

Labor supply and the pension system – Evidence from a Regression Kink Design

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Outline

- 1 Motivation
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Motivation I

Background

- Demographic ageing puts pressure on PAYG pension systems
- Germany had a very generous pension system which was considered to be not sustainable
- Several pension reforms improved the financial sustainability of the pension system
- Germany started in 1992 to reduce incentives for early retirement by introducing actuarial deductions (several reforms followed)

Motivation II

Research question and empirical design

- **Research question:** What is the causal effect of the pension reform on the retirement behavior?
- **Empirical design:**
 - Deductions for early retirement were phased in by monthly cohorts (0.3% per month; maximum of 18%). In other words: full-pension retirement age increased by one month per cohort
 - We exploit the change in the policy function as a *Regression Kink Design (RKD)*; i.e. we exploit the discontinuity in the slope of the policy function
- **Preliminary findings:** Significant increase in retirement age of men and women but smaller effects than in previous studies

Previous literature

- All papers that analysed this reform are variants of semi-structural option value models
 - Siddiqui (1997): men postpone 1 year; women 0.6 years; Berkel and Börsch-Supan (2004): men postpone 1.8 years, women 0.7 years; Hanel (2010): men postpone 1 year, women 2.2 years
- Related study: Mastrobuoni (2009). He exploits kinks in US pension benefits cuts similar to the 1992 reform in Germany

Pension reform I

Unemployment pensions

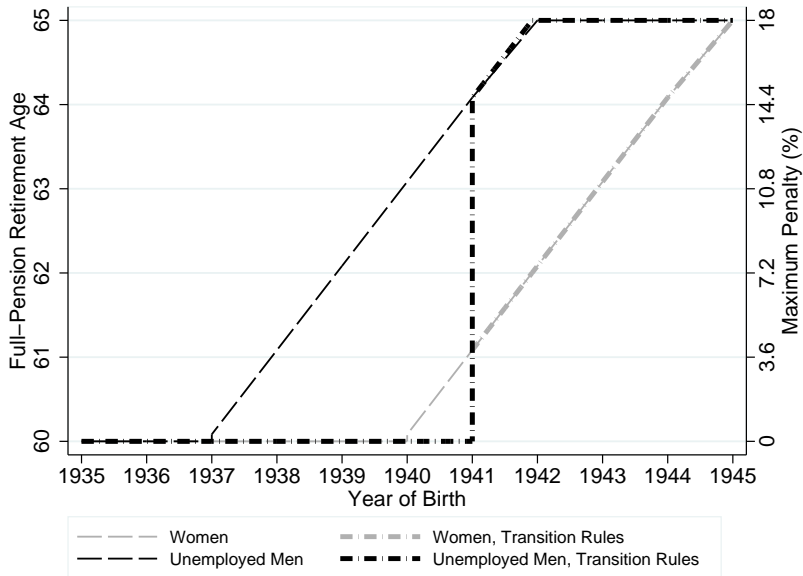
- Earliest retirement age: 60
- Eligibility:
 - After age 58.5 52 weeks unemployed OR at least 24 months old-age part-time
 - Waiting period: 15 years (insurance record)
 - Last 10 years at least 8 years compulsory contributions
- Reform in 1992/1996:
 - Starting with cohort 1937 gradual increase of full-pension retirement age by 0.3% per month (i.e. 3.6% per year)
 - Fully phased in with cohort 1942 (2002)
 - Transition rules for cohorts 1937 – 1941

Pension reform II

Pension for women

- Earliest retirement age: 60
- Eligibility:
 - Waiting period: 15 years (insurance record)
 - After age 40 at least 10 years of compulsory contributions
- Reform in 1992/1997:
 - Starting with cohort 1940 gradual increase of full-pension retirement age by 0.3% per month (i.e. 3.6% per year)
 - Fully phased in with cohort 1945 (2005)
 - Transition rules for cohort 1940

Policy schedule



Data I

Pension insurance records

- Annual 5% sample of all insured individuals (monthly data); waves 2002 through 2012
- Cohorts 1935 to 1945
 - Men: 1935 – 1936 pre-treatment / 1937 – 1941 treatment cohorts
 - Women: 1935 – 1939 pre-treatment / 1940 – 1944 treatment cohorts
- Use different data sources to control for cohort-, region-, gender-, and year-specific averages (mainly SOEP)

