Early retirement disincentives: Effectiveness and implications for distribution and welfare

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Motivation

- Pension systems are under financial pressure
- Germany: Reforms due to population aging, reunification and high unemployment
  1. Eligibility age elevated
  2. Replacement rates lowered
  3. Subsidies for private old-age provisions
  4. Introduction of disincentives for early retirement (our focus)
- Little evidence for effectiveness and (individual) welfare implications
- Reform evaluation serves as a blueprint for further reforms in Germany (e.g. baby boomers) or as example for other countries

Summary

- Research questions:
  1. Can disincentives steer retirement behavior?
  2. What are the distributional, individual welfare, and fiscal implications?
- Data: Administrative pension data for cohorts 1935-1945
- Conceptual framework:
  1. Estimation of a structural dynamic retirement model (DPDC)
  2. Use estimation outcomes to simulate different scenarios/reforms
  3. Compute differences in aggregate outcomes

Literature Overview

1. Pension reform effects on labor markets:
   - Mastrobuoni (2009); Hanel (2010); Staubli und Zweimüller(2013); Haan und Prowse (2014); Laun und Wallenius (201X); Ataly and Barret (2014)
2. Incentives in pension systems:
   - Blundell, Meghir, und Smith (2002); Börsch-Supan (2002); Hirte (2002); Schnabel (1999); Siddiqui (1997)
3. Incentives in dynamic retirement models:
   - Stock and Wise (1990), Rust and Phelan (1997); French and Jones (2011)

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The German statutory pension scheme (until 2011) and sample selection

(1) Pay-as-you-go system of Bismarckian variety: Strong link between pension level and prior contributions

(2) Mandatory for the vast majority of employees

(3) Scheme offers various retirement possibilities depending on the retiree's situation (unemployment, disability, invalidity, women)

(4) **Here:** Focus on regular old-age pension (age 65) and pension for long-term insured (age 63 and 35 years in the pension system)

$\Rightarrow$ Individuals are able to retire at 63

Data: Insurance account samples 2002 to 2012 (VSKT, process generated administrative data).

Precise monthly information from age 14 to 67: earnings, (un-)employment, retirement entry, sickness, pension points ...

Sample:

(1) Mandatorily insured West German men born between 1935 and 1945

(2) Employed before retirement and eligible for retirement at age 63 (not disabled/unemployed)

(3) Number of obs.: Between 43 and 144 per cohort (946 in total)

Once fully implemented, the reform introduced deductions of 0.3% per month retiring before age 65.

Deductions are phased-in gradually:

Date of birth	Retirement age without deduction	Distance to 65 without deductions (in month)	Maximal deduction
Before 1937	63	24	0%
Januar 1937	63 + 1 month	23	0.3%
June 1937	63 + 6 month	18	1.8%
Januar 1938	64 + 1 month	11	3.9%
June 1938	64 + 6 month	5	5.7%
After 1938	65	0	7.2%

Descriptives of key determinants (sample averages)

Cohort	Retirement Age	Monthly Pension*	Earnings Points [63]	Pension value [65]*	Penalty in %
1935	63.55	1680.97	57.73	28.91	0.00
1936	63.67	1660.76	55.98	28.71	0.00
1937	63.61	1636.40	55.72	29.18	1.06
1938	63.75	1565.26	54.42	29.03	3.70
1939	63.89	1607.84	56.33	28.70	4.28
1940	64.03	1558.46	54.84	28.27	3.77
1941	64.06	1564.30	55.85	27.83	3.69
1942	64.34	1555.65	55.18	27.28	2.67
1943	64.37	1558.10	54.43	26.81	2.56
1944	64.32	1538.50	53.96	27.18	2.73
1945	64.27	1532.81	54.71	27.20	2.91

** 2010 real values.*

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Main features

(1) Dynamic retirement model of mandatorily insured employees in Germany

(2) Individuals are forward-looking and make retirement choices by optimizing leisure-consumption trade-off

(3) Detailed modeling of the German tax code, the social security contributions and the pension system

(4) Focus on individuals retiring through regular old age pension scheme (no pensions due to disability/unemployment)

Expected lifetime utility

$$E\left\{\sum_{j=0}^{T-t} p_{t+j,b}\beta^j U(\mathbf{s}_{nt+j}, d_{nt+j})\right\}$$

