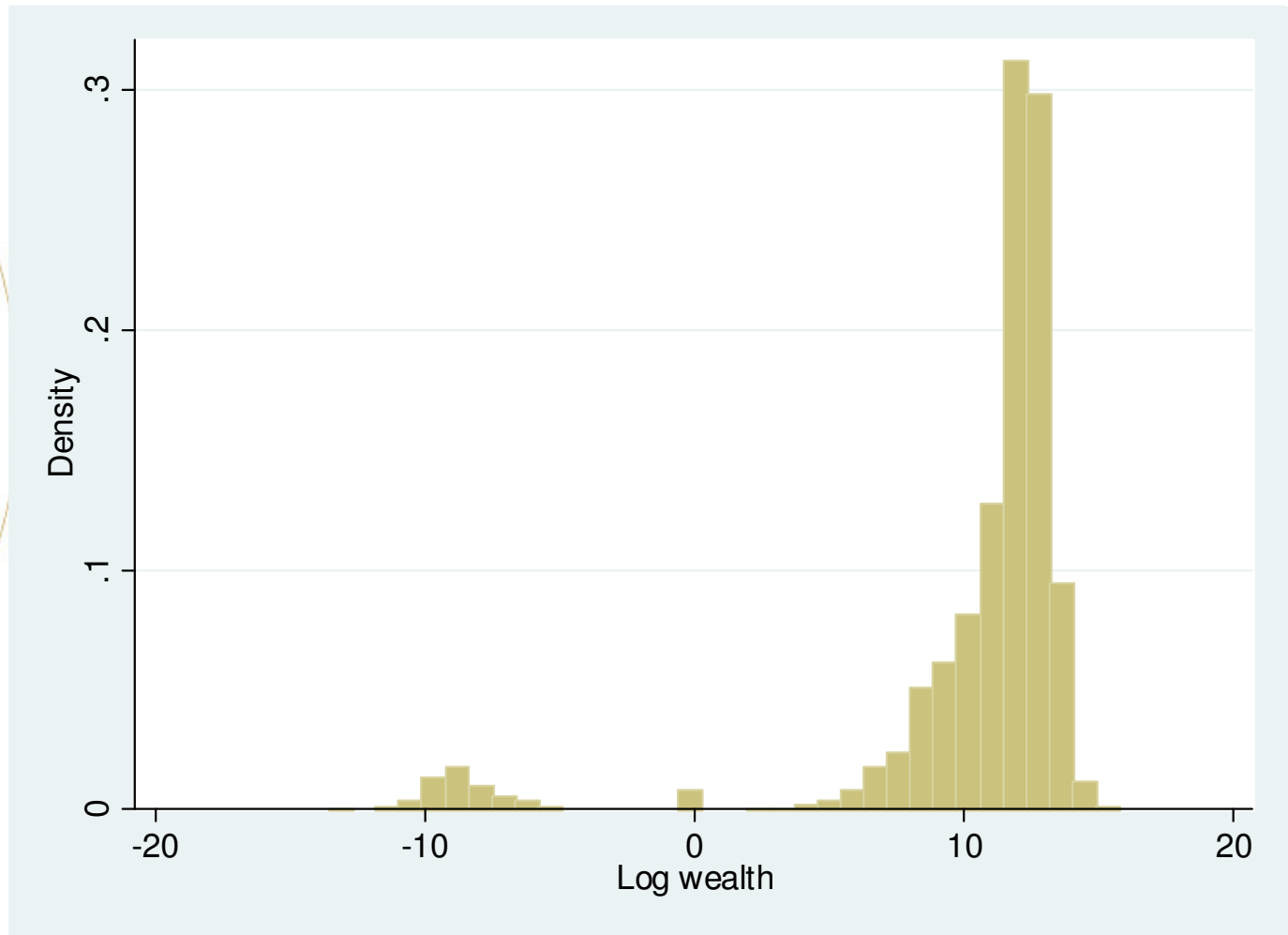
$$\log wealth = \begin{cases} \log(w_{it}) & \text{if wealth} > 0, \\ \log(w_{it} + 1) & \text{if wealth} = 0, \\ -\log(-w_{it}) & \text{if wealth} < 0. \end{cases}$$

Descriptives participation in voluntary pensions

- Do you participate in any additional pension arrangement?

Sample	2003	2004	2005
third pillar - 'lijfrente'	28%	29%	30%
third pillar - 'koopsom'	10%	13%	11%
second pillar - 'extra entitlements'	1%	2%	2%
second pillar - 'extra payments'	2%	1%	1%
participation in one of the above	37%	41%	40%
N	552	630	710

