



MINISTRY OF FINANCE

Statutory Pension Age, (Pensions Wealth) Present and Future Retirement

Modelling Retirement with Preference
Heterogeneity, Microsimulation and Policy Analysis
(work in progress)*

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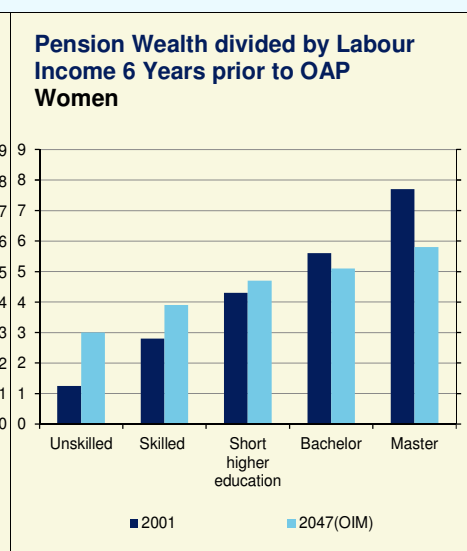
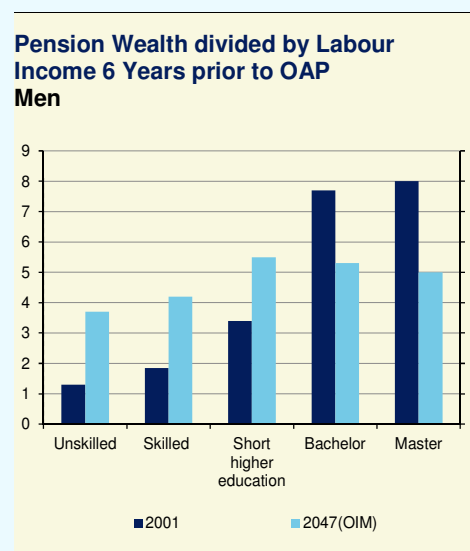
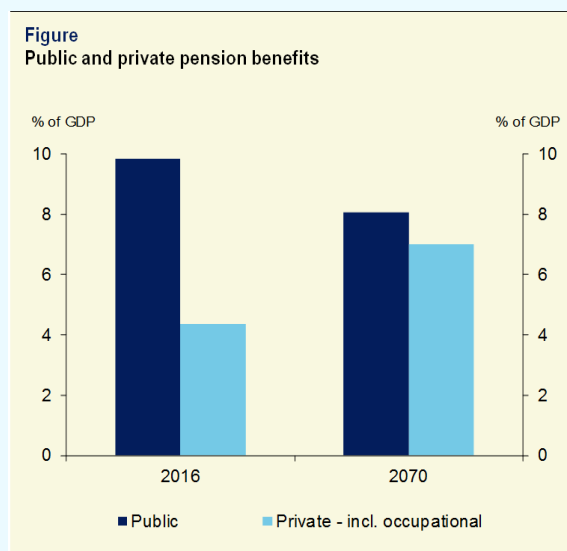
* This presentation presents preliminary results that illustrates the joint work analyzing retirement by the authors. These results do not necessarily represent the collective view of the Ministry of Finance.

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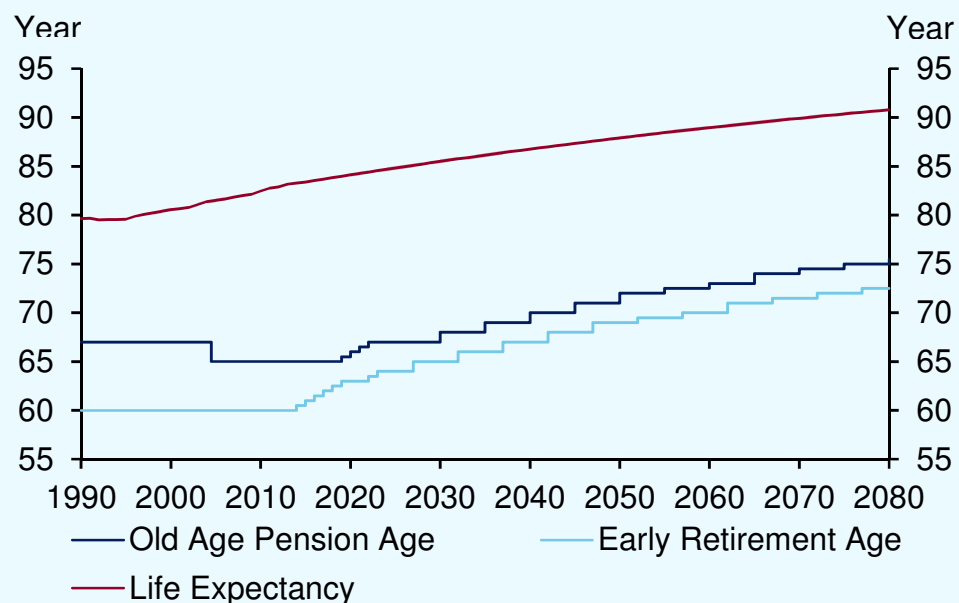
RESEARCH QUESTION 1

- **Recent Reforms of the Pension System (2006 & 2011)**
 - Indexation of Statutory Retirement Ages
- **Mandatory Labour Market Pensions Expanded during the 1990'ties**
 - Future generations will have large pension savings
- **Will this result in earlier retirement and weaken fiscal sustainability?**



...2: FISCAL BURDEN OF AGING POPULATIONS

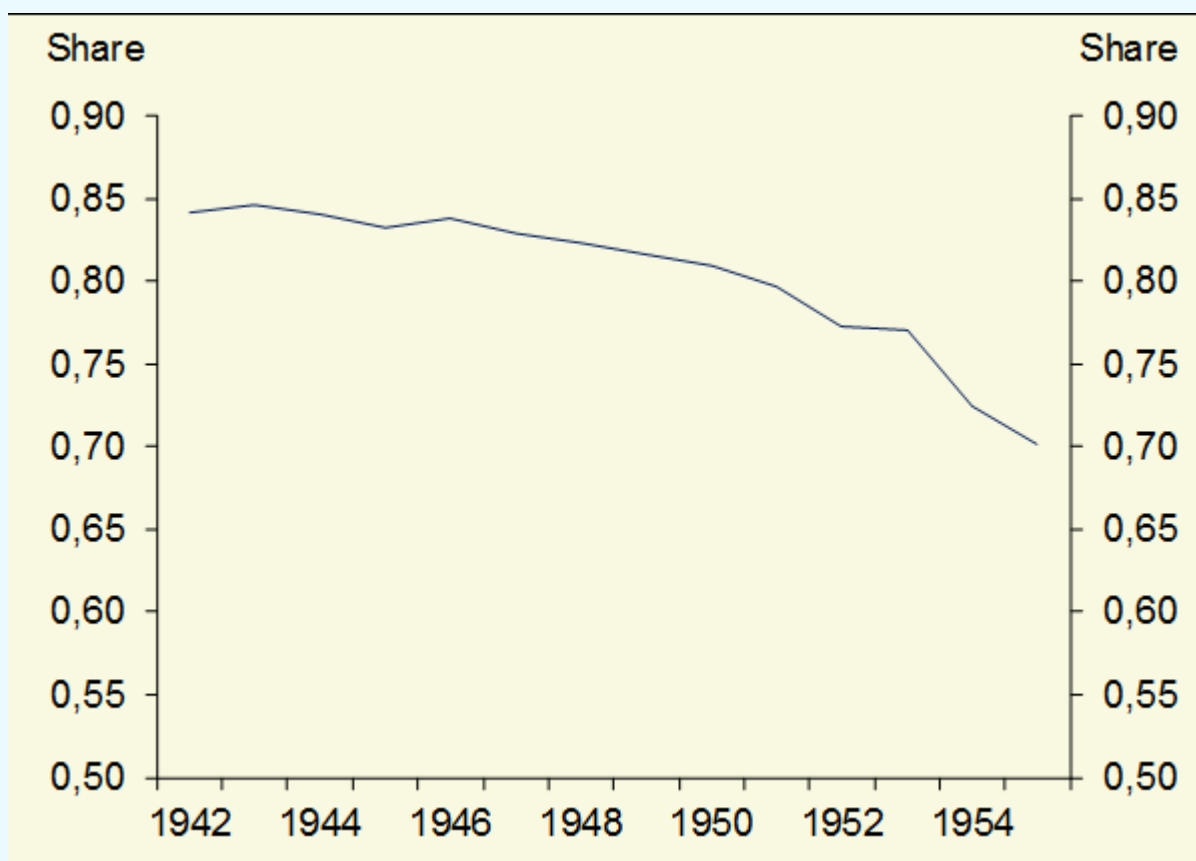
- **Cutting Pension Benefit Levels (E.g. Germany, Sweden)**
- **Postponing statutory retirement ages (E.g. Denmark)**
 - Indexation of Early Retirement Age and Old Age Pension Age



- How will indexation affect the effective retirement ages ...(and fiscal sustainability)?

