Policy Uncertainty, Misinformation and Retirement Age Reform

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Introduction

Retirement Age Increases around the World

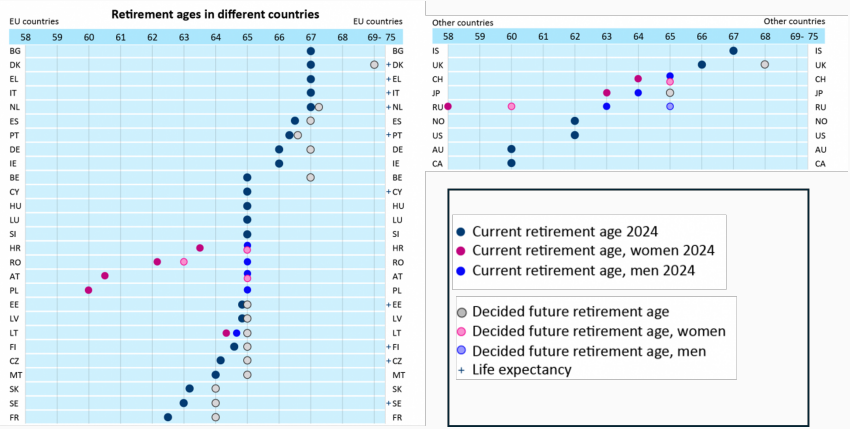

Figure 1: *

Source: Finnish Centre for Pensions

Case of Germany

Statutory Retirement Age (SRA)

- year at which full public pension can be claimed
- 2007 reform: gradual increase to 67 years, further increases debated $\rightarrow$ very salient

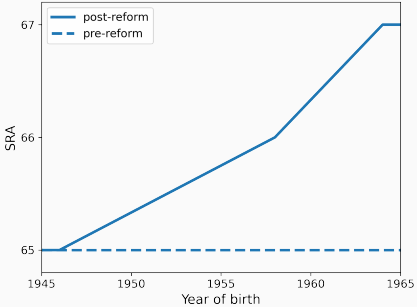

Figure 2: SRA by Birth Year, 2007 reform

Case of Germany

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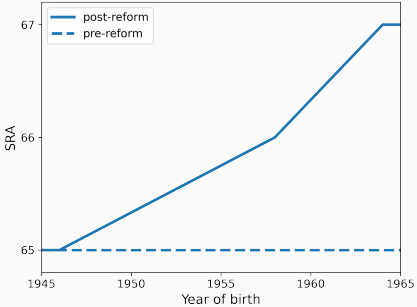
Early Retirement Penalty (ERP)

- penalty of 3.6% of retirement income per year of early retirement (i.e. the bite of the SRA)
- around one third retire with penalties



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Research Questions

Main Idea: retirement policy reform effects emerge at the end of working life

$\Rightarrow$ Life-cycle responses driven by policy expectations & comprehension

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Survey Evidence

- **Q1:** How do retirement policy beliefs evolve over the life-cycle?
  Method: Elicitation of policy beliefs in German population

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$\Rightarrow$ Life-cycle responses driven by policy expectations & comprehension

Survey Evidence

- **Q1:** How do retirement policy beliefs evolve over the life-cycle?
  Method: Elicitation of policy beliefs in German population

Structural life-cycle model

- **Q2:** How does explicit belief modeling affect life-cycle responses to policy reform?
  Method: Comparing predictions of a rich life-cycle model with and without uncertainty
- **Q3:** What are the effects of removing policy uncertainty and misinformation?
  Method: Evaluating policy announcement strategies and population debiasing

Preview of Findings

1. **Beliefs over life-cycle:** people expect further reforms, uncertainty and misinformation decrease with age

2. **Beliefs and retirement age reform:** accounting for subjective uncertainty and belief updating attenuates life-cycle responses to reforms

3. **Expectation management:** eliminating uncertainty and misinformation leads to earlier retirement and consumption shifting over life-cycle

Related Literature

- Importance of beliefs for decisions and biased beliefs: Manski (2004), Zafar and Kuchler (2019); Delavande and Zafar (2019), and Wiswall and Zafar (2021)
- retirement policy evaluation in structural life-cycle models: French (2005), Haan and Prowse, 2014; Iskhakov and Keane (2021); van der Klaauw and Wolpin (2008); Daminato and Padula (2024)
- behavioral effects of the retirement age: Seibold (2021), Staubli & Zweimüller (2013), Rabaté et al (2024)
- importance of retirement uncertainty: Caliendo et al., (2019); Caliendo et al., (2023); Luttmer and Samwick (2018)

Outline

Introduction

Policy Beliefs

Model

Estimation

Counterfactuals

Summary

Policy Beliefs

Policy Beliefs - Overview

Data and Identification

- Questions in SOEP-IS, representative of German working-age population (N=795)
- Variation in age identifies belief evolution over life-cycle

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- *Misinformation:* knowledge about size of ERP

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Formalization

- *Uncertainty*: autoregressive process, updates as current policy is observed
- *Misinformation*: classification into informed/uninformed, random updating

SRA Expectations – Elicitation

Question: Under the current system, the retirement age is increased to 67. How likely do you think the following three statutory retirement ages will be at the time of your retirement? Please answer so that your three statements add up to 100%.