Histogram log wealth



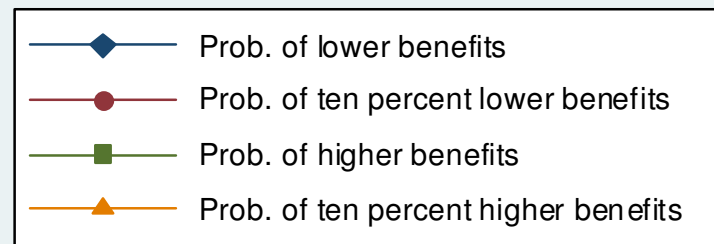
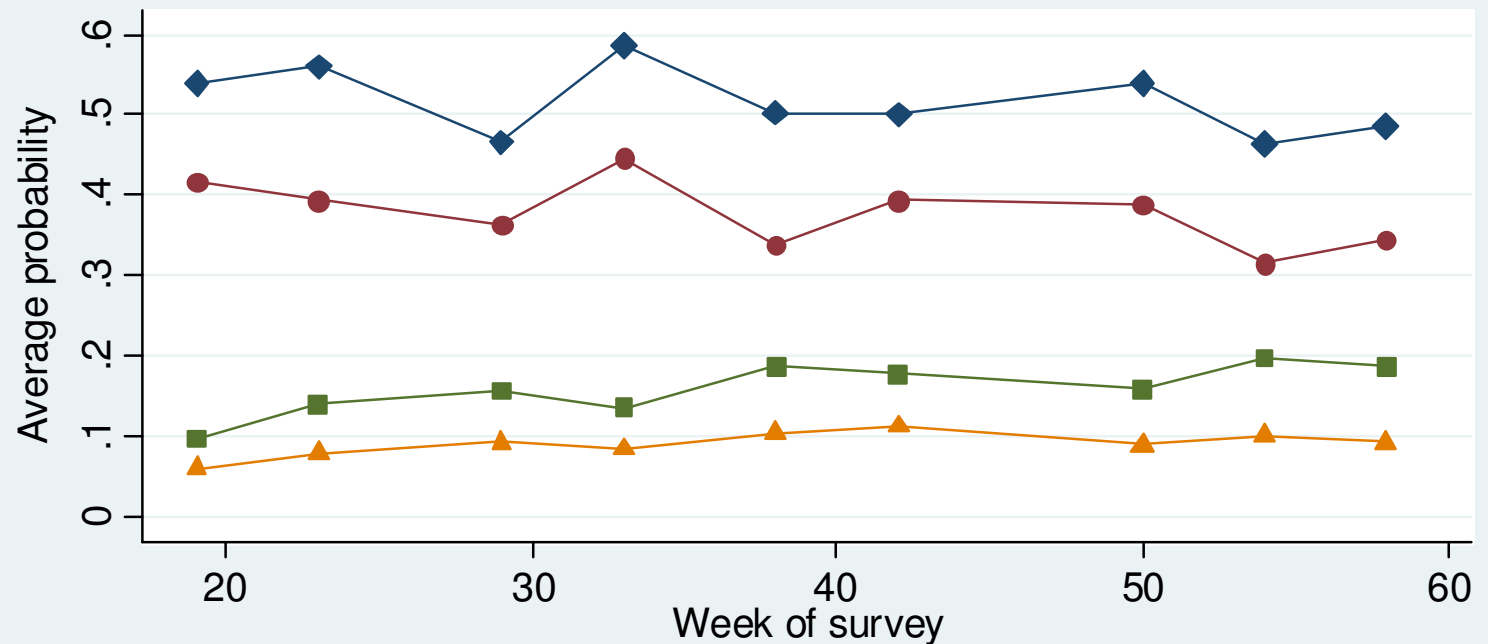
Independent variables I

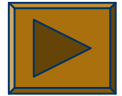
- From Pensionbarometer (9 waves from Apr 2006/ Feb 2007)
 - What is the probability you assign to the event that within ten years AOW-benefits
 - **will go down by more than ten percent?**
 - will go down?, will go up?, will go up by more than ten percent?
 - What is the probability you assign to the event that within ten years the AOW-eligibility age
 - **will go up by more than two years?**
 - will go up?, will go down?, will go down by more than two years?
- Standardized for week of survey
- Means over waves merged with DHS



Descriptives expectations β

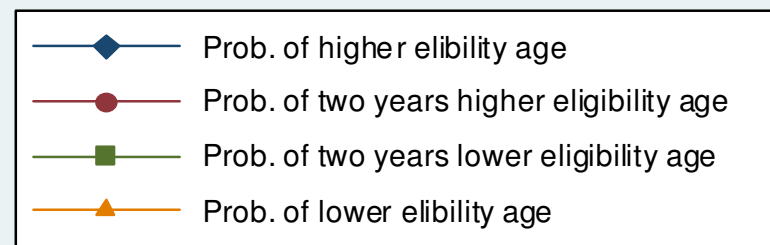
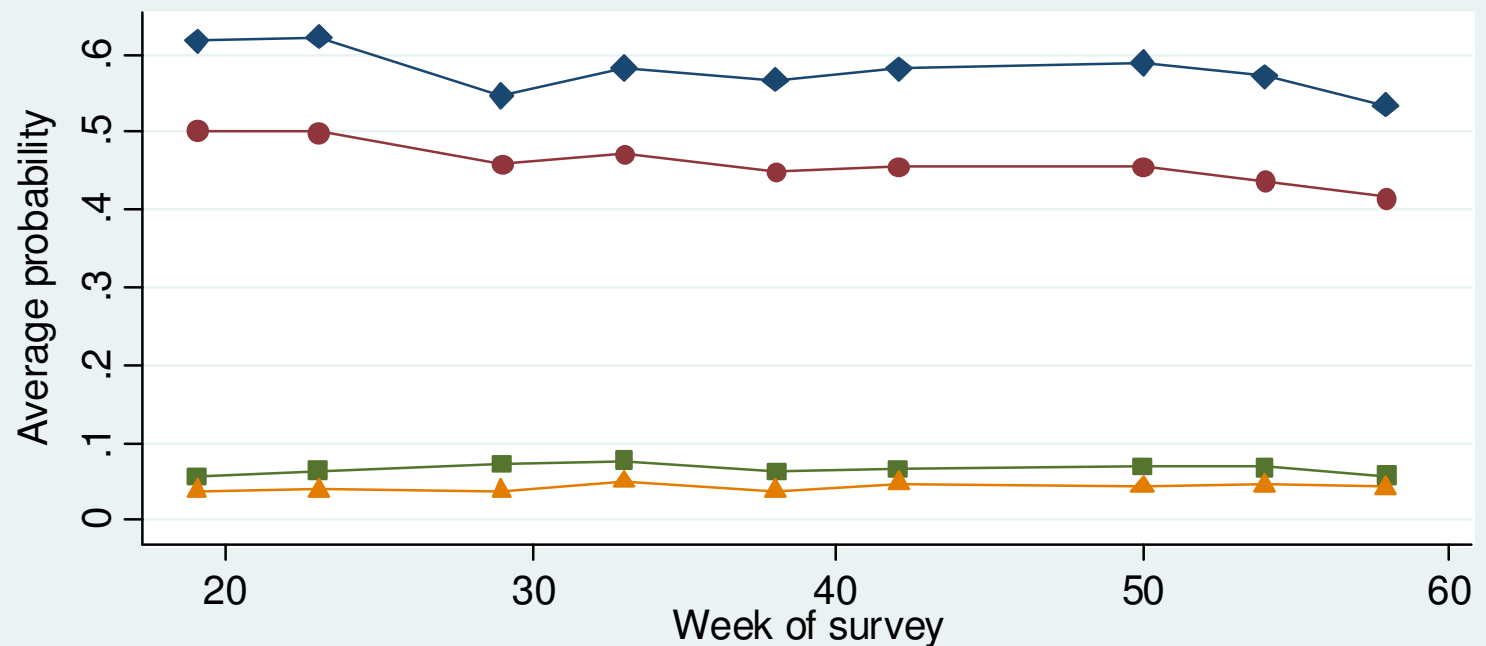
Average probability of changes in level benefits





Descriptives expectations γ

Average probability of changes in eligibility age



Independent variables II

- From DHS (2003-2006, thanks to DNB)
 - Do you expect the difference in tax rates between non-retired and retired to go down?

