The Impact of Social Security Eligibility and Pension Wealth on Retirement

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Normal Retirement Ages Around the World

US: 66, increase to 67 in 2027
UK: 66, increase to 67 in 2028
Germany: 66, increase to 67 in 2031
China: 60/55, increase to 65 in 2055
France: 62, increase to 64 in 2030

Börsch-Supan and Coile (2018); Lee and Mason (2011); OECD (2021); Börsch-Supan and Coile (2023)

Introduction

Opposing incentives of two major policies implemented across the developed world:

1. Aging populations:
   → Delay normal retirement age
   → **Retire later**

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Large literature on 1, but open question what the net effect is of 1 & 2.

Literature

Question

What is the effect of delaying access to social security in light of increased pension wealth?

Denmark is an ideal laboratory to answer this:

- Front-runner in terms of timing and scope of policy that links normal retirement age to life expectancy
- Early adaption of incentivized occupational pensions
- Data availability

Preview of findings

1. Positive labor supply responses, stronger for low pension wealth workers
2. Survey evidence suggests that this response pattern extends into the future

Outline

1. The Danish Pension System
2. The 2006 Reform
3. Admin data
4. Survey data
5. Results
6. Conclusion

Structure of the Danish Pension System

- Social security benefits
  - Pay-as-you-go funded
  - Universal, flat-rate benefit. Not tied to labor market performance, but:
  - Means tested against earnings and occupational pension income
- Occupational pensions
  - Gradually introduced in the early 1990's, now the norm
  - Negotiated through collective bargaining agreements
  - Predominately defined contribution plans
- Individual supplementary pensions
  - Voluntary additional savings
  - Small compared to social security and occupational pensions

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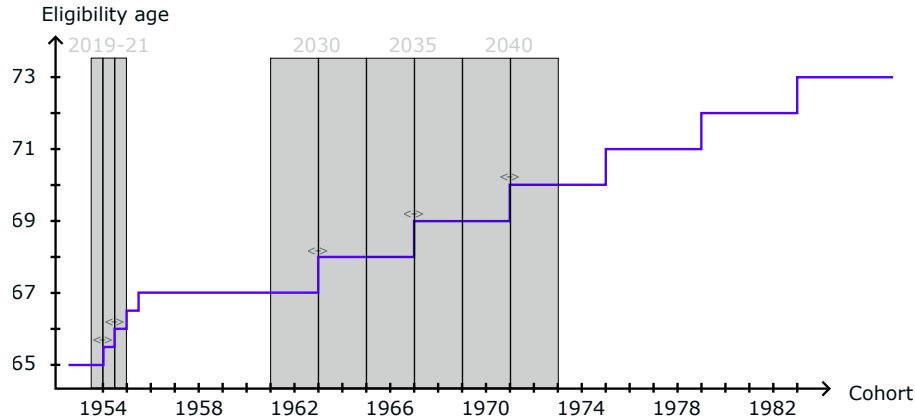
Reform: Normal Retirement Age

Decided in 2006 by large majority, revised in 2011, implemented from 2019.

Goal: 14.5 years in retirement (in expectation)

	Birth dates	Eligibility age	Starting year	# of C/T
Admin	-31 December 1953	65.0		
	1 January 1954-	65.5	2019	9,811/10,732
	1 July 1954-	66.0	2020	10,732/9,888
	1 January 1955-	66.5	2021	
Survey	1 July 1955-	67.0	2022	
	1 January 1963-	68.0	2030	824/814
	1 January 1967-	69.0	2035	817/760
	1 January 1971-	70.0*	2040	715/679
	1 January 1975-	71.0*	2045	
	1 January 1979-	72.0*	2050	
	1 January 1983-	73.0*	2055	

Reform: Normal Retirement Age



Shaded areas indicate cohorts in the analysis.

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Admin data

Standard Danish register data:

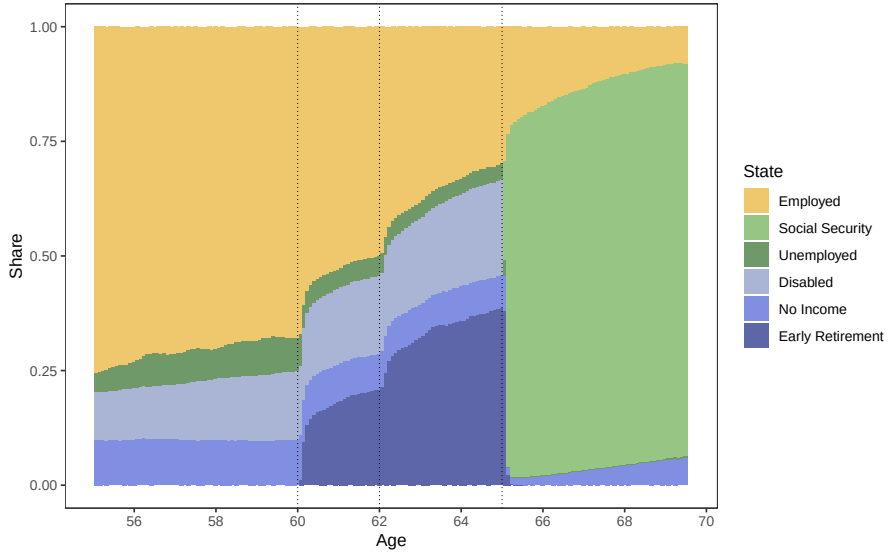
- Monthly earnings and transfers
- Annual wealth info

Consider only normal retirement age, include:

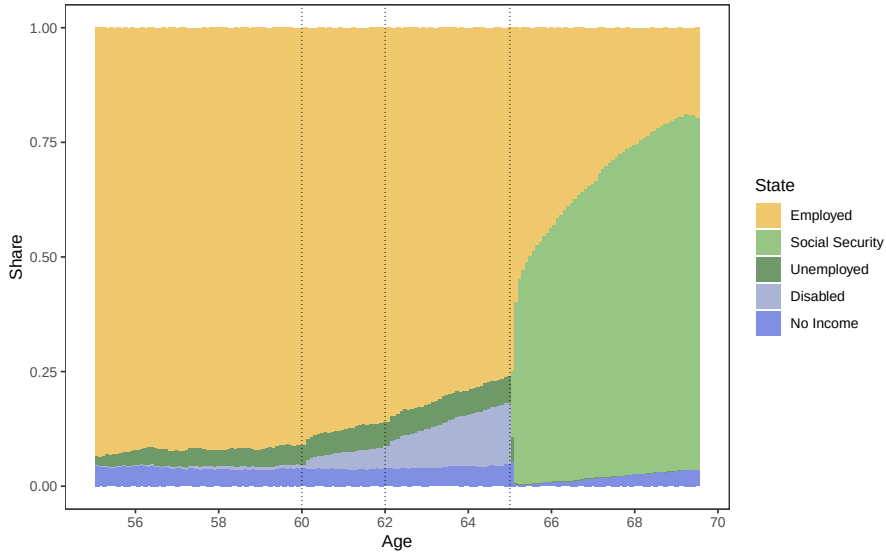
- People working at age 59
- Natives
- No early retirement or disability benefits

Cohorts: 1953.5, 1954.0, 1954.5.

Paths Out of the Labor Force 1953.5

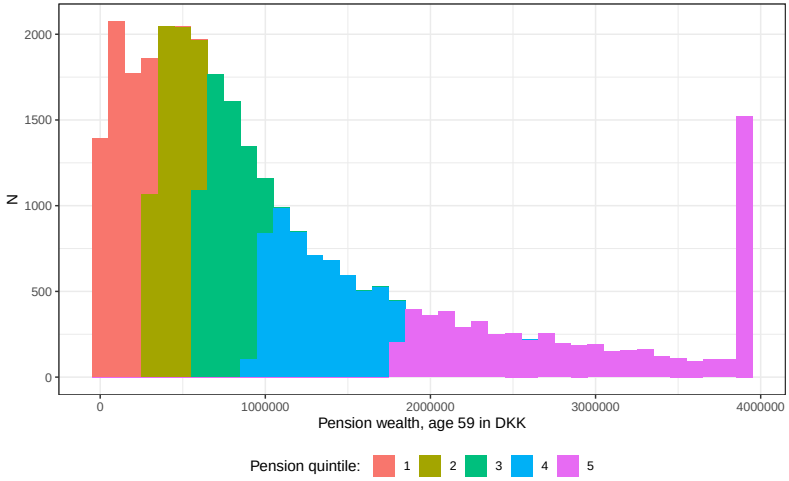


Paths Out of the Labor Force - Sample 1953.5



Distribution of pension wealth

Divide sample into cohort-specific pension wealth quintiles.