Answers: "67", "68", and "69 and above".

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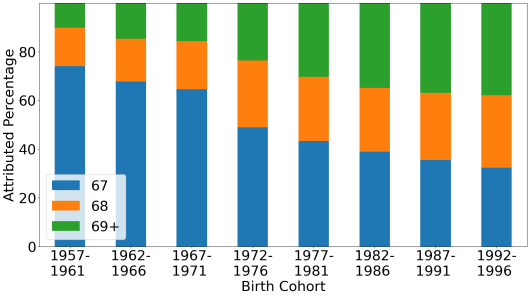

SRA Expectations – Formalization

Step 1: Fit truncated normal distribution through individual responses

- Recovers estimate of subjective mean and forecast variance Example Fit

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$$SRA_{t+1} = \alpha + SRA_t + \epsilon_{t+1} \tag{1}$$

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$$SRA_{t+1} = \alpha + SRA_t + \epsilon_{t+1} \tag{1}$$

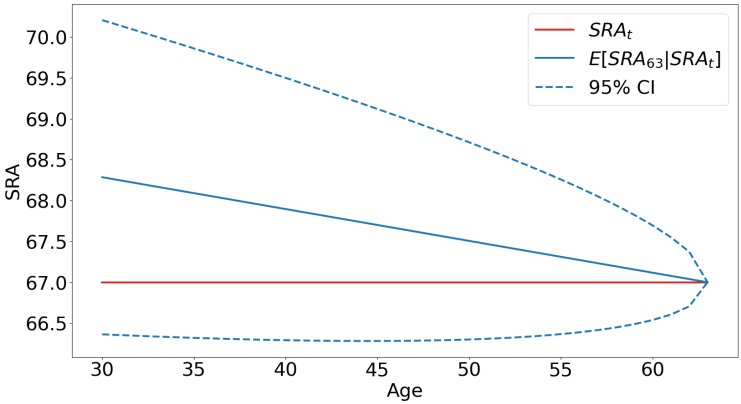
Implies for any $T \geq t$

- Policy expectation: $E[SRA_T|SRA_t] = SRA_t + (T-t)\alpha$
- Policy uncertainty: $Var[SRA_T|SRA_t] = (T-t) \cdot Var(\epsilon) = (T-t) \cdot \sigma^2$

$\rightarrow$ expectations and current policy converge over time, forecast variance decreases

SRA Expectations – Illustration

Example: Agents have beliefs with estimated parameters ($\alpha = 0.04, \sigma^2 = 0.03$). However, real policy never changes, meaning actual SRA stays at 67.



Early Retirement Penalty – Elicitation

Question: What percentage do you think the pension insurance will deduct from your monthly pension if you retire one year before your regular retirement age?

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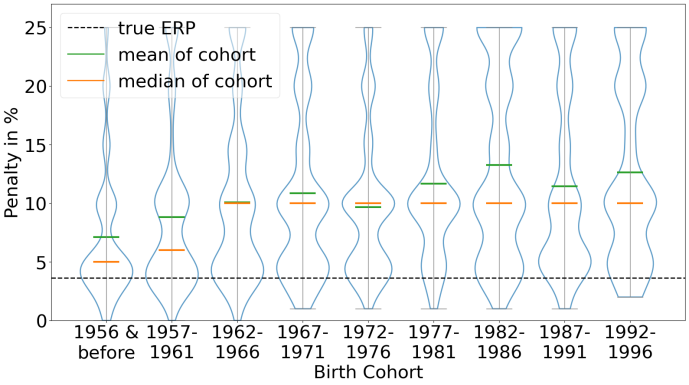
Question: What percentage do you think the pension insurance will deduct from your monthly pension if you retire one year before your regular retirement age?

True Answer: 3.6%



Note: Distributions censored at 25 percent.

