The shadow of longevity - does social security reform reduce gains from increasing the retirement age?

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Motivation

Major issues in pension economics:

- increasing old-age dependency ratio
- majority of pension systems fail to assure actuarial fairness
- in most countries people tend to retire as early as legally allowed

Typical reform proposals

- switch to DC systems and strengthen the link between contributions and benefits
- raise the social security contributions
- cut government expenditure or ...
- **increasing minimum eligibility retirement age (MERA)**

Literature review

Two streams of literature:

1. Answering the question about optimal retirement age (Gruber and Wise (2007), Galasso (2008), Heijdra and Romp (2009))
2. Comparing different pensions system reforms: increasing retirement age vs. cut in benefits/privatization of the system/... (Auerbach et al. (1989), Hviding and Marette (1998), Fehr (2000), Boersch-Supan and Ludwig (2010), Vogel et al. (2012))

Fehr (2000)

Macroeconomic effects of retirement age increase may depend on the existing relation between contributions and benefits

Remaining gaps in the literature

- how the macroeconomic effects differ between various pension systems?
- what happens to the welfare of each affected generation and why?

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Does social security reform reduce gains from higher retirement age?

└─ Motivation and insights from literature

Goals and expectations

Goal

Analyse macroeconomic and welfare implications of retirement age increase under DB (defined benefit), NDC (notionally defined contribution), and FDC (**partially** funded defined contribution) systems

Expectations

- under DB: leisure ↓, taxes ↓, welfare?
- under NDC: leisure ↓, pensions ↑, welfare?
- under FDC: leisure ↓, pensions ↑, welfare?

Why a full model? → labor supply adjustments & general equilibrium effects...

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Model structure - consumer I

- is "born" at age $J = 20$ and lives up to $J = 100$
- optimizes lifetime utility derived from leisure and consumption:

$$U_0 = \sum_{j=1}^{J} \delta^{j-1} \pi_{j,t-1+j} u_j(c_{j,t-1+j}, l_{j,t-1+j}) \tag{1}$$

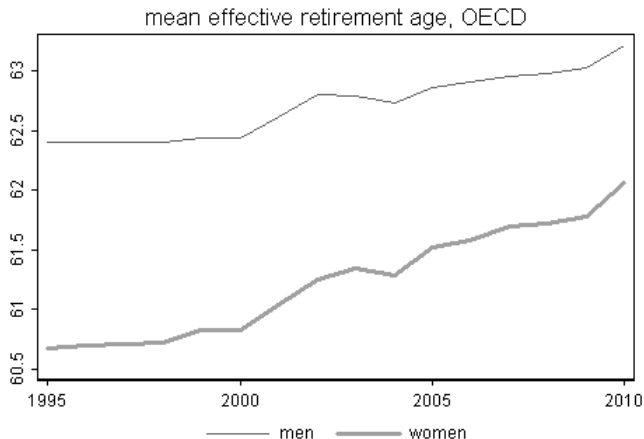$+$ accidental bequests are spreaded equally to all cohorts

$$u(c, l) = \phi \log(c) + (1 - \phi) \log(1 - l), \tag{2}$$

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└─ Model setup

Model structure - consumer II

- is paid a market clearing wage for labour
- receives market clearing interest on private savings
- is free to choose how much to work, but only until retirement age $\bar{J}$ (forced to retire)

Does social security reform reduce gains from higher retirement age?

Model setup

Model structure - consumer III

mean effective retirement age, OECD

Model structure - consumer IV

- is paid a market clearing wage for labour
- receives market clearing interest on private savings
- is free to choose how much to work, but only until retirement age $\bar{J}$ (forced to retire)

The budget constraint of agent j in period t is given by:

$$
\begin{aligned}
(1 + \tau_{c,t})c_{j,t} + s_{j,t} + \Upsilon_t \quad = \quad & (1 - \tau_{l,t})(1 - \tau_{j,t}^{\iota})w_{j,t}l_{j,t} \leftarrow \text{ labor income} \quad (3) \\
+ \quad & (1 + r_t(1 - \tau_{k,t}))s_{j,t-1} \leftarrow \text{ capital income} \\
+ \quad & (1 - \tau_{l,t})p_{j,t} + b_{j,t} \leftarrow \text{ pensions and bequests}
\end{aligned}
$$