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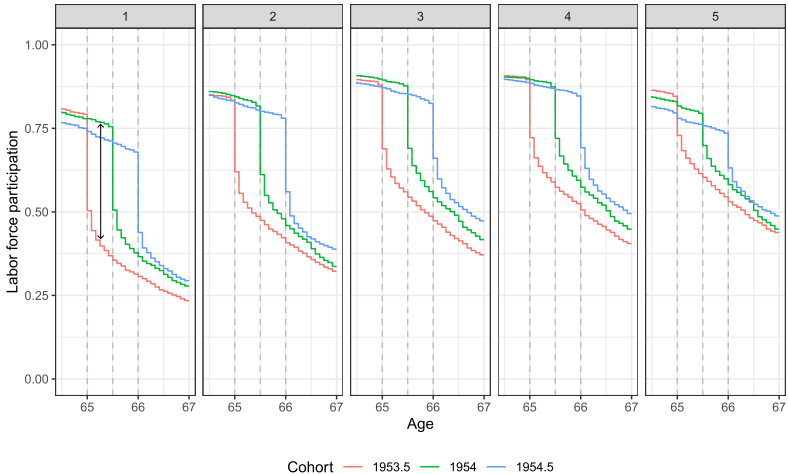
Retirement, admin, by cohort and pension wealth

Retirement: No longer working, claiming public or private pension.



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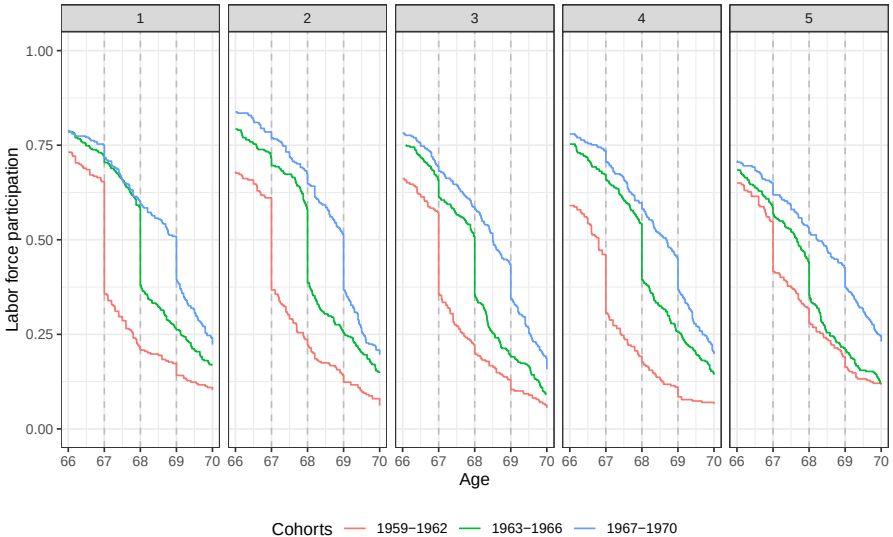
Survey data

- Copenhagen Life Panel survey 2021
- 23,802 were sampled from the registers
- ...then invited to participate via an official email account
- 5,006 respondents
- Both respondents and non-respondents are linked back into the registers
- Younger cohorts, 1961-1972
- Condition on working now and in expectation at age 64
- Pension wealth quintiles based on expected income in retirement

Expected retirement age, survey, by cohort and pension wealth



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Identification Strategy

Regression Discontinuity Design:

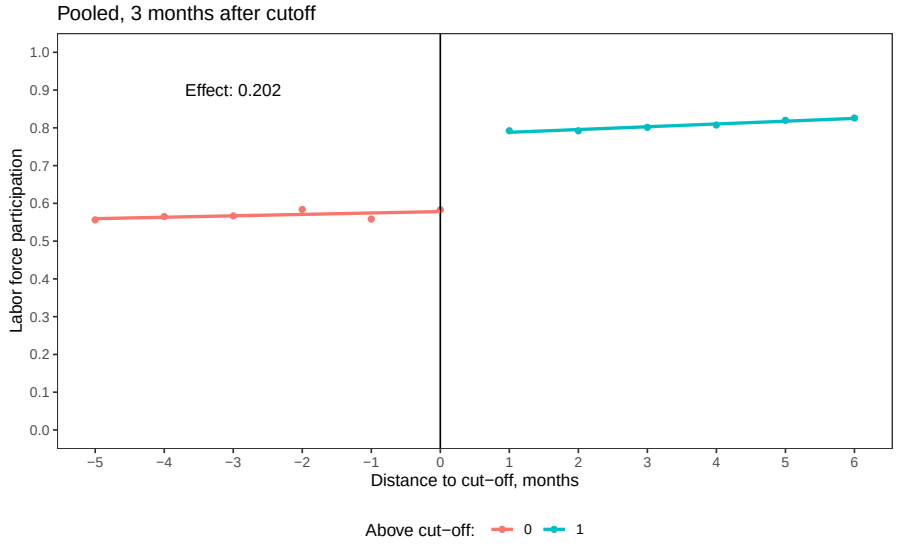
$$y_i = \beta_0 + \beta_1 D_i + \beta_2 W_i + \beta_3 D_i W_i + \varepsilon_i$$