Early Retirement Penalty – Formalization

Step 1: Classify responses into "informed" and "uninformed"

- Threshold (5 percent) chosen to minimize distance of average "informed" response from true value

Step 2: Estimate parameters of updating process

- Random updating at constant rate, being informed is absorbing
- Parameters: hazard rate, initial share of uninformed, ERP belief of uninformed Estimates
- Estimation: age-specific uninformed shares as moments Fit

Model

Agents & Choices

Agents

- men & women from age 30 until stochastic death (max age: 100)
- individual decisions by household head, stochastic partners with deterministic income
- individuals differ on states x_t:
  - education and sex (together *type* τ)
  - work experience e_t, partner state p_t $\rightarrow$ jointly determine household income Y_t
  - household wealth a_t
  - health h_t, job-offers o_t
  - policy SRA_t and informed state i_t

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Annual decisions to maximize expected disc. utility

- employment (discrete): $d_t \in \{$full-time work, part-time work, unemployment, retirement$\}$
  - can only work with job-offer
  - retirement is absorbing, early retirement if $h_t = disability$
- consumption-savings (continuous): $c_t \in [0, a_t]$

Utility

Flow utility

$$u(c_t, d_t, x_t) = \frac{\left(\frac{c_t}{n_t(x_t)}\right)^{1-\mu} - 1}{1-\mu} - L_t(x_t, d_t) + \epsilon_t(d_t) \tag{2}$$

- $n(x_t)$: consumption equivalence, depends on household size
- $L_t(x_t, d_t)$: dis-utility of labor choice (compared to retirement baseline), depends on sex, health, nb. of children,
- $\epsilon_t(d_t)$: taste-specific utility shock

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Utility at death

$$u_b(a) = \theta \frac{a^{1-\mu}}{1-\mu} \tag{3}$$

Budget

Intertemporal budget

$$a_{t+1} = (1 + r)(a_t - c_t) + Y_t(x_t, d_t). \tag{4}$$

Household income

$$Y_t(x_t, d_t) = y_t(x_t, d_t) + y_t^p(x_t) + B(x_t, d_t) - T(x_t, d_t) \tag{5}$$

- labor or retirement income y_t - function of experience with transitory income shock
- partner income y_t^p- deterministic function of stochastic partner state
- benefits B - child benefits and means tested social assistance
- taxes T - social security contributions, progressive and joint taxation

Job Offer and Job Destruction

- probability dependent on sex, education, age, and health

Stochastic Processes

Job Offer and Job Destruction

- probability dependent on sex, education, age, and health

Family

- partner p_t: stochastic arrival, departure, and retirement of partners; Markov process, dependent on age, sex, and education
- children N_t: deterministic, conditional on partner, age, education, and sex
- determines partner income, consumption scale, and influences utility of labor choice

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Health & Mortality

- health $h_t \in \{healthy, unhealthy, disabled, dead\}$: Markov process, dependent on age, sex, and education

Estimation

Data

Datasets

- German Socio-Economic Panel (GSOEP): choices, state variables, derived variables (income, children)
- German Federal Statistical Office: mortality table
- German Pension Insurance: retirement data

Structural Estimation Dataset

- estimation years = 2013-2020
- $N = 125,629$
- choice variables: labor, unemployment, retirement (linked with admin data)
- state variables: education, sex, partner state, health, wealth, work experience

Estimation

First step estimation - outside of model

- stochastic processes: partner transitions Fit, job separations Fit, health and death Fit
- derived variables: wages Fit, partner income Fit, number of children Fit

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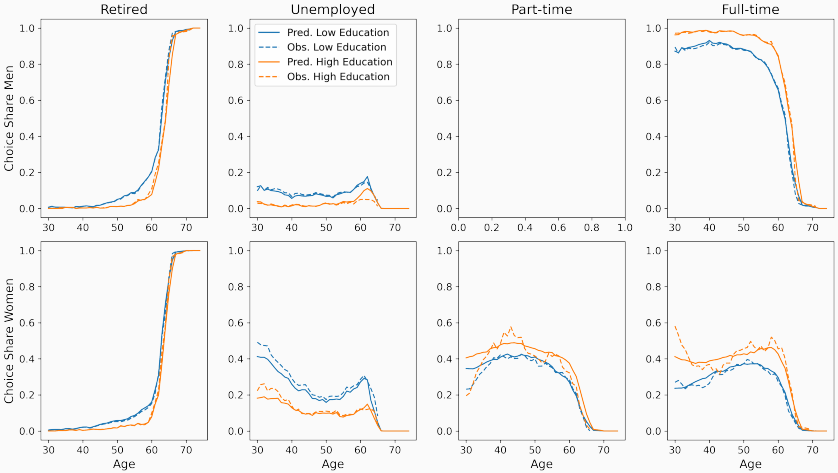
Likelihood estimation from sample $\mathcal{M}$