EARLY RETIREMENT SCHEME IS REDUCED

Members of ERP-scheme (share of birth cohort)



APPROACH

- **Recent Approaches**

- Estimate Structural Model and Policy Experiments (e.g. French 2005 & French & Jones 2011)
- Evaluate reforms using dif in dif and similar (e.g. Cribb, Emmerson & Tetlow 2016, Schaarup, Schultz & Søgaard 2013)
- Using survey data (e.g. Maurer, Mitchell, Rogalla, Schimetschek 2014)

- **Our approach**

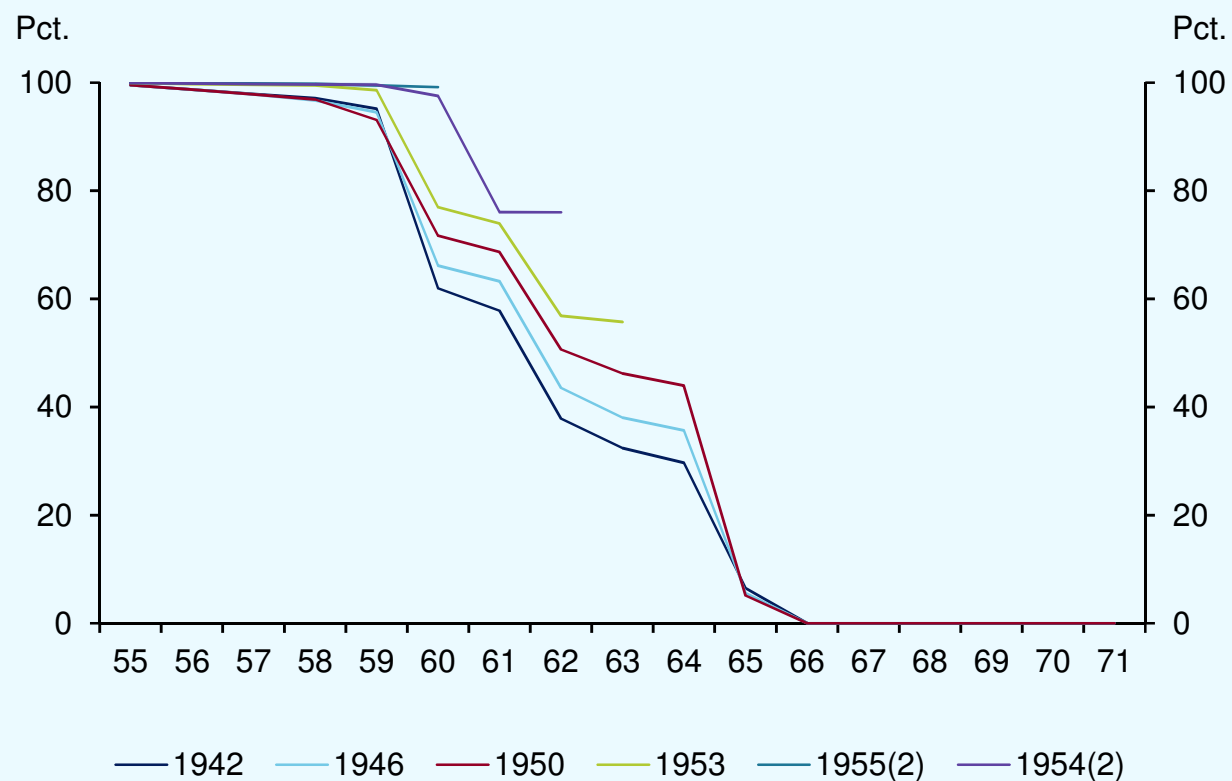
- Estimate a Structural Model (using Danish Register Data)
- Microsimulation Model (MFI or SMILE): Future Income & Pension Saving
- Policy experiments: On older cohorts (with observed retirement) and future cohorts (unobserved retirement)
- Reforms used for model validation (increase in early retirement ages)

THE DANISH SETTINGS

- **Old Age Pensions System**
 - From 65 and the rest of one's life (means tested)
 - Weak economic incentive (OAP benefit level is increased with later retirement)
- **Early retirement Scheme**
 - From 60-64 years, membership based (means tested)
 - Strong economic incentives to postpone retirement until age 60 (62)
 - Have to work until 60 to claim benefits
- **Recent reforms / changes of economic incentives**
 - Increase in early retirement and old age pension ages
 - Early retirement scheme reduced
 - Labour market pensions scheme is maturing
 - 'Healthy aging' ?

TRENDS IN DANISH RETIREMENT

Departure from employment to voluntary retirement for cohorts



RETIREMENT MODEL: - UTILITY SPECIFICATION

At age a_0 and given retirement age r expected utility for consumer i is given by:

$$U_i = \sum_{a=a_0}^T u_{a,r}(c_a, \alpha_o, \alpha_1, k_i) \beta^{a-a_0} (1 - \mu_{a_0,a})$$

- where β is discount factor and $\mu_{a_0,a}$ is the mortality rate at age a conditional on living at age a_0

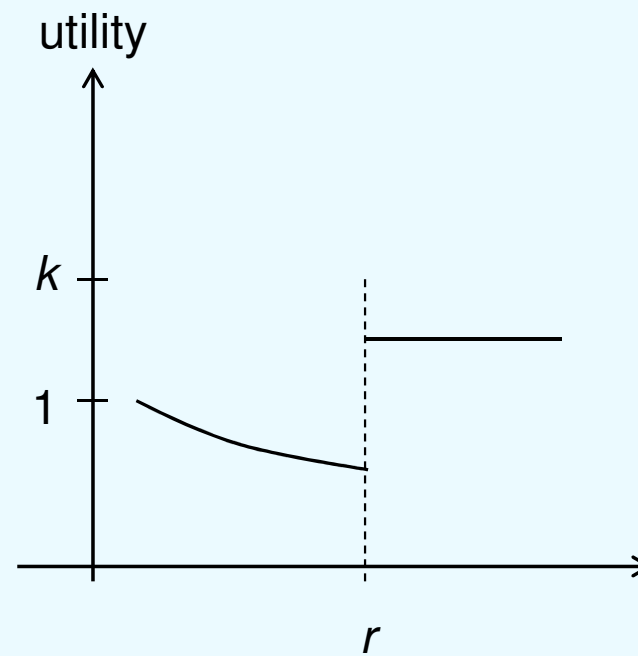
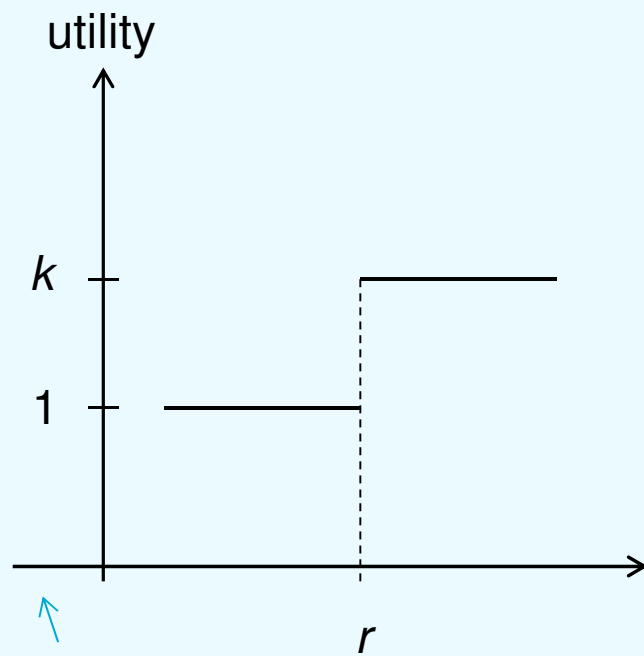
CRRA utility function with preference function $\gamma_{a,r}(\alpha_o, \alpha_1, k_i)$ that scales consumption:

$$u_{a,r}(c_a, \alpha_o, \alpha_1, k_i) = \frac{(\gamma_{a,r}(\alpha_o, \alpha_1, k_i) c_a)^{1-\rho}}{1-\rho}$$