	2003	2004	2005	2006
Percentage agreeing	71%	73%	78%	79%
N sample	388	442	573	542

- Consistency in answering (trans. prob. 16% and 57%):

	Yes	Both	No
Percentage consistent	57%	31%	12%
N sample	481	256	100

- Dummy is used for consistent belief in contributions

Empirical strategy

- Reduced-form model estimated
- Panel → Random Effects
- Participation regression: Probit
- Wealth regression: GLS

$$y_{it} = \alpha_i + \kappa_1 * \Pr(O = B) + \kappa_2 * \Pr(O = C) + \kappa_3 * \text{Dummy}(O = D) + \mathbf{x}_{it}' \boldsymbol{\nu} + \varepsilon_{it}$$

$$\varepsilon_{it} \sim NID(0, \sigma_\varepsilon^2)$$

$$\alpha_i \sim N(0, \sigma_\alpha^2)$$

- Interaction terms: household income group & age group



Descriptives controls

- Breadwinners only
- Average income is €39.255 euro
- 18% women
- 65% married
- 3% age 20-29, 16% 30-39, 22% 40-49, 26% 50-59, 18% 60-69, 15% >69
- 45% tertiary education
- Mean self-assessed health status is 2.1 (1=excellent health, 5=bad health)
- 30% ABP, 13% Construction and Metal, 8% PGGM

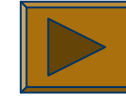
Results RE Probit

	1	2	3
	Participation additional pension savings	Participation additional pension savings	Participation additional pension savings
	<i>Separate</i>	<i>Combined</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	0.453	0.016	0.173
	<i>0.423</i>	<i>0.465</i>	<i>0.474</i>
Prob. of two years later benefits	0.880*	0.811	0.461
	<i>0.415</i>	<i>0.455</i>	<i>0.437</i>
Dummy cons. belief contributions	0.598*	0.570*	0.578*
	<i>0.234</i>	<i>0.235</i>	<i>0.252</i>
N	1,892	1,892	1,647
aic 1	1775.4	1775.5	1544.0
aic 2	1780.9		
aic 3	1777.5		
rho 1	0.864	0.864	0.862
rho 2	0.864		
rho 3	0.864		
	standard errors under coefficients		
	* p<.05, ** p<.01, *** p<.001		

"Do expectations relate to savings?"

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Results RE GLS

	1	2	3	4
	Log wealth	Log wealth	Log wealth	Log wealth
	<i>Separate</i>	<i>Combined 1</i>	<i>Combined 2</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	0.590	1.004	1.111	0.834
	<i>0.529</i>	<i>0.577</i>	<i>0.590</i>	<i>0.584</i>
Prob. of two years later benefits	-0.649	-1.048	-0.656	-1.051*
	<i>0.512</i>	<i>0.558</i>	<i>0.713</i>	<i>0.535</i>
Dummy cons. belief contributions	0.100	0.092	0.085	0.363
	<i>0.291</i>	<i>0.292</i>	<i>0.292</i>	<i>0.311</i>
Prob. of two years later retirement	-0.673		-0.671	
	<i>0.543</i>		<i>0.760</i>	
N	2,850	2,850	2,850	2,497
Ind	837	837	837	725
rho	<i>0.694</i>	<i>0.694</i>	<i>0.694</i>	<i>0.692</i>
r2_o	<i>0.15</i>	<i>0.16</i>	<i>0.16</i>	<i>0.16</i>
r2_b	<i>0.21</i>	<i>0.22</i>	<i>0.22</i>	<i>0.21</i>
r2_w	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>
			standard errors under coefficients	
			* p<.05, ** p<.01, *** p<.001	

Results interactions RE GLS income

2			
Log wealth			
	Prob. of ten percent lower benefits	Prob. of two years later benefits	Dummy cons. belief contributions
Simple effect	1.900	-3.383**	0.296
	-1.273	-1.255	-0.634
Interaction with low income	-2.064	4.415*	-0.356
	-2.005	-2.044	-1.078
Interaction with low middle income	-1.146	3.963*	-1.124
	-1.812	-1.695	-0.877
Interaction with high middle income	-1.006	1.529	0.338
	-1.686	-1.644	-0.872
Interaction with high income	-0.331	2.889	0.300
	-1.847	-1.863	-0.910
N	2,850		
Ind	837		
rho	0.694		
r ² o	0.16		
r ² b	0.23		
r ² w	0.02		
		t-statistics under coefficients	
		* p<.05, ** p<.01, *** p<.001	