- Monthly choices, individuals die no later than period $T = 100$
- $p_{t+j,b}$: individual conditional survival probability of cohort b
- β^j: subjective time discount factor
- $\mathbf{s}_{nt}$: vector of state variables (age, birth cohort, accumulated pension points, wage, previous period's choice)
- d_{nt}: individual's retirement choice

Utility function

$$
\begin{aligned}
U(\mathbf{s}_{nt}, d_{nt}) =& \alpha_1 \frac{c(\mathbf{s}_{nt}, d_{nt})^{(1-\rho)} - 1}{(1-\rho)} + \alpha_{2n} retirement(d_{nt}) + \epsilon_{nt}(d_{nt}) \\
\alpha_{2n} =& \alpha_{21n} + \alpha_{22} ret63_1(d_{nt}) + \alpha_{23} ret65_1(d_{nt})
\end{aligned}
$$

- $c(\mathbf{s}_{nt}, d_{nt})$: consumption
- ρ: coefficient of risk aversion
- $ret63_1(d_{nt})$ and $ret65_1(d_{nt})$ capture preference for first and last possible months of retirement
- $\epsilon_{nt}(d_{nt})$ follows a type 1 extreme value distribution

Value function

$$V_t(\mathbf{s}_{nt}) = \max_{d_{nt} \in D(\mathbf{s}_{nt})} \left\{ U(\mathbf{s}_{nt}, d_{nt}) + p_{t+1}\beta \int_{\epsilon} \left[\sum_{\mathbf{s}_{nt+1}} V_{t+1}(\mathbf{s}_{nt+1}) q(\mathbf{s}_{nt+1} | \mathbf{s}_{nt}, d_{nt}) \right] g(\epsilon_{nt+1}) \right\}$$

- $D(\mathbf{s}_{nt})$ is the choice set (no more choices after retirement)
- $q(\mathbf{s}_{nt+1} | \mathbf{s}_{nt}, d_{nt})$ is a Markov transition function
- $g(\epsilon_{nt})$ is the bivariate density function of random component

Wages, pension claims and budget

- Unobserved/Counterfactual wages: imputed by last observed wage in the respective month [allowing for cyclical variations]
- Working individuals accumulate pension claims proportional to real wages
- Budget constraint:

$$c(\mathbf{s}_{nt}, d_{nt}) = G\left(\mathbf{s}_{nt}, d_{nt}\right) - savings\left(\mathbf{s}_{nt}, d_{nt}\right)$$
$$wealth(\mathbf{s}_{nt+1}) = \left(wealth(\mathbf{s}_{nt}) + savings\left(\mathbf{s}_{nt}, d_{nt}\right)\right)(1 + r)$$

Note: In the current version, $savings = wealth = 0$

Unobserved heterogeneity

- Unobserved heterogeneity is modeled semi-nonparametrically by allowing for a finite number of unobserved types $m \in 1, ..., M$
- Probability that individual n is of type m is given by γ_m, where γ_M is normalized to zero and $\sum_{m=1}^{M} \gamma_m = 1$
- Individual-specific parameter α_{21n} is assumed to be equal to the respective type-specific parameter α_{21m}

Solving the model

Expected value function:

$$v_t(\mathbf{s}_{nt}, d_{nt}) = u(\mathbf{s}_{nt}, d_{nt}) + p_{t+1}\beta \sum_{\mathbf{s}_{nt+1}} \log \left\{ \sum_{d_{nt+1} \in D(\mathbf{s}_{nt+1})} exp(v_{t+1}(\mathbf{s}_{nt+1}, d_{nt+1})) \right\} q(\mathbf{s}_{nt+1} | \mathbf{s}_{nt}, d_{nt})$$

Choice probabilities:

$$Prob(d_{nt} | \mathbf{s}_{nt}) = \frac{exp(v_t(\mathbf{s}_{nt}, d_{nt}))}{\sum_{j \in D(\mathbf{s}_{nt})} exp(v_t(\mathbf{s}_{nt}, j))}$$

Log-likelihood:

$$\sum_{n=1}^{N} \log \left\{ \sum_{m=1}^{M} \gamma_m \prod_{t=1}^{T} \left[\sum_{d_{nt}} Prob_m(d_{nt} | \mathbf{s}_{nt}, \theta) \times I(d_{nt}) \right] \right\}$$