y_{it} : Participating (1) / Retired (0), measured at 3 months after cut-off

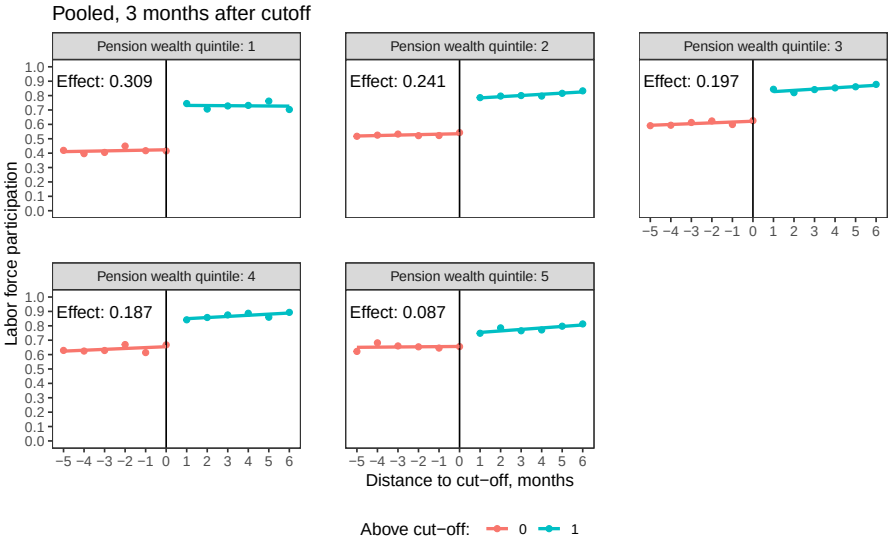
D_i : Treatment dummy

W_i : Distance to cut-off

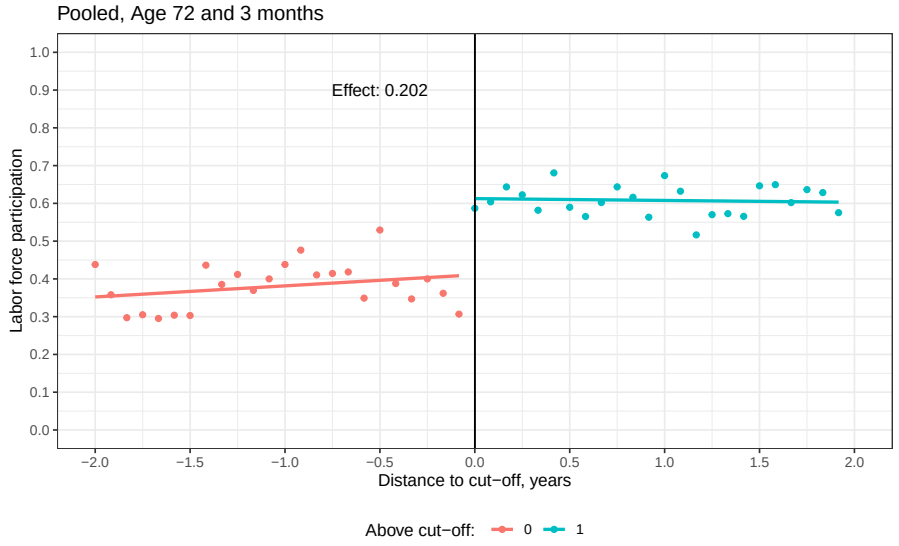
Admin data RDD, pooled



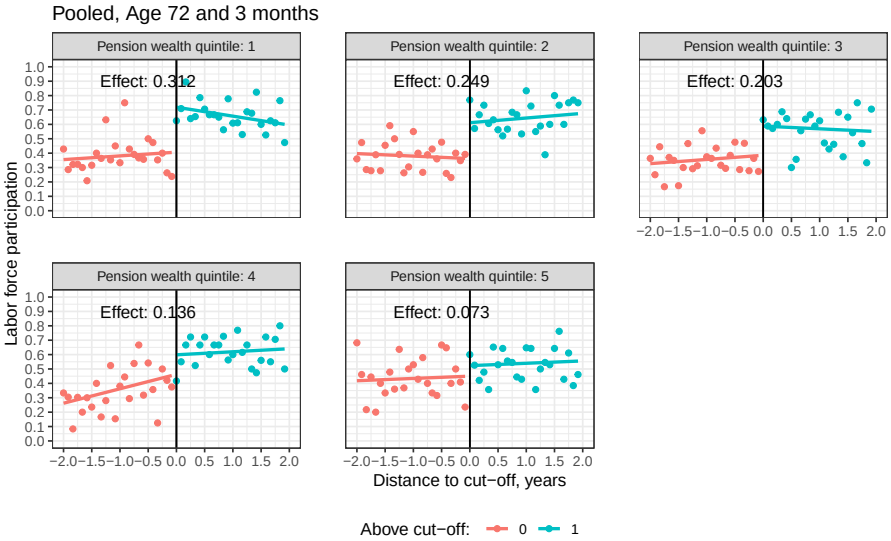
Admin data RDD, pooled, by pension wealth



Survey data RDD, pooled

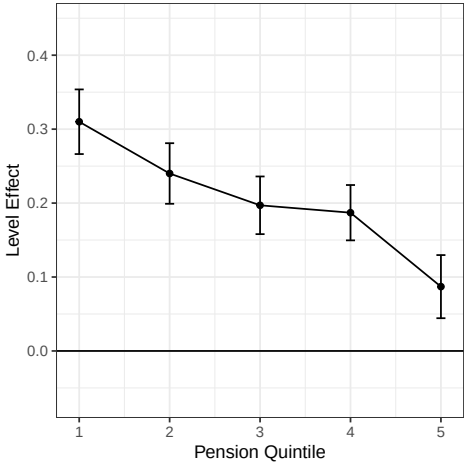


Survey data RDD, pooled, pension wealth



Summary of RD results

(a) Administrative data



A:non-emp | A:gender | A:household | A:liquid | A:wealth | S:bw | S:current

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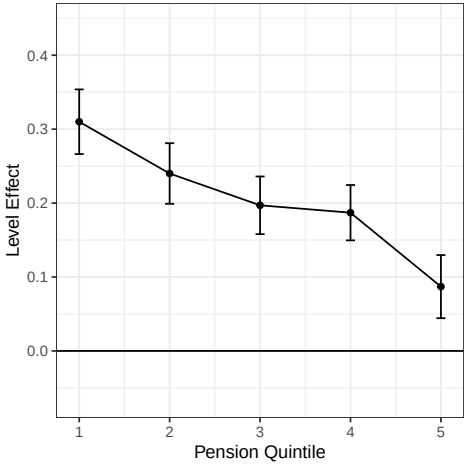
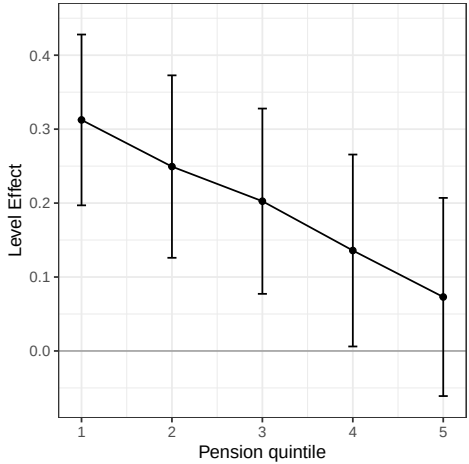


(b) Survey data



A:non-emp | A:gender | A:household | A:liquid | A:wealth | S:bw | S:current

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Conclusion

- Linking social security to life expectancy thereby delaying eligibility induces poor people to work longer.
- The response pattern is likely to extend well into the future.

Thank you

Literature

1. Causal evidence on the labor supply response to pension reform

   Austria (Staubli and Zweimüller (2013); Manoli and Weber (2016)), France (Rabate and Rochut (2020)), Germany (Geyer and Welteke (2021)), the Netherlands (Rabaté et al. (2024)), Switzerland (Lalive et al. (2017)), the UK (Cribb et al. (2016)), and the US (Mastrobuoni (2009); Behaghel and Blau (2012))

2. Expectations of future labor supply responses for younger cohorts

   Dominitz and Manski (1997); Delavande and Rohwedder (2011)

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Sample selection

Table: Sample size

Sample criteria	N
Population	94,966
Native Danes	88,301
Working age 59	68,133
Not disabled	67,853
Not self-employed	66,625
Not on early retirement	30,431

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Balance Table - Admin Cohorts 1953.5 vs 1954.0

	Control	Treatment	Difference	p-value
N	9728	10635		
Female	0.399	0.4	0.001	0.921
	(0.49)	(0.49)	(0.007)	
College	0.623	0.613	-0.01	0.144
	(0.485)	(0.487)	(0.007)	
Earnings	458,165	454,452	-3,712	0.409
	(317,523)	(324,199)	(4,500)	
Total wealth	826,225	797,393	-28,832	0.454
	(2,350,327)	(3,116,955)	(38,489)	
Pension savings	1,698,540	1,696,856	-1,684	0.957
	(2,331,798)	(2,055,963)	(30,926)	

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Balance Table - Admin Cohorts 1954.0 vs 1954.5

	Control	Treatment	Difference	p-value
N	10635	9790		
Female	0.4	0.403	0.004	0.586
	(0.49)	(0.491)	(0.007)	
College	0.613	0.623	0.011	0.122
	(0.487)	(0.485)	(0.007)	
Earnings	454,452	452,158	-2,295	0.657
	(324,199)	(405,794)	(5,167)	
Total wealth	797,393	1,256,014	458,620	0.312
	(3,116,955)	(44,809,967)	(453,888)	
Pension savings	1,696,856	1,688,831	-8,025	0.798
	(2,055,963)	(2,397,353)	(31,377)	