Data II

Pension Eligibility Criteria

- Data do not allow unambiguous identification of eligibility for early retirement plans; we distinguish “soft” and “strict” eligibility criteria
- Unemployment pensions:
 - Strict: 15 years waiting period, compulsory contributions in 8 of the last 10 years; *have to be unemployed after age 58.5 for one year*
- Women’s pension:
 - Strict: 15 years waiting period, 10 years of compulsory contributions *after the age of 40*

Data III

Number of observations; different Samples

Pension Scheme	Soft Eligibility	Strict Eligibility	Ineligibility	Total
Unemployment	394,488	104,644	24,624	419,112
Women	445,608	371,736	153,576	599,184

Data IV

- Not possible to determine whether an individual benefits from transition rules

	Control	Treatment	Post-Treatment
Unemployment Pensions			
Baseline Specification	1935 – 1940	1941	1942 – 1945
Alternative Specification	1935 – 1936	1941	1942 – 1945
Women Pensions			
Baseline Specification	1935 – 1940	1941 – 1944	none
Alternative Specification	1935 – 1939	1941 – 1944	none

Regression Kink Design

- RKD allows to estimate causal effects if the policy variable has kinks/discontinuities in the first derivative
- Similar to RD: associate a jump in the outcome with a jump in treatment; Here: kink in the outcome associated with a kink in the treatment
- RKD relies on a regressor that is a deterministic function of a behaviorally endogenous variable
- Retirement benefit deductions are determined by retirement age and cohort
- Similar to RD: a function that depends on cohort defines the maximum deductions, it is continuous except at two points
- Cohorts are assigned to either side of the kink as good as randomly; these cohorts should be very similar

The policy function must be known and have a kink at $X = c$. The policy of interest can be defined in terms of maximum penalties or in terms of full-pension retirement age.

$$B_i^{pen} = \begin{cases} 0 & \text{if } X_i \leq c \\ 0.036 (NRA(x_i) - 60) & \text{if } X_i > c. \end{cases} \quad (1)$$

Alternatively expressed:

$$b^{pen}(x) = \max(0.036(x - c), 0) \quad (2)$$

For the slope of the policy function, the following holds:

$$\lim_{x \uparrow c} \frac{\partial b^{pen}(x)}{\partial x} = 0 \neq 0.036 = \lim_{x \downarrow c} \frac{\partial b^{pen}(x)}{\partial x} \quad (3)$$

Regression Kink Design

$$Y = \tau B + g(X) + U \quad (4)$$

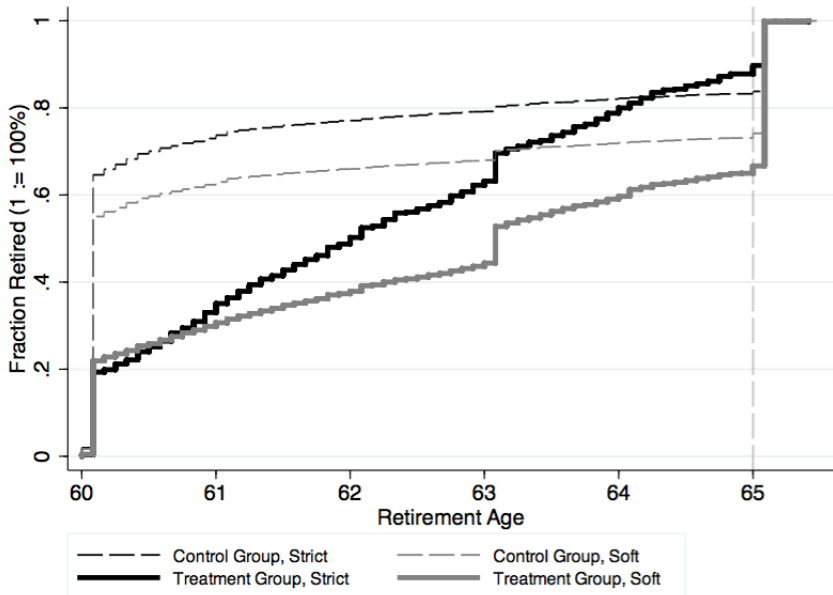
- Under some regularity assumptions, the ATT can be estimated:

$$\tau_{RK} = \frac{\lim_{x \downarrow c} \frac{\partial \mathbf{E}(Y_i | X_i = x)}{\partial x} - \lim_{x \uparrow c} \frac{\partial \mathbf{E}(Y_i | X_i = x)}{\partial x}}{\lim_{x \downarrow c} \frac{\partial b(x)}{\partial x} - \lim_{x \uparrow c} \frac{\partial b(x)}{\partial x}} \quad (5)$$