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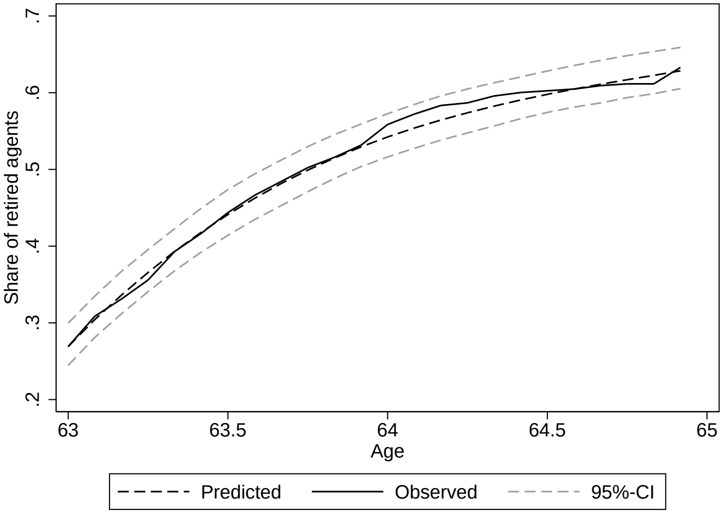
	Estimates	Standard errors
Utility function:		
α_1 (consumption)	0.384	(0.0760)
ρ (crra)	1.662	(0.1685)
α_{211} (leisure, type 1)	-0.758	(0.2823)
α_{212} (leisure, type 2)	0.279	(0.0312)
α_{22} (leisure $\times$ $ret63_1$)	1.898	(0.1172)
α_{23} (leisure $\times$ $ret65_1$)	3.954	(0.0146)
γ_1 (prob. of type 1)	0.144	(0.0338)
Log-likelihood:	-1,851.4	

Model fit


Share of retired agents
.2
.3
.4
.5
.6
.7
63
63.5
64
64.5
65
Age
Predicted
Observed
95%-CI

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Reform evaluation

(1) Effects relative to a scenario without disincentives

(2) Expected consumption: NPV of expected remaining lifetime consumption at age 63

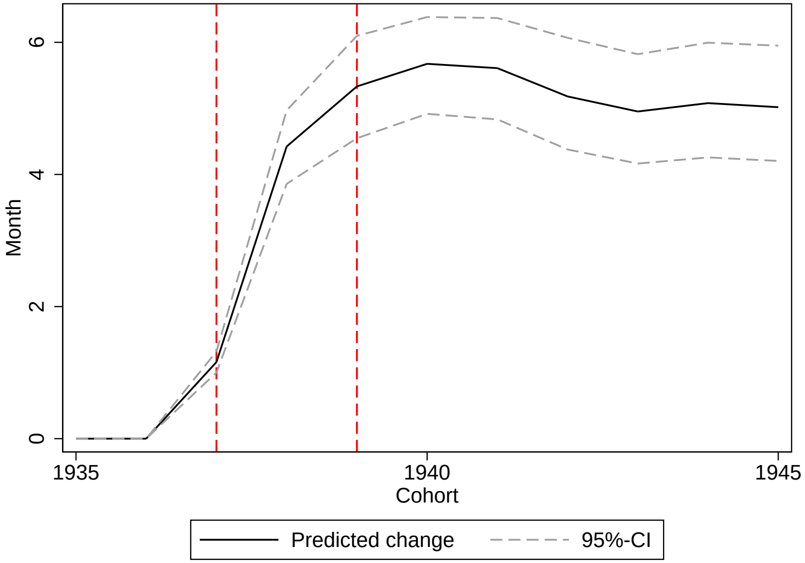
(3) Compensating and equivalent variations refer to NPVs at age 63 (annuitized over the remaining lifetime)

(4) Confidence intervals based on parametric bootstrapping (200 draws)

Average reform effects for birth cohorts 39-45 (E[·] at age 63)