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4. Conclusion



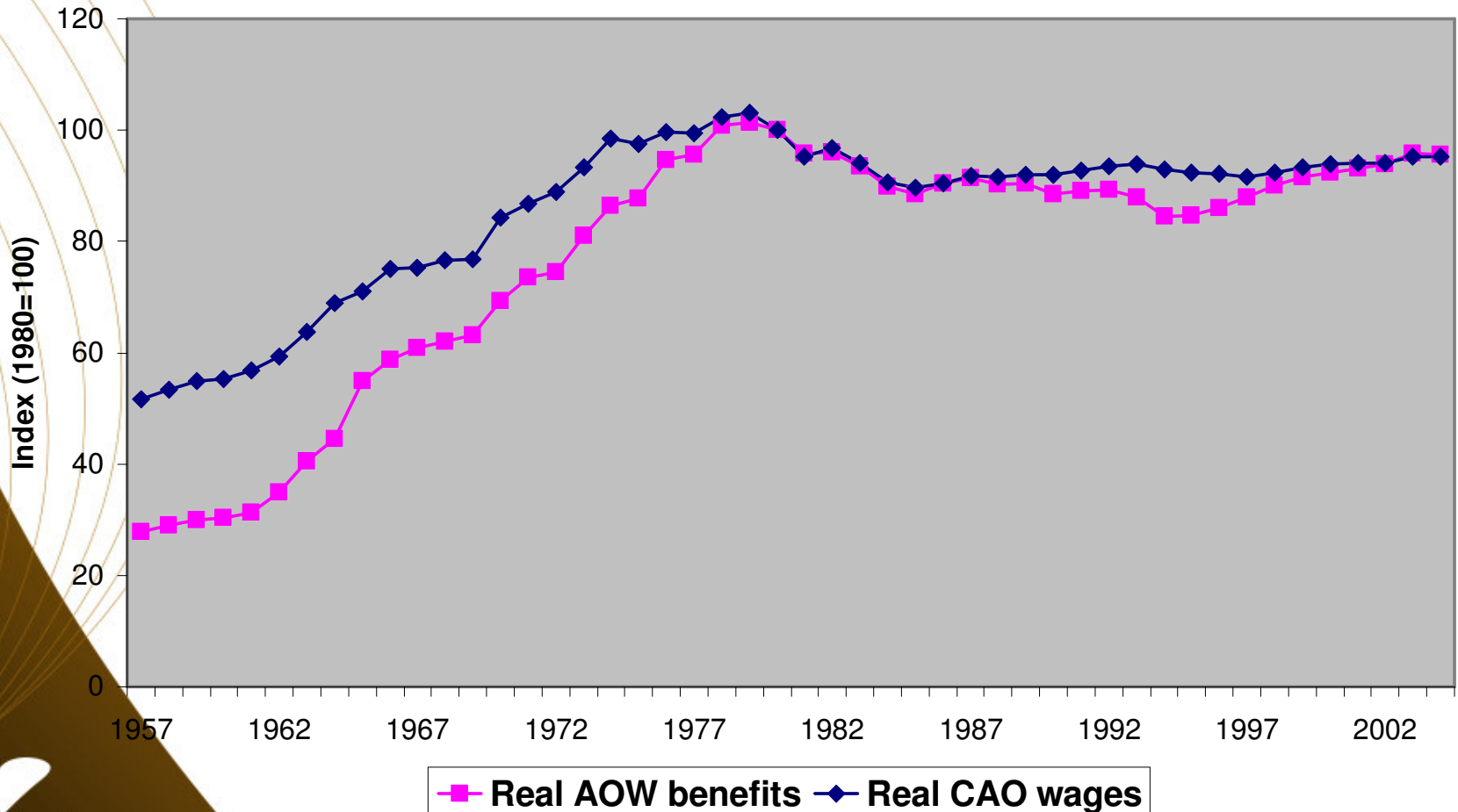
- Expectations over the future of old age social security are related to savings
 1. Those who are more worried over the future level of benefits (β is high) save more
 2. Low income individuals who are more worried about later benefits (γ is high) save more
 3. High income individuals who are more worried about later benefits (γ is high) save less
 4. Those who are more worried over future contributions by retirees (δ is high) do not save differently

Implications and further research

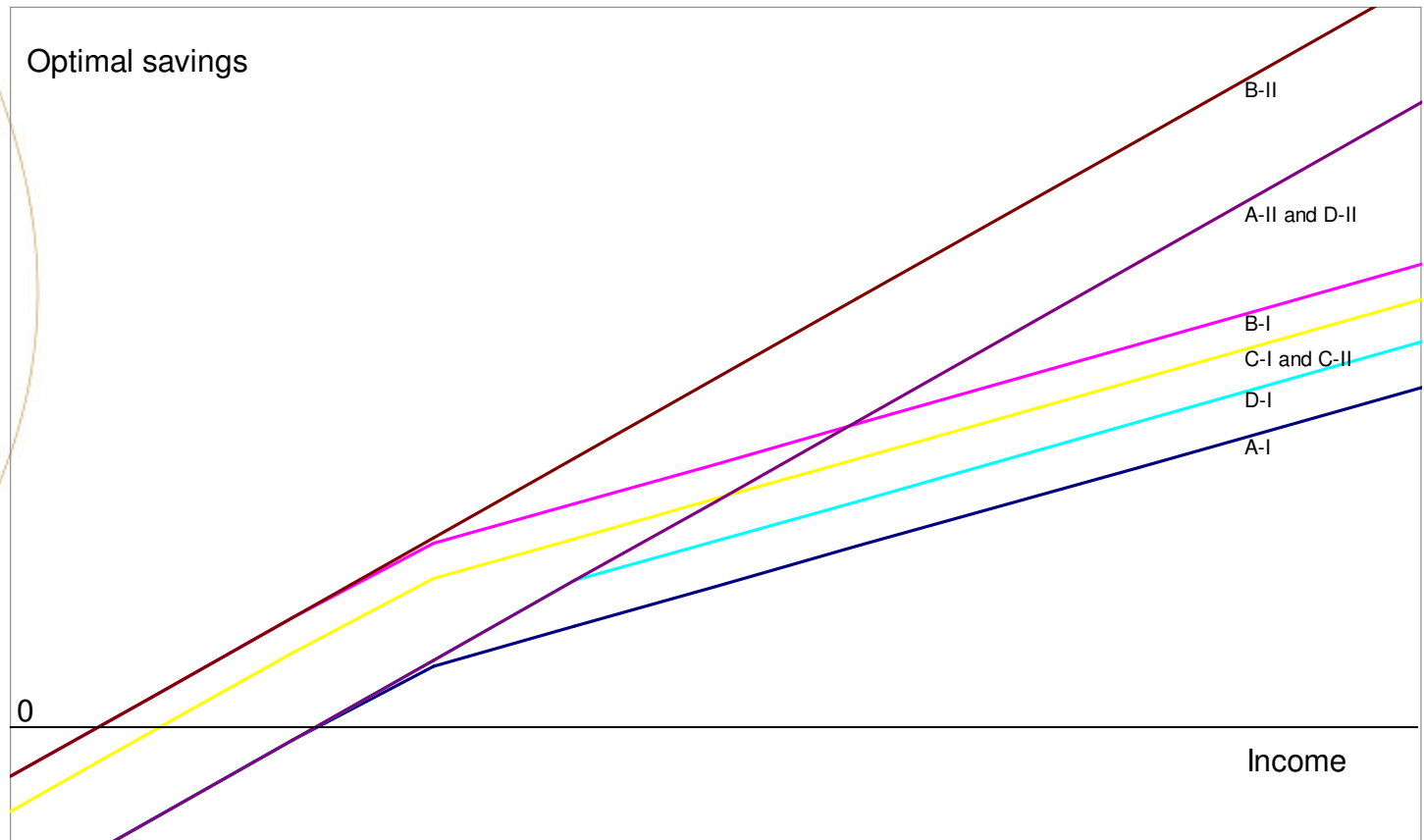
- People who prefer to work beyond the SS eligibility age expect not too – perception eligibility age is wrong!
- Manage expectations...