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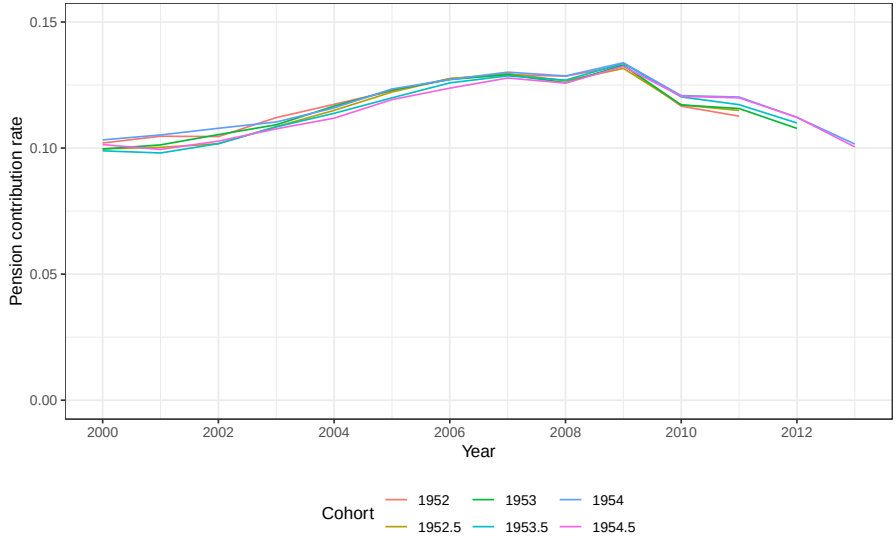
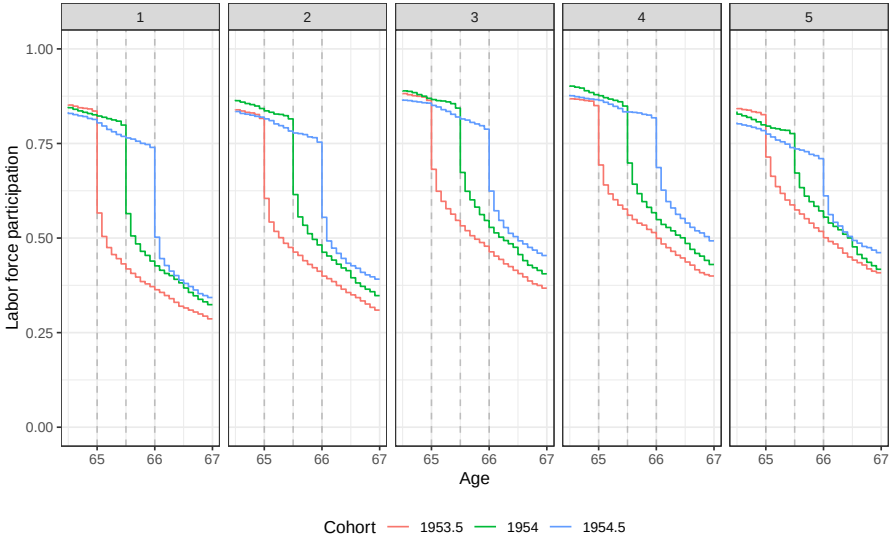
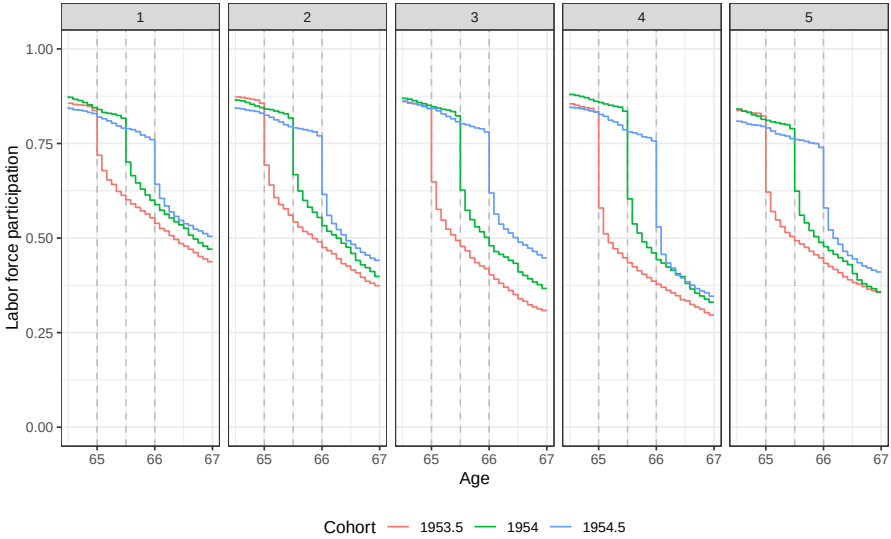
Average contribution rates



Retirement, by cohort and pension wealth, 2005



Retirement, by cohort and liquid wealth



Retirement, by cohort and wealth

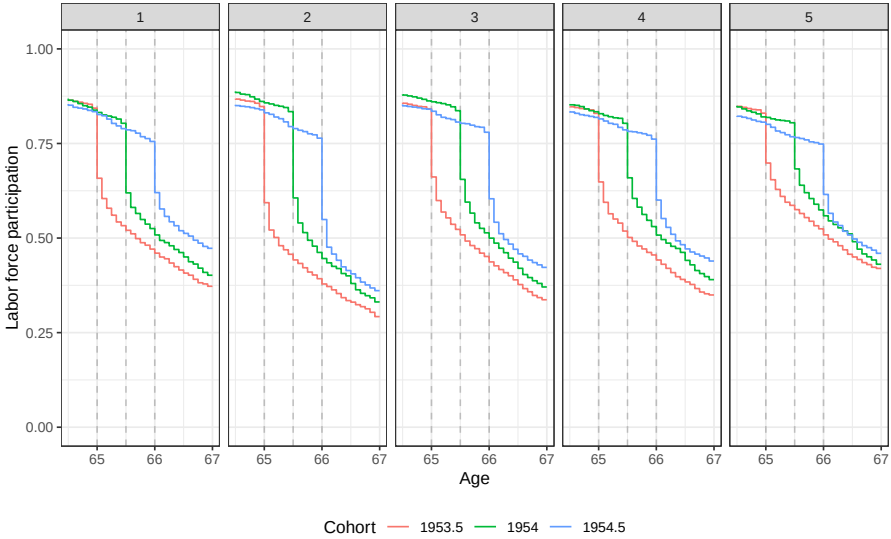


Table: Balance Table - Survey 2021

	Respondent	Non-respondent	Difference	p-value
N	5006	18796		
Female	0.5	0.494	0.006	0.447
	(0.5)	(0.5)	(0.008)	
Age	54.768	54.515	0.253	0
	(3.411)	(3.448)	(0.054)	
College	0.505	0.33	0.175	0
	(0.5)	(0.47)	(0.008)	
Employed	0.919	0.786	0.134	0
	(0.272)	(0.41)	(0.005)	
Earnings	505,021	386,956	118,065	0
	(360,972)	(387,674)	(5,833)	
Total wealth	531,604	453,628	77,975	0.004
	(1,530,873)	(2,201,550)	(26,945)	
Pension savings	2,141,693	1,672,916	468,776	0
	(1,829,145)	(1,739,611)	(28,799)	

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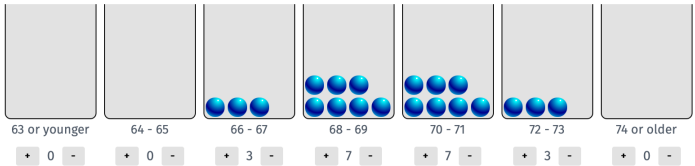
Survey Instrument

Questions:

- $\mathbb{E}[SS]$: *At what age do you anticipate first being eligible for social security?*
- $\mathbb{E}[R_{65}]$: *Suppose that you first become eligible for social security at the age of 65. At what age do you expect to retire?*
- $\mathbb{E}[R_{TA}]$: *Suppose that you first become eligible for social security at the age of [Table]. At what age do you expect to retire?*



$\mathbb{E}[R]$: Interpolation between $\mathbb{E}[R_{65}]$ and $\mathbb{E}[R_{TA}]$

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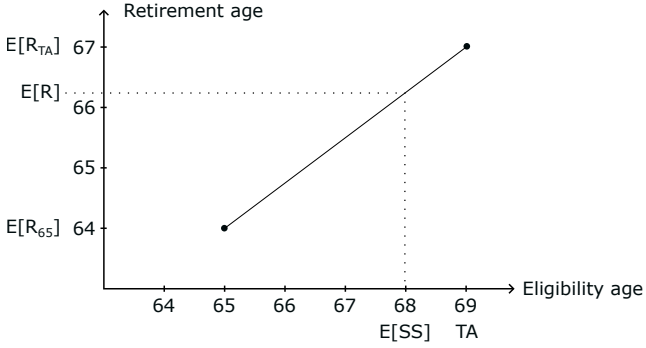
Retirement Age Interpolation

Expected retirement age is the interpolation between $\mathbb{E}[R_{65}]$ and $\mathbb{E}[R_{TA}]$:

$$\mathbb{E}[R] = \frac{\mathbb{E}[R_{65}](TA - \mathbb{E}[SS]) + \mathbb{E}[R_{TA}](\mathbb{E}[SS] - 65)}{TA - 65}$$