Model structure - producer

$$\max_{(Y_t, K_t, L_t)} Y_t - w_t L_t - (r_t^k + d)K_t \qquad (4)$$

$$\text{s.t. } Y_t = K_t^\alpha (z_t L_t)^{1-\alpha}$$

Standard firm optimization implies:

- $w_t = (1 - \alpha) K_t^\alpha (z_t L_t)^{-\alpha}$
- $r_t^k = \alpha K_t^{\alpha-1} (z_t L_t)^{1-\alpha} - d$

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Model structure - government

- collects social security contributions and pays out pensions of DB and NDC system

$$subsidy_t = \tau_t^{\iota} \cdot w_t L_t - \sum_{j=\bar{J}}^{J} p_{j,t} \pi_{j,t} N_{t-j} \qquad (5)$$

- collects taxes on earnings, interest and consumption
- spends GDP fixed amount of money on unproductive (but necessary) activities
- services debt

$$T_t = \tau_{l,t}\left((1-\tau_t^{\iota})w_t L_t + \sum_{j=\bar{J}_t}^{J} p_{j,t}^{\iota}\pi_{j,t} N_{t-j}\right) + \left(\tau_{c,t}c_t + \tau_{k,t}r_t s_{j,t-1}\right)\sum_{j=1}^{J}\pi_{j,t} N_{t-j}.$$
$$(6)$$

$$G_t + subsidy_t^{\iota} + r_t D_{t-1} = T_t + (D_t - D_{t-1}) + \Upsilon_t \sum_{j=1}^{J}\pi_{j,t} N_{t-j}. \qquad (7)$$

- and wants to maintain long run debt/GDP ratio fixed

Pension systems

- Defined Benefit → constructed by imposing a mandatory exogenous contribution rate τ and an exogenous replacement rate ρ

$$p_{j,t}^{DB} = \begin{cases} \rho_t w_{j-1,t-1}, & \text{for } j = \bar{J}_t \\ \kappa_t^{DB} \cdot p_{j-1,t-1}^{DB}, & \text{for } j > \bar{J}_t \end{cases} \qquad (8)$$

- Defined Contribution → constructed by imposing a mandatory exogenous contribution rate τ and actuarially fair individual accounts
  - Notional

$$p_{j,t}^{NDC} = \begin{cases} \dfrac{\sum_{i=1}^{\bar{J}_t-1} \left[\Pi_{s=1}^i (1+r_{t-i+s-1}^I) \right] \tau_{\bar{J}_t-i,t-i}^{NDC} w_{\bar{J}_t-i,t-i} l_{\bar{J}_t-i,t-i}}{\Pi_{s=\bar{J}_t}^J \pi_{s,t}}, & \text{for } j = \bar{J}_t \\ \kappa_t^{DB} \cdot p_{j-1,t-1}^{NDC}, & \text{for } j > \bar{J}_t \end{cases} \qquad (9)$$

  - Funded

$$p_{j,t}^{FDC} = \begin{cases} \dfrac{\sum_{i=1}^{\bar{J}_t-1} \left[\Pi_{s=1}^i (1+r_{t-i+s-1}) \right] \tau_{\bar{J}_t-i,t-i}^{FDC} w_{\bar{J}_t-i,t-i} l_{\bar{J}_t-i,t-i}}{\Pi_{s=\bar{J}_t}^J \pi_{s,t}}, & \text{for } j = \bar{J}_t \\ (1+r_t) p_{j-1,t-1}^{FDC}, & \text{for } j > \bar{J}_t \end{cases} \qquad (10)$$

Does social security reform reduce gains from higher retirement age?

└─ Model setup

What we do

What happens within each experiment?