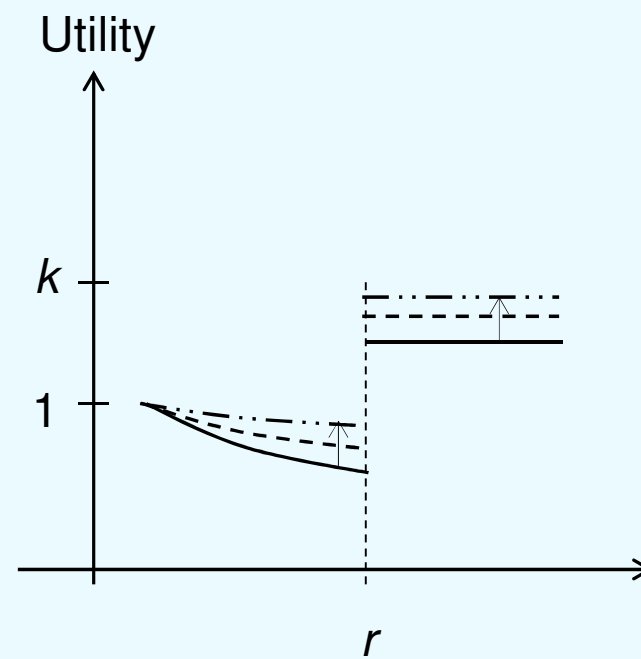
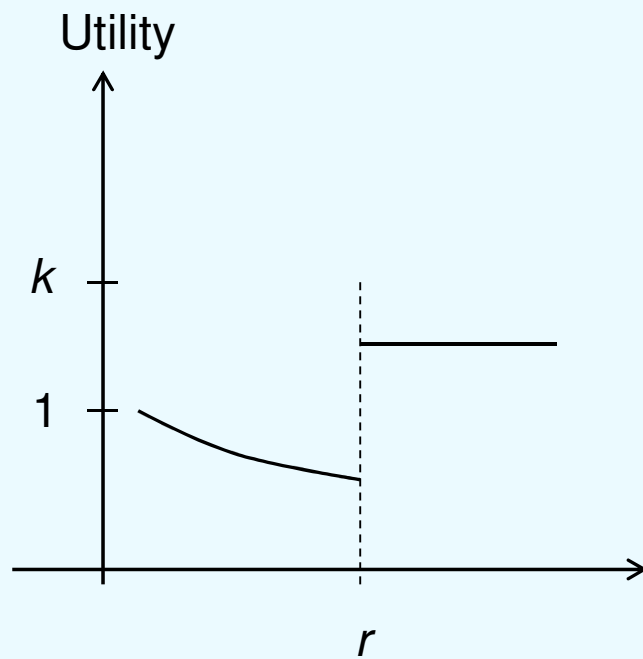
Age related preferences for retirement

$$\gamma_{a,r}(\alpha_o, \alpha_1, k) = \begin{cases} e^{(-\alpha_o + \alpha_1 b) a^2} & \text{if } a < r \\ k e^{(-\alpha_o + \alpha_1 b) r^2} & \text{if } a > r \end{cases}$$

AGE RELATED PREFERENCES (ATTRITION)



COHORT TREND IN ATTRITION



DATA

- **Danish register data, 33% of cohort 1942-1955 employed at age 54**
 - About 42.000 individuals
 - First data year 1993, last data year 2014 (2015)
- **We observe:**
 - Retirement age, Financial Wealth, Pension Wealth, Salary, Benefit entitlements, spouses, housing etc.
- **We simulate for hypothetical retirement ages:**
 - Counter-factual salaries
 - Pensions (ERP, OAP, counterfactual private pension savings, housing benefits etc.) and taxes

ESTIMATION AND IDENTIFICATION

- Outer search routine evaluates log likelihood at parameter combination $(\alpha_0, \alpha_1, \beta, \sigma)$
- Given $(\alpha_0, \alpha_1, \beta, \sigma)$ inner EM algorithm derives population distribution in leisure preferences $p(k)$
- **Estimate functional form**
 - Assuming consistency between chosen retirement age and variation in economic incentives across retirement ages
- **Validate model across pension reform: indexation ERP age**

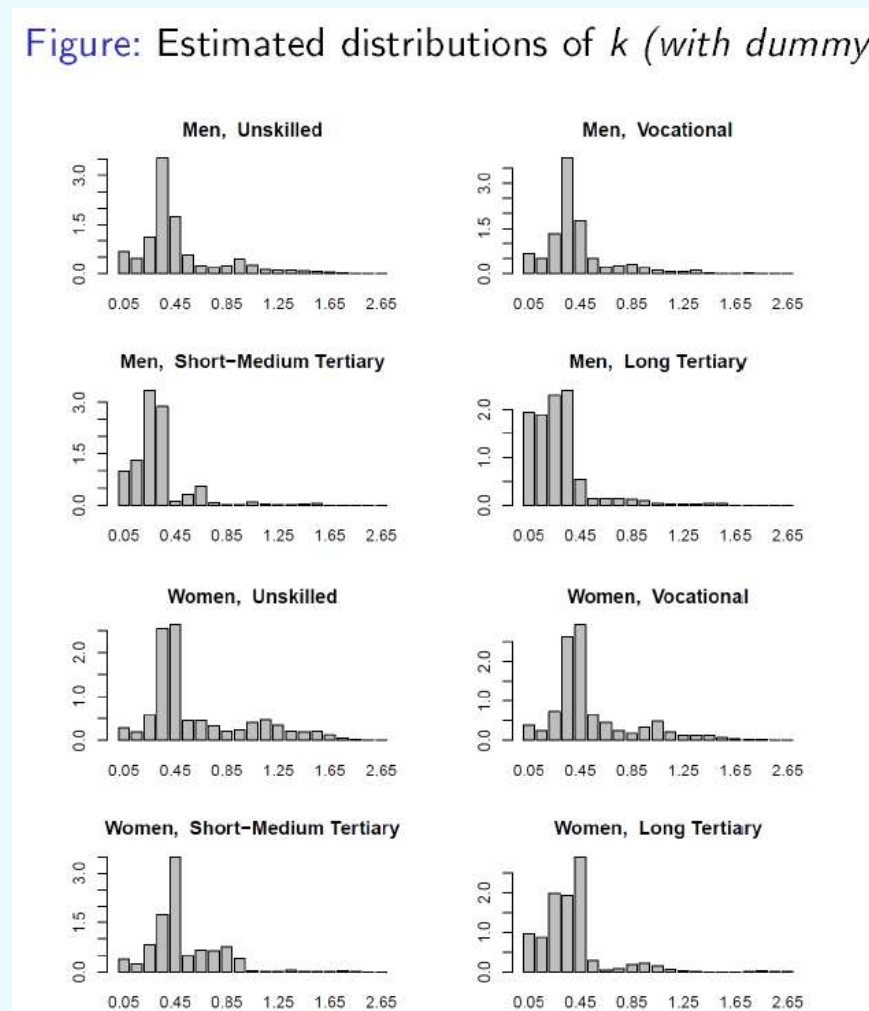
ESTIMATION RESULTS – WITH SOCIAL DUMMY

Men						
	N	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\beta}$	$\hat{\rho}$	D65
Unskilled	20678	0.0087	-0.000049	0.915	1.23	0.0068
Vocational	33160	0.0105	-0.000065	0.897	1.19	0.0091
Short-Med. Tert.	0.0096	0.0111	-0.000075	0.927	1.03	0.0821
Long Tertiary	0.0093	0.0123	-0.000089	0.914	1.00	0.0954
Women						
	N	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\beta}$	$\hat{\rho}$	D65
Unskilled	21872	0.0061	-0.000012	0.948	1.52	0.0004
Vocational	27416	0.0066	-0.000013	0.939	1.47	0.0006
Short-Med. Tert.	15963	0.0073	-0.000013	0.929	1.35	0.0021
Long Tertiary	2752	0.0066	-0.000008	0.966	1.13	0.0491