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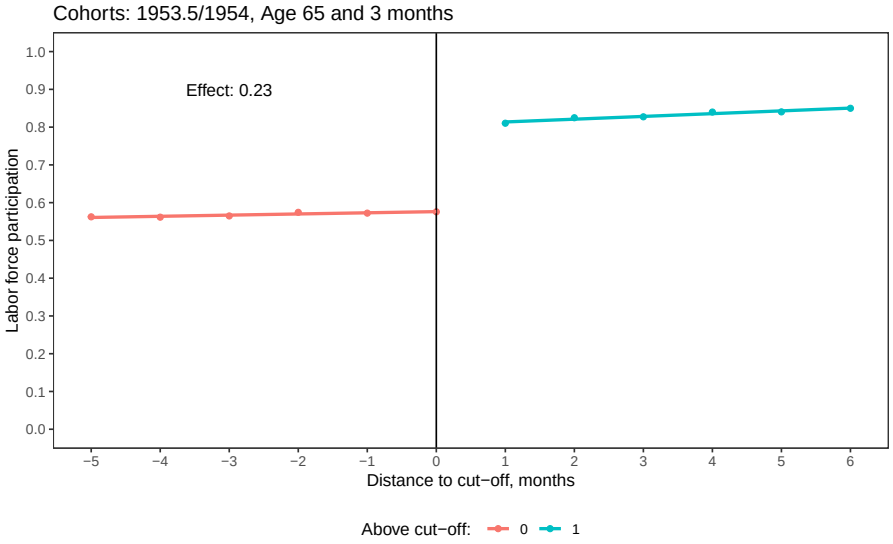
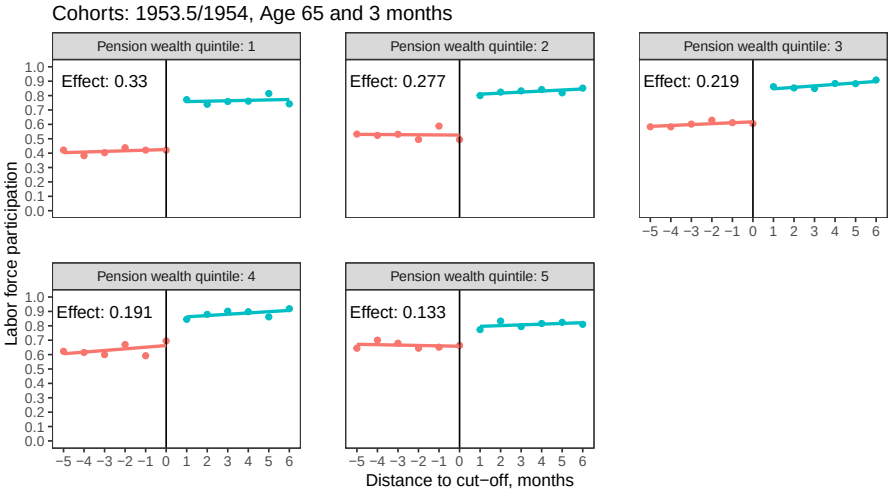
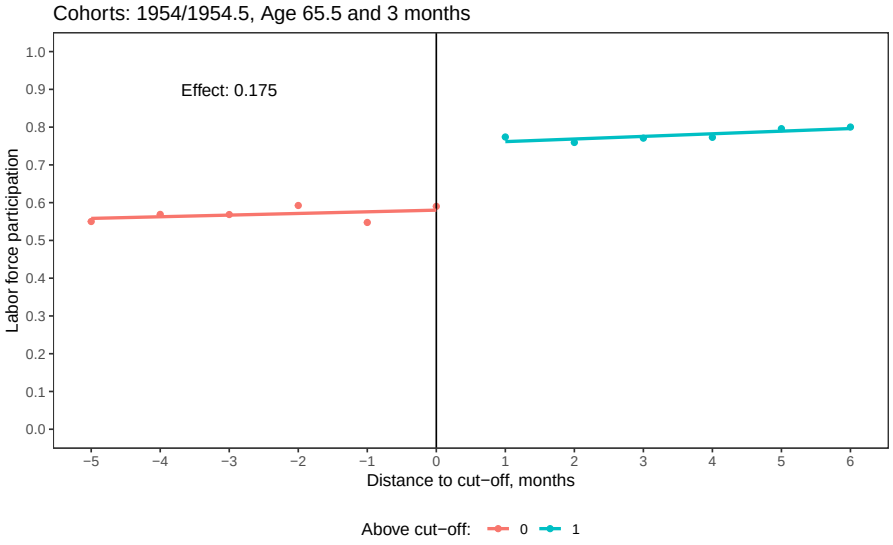
Admin data RDD, cohorts 1953.5/1954.0



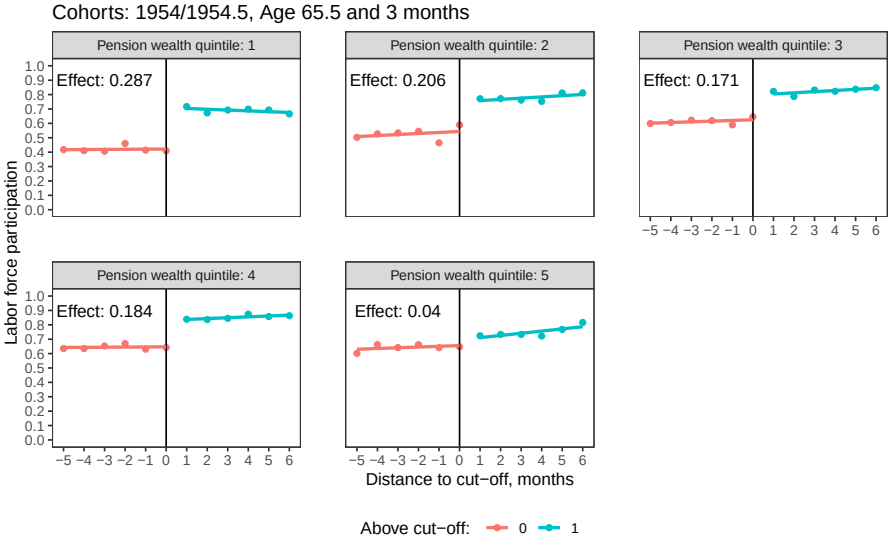
Admin data RDD, cohorts 1953.5/1954.0, pension wealth



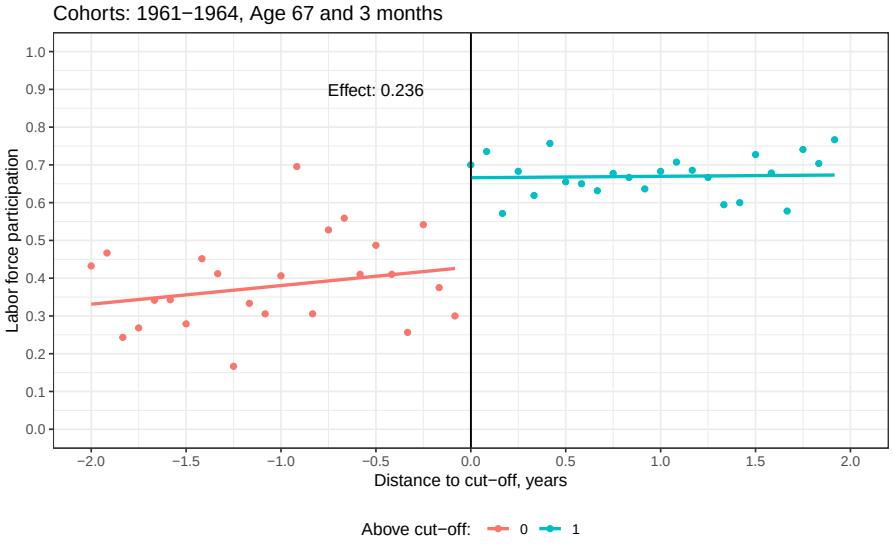
Admin data RDD, cohorts 1954.0/1954.5



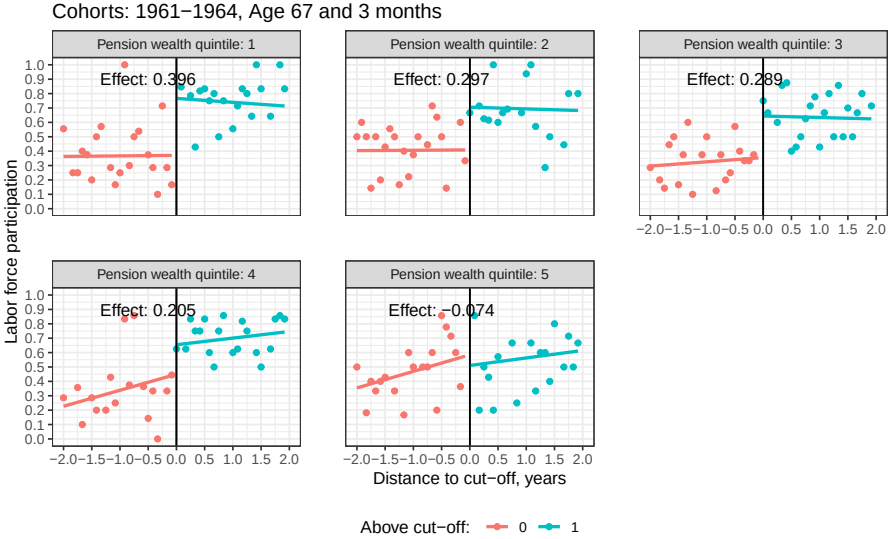
Admin data RDD, cohorts 1954.0/1954.5, pension wealth