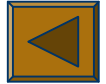
- Longitudinal expectations
- Administrative data on wealth and income
- Individuals – Households – Children?

Real level of contract wages and AOW benefits over time

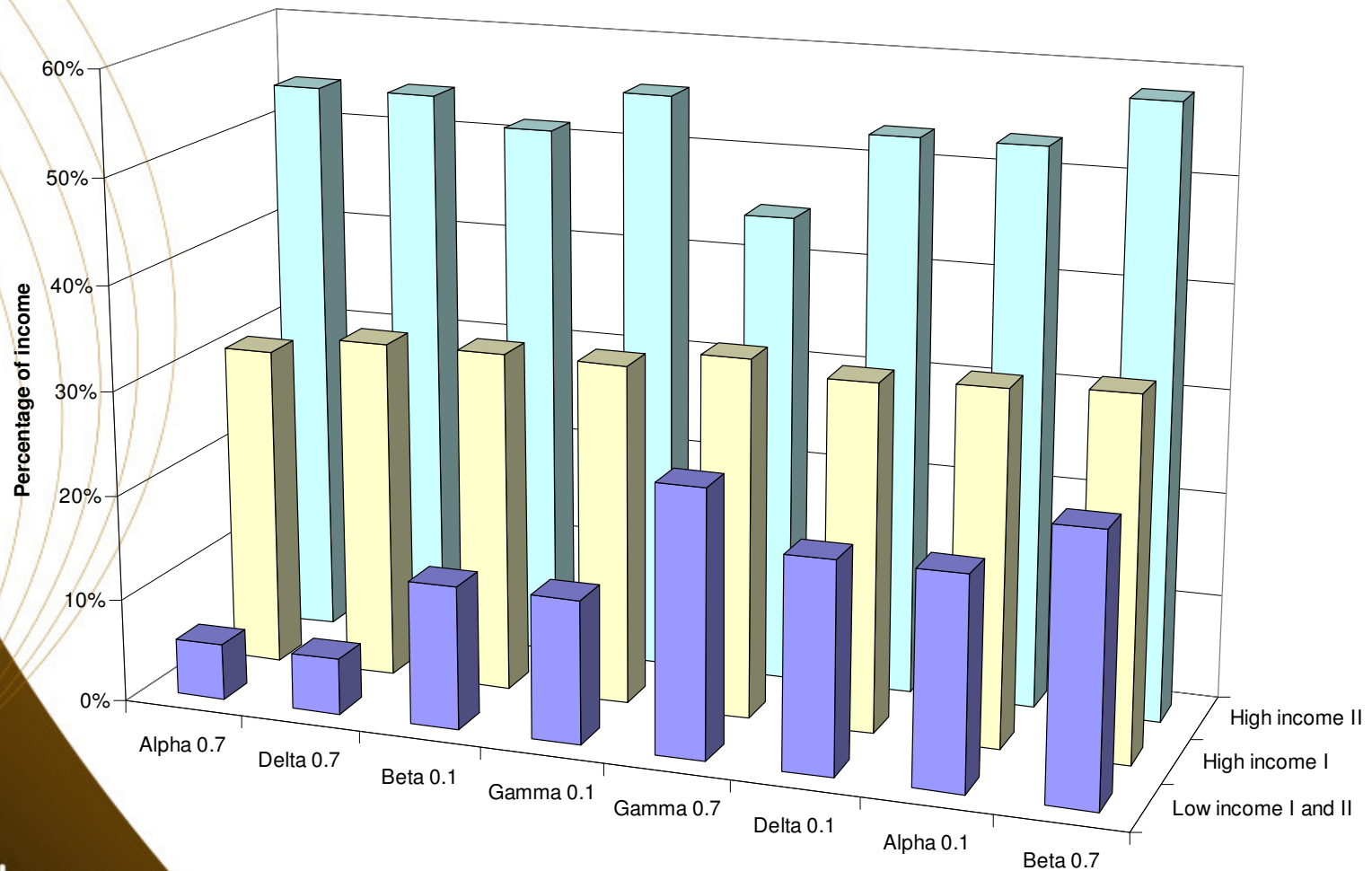


Optimal saving for different policies under I and II





Stochastic world: Percentage of income saved