- disutility parameters of work
- unobserved transitions: disability pension eligibility details, job offers details

$$\mathcal{L}(\mathcal{M}, \theta) = \Pi_{i=0}^{N} \Pi_{t=0}^{T} \left(\sum_{o_t=0}^{1} \sum_{h_t=0}^{2} \sum_{i_t=0}^{1} P(d_{it}|x_{it}, o_t, i_t, h_t, \theta) \pi(o_t|x_{it-1}) \pi(h_t|x_{it-1}) G(i_t|x_{it}) \right) \quad (6)$$

Model fit



Wealth Fit

Counterfactuals

Counterfactual: Increase the Retirement Age

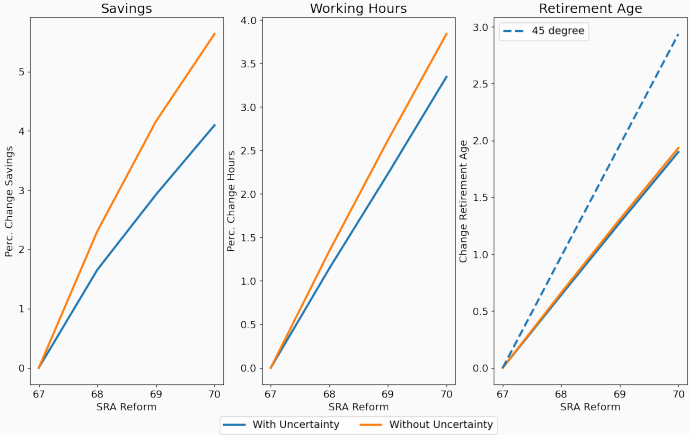
RQ2: influence of beliefs on responses to SRA increase

- measure effects of SRA increase on behavior:
  1. savings
  2. labor supply
  3. retirement timing
- compare with and without uncertainty

Counterfactual setup

- agents start at age 30 with $SRA_{30} = 67$
- SRA belief: parametrized with survey-elicited expectations in scenarios with uncertainty
- True SRA: we consider i. no increase and ii. *gradual* increases to $\{68, 69, 70\}$

Counterfactual: Increase the Retirement Age - Results



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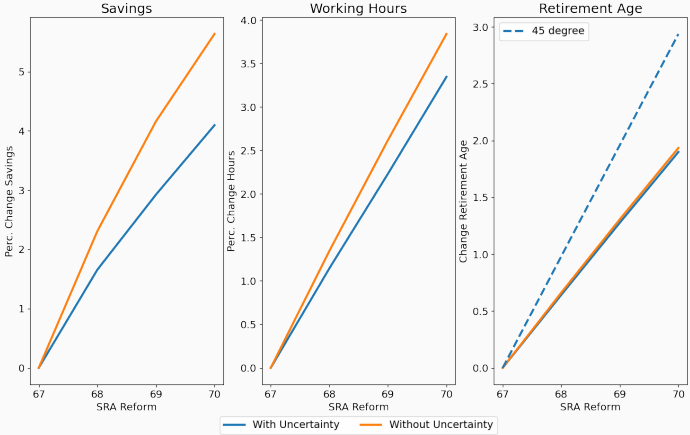

Observe: Including uncertainty attenuates responses even when expectation coincides with true policy (around $SRA_T = 68.5$).

Counterfactual: Belief Management - Announcement Timing

RQ3.1 Effect of Timing of Announcement

- same (2-year) SRA increase, announced at different points in the life-cycle
- after announcement, no more uncertainty
- baseline: announcement happens at age 63

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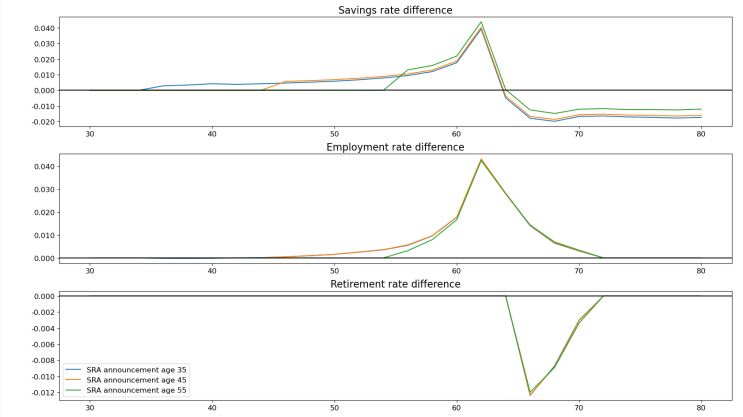
Counterfactual setup

- agents start at age 30 with $SRA_{30} = 67$
- SRA belief: parametrized with survey-elicited expectations until time of announcement at age $\{35, 45, 55\}$
- True SRA: starts at 67, *sudden* increase to 69

Counterfactual: Announcement Timing - Results



Observe: People spread expected loss over life-cycle when it is announced, by saving and working more.