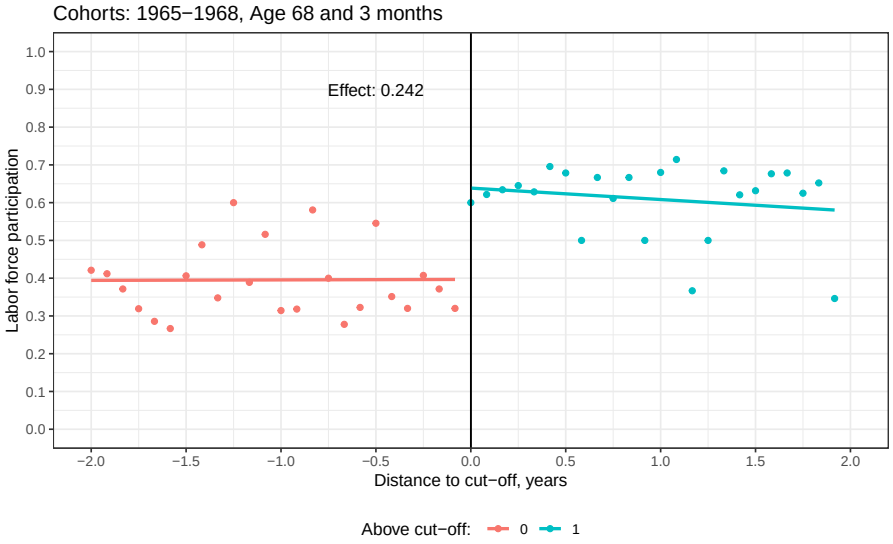
Survey data RDD, cohorts 1961-1964



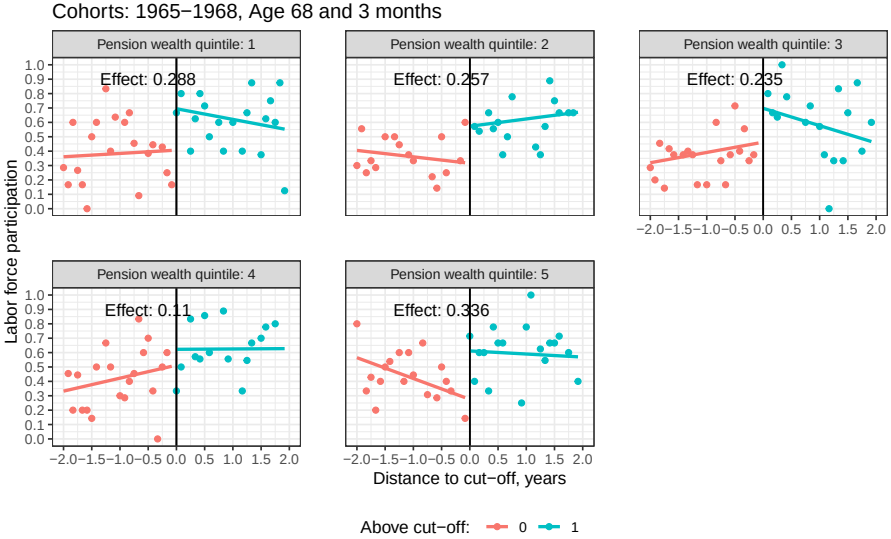
Survey data RDD, cohorts 1961-1964, pension wealth



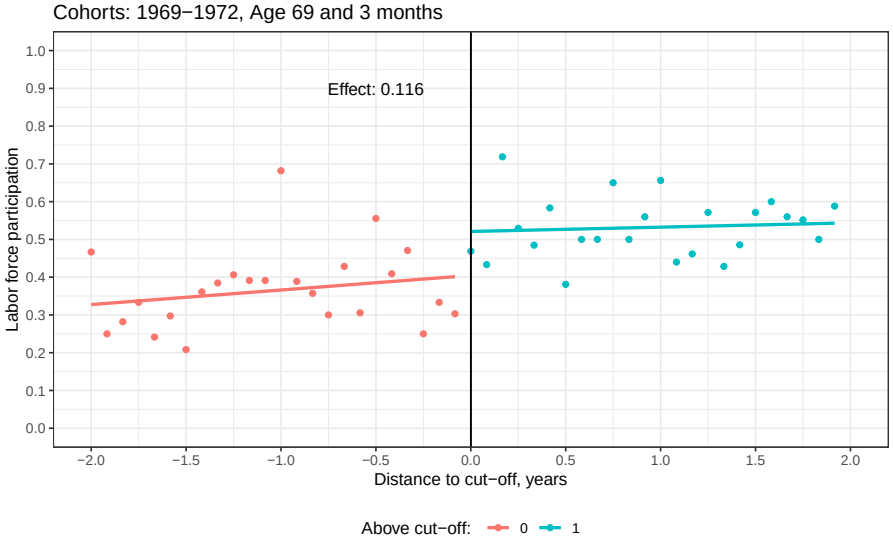
Survey data RDD, cohorts 1965-1968



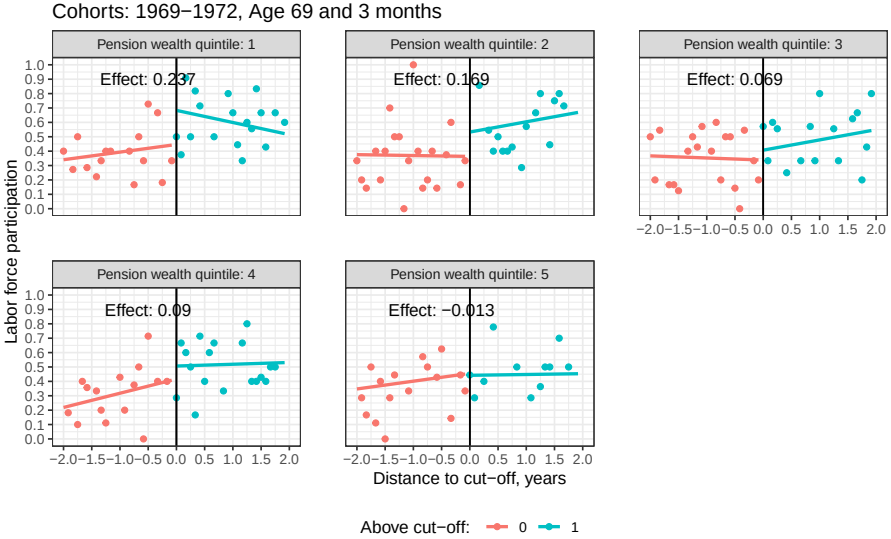
Survey data RDD, cohorts 1965-1968, pension wealth