1. Run the no policy change scenario $\Rightarrow$ baseline
2. Run the policy change scenario $\Rightarrow$ reform
3. For each cohort compare utility, compensate the losers from the winners
4. If net effect positive $\Rightarrow$ reform efficient

Welfare analysis - like Nishiyama & Smetters (2007) Macroeconomci analysis

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Reform of the systems

Three experiments:

1. DB with flat retirement age $\rightarrow$ DB with increasing retirement age
2. NDC with flat retirement age $\rightarrow$ NDC with increasing retirement age
3. FDC with flat retirement age $\rightarrow$ FDC with increasing retirement age

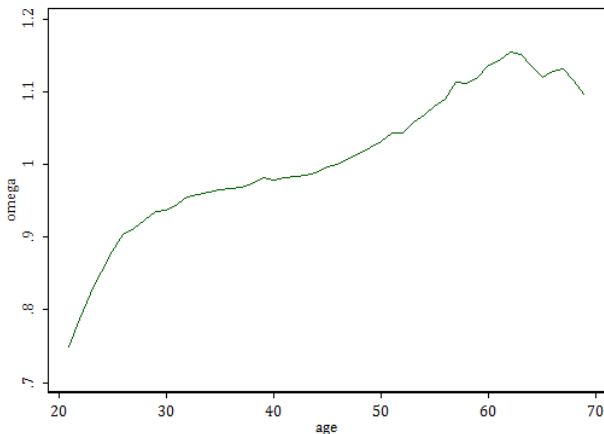What is flat and what is increasing retirement age?

baseline
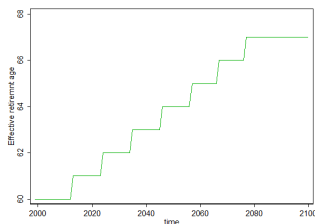
flat

reform

Age-productivity profile - flat or ...?

heterogeneity between cohorts due to age-specific productivity, $w_{j,t} = \omega_j w_t$

Deaton (1997) decomposition

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1 Motivation and insights from literature

2 Model setup

3 Baseline and reform scenarios

4 Calibration

5 Results
- Welfare
- Macroeconomic effects

Calibration to replicate 1999 economy of Poland

- Preference for leisure (ϕ) chosen to match participation rate of 56.8%
- Impatience (δ) chosen to match interest rate of 7.4%
- Replacement rate (ρ) chosen to match benefits/GDP ratio of 5%
- Contributions rate (τ) chosen to match SIF deficit/GDP ratio of 0.8%
- Labor income tax (τ_l) set to 11% to match PIT/GDP ratio
- Consumption tax (τ_l) set to match VAT/GDP ratio
- Capital tax set *de iure = de facto*

Final parameters

Table: Calibrated parameters

|		Age-productivity profile	
		ω - D97	$\omega = 1$
α	capital share	0.31	0.31
τ_l	labor tax	0.11	0.11
ϕ	preference for leisure	0.578	0.526
δ	discounting rate	0.998	0.979
d	depreciation rate	0.045	0.045
τ	total soc. security contr.	0.060	0.060
ρ	replacement rate	0.138	0.227
		resulting	
Δk_t	investment rate	21	21
r	interest rate	7.4	7.4

Exogenous processes in the model I

Demographics

- Demographic projection until 2060, after that 80 years, and after that "new steady state"
- No of births (j=20) - from the projection, constant afterwards
- Mortality rates - from the projection, constant afterwards
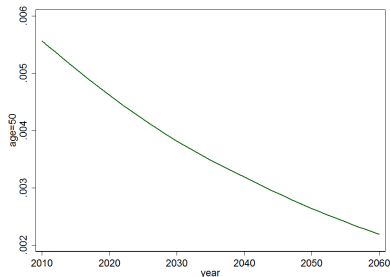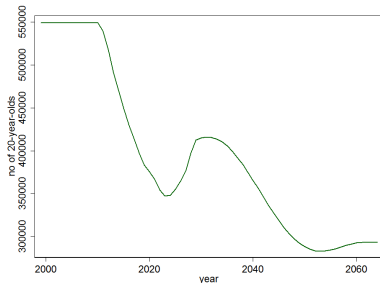
Exogenous processes in the model II