Counterfactual: Belief Management - De-Biasing

RQ3.2 Effect of Timing of Removing Bias

- counterfactual: everyone starts informed
- baseline: misinformation with random updating

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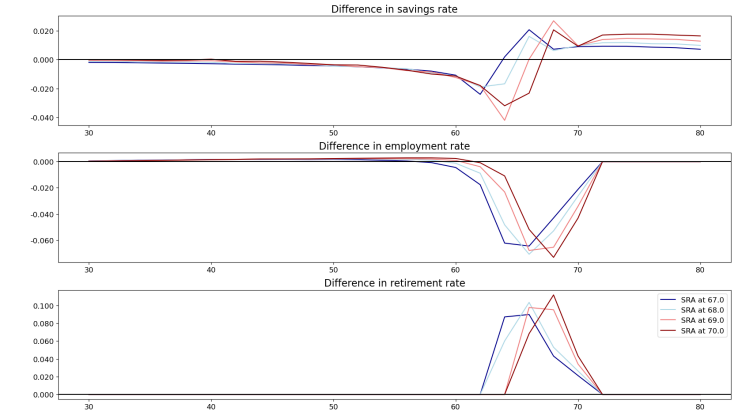


Observe: People spread expected gain over life-cycle by savings less. Old-age labor supply decreases and people retire sooner.

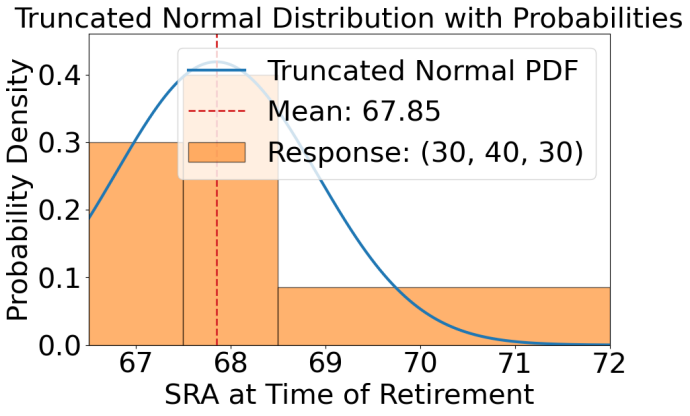
Summary

Summary of Results

1. **Retirement age policy beliefs over the life-cycle**
   - people expect further SRA increases, overestimate ERP
   - uncertainty and misinformation decrease with age
2. **Importance of Subjective Beliefs in Policy Evaluation**
   - in baseline model (with uncertainty and misinformation) reaction close to findings in literature
   - model without uncertainty overestimate life-cycle reactions
3. **Expectation Management**
   - **early announcement** leads to welfare gains and increases in savings and elderly labor supply
   - **de-biasing** leads to welfare gains, but lower savings, lower labor supply and earlier retirement

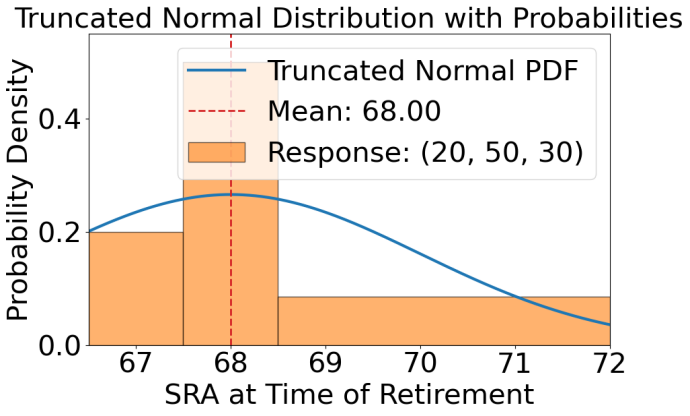
Appendix

Truncated Normal Distribution



Back to SRA Formalization

Truncated Normal Distribution



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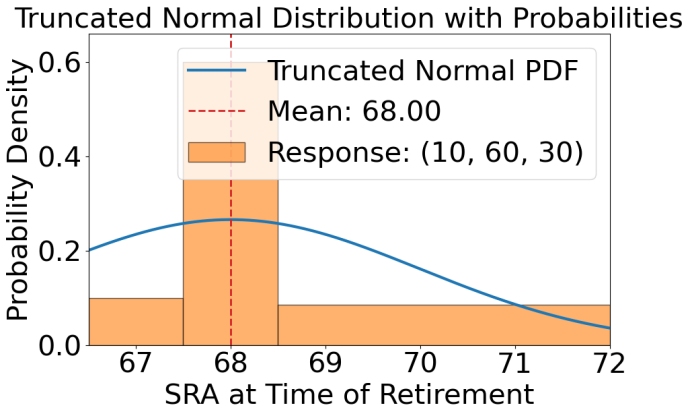


Back to SRA Formalization

SRA process parameters

Table 1: Expectation process parameter estimates

Parameter Name	Parameter	Estimate
Drift	α	0.039
		(0.0013)
Variance of belief process	σ^2_{SRA}	0.0291
		(0.0009)

Notes: OLS estimate of expected increase α and variance of random walk. Standard errors in parentheses.