ESTIMATION RESULTS – WITH SOCIAL DUMMY

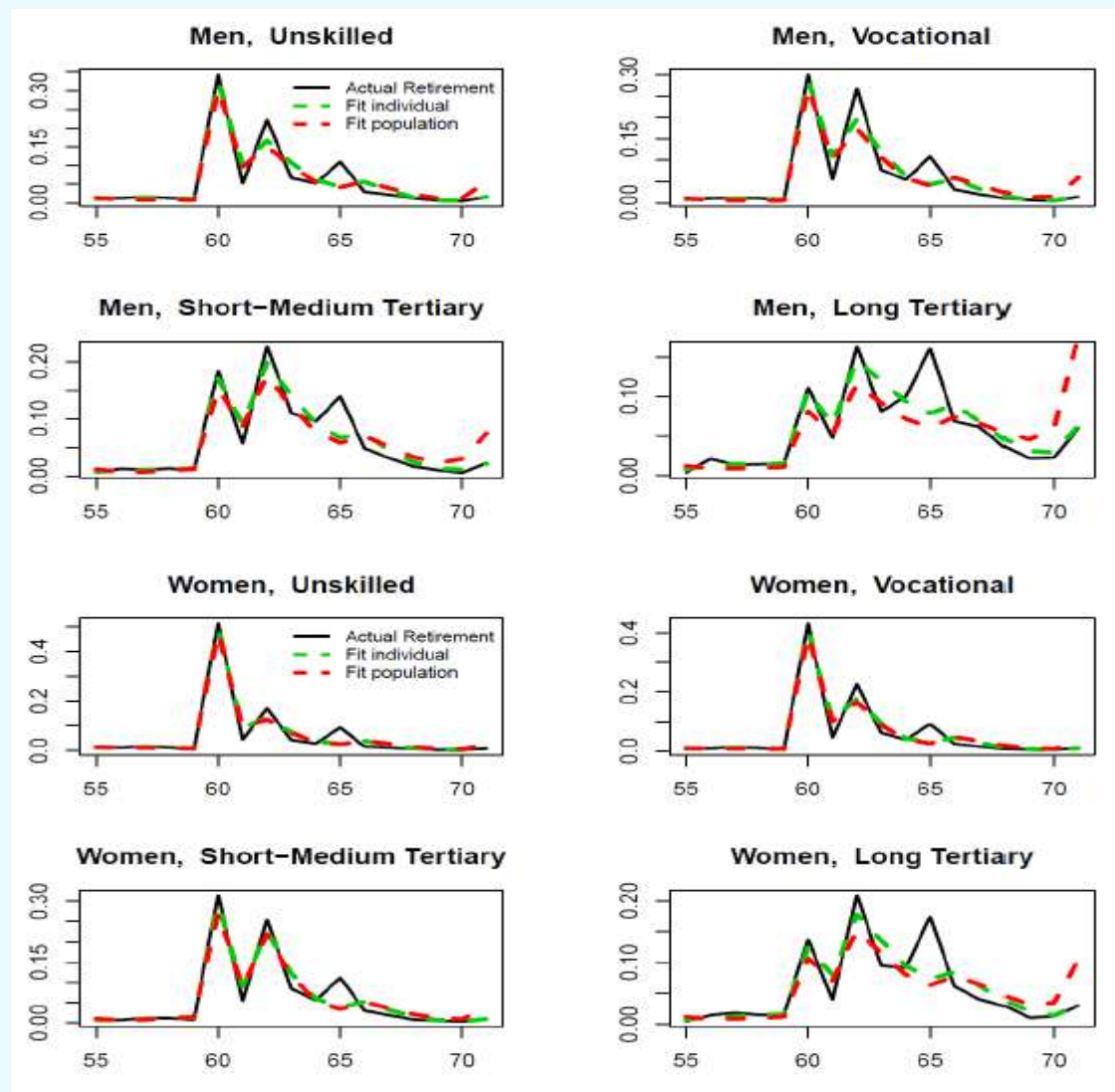
- PREFERENCE DISTRIBUTION

Figure: Estimated distributions of k (with dummy)



