Growing Old Gracefully

Pension policy for an ageing society

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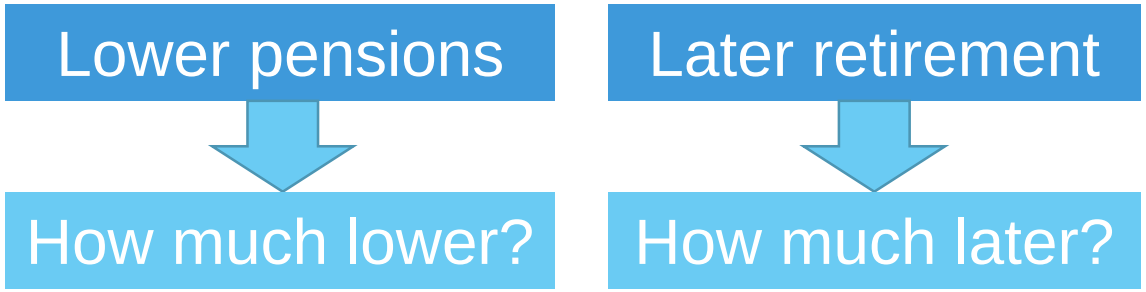
Motivation

- Increasing longevity (i.e. lower mortality rates) – lower pensions/later retirement



- Use a macro-model that tracks ageing individuals and incorporates responses to changing incentives → overlapping generations model

Outline

- Model overview (micro-macro linkages)
  - Calibration
  - Demographics
  - Pensions
- Simulations
- Results

Model overview

EDGE-M3(IT) – overlapping generations model for Italy

EDGE-M3: European **D**ynamic **G**eneral **E**quilibrium – **M**icro-**M**acro **M**odel

EDGE-M3(IT) – model for Italy

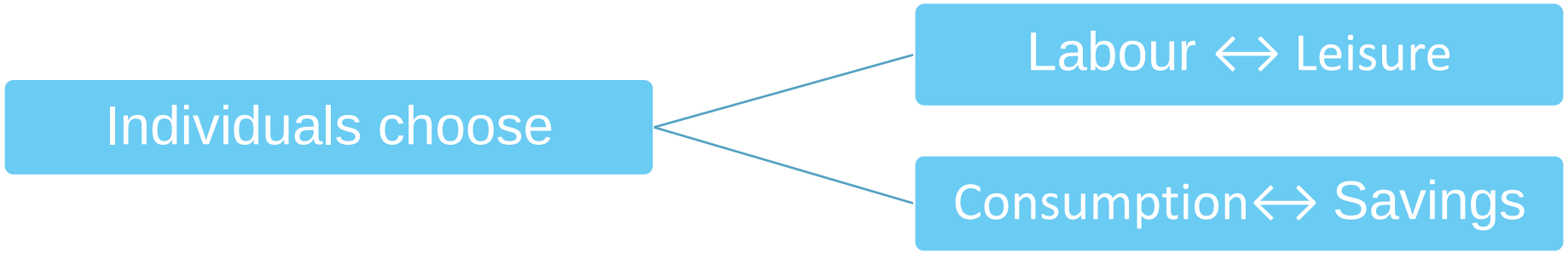
- OLG structure (individuals, firms, government)
- 560 types of representative individuals:
  - 7 earnings-ability types (including top 1%) x 80 ages (age 20 to 99)