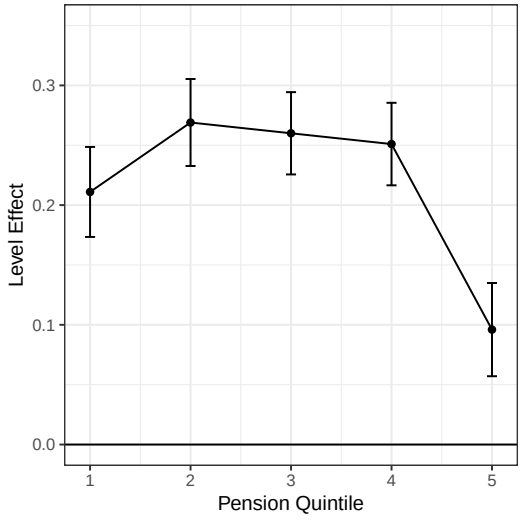
Survey data RDD, cohorts 1969-1972



Survey data RDD, cohorts 1969-1972, pension wealth



Admin data, non-employment



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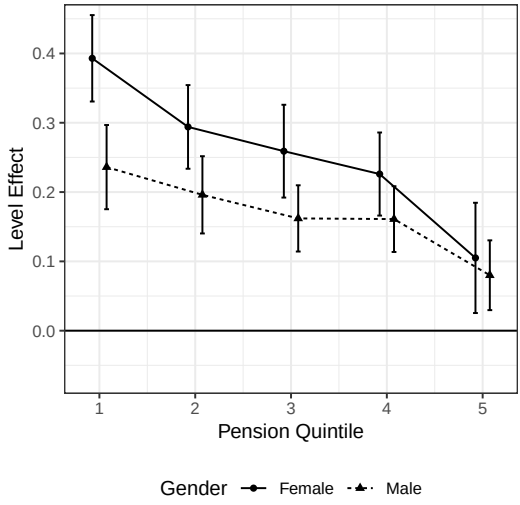
Admin data, by gender



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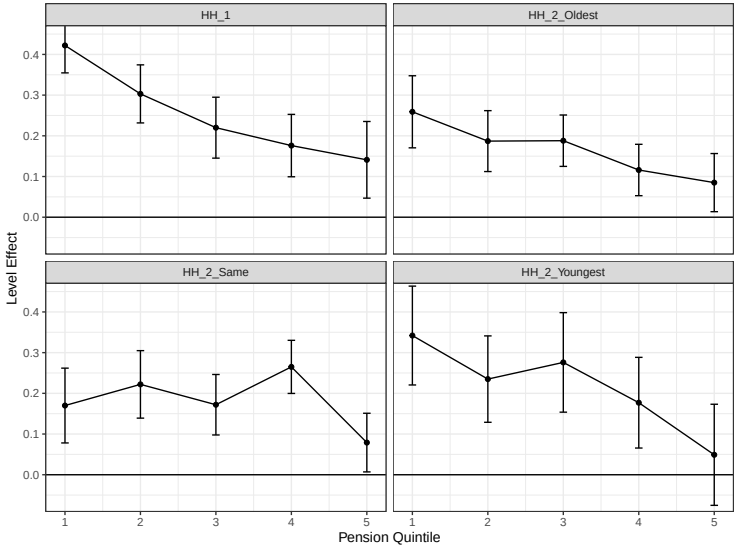
Admin data, by household type



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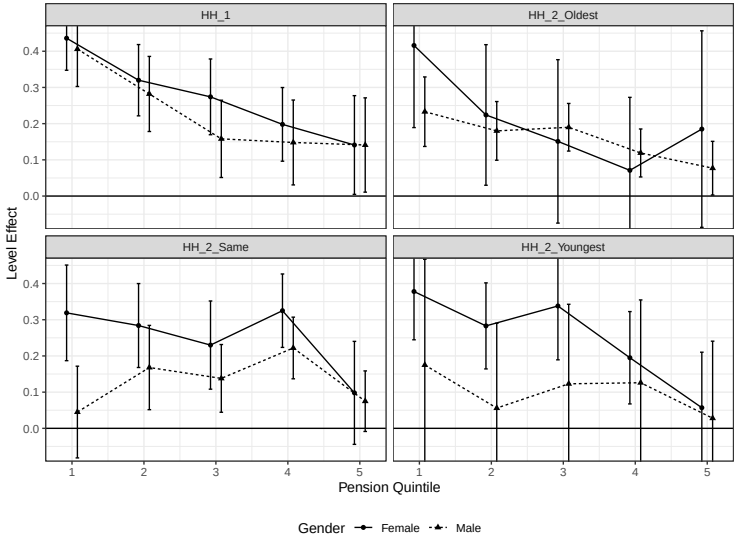
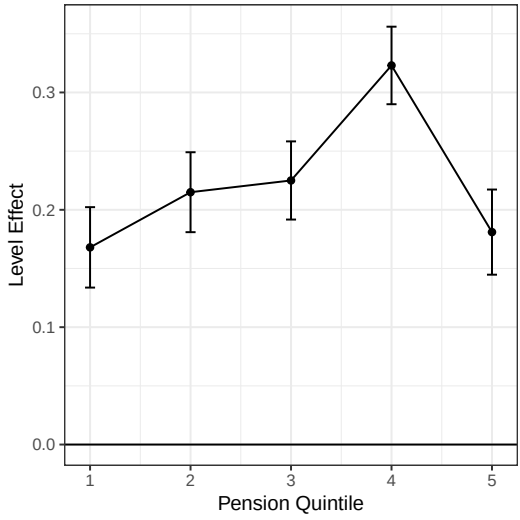
Admin data, by household type and gender



Admin data, stratified by liquid wealth



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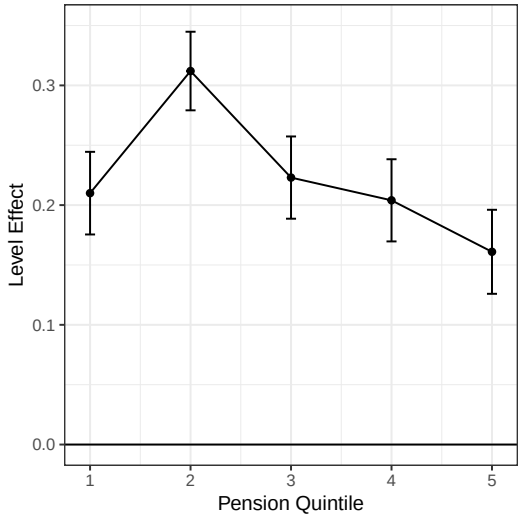
Admin data, stratified by total wealth



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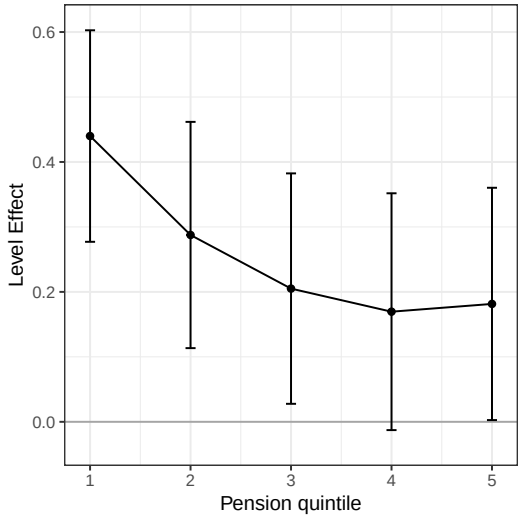
Survey data, smaller bandwidth



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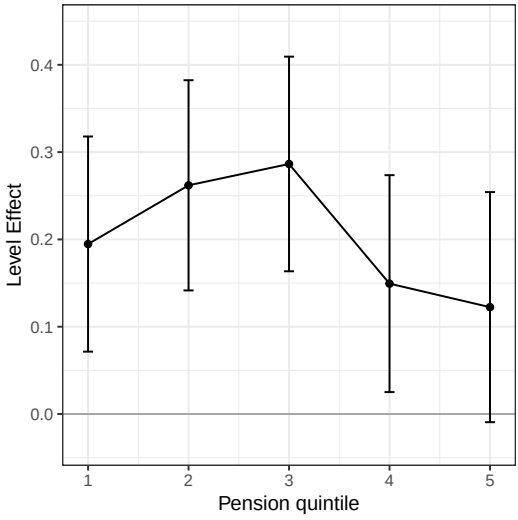
Survey data, stratified by current pension wealth



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Welfare calculations, elasticities

Elasticity of odds ratio is related to Frisch labor supply elasticity (following Laun (2017)):

$$\varepsilon_{\frac{S(\tilde{r})}{1-S(\tilde{r})},w_{\tilde{r}}} = \varepsilon_{S(\tilde{r}),w_{\tilde{r}}}\left[1 + \frac{S(\tilde{r})}{1-S(\tilde{r})}\right]$$

I regress log(1-participation tax rate) on employment to get at the labor supply elasticity for analysis sample:

$$P_{i,t} = \varepsilon_{S(\tilde{r}),w_{\tilde{r}}} \log(1-\tau^A_{i,t}) + \delta_t + \mu_a + \varepsilon_{i,t}$$

$$\tau^A_{i,t} = 1 - \frac{d_{i,t} - d_{0i,t}}{w_{i,t}}$$

(instrument $\log(1-\tau^A_{i,t})$ *using a dummy = 1 post cutoff, control, = 0 otherwise)*

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Hedonic regressions

Cohorts 1948-53, split into employed and retired.