Back to SRA Formalization

ERP process parameters

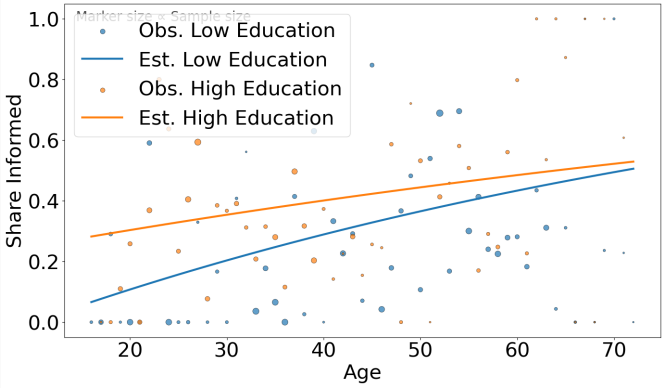
Table 2: Early Retirement Penalty parameters

	Education	
Parameter Name	Low	High
Subjective ERP	0.184	0.181
	(0.013)	(0.017)
Informed share at 18 years	0.066	0.283
	(0.049)	(0.063)
Information rate	0.011	0.008
	(0.028)	(0.004)

Notes: Parameter estimates for different education level. Standard errors are reported in parentheses.

Back to ERP Formalization

ERP process moments and fit



Back to ERP Formalization

Bellman

$$V(x_t) = \max_{0 \leq c_t \leq a_t, d_t} u(c_t, d_t, x_t) + \beta \, \mathbb{E}\left[V(x_{t+1} | c_t, d_t, x_t)\right] \tag{7}$$

Job offers Transitions

- From first step estimation, we have ϕ_{sep} in

$$\pi(o_{t+1} = 0 | x_t, d_t \in \{2, 3\}) = \Lambda_{sep}\left(Z_{sep}(x_t)'\phi_{sep}\right). \tag{8}$$

- From the structural estimation, we obtain ϕ_o

$$\pi(o_{t+1} = 1 | x_t, d_t = 1) = \Lambda_o\left(Z_o(x_t)'\phi_o\right) \tag{9}$$

Back to Estimation

Disability probability

- In the first step, we estimate the Markov probability matrix from good to bad health
- Assumption: individuals can be eligible for disability benefits **only** if they are in bad health

Let $\pi^{fs}(h_t = bad|x_{t-1})$ be the first step estimated probability of bad health in period t. Then:

$$\pi(h_t = bad|x_{t-1}) = \pi^{fs}(h_t = bad|x_{t-1}) * (1 - \pi(h_t = disability))$$

and

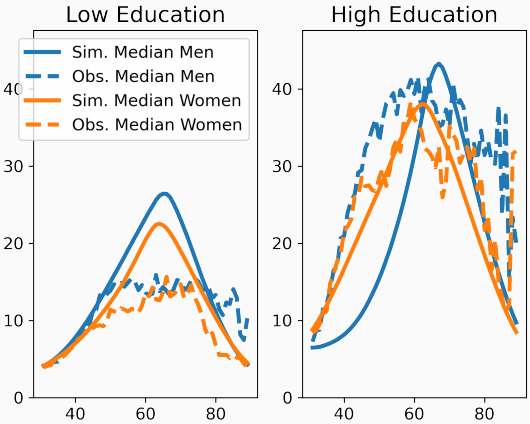
$$\pi(h_t = disability|x_{t-1}) = \pi^{fs}(h_t = bad|x_{t-1}) * \pi(h_t = disability)$$