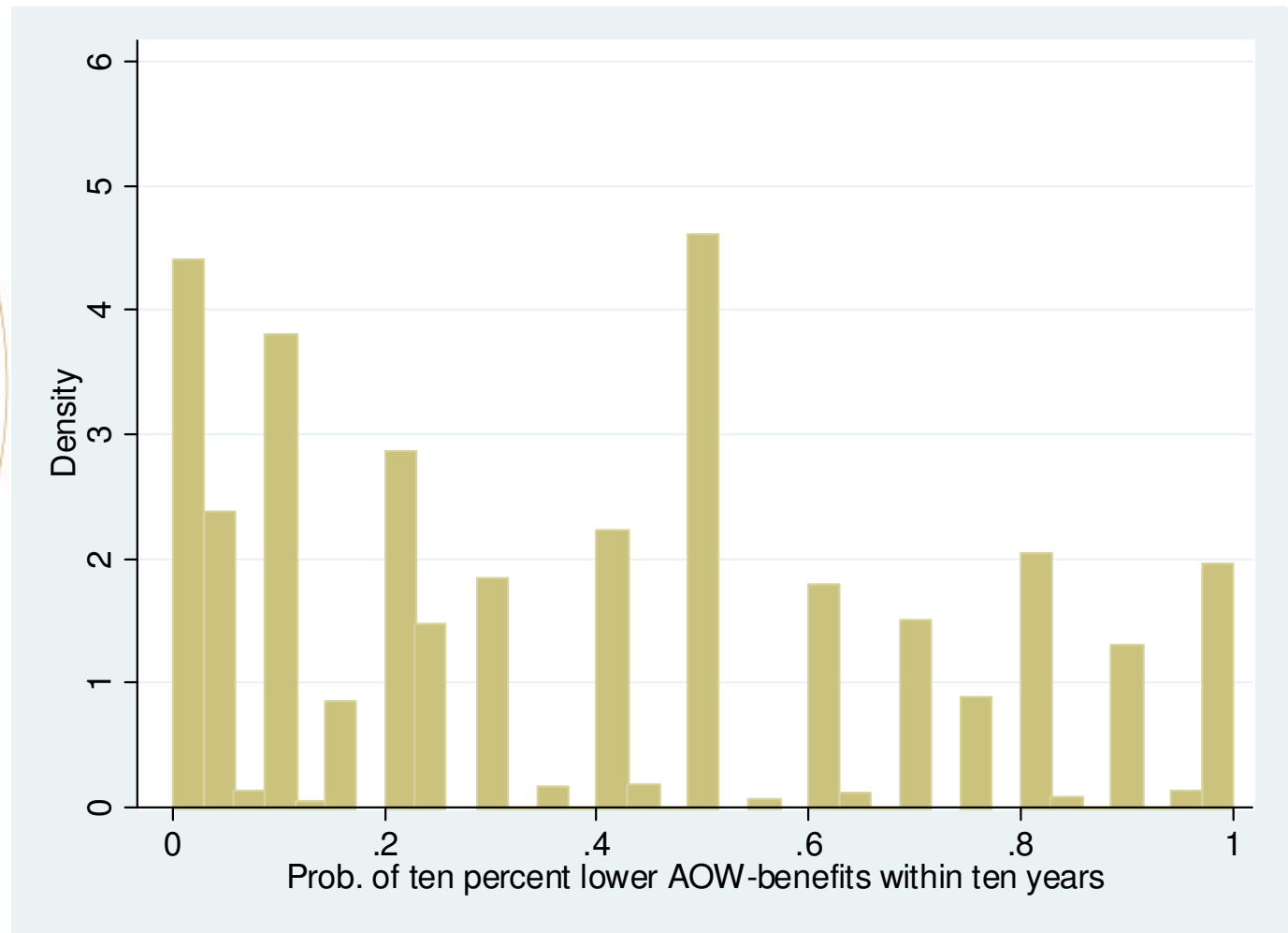




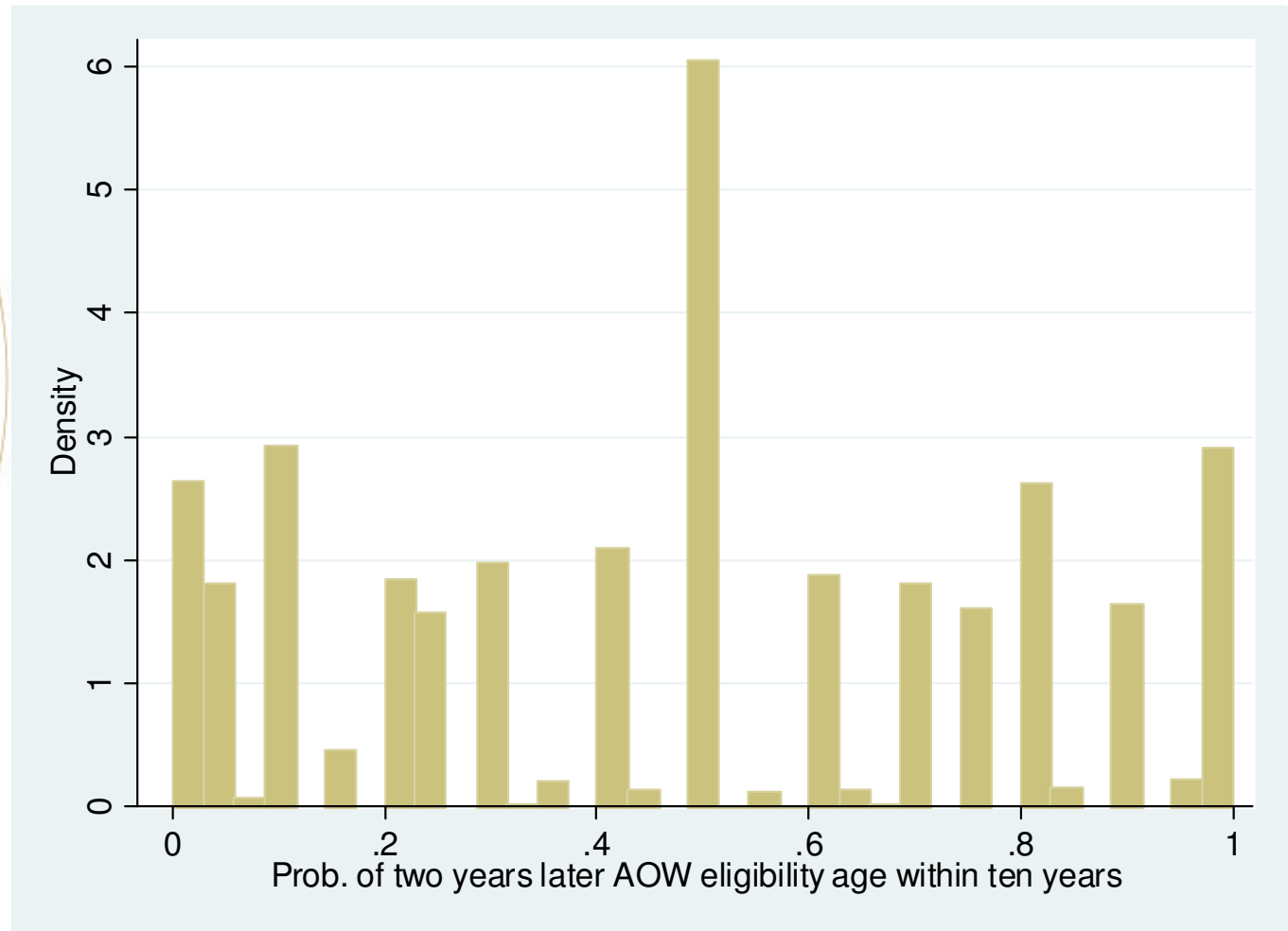
Rationality of expectations

- Rationality of type 1: higher general than specific probabilities
 - Exp. lower benefits 79%
 - Exp. later benefits 83%
- Rationality of type 2: sum of prob higher and lower events do not add up to one