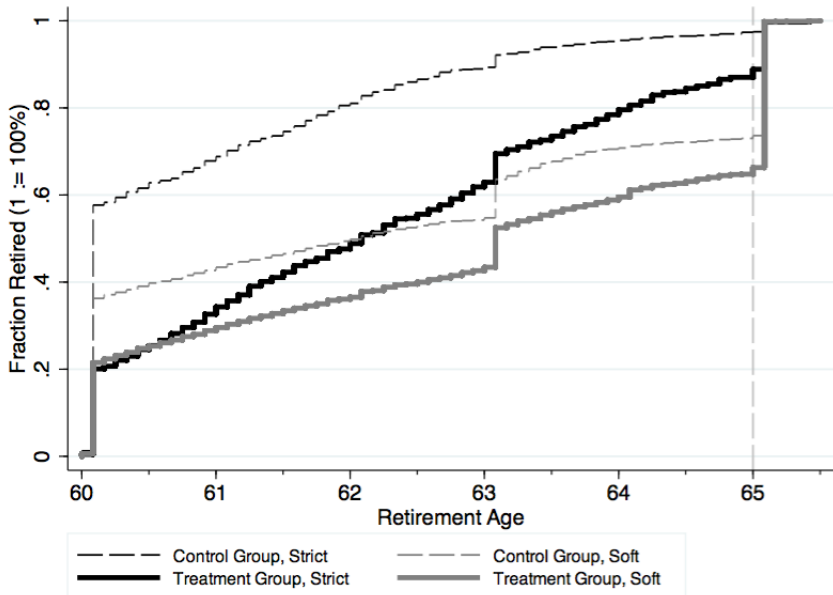
- Local polynomial regression:

$$\mathbb{E}[Y | X = x] = \mu_0 + \left[\sum_{p=1}^{\bar{p}} \gamma_p (x - c)^p + \beta_p (x - c)^p \cdot T^* \right], \quad (6)$$