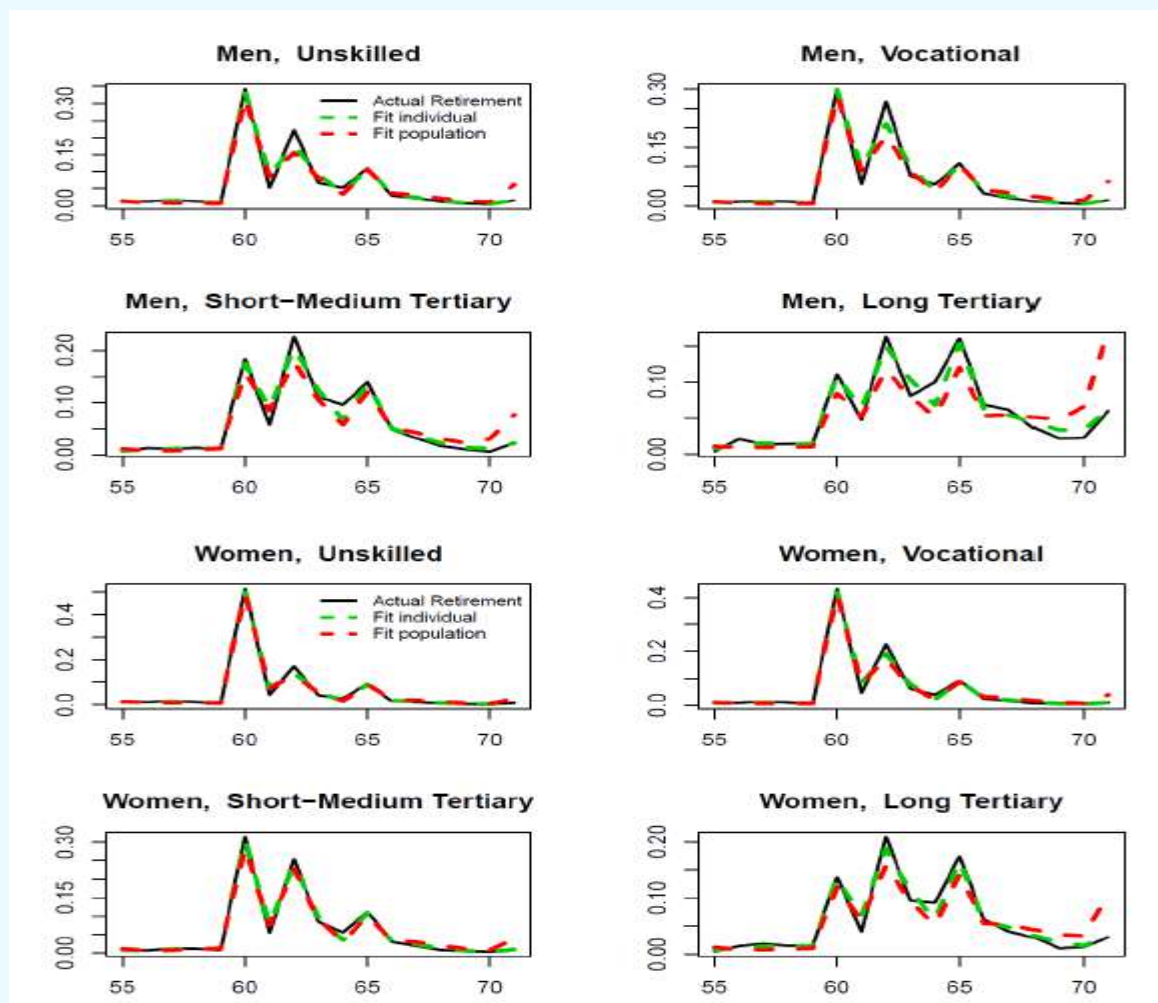
MODEL FIT

- MODEL WITHOUT SOCIAL NORM



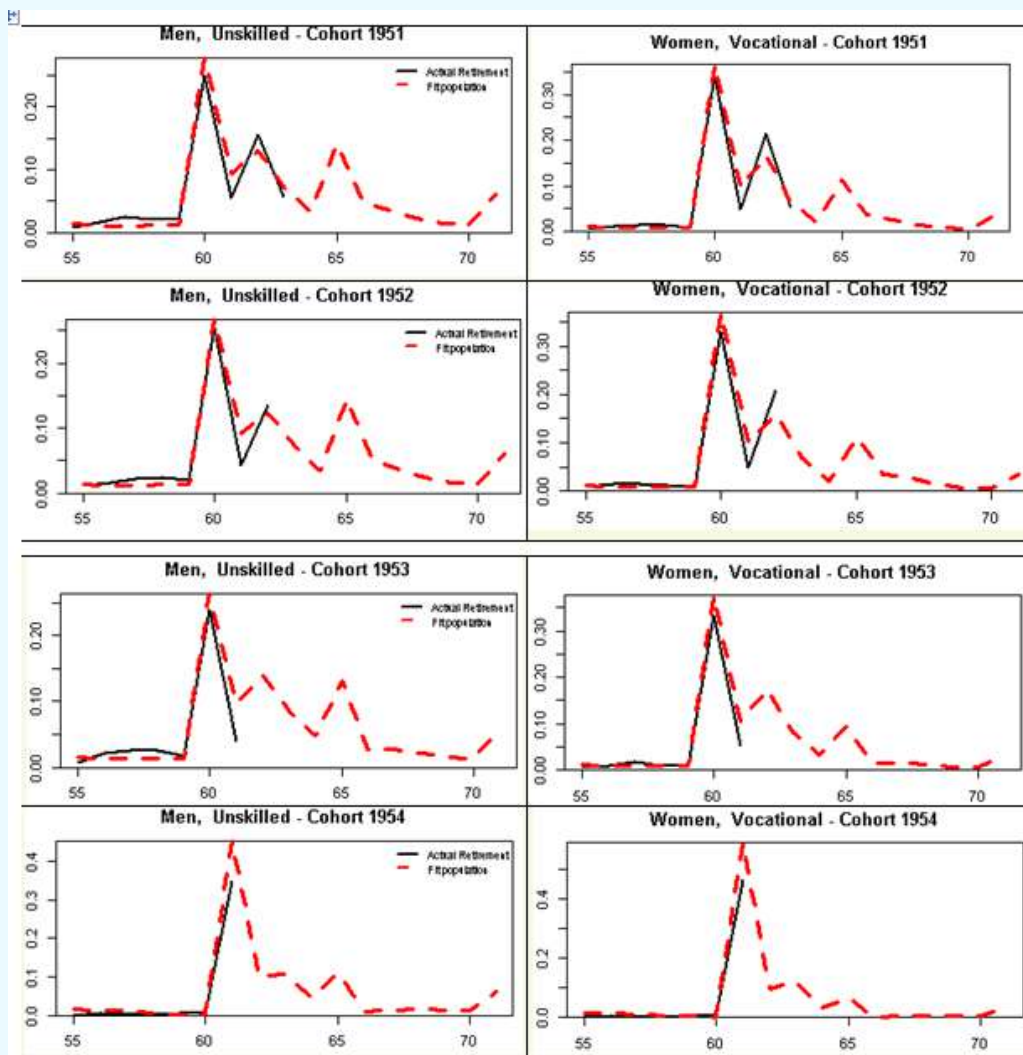
MODEL FIT

- MODEL WITH SOCIAL NORM

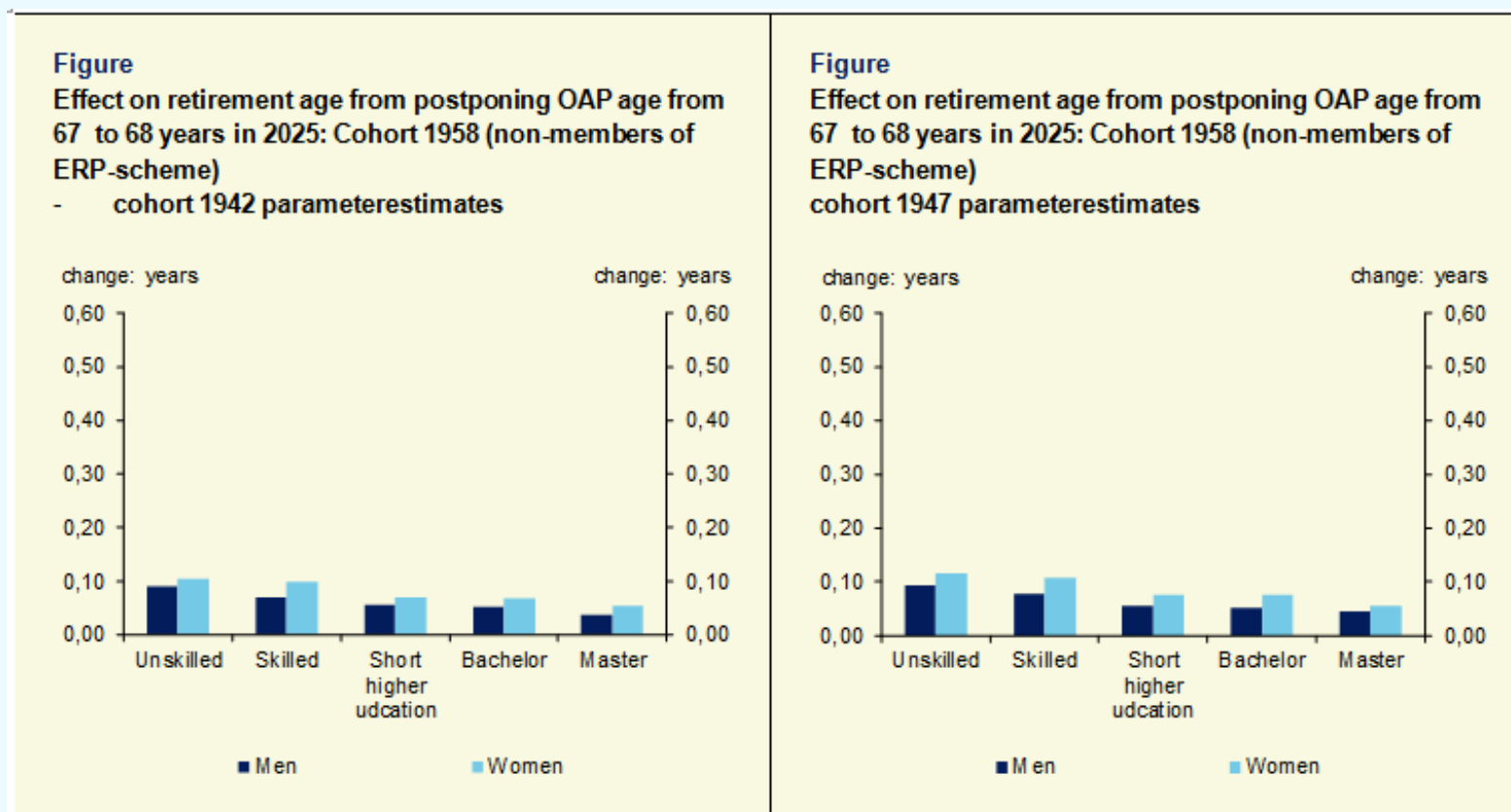


EKSTERNAL VALIDATION

- PREDICTION OF RETIREMENTS FOR YOUNGER COHORTS
(NOT USED IN ESTIMATION OF ECONOMETRIC MODEL)



POLICY EXPERIMENT 1: INCREASE IN OAP AGE (MODELS WITHOUT ATTRITION TREND)



POLICY EXPERIMENT 1: INCREASE IN OAP AGE

SMALL CHANGE IN ECONOMIC INCENTIVES

Figure
Average discounted wealth for skilled male workers at retirement age 68 (cohort 1958, non ERP-members)

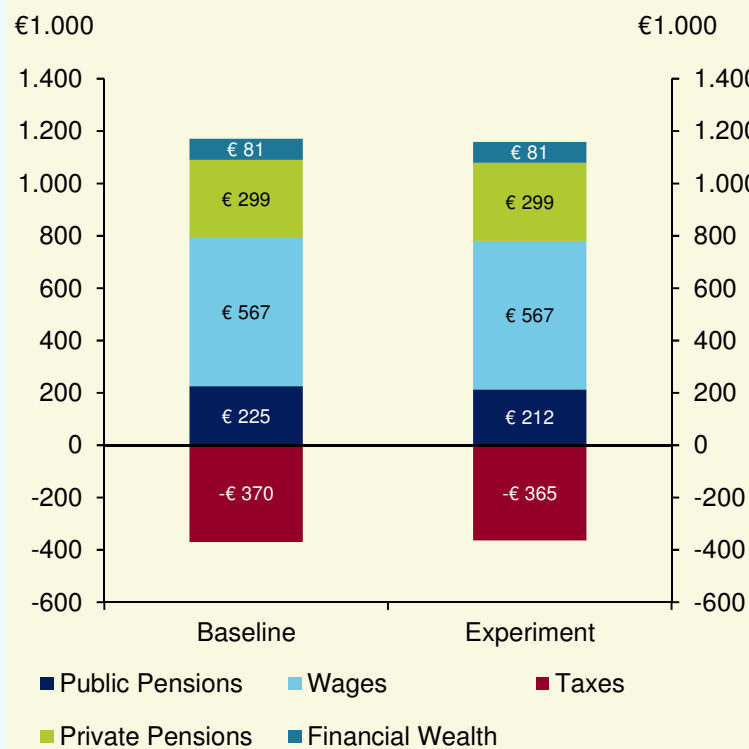
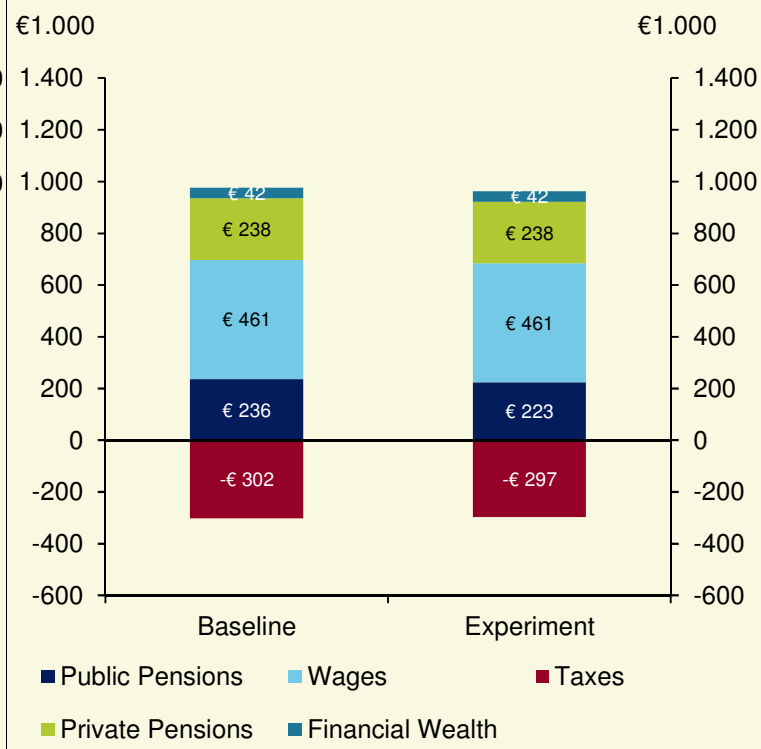