 - Exp. lower benefits 92%
 - Exp. later benefits 95%
- Overall irrationality defined as breaching type 1 and 2
 - Exp. lower benefits 1% (irrational lower)
 - Exp. later benefits 1% (irrational later)

Histogram β (N=3,592)



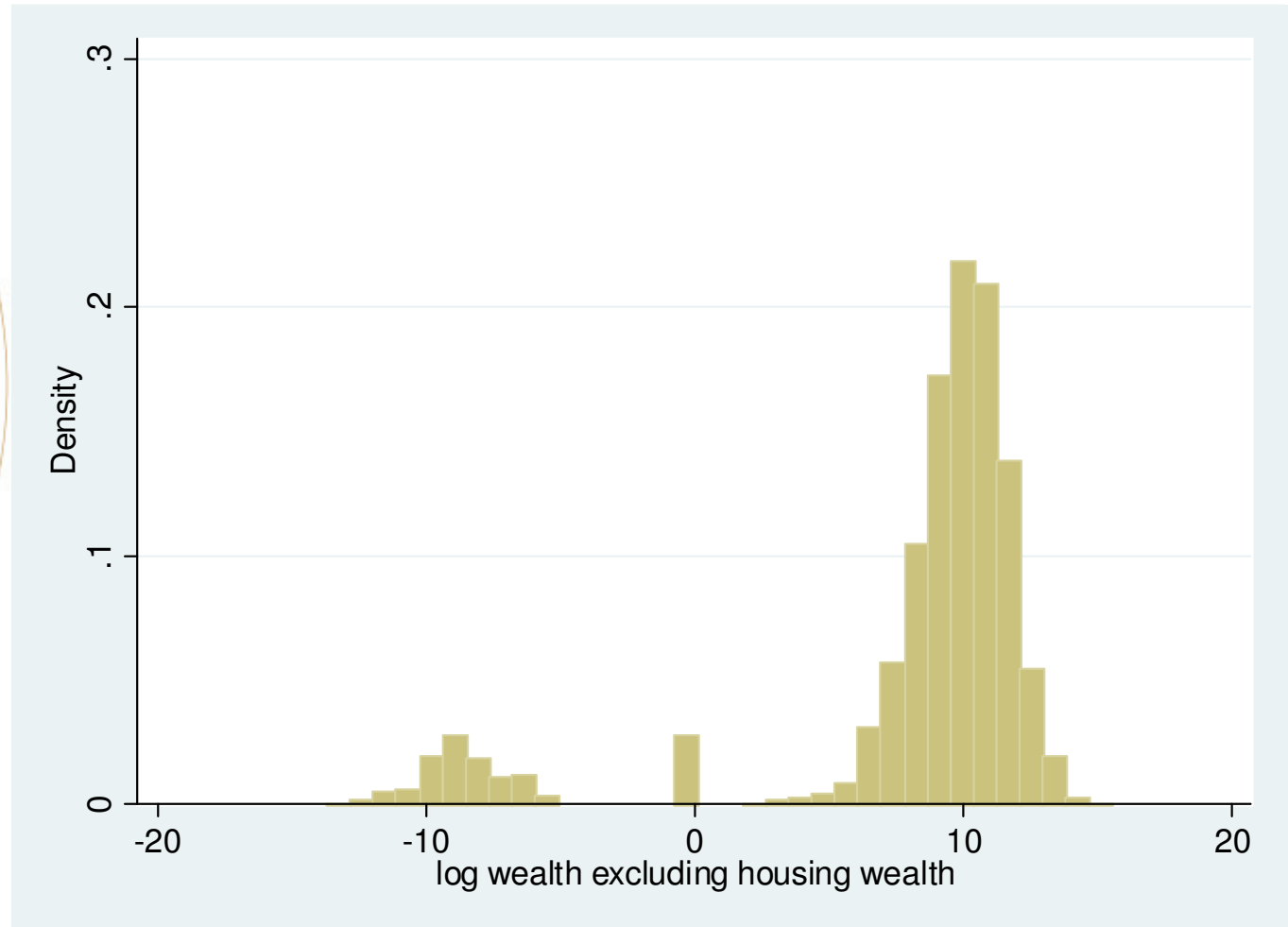
Histogram γ (N=3,632)



Histogram prob. of later retirement age (N=3,297)