with

$$\pi(h_t = disability) = \Lambda_{dis}\left(Z_{dis}(x_t)'\phi_{dis}\right)$$

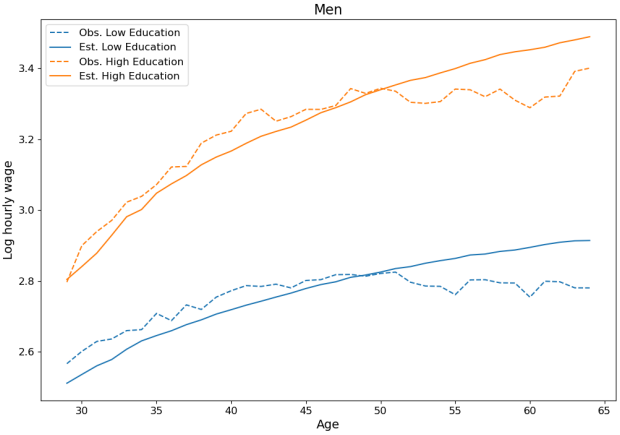
Back to Estimation

Wealth



Back to Fit

Wages Men



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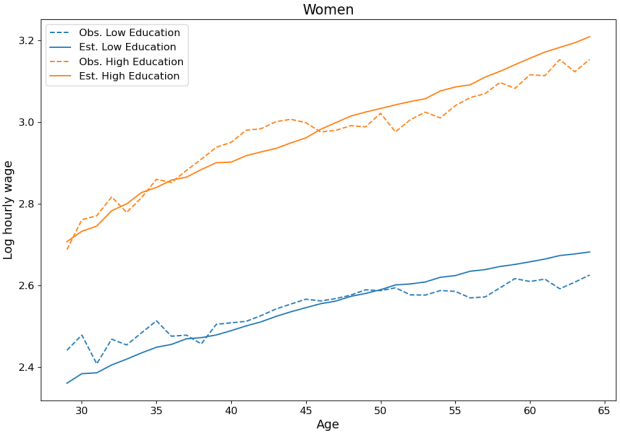
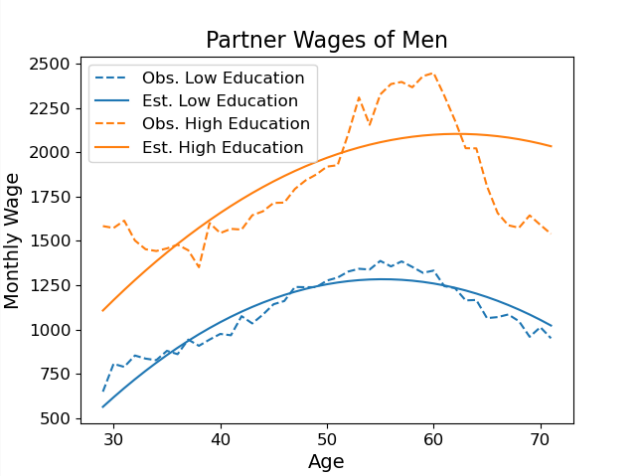
Wages Women



Back to Estimation

Partner wages Men



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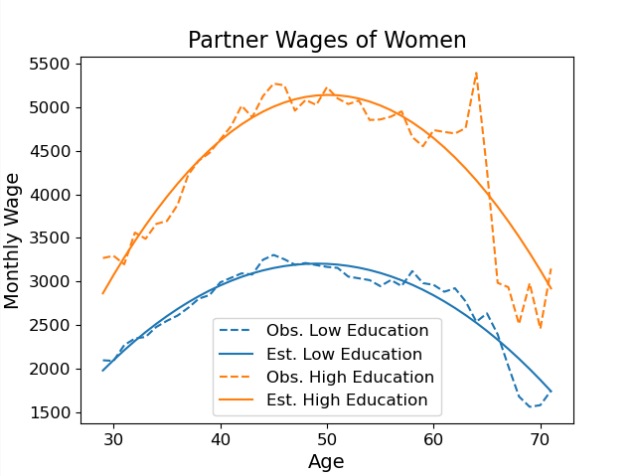
Partner wages Women



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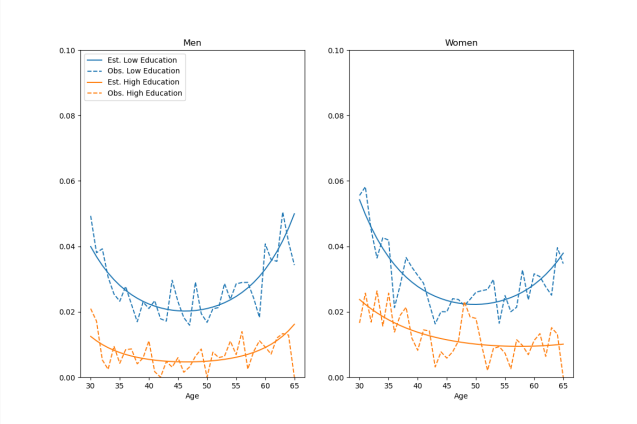
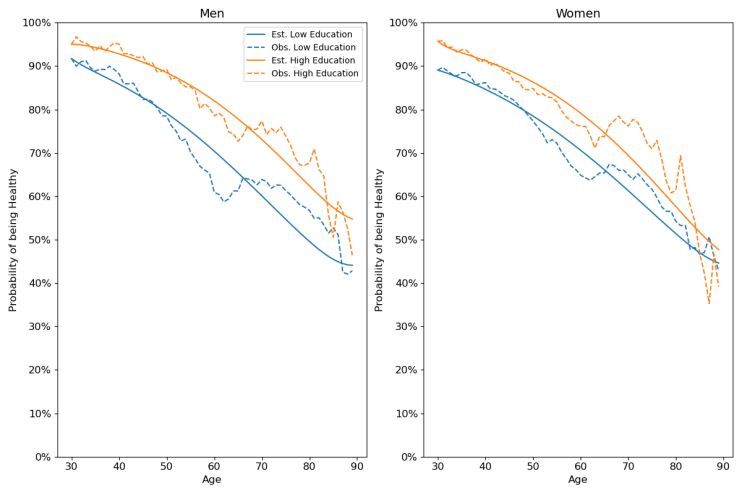
Job separation