Figure
Average discounted wealth for skilled female workers at retirement age 68 (cohort 1958, non ERP-members)



POLICY EXPERIMENT 1: INCREASE IN OAP AGE (MODELS WITH ATTRITION TREND)

Figure
 Effect on retirement age from postponing OAP age from 67 to 68 years in 2025: Cohort 1958 (non-members of ERP-scheme)
 - model with attrition trend

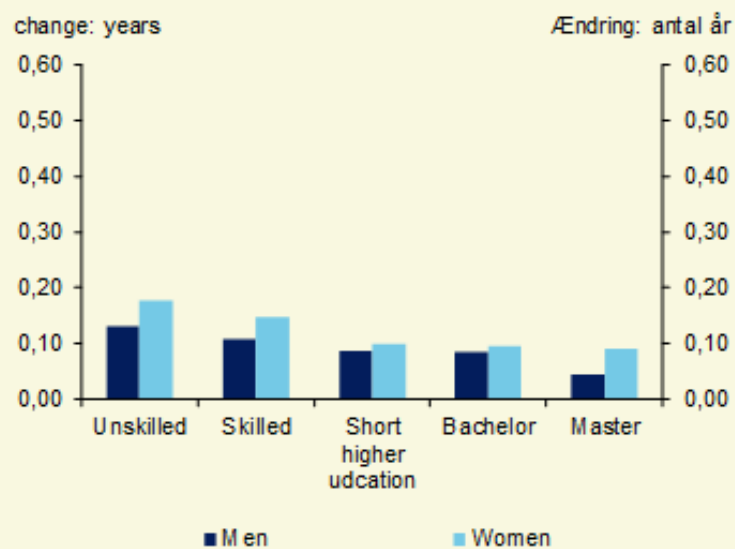
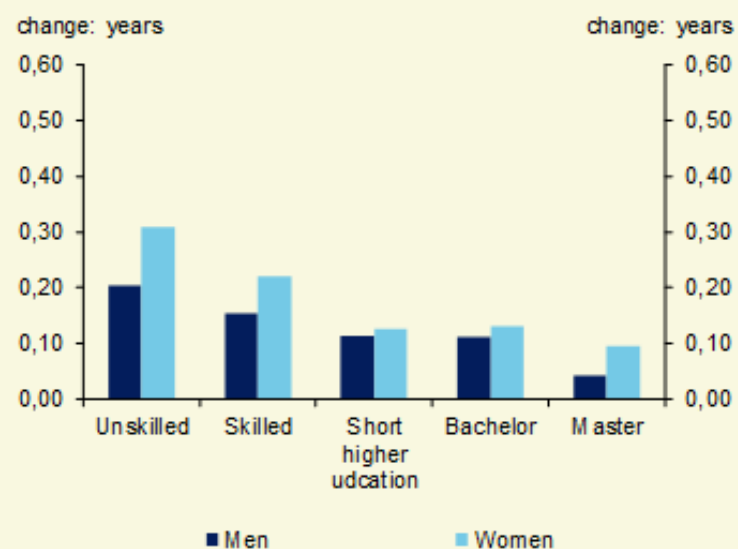
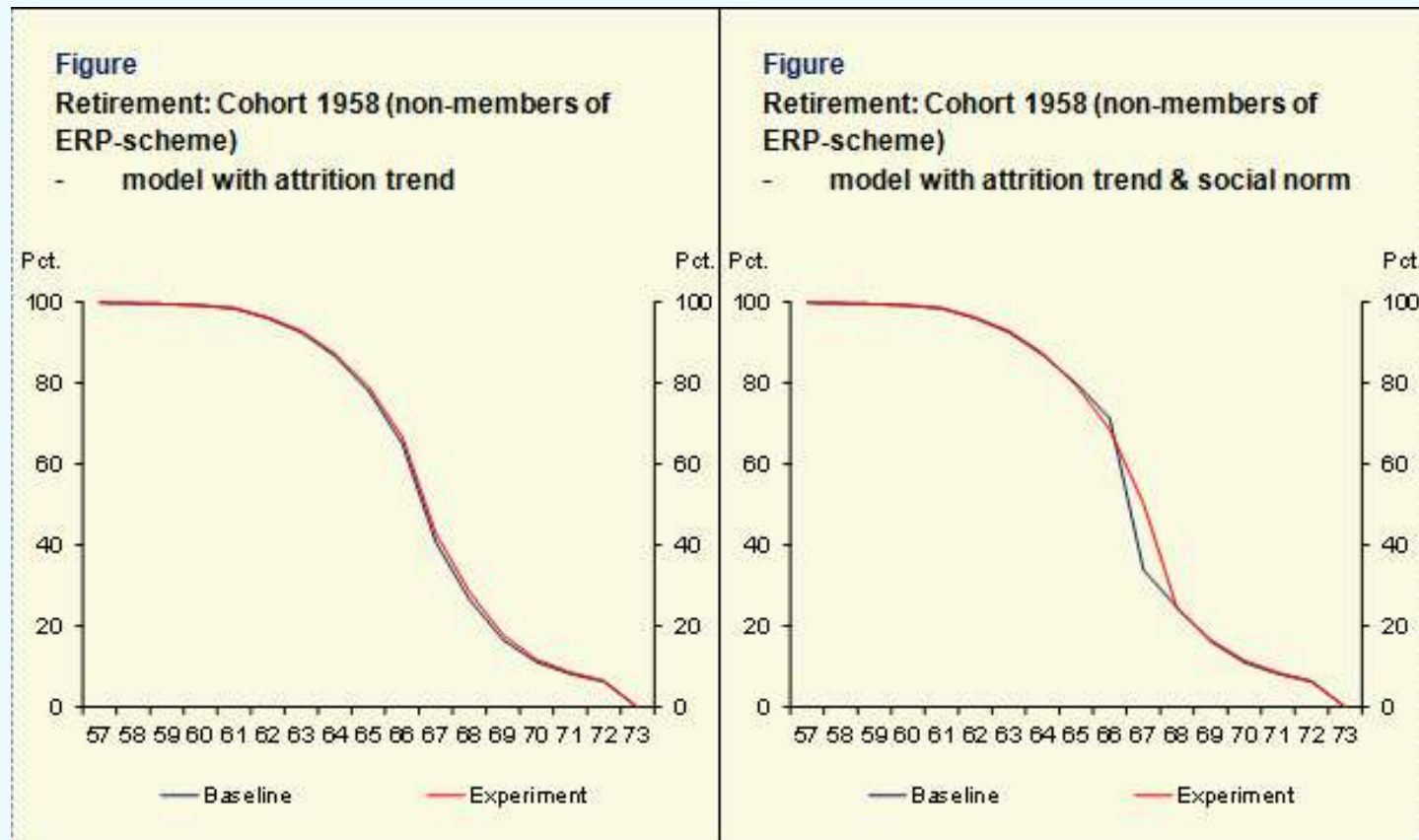


Figure
 Effect on retirement age from postponing OAP age from 67 to 68 years in 2025: Cohort 1958 (non-members of ERP-scheme)
 - model with attrition trend & social norm