Productivity growth

- Labor augmenting productivity parameter
- Data historically, projection from AWG, after that "new steady state", 1.7%
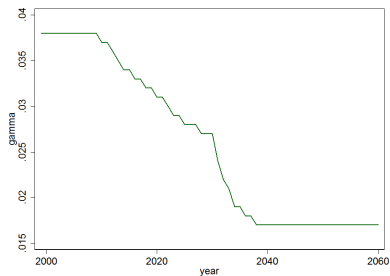
1. Motivation and insights from literature

2. Model setup

3. Baseline and reform scenarios

4. Calibration
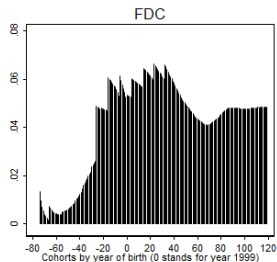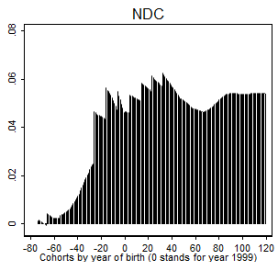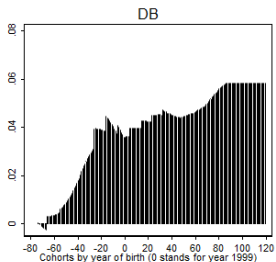
5. Results
   - Welfare
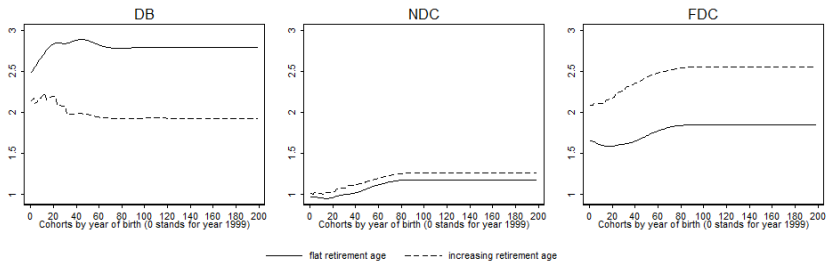   - Macroeconomic effects

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Is the reform efficient?

Yes!

Net consumption equivalent	Deaton	Flat
DB	9.88%	3.70%
Transition to NDC	11.31%	4.41%
Transition to FDC	11.81%	4.70%

Who gains? Everybody!

Does social security reform reduce gains from higher retirement age?

└─ Results

  └─ Welfare

Why they gain? Benefits under DC systems ...

flat retirement age ----- increasing retirement age

... and taxes under DB system ...
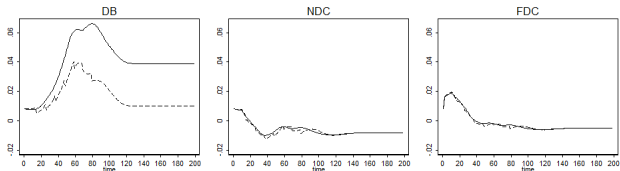
Does social security reform reduce gains from higher retirement age?

└─ Results
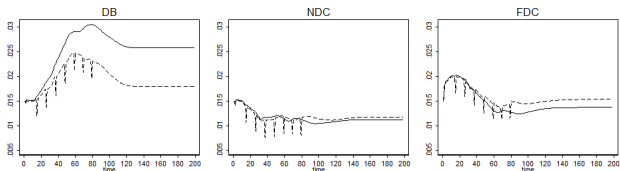
   └─ Welfare

Is there any behavioral response? Of course!

DB   NDC   FDC

age (with j=1 standing for a 20 year old)

——— flat retirement age   - - - - increasing retirement age

Does social security reform reduce gains from higher retirement age?