Back to Estimation

Health shares



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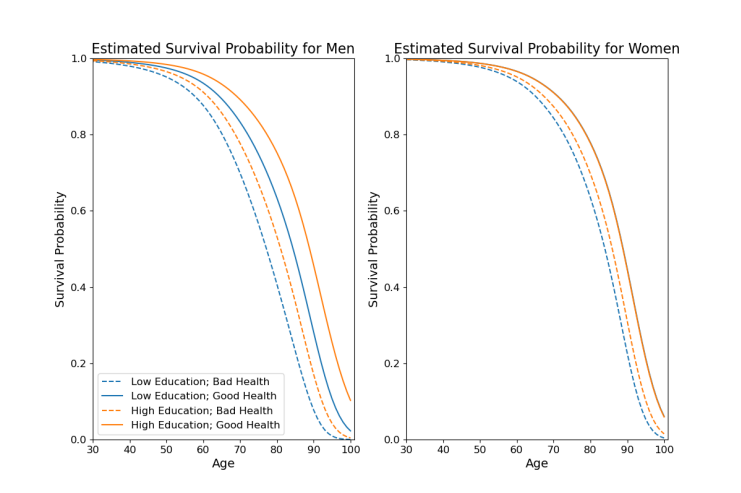
Survival



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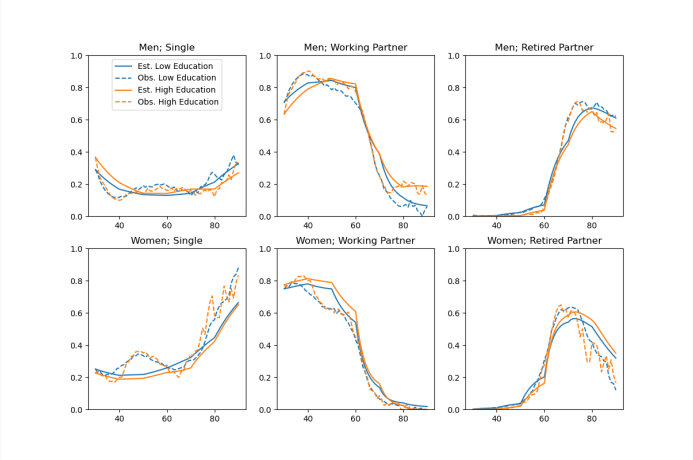
Partner Transition



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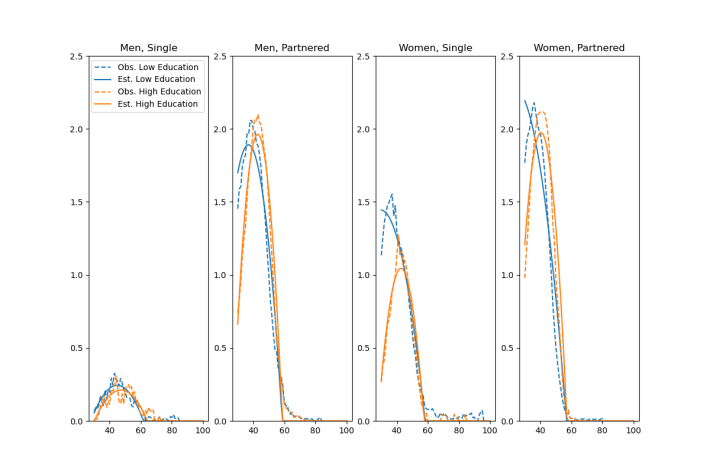
Children



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Outside parameters

Parameter name	Value
Interest rate	0.03
Discount factor	0.97
CRRA curvature	1.5
Bequest scale	2.4