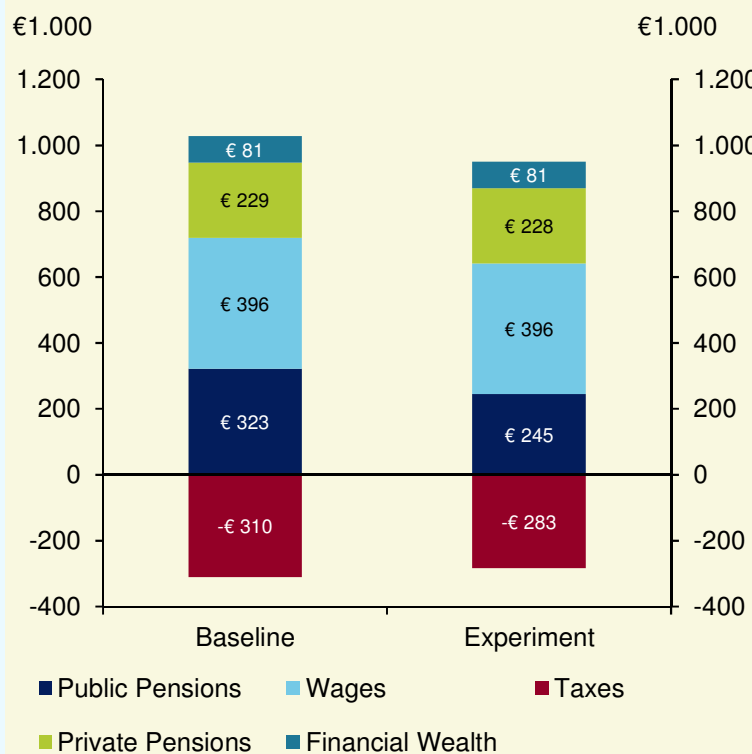
POLICY EXPERIMENT 1: INCREASE IN OAP AGE (MODELS WITH ATTRITION TREND)



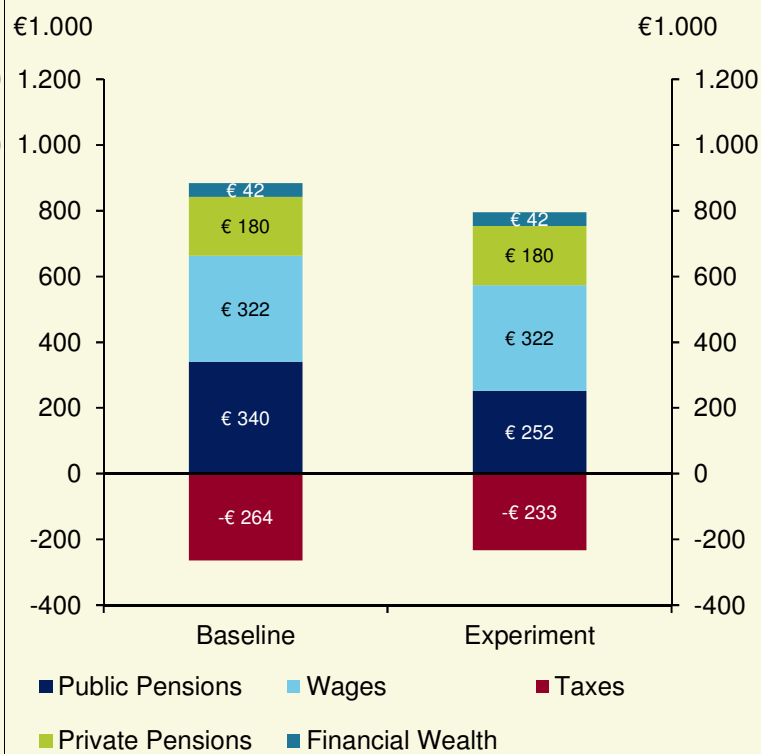
POLICY EXPERIMENT 1: INCREASE IN ERP AGE

LARGE CHANGE IN ECONOMIC INCENTIVES

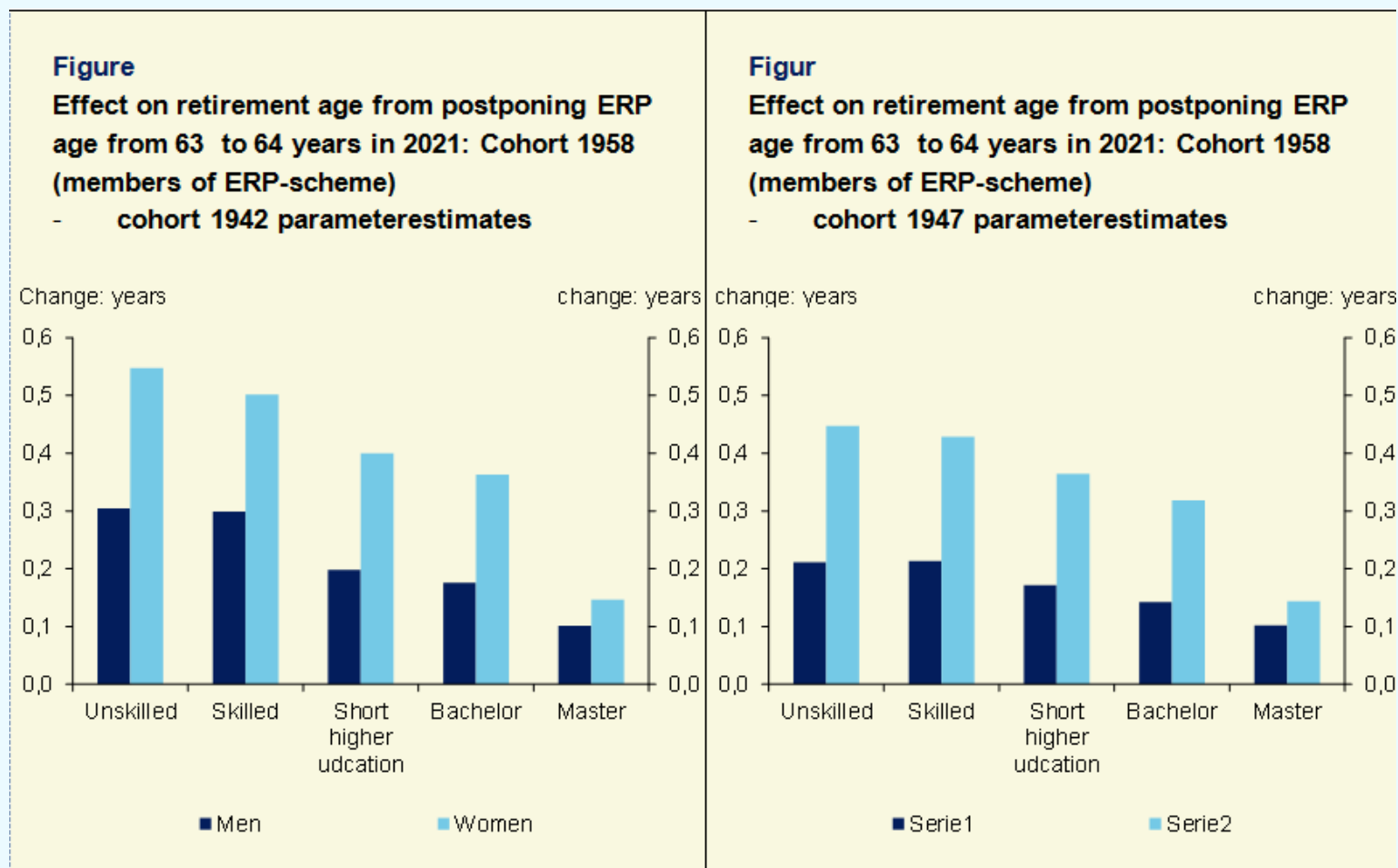
Figur 1
Average discounted wealth for skilled male workers at retirement age 63 (cohort 1958, ERP-members)



Figur 2
Average discounted wealth for skilled female workers at retirement age 63 (cohort 1958, ERP-members)



POLICY EXPERIMENT 1: INCREASE IN ERP AGE (MODELS WITHOUT ATTRITION TREND)



POLICY EXPERIMENT 1: INCREASE IN ERP AGE (MODELS WITH ATTRITION TREND)

Figure
Effect on retirement age from postponing ERP age from 63 to 64 years in 2021: Cohort 1958 (members of ERP-scheme)
 - model with attrition trend