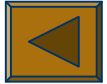
Histogram log wealth excl. housing





RE GLS positive log wealth

	1	2	3	4
	Pos. log wealth	Pos. log wealth	Pos. log wealth	Pos. log wealth
	<i>Separate</i>	<i>Combined 1</i>	<i>Combined 2</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	0.336 <i>0.203</i>	0.423 <i>0.221</i>	0.430 <i>0.226</i>	0.233 <i>0.226</i>
Prob. of two years later benefits	-0.068 <i>0.197</i>	-0.230 <i>0.213</i>	-0.203 <i>0.272</i>	-0.109 <i>0.207</i>
Dummy cons. belief contributions	0.041 <i>0.111</i>	0.028 <i>0.111</i>	0.028 <i>0.112</i>	0.080 <i>0.120</i>
Prob. of two years later retirement	-0.014 <i>0.209</i>		-0.045 <i>0.290</i>	
N	2,693	2,693	2,693	2,363
Ind	810	810	810	703
rho	<i>0.891</i>	0.891	0.891	0.893
r2_o	<i>0.28</i>	0.29	0.29	0.27
r2_b	<i>0.28</i>	0.29	0.29	0.27
r2_w	<i>0.29</i>	0.29	0.29	0.29
			standard errors under coefficients	
			* p<.05, ** p<.01, *** p<.001	



RE GLS log wealth excl housing

	1	2	3	4
	Log wealth excl housing	Log wealth excl housing	Log wealth excl housing	Log wealth excl housing
	<i>Separate</i>	<i>Combined 1</i>	<i>Combined 2</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	-0.402	-0.247	0.036	-0.189
	<i>0.647</i>	<i>0.707</i>	<i>0.721</i>	<i>0.710</i>
Prob. of two years later benefits	-0.553	-0.494	0.540	-0.355
	<i>0.626</i>	<i>0.683</i>	<i>0.872</i>	<i>0.650</i>
Dummy cons. belief contributions	0.244	0.277	0.260	0.469
	<i>0.355</i>	<i>0.357</i>	<i>0.357</i>	<i>0.377</i>
Prob. of two years later retirement	-1.342*		-1.770	
	<i>0.663</i>		<i>0.929</i>	
N	2,850	2,850	2,850	2,497
Ind	837	837	837	725
rho	<i>0.589</i>	0.589	0.588	0.583
r2_o	<i>0.08</i>	0.08	0.09	0.09
r2_b	<i>0.13</i>	0.13	0.14	0.14
r2_w	<i>0.01</i>	0.01	0.01	0.01
			standard errors under coefficients	
			* p<.05, ** p<.01, *** p<.001	

RE Tobit log housing wealth

	1	2	3	4
	Log housing wealth	Log housing wealth	Log housing wealth	Log housing wealth
	<i>Separate</i>	<i>Combined 1</i>	<i>Combined 2</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	1.452*	1.445	1.323	1.037
	0.726	0.781	0.777	0.760
Prob. of two years later benefits	-0.241	-0.980	-1.112	-1.115
	0.633	0.696	0.947	0.689
Dummy cons. belief contributions	0.331	0.163	0.136	0.339
	0.390	0.442	0.437	0.465
Prob. of two years later retirement	0.942		1.191	
	0.687		1.041	
N	2,850	2,850	2,850	2,497
Ind	837	837	837	725
aic	10821.3	10827.5	10821.2	9629
rho	0.94	0.94	0.94	0.94
			standard errors under coefficients	
			* p<.05, ** p<.01, *** p<.001	

RE GLS positive log wealth excluding housing wealth

	1	2	3	4
	Pos. log wealth excl. housing wealth	Pos. log wealth excl. housing wealth	Pos. log wealth excl. housing wealth	Pos. log wealth excl. housing wealth
	<i>Separate</i>	<i>Combined 1</i>	<i>Combined 2</i>	<i>Without .50</i>
Prob. of ten percent lower benefits	0.373	0.443*	0.453*	0.253
	<i>0.205</i>	<i>0.224</i>	<i>0.229</i>	<i>0.229</i>
Prob. of two years later benefits	-0.021	-0.194	-0.157	-0.089
	<i>0.200</i>	<i>0.217</i>	<i>0.275</i>	<i>0.210</i>
Dummy cons. belief contributions	0.068	0.052	0.051	0.104
	<i>0.113</i>	<i>0.113</i>	<i>0.113</i>	<i>0.122</i>
Prob. of two years later retirement	0.012		-0.065	
	<i>0.211</i>		<i>0.292</i>	
N	2,520	2,520	2,520	2,215
Ind	780	780	780	677
rho	<i>0.897</i>	<i>0.896</i>	<i>0.897</i>	<i>0.898</i>
r2_o	<i>0.30</i>	<i>0.31</i>	<i>0.31</i>	<i>0.29</i>
r2_b	<i>0.29</i>	<i>0.29</i>	<i>0.29</i>	<i>0.28</i>
r2_w	<i>0.30</i>	<i>0.30</i>	<i>0.30</i>	<i>0.30</i>
			standard errors under coefficients	
			* p<.05, ** p<.01, *** p<.001	

Results interactions RE GLS age

1			
Log wealth			
	Prob. of ten percent lower benefits	Prob. of two years later benefits	Dummy cons. belief contributions
Simple effect	0.97 <i>0.844</i>	-0.635 <i>0.81</i>	0.545 <i>0.427</i>
Interaction with age 20-29	-0.941 <i>2.444</i>	-3.977 <i>2.378</i>	-3.199** <i>1.145</i>
Interaction with age 30-39	0.962 <i>1.438</i>	-2.278 <i>1.35</i>	-0.744 <i>0.695</i>
Interaction with age 40-49	1.221 <i>0.989</i>	-0.387 <i>0.981</i>	-0.103 <i>0.502</i>
Interaction with age 60-69	-0.521 <i>1.044</i>	0.61 <i>1.026</i>	0.083 <i>0.551</i>
Interaction with age >69	-0.896 <i>1.315</i>	0.631 <i>1.365</i>	-1.36 <i>0.735</i>
N	2,850		
Ind	837		
rho	0.692		
r2_o	0.17		
r2_b	0.23		
r2_w	0.03		
		t-statistics under coefficients	
		* p<.05, ** p<.01, *** p<.001	