Regressions to predict income above/below cutoff for analysis cohorts.

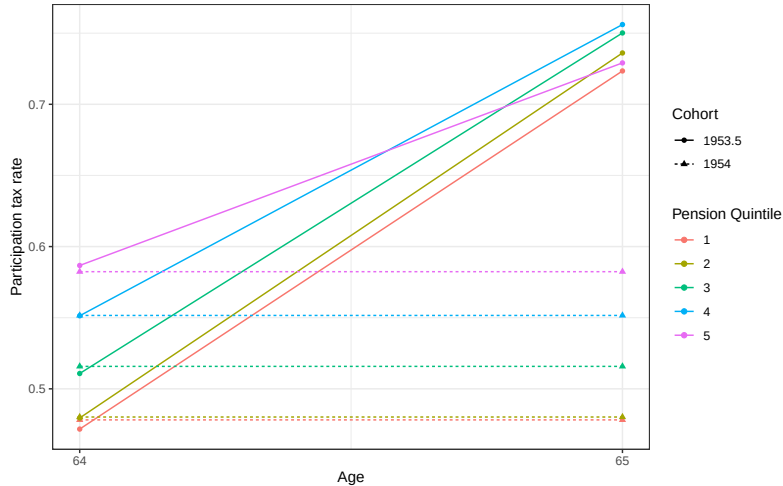
- employed gross earnings, $\tilde{w}$
- employed disposable income, $\tilde{d}$
- retired disposable income, control, $\tilde{d_0^C}$
- retired disposable income, treatment $\tilde{d_0^T}$

Observables:

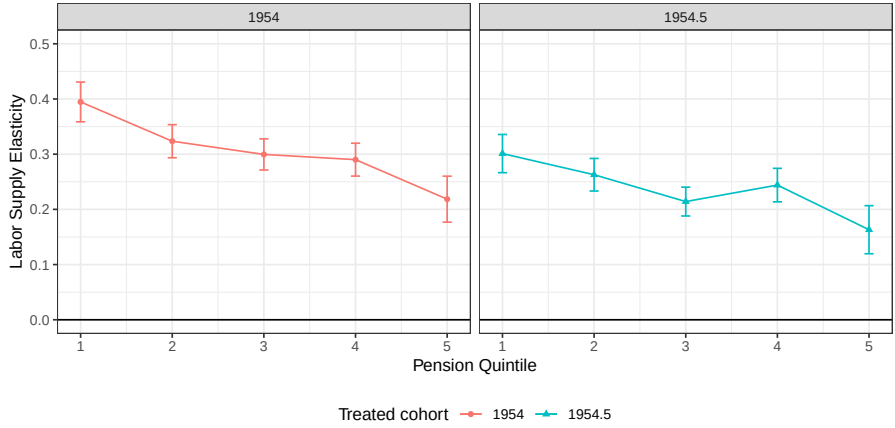
- avg earnings age 60-63
- gender
- education across five tiers
- four-digit occupation codes
- three-digit industry classifications
- pension wealth
- other forms of wealth

Average tax rates, $\frac{T}{w}$

Tax rate goes up for control group above cut-off.



Elasticity, $\varepsilon_{S(\tilde{r}),w_{\tilde{r}}}$



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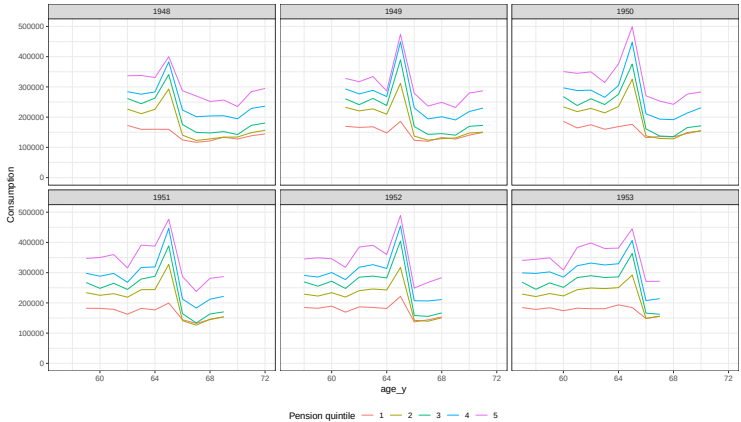
Consumption Around Retirement

$$C_i \approx (Y_{it} - \tau_{it}) - (A_{it} - A_{it-1})$$

Cohorts 1948-53 who retire no later than age 70, measured 1-3 years prior and post



Consumption Around Retirement

Use consumption in retirement to approximate difference in social marginal utility.

$$SMU_{r,t} = \mathbb{E}\left[\omega_i \frac{\partial u(c_{r,t}, \zeta_{r,t})}{\partial c} \middle| r_i = r\right]$$

$$\frac{\partial u(c_{r,t}, \zeta_{r,t})}{\partial c} \approx \frac{\partial u(c_{r,pre}, \zeta_{r,t})}{\partial c}\left[1 + \frac{-\frac{\partial^2 u(c_{r,pre}, \zeta_{r,t})}{\partial c^2} c_{r,pre}}{\frac{\partial u(c_{r,pre}, \zeta_{r,t})}{\partial c}} \frac{c_{r,pre} - c_{r,t}}{c_{r,pre}}\right]$$

$$\frac{SMU_{r,t}}{SMU_{r',t}} = \frac{\mathbb{E}\left[\omega_i \frac{\partial u(c_{r,t}, \zeta_{r,t})}{\partial c} \middle| r_i = r\right]}{\mathbb{E}\left[\omega_i \frac{\partial u(c_{r',t}, \zeta_{r',t})}{\partial c} \middle| r_i = r'\right]} \approx \frac{\omega_r \frac{\partial u(c_{r,pre}, \zeta_{r,t})}{\partial c}\left[1 + \gamma(c_{r,pre}, \zeta_{r,t}) \frac{c_{r,pre} - c_{r,t}}{c_{r,pre}}\right]}{\omega_{r'} \frac{\partial u(c_{r',pre}, \zeta_{r',t})}{\partial c}\left[1 + \gamma(c_{r',pre}, \zeta_{r',t}) \frac{c_{r',pre} - c_{r',t}}{c_{r',pre}}\right]}$$

$$\frac{SMU_{65^-} - SMU_{66^+}}{SMU_{65}} \approx \frac{\gamma\left[\Delta c^{65^-} - \Delta c^{66^+}\right]}{1 + \gamma \Delta c^{65}}$$

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Underlying Model

Individual i, age t, state $\pi_{i,t}$, consumption $c_{\pi_{i,t}}$, other choices/characteristics $\zeta_{\pi_{i,t}}$

$$U_i(c,\zeta,\pi) = \sum_{t=0}^{T} \beta^t \int u(c(\pi_{i,t}),\zeta(\pi_{i,t}))\, dF(\pi_{i,t})$$

$$a_{i,t+1}(\pi_{i,t}) = R(\pi_{i,t})\left[a_{i,t}(\pi_{i,t-1}) + y(\pi_{i,t}) - c(\pi_{i,t})\right]$$

$$y(\pi_{i,t}) = \begin{cases} w(\pi_{i,t}) - \tau(\pi_{i,t}) & , \text{ if } s(\pi_{i,t}) = 1 \\ b(\pi_{i,t}) & , \text{ if } s(\pi_{i,t}) = 0 \end{cases}$$

Government:

$$W(b,\tau) = \int_i \omega_i \mathcal{U}_i(b,\tau) + \lambda GBC(b,\tau)\, di$$

$$GBC(b,\tau) = \sum_r \left[S(r)\frac{\tau_r}{R^r} + \left[S(r-1) - S(r)\right] NPV_r \right] - G_0$$

$$\mathbb{E}\left[\omega_i \frac{\partial u(c_{r,t},\zeta_{r,t})}{\partial c} \middle| r_i = r\right] = \lambda\left[1 + \sum_{r'}\left[\left[\tau_{r'} - (NPV_{r'+1} - NPV_{r'})\right]\frac{\partial(1-S(r'))}{\partial b_{r,t}}\frac{1}{S(r)}\right]\right]$$

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