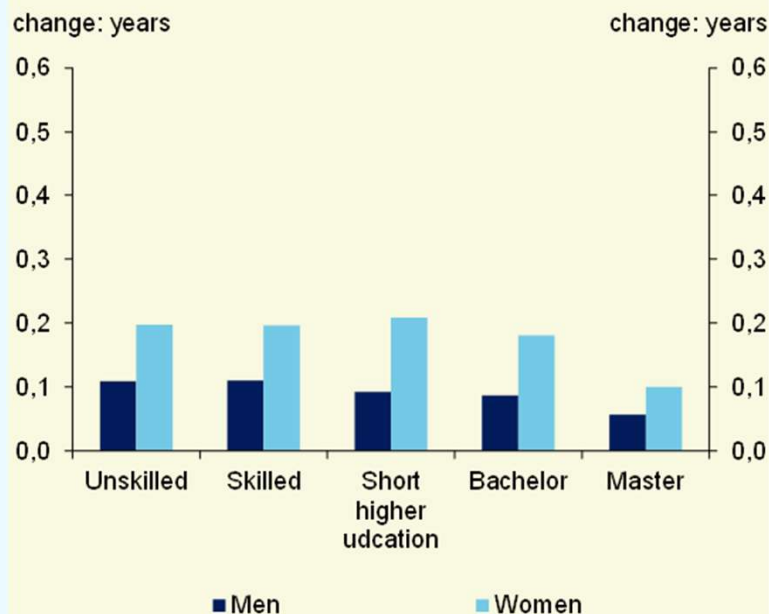
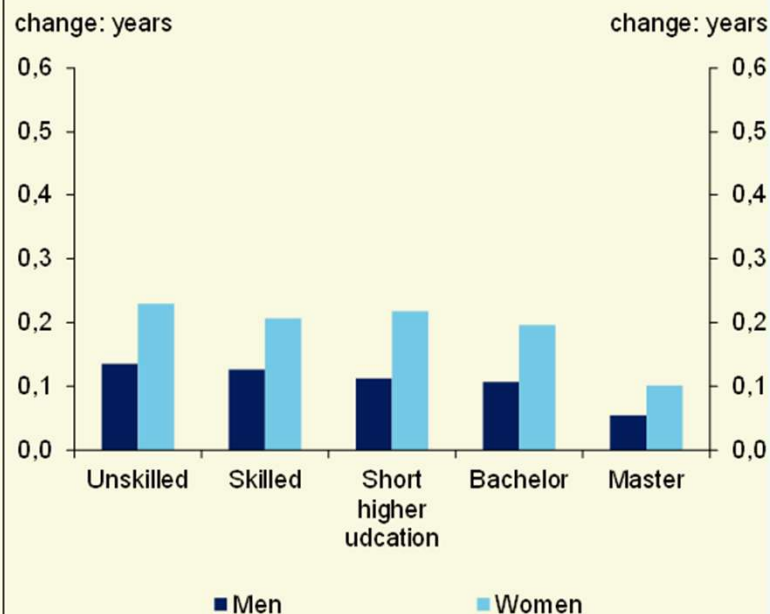
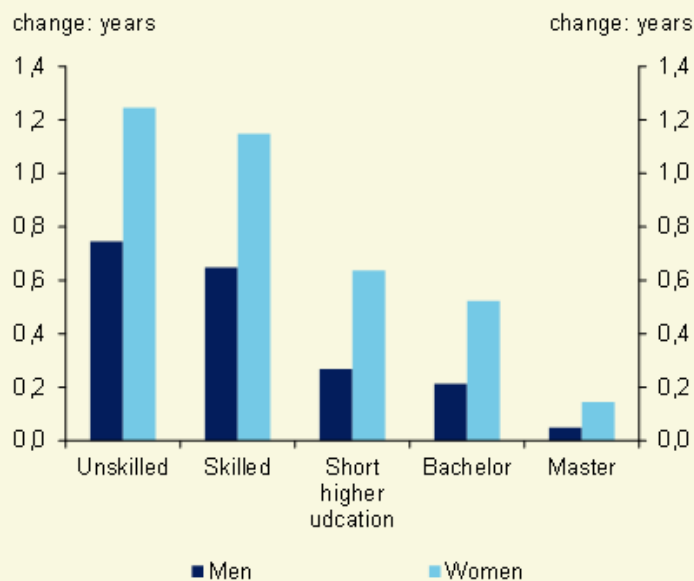


Figure
Effect on retirement age from postponing ERP age from 63 to 64 years in 2021: Cohort 1958 (members of ERP-scheme)
 - model with attrition trend & social norm



POLICY EXPERIMENT 2: ABOLISHING ERP-SCHEME (EFFECT IN ABOUT 2025 & 2050)

Figure
Effect on retirement age from abolishing ERP scheme: Cohort 1958 in about 2021 (members of ERP-scheme)
- model with attrition trend



POLICY EXPERIMENT 2: ABOLISHING OF ERP-SCHEME (ECON INCENTIVES IN 2025)

Table

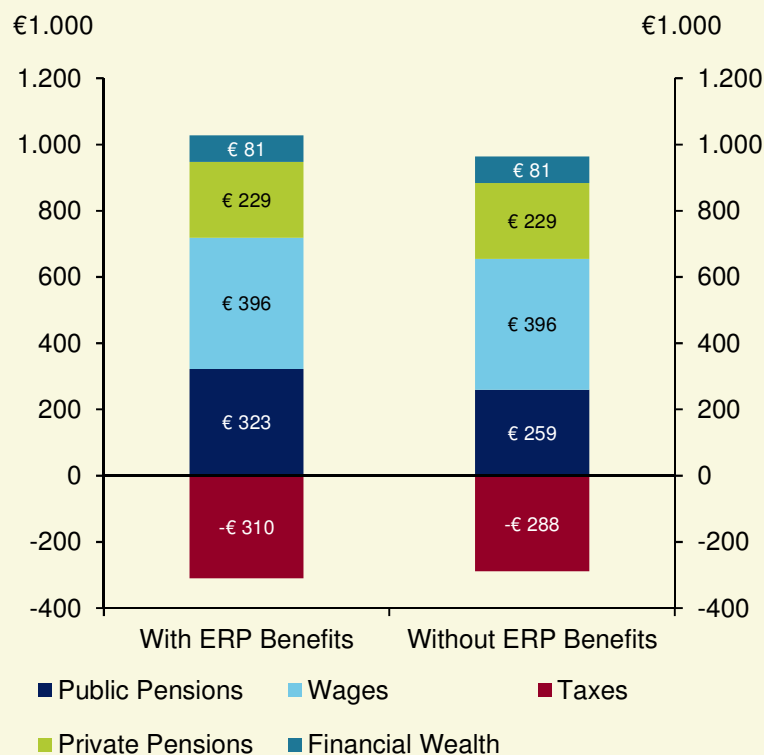
Average change in discounted effective wealth from abolishing ERP (ERP-members)

	Cohort 1958 at retirement age 63
Group	1.000,00 €
Men, Unskilled	-42
Men, Skilled	-40
Men, higher education (short)	-30
Men, higher education (bachelor)	-29
Men, higher education (master)	-18
Women, Unskilled	-47
Women, Skilled	-47
Women, higher education (short)	-42
Women, higher education (bachelor)	-39
Women, higher education (master)	-25

POLICY EXPERIMENT 2: ABOLISHING OF ERP-SCHEME (ECON INCENTIVES IN 2025)

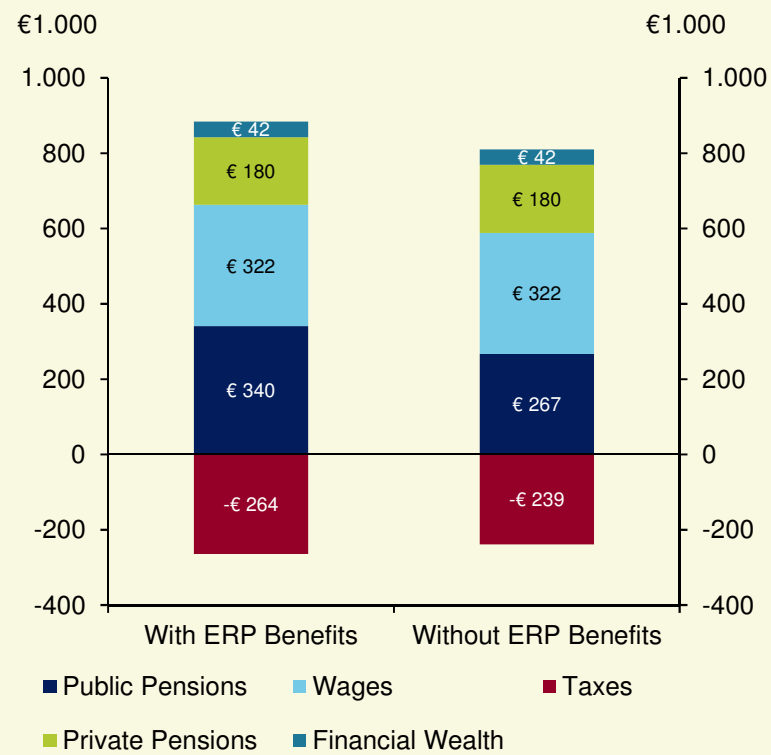
Figure

Average discounted wealth for skilled male workers at retirement age 63 (cohort 1958, ERP-members)



Figure

Average discounted wealth for skilled female workers at retirement age 63 (cohort 1958, ERP-members)



Thank You