	Reform effects	CI (95%)
ΔE[retirement age] (months)	5.24	[4.46,6.09]
ΔE[NPV of consumption]	€-839	[€-2331,€416]
ΔE[NPV of consumption] (%)	-0.37%	[-0.88%,0.02%]
ΔGini coefficient (%)	3.28%	[1.75%,4.87%]
ΔMonthly retirement income	€-32.8	[€-37.7,€-28.1]
Average compensating variation	€6823	[€6089,€7623]
NPV of net public returns	€25,017	[€22,764,€27,146]
ΔE[NPV of pension benefits]	€13,677	[€12,932,€14,391]
ΔE[NPV of pension contributions]	€4075	[€3441,€7623]
ΔE[NPV of other contr. & taxes]	€7264	[€6178,€8147]

Effects of reform on expected retirement age by birth cohort



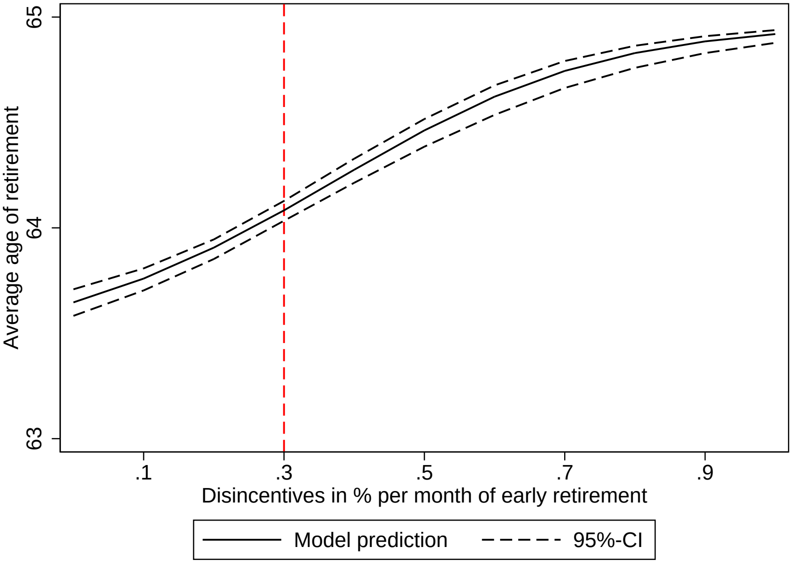
Counterfactual scenarios

What are the effects of higher or lower disincentives?

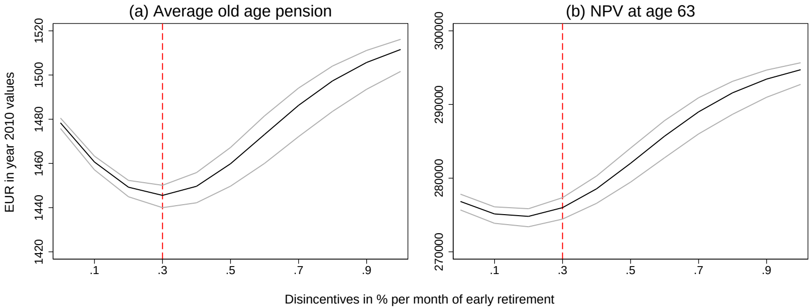
(1) Compute counterfactual scenarios with disincentives ranging between 0.1% and 1% per month for all cohorts

(2) Calculate outcome measures for each scenario

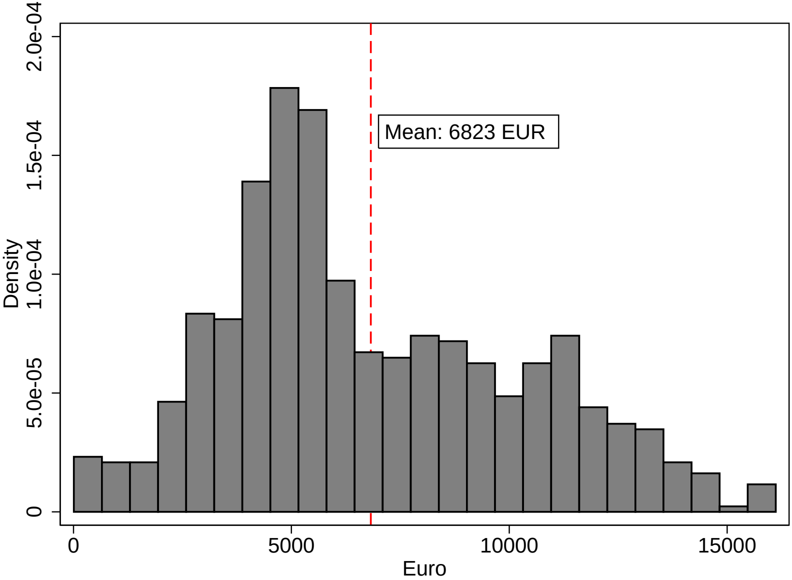
Expected retirement age by disincentive level