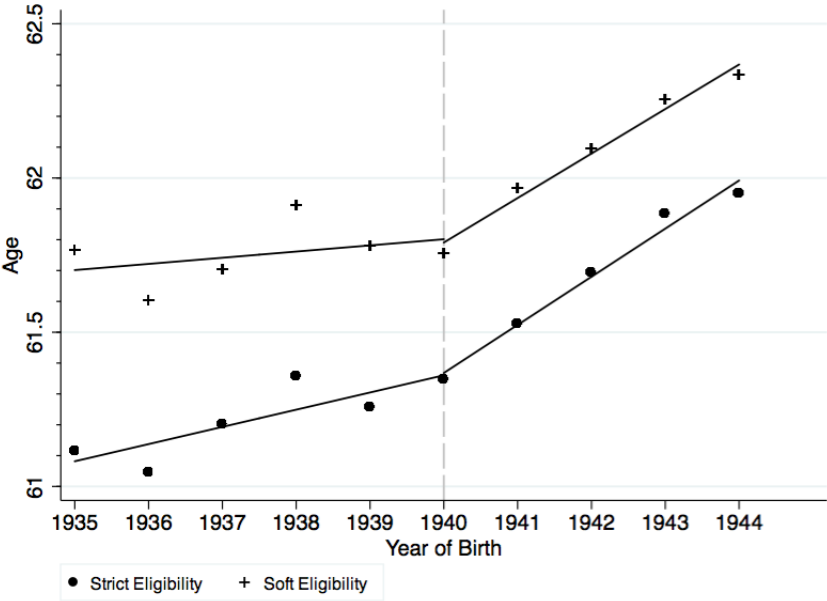
CDF of retirement age, women by cohort



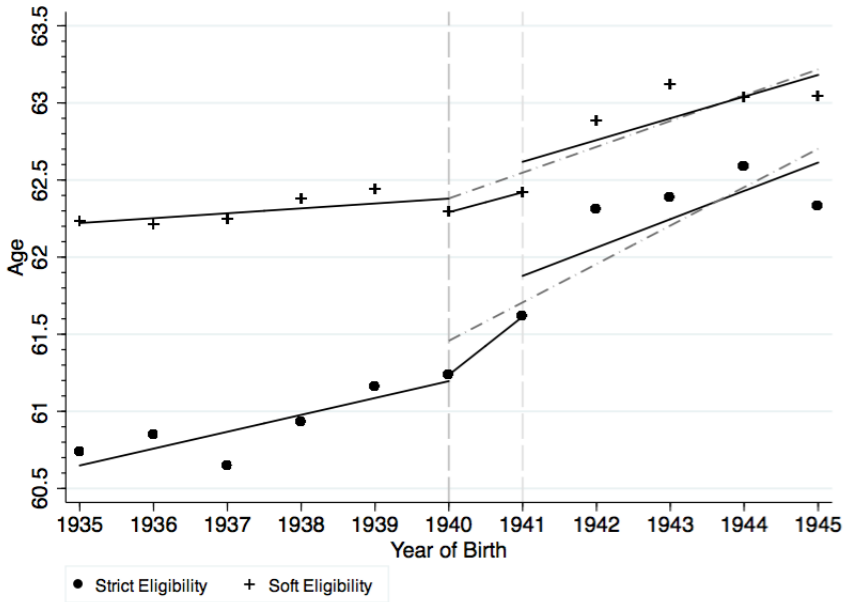
CDF of retirement age, men by cohort



Average retirement age, women by cohort



Average retirement age, men by cohort



Estimation Results

	Raw		Sophisticated	
	Strict	Soft	Strict	Soft
	Women			
Baseline	0.0976** (0.0423)	0.114*** (0.0428)	0.0841* (0.0442)	0.118*** (0.0444)
Alternative	0.0810* (0.0459)	0.0863* (0.0465)	0.0603 (0.0478)	0.0820* (0.0480)
	Unemployed Men			
Baseline	0.0711 (0.0556)	0.109*** (0.0365)	0.0921 (0.0586)	0.128*** (0.0373)
Alternative	-0.0117 (0.0662)	0.0720* (0.0413)	0.0454 (0.0702)	0.113*** (0.0433)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Example (Baseline, Sophisticated, Strict, Men): Retirement age increases by 0.0841 months per month increase in the full-retirement age with deductions of 0.3% per year; i.e. the fully implemented reform leads to an increase of 5 months.

Conclusion

- RKD estimates show a positive effect of the pension reform 1992 on the retirement age of men and women
- The effect is similar across genders and considerably smaller than previous estimates
- The results for men are “very preliminary”; need better ways to deal with transition rules
- To do:
 - Robustness tests
 - Increase of sample size in order to estimate the reform effect closer at the kink

References I

- Berkel, B. and Börsch-Supan, A., 2004. Pension reform in germany: The impact on retirement decisions. *FinanzArchiv: Public Finance Analysis*, 60(3):393–421.
- Hanel, B., 2010. Financial incentives to postpone retirement and further effects on employment – evidence from a natural experiment. *Labour Economics*, 17(3):474–486.
- Mastrobuoni, G., 2009. Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities. *Journal of Public Economics*, 93(11):1224–1233.
- Siddiqui, S., 1997. The pension incentive to retire: empirical evidence for west germany. *Journal of Population Economics*, 10(4):463–486.

Unemployment insurance

- Until 31.01.2006: after 64 years of employment subject to ssc eligible for 32 months of unemployment insurance; note that this is exactly the period needed to be eligible for unemployment pensions! 8 years...
- Between 01.02.2006 until 31.12.2007: only 18 months
- Since 01.01.2008 24 months

Share of different pension types by year

Year	Women		Men
	Women's pension	Unemp. pension	Unemp. pension
1995	37.2	4.2	36.7
2000	41.6	3.5	36.5
2005	32.8	2.1	28.8
2010	34.1	2.2	17.5

Example: In 2000 36.5% of all men who entered old-age retirement pensions drew unemployment pensions.