└─ Results

  └─ Macroeconomic effects
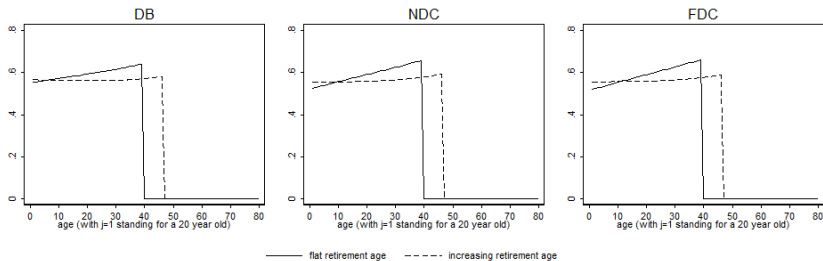
Labor supply in the final steady state

| | Labor supply (no reform) | Labor supply with MERA increase | | | |
| | | $j < 60$ | | $j \geq 60$ | Total |
	Average	Average	Aggregate (baseline=100%)	Average	Aggregate (baseline=100%)
DB	63.2%	59.6%	94.4%	71.8%	113.7%
NDC	62.0%	58.8%	94.8%	72.3%	114.7%
FDC	61.7%	59.0%	95.5%	72.2%	115.4%

Does social security reform reduce gains from higher retirement age?

└─ Results

    └─ Macroeconomic effects

Aggregated labor supply (in mio of individuals)
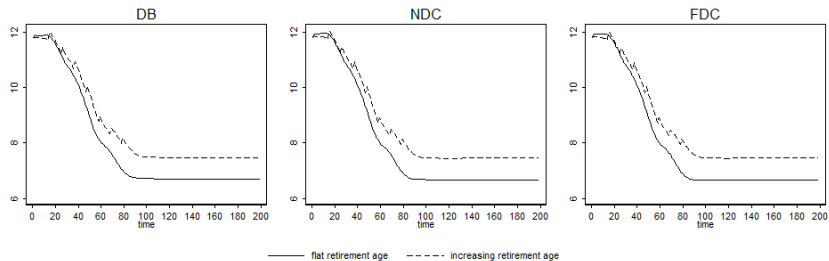
Capital (per effective unit of labor) decreases

flat retirement age   increasing retirement age

Does social security reform reduce gains from higher retirement age?

└─ Results

   └─ Macroeconomic effects
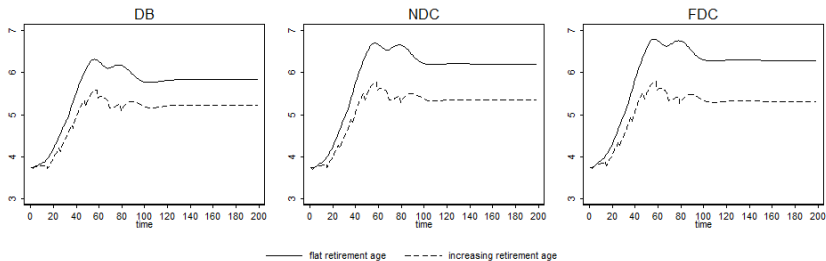
But mostly due to decrease in "precautionary savings"

Does social security reform reduce gains from higher retirement age?

Results

Macroeconomic effects
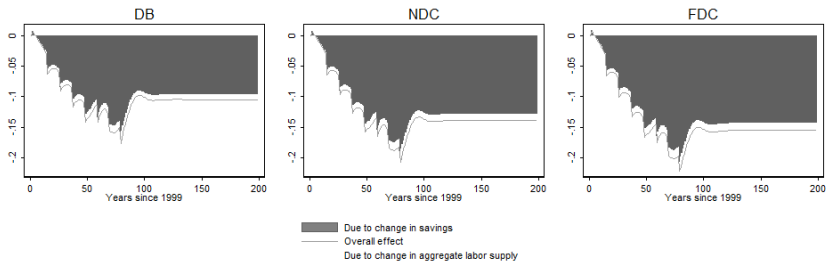
Conclusions

- extending the retirement age is universally welfare enhancing
- some downward adjustment in individual labor supply, but the aggregated supply increases
- effects on capital are ''overstated''

Does social security reform reduce gains from higher retirement age?

Results

Macroeconomic effects

Questions or suggestions?

Thank you!