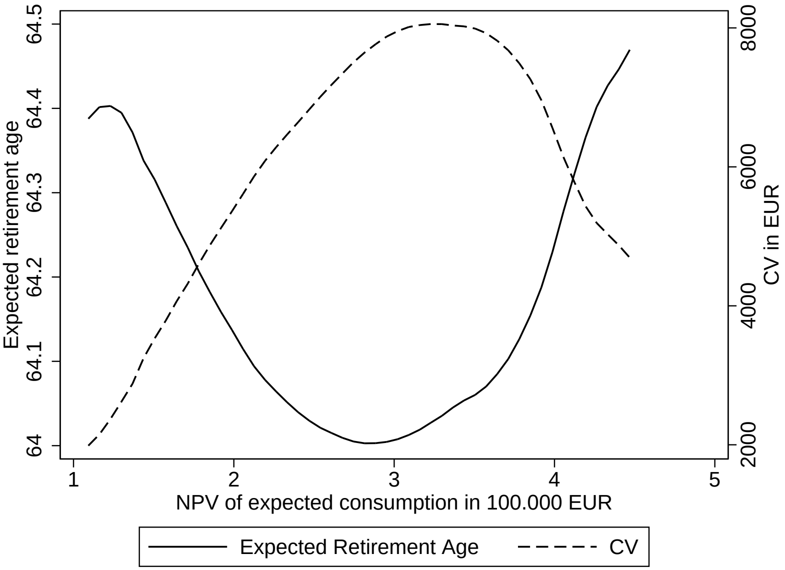
NPVs by disincentive level



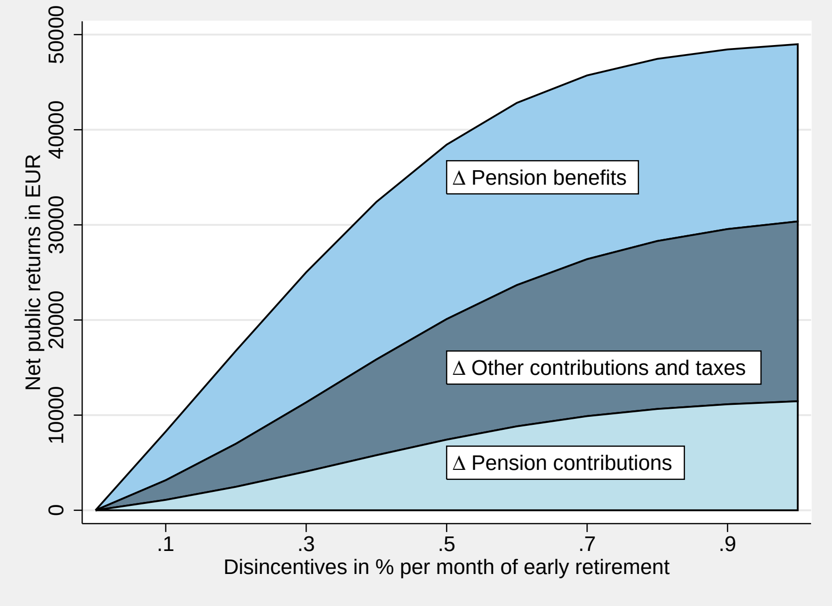
Distribution of compensating variations



Predicted CVs and E(retirement age) by NPVs



Net public returns of retirement disincentives



Conclusion

(1) Disincentives in general able to steer individuals' retirement behavior

(2) 0.3% penalty increased retirement age by 5.24 months

(3) Costs: lower retirement income (€-32.8), increase in inequality and non-negligible welfare losses especially for medium income earners

(4) Private-pension subsidies: only partial compensation, difficulties due to heterogeneity

(5) Average net public returns of €25,017 (about 10% of average expected net pension benefits) $\Rightarrow$ pension system's financial stability can be increased substantially