Individual Optimisation

Born age 0 → Economically active at age 20 → Max age 99

Objective: maximise lifetime utility s.t. budget constraint

$$Utility = \ + U(consumption) - U(labour) + U(bequests)$$

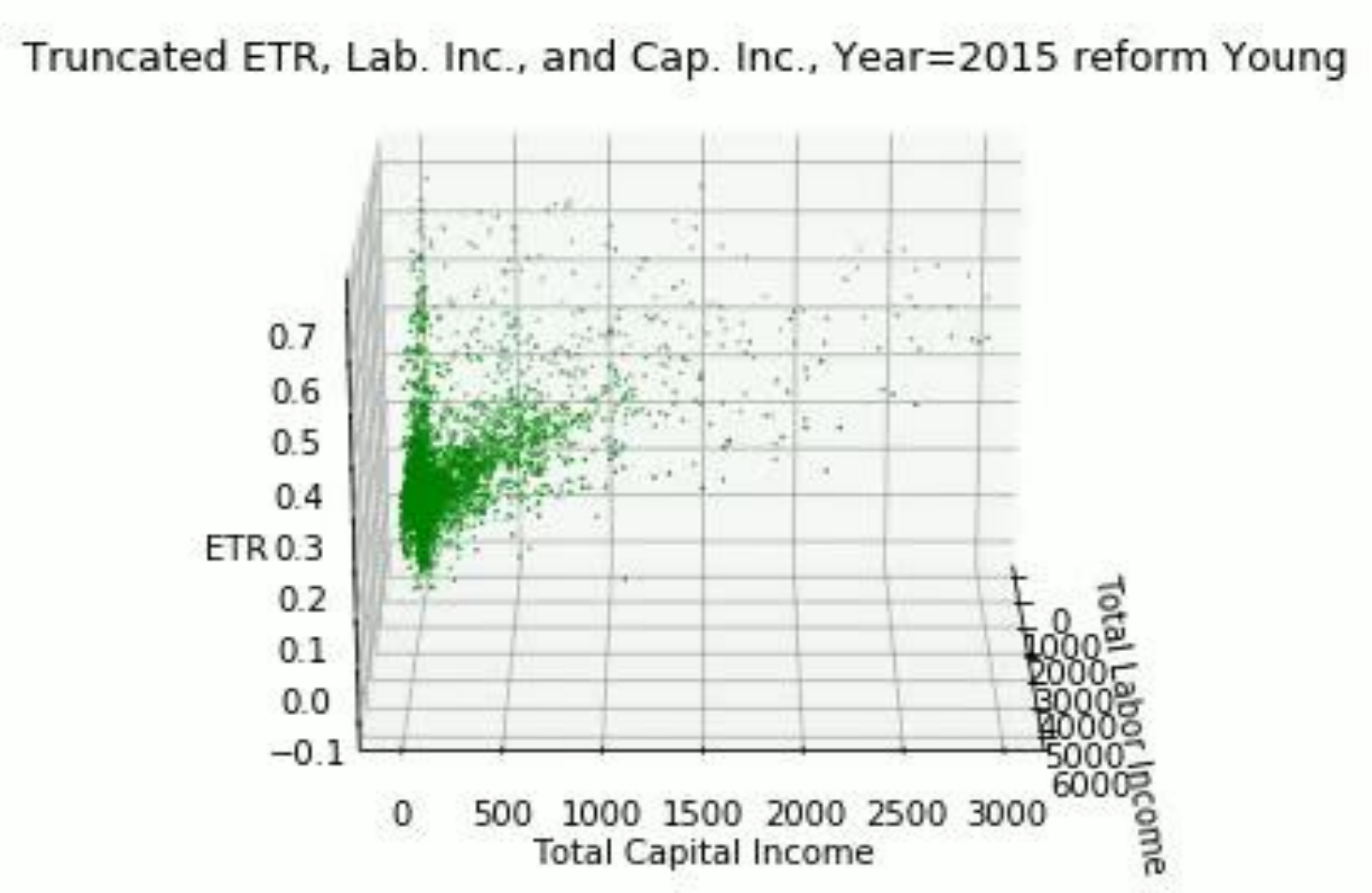


EDGE-M3(IT) – overlapping generations model for Italy

- EUROSTAT's demographic trends
- Micro-calibrated/estimated
  - Earnings profiles, labour supply, consumption tax, bequests
- Income tax functions (following DeBacker, Evans & Phillips, 2019)
  - micro-macro linkage with EUROMOD
  - based on EUROMOD output

Calibration

EDGE-M3(IT) – Income tax function



*Calculations from **EUROMOD** using EU-SILC 2015*

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EDGE-M3(IT) – Income tax function

- Function characteristics: monotonically increasing in income; at a diminishing rate (concave); L-inc & K-inc jointly predict ETR

→Cobb-Douglas aggregator of polynomials in L-inc & K-inc

Following DeBacker, Evans & Phillips (2019):

$$\tau(x,y) = [\tau(x) + shift_x]^{\phi} [\tau(y) + shift_y]^{1-\phi} + shift$$

$$\text{where} \quad \tau(x) \equiv (max_x - min_x) \left(\frac{Ax^2 + Bx}{Ax^2 + Bx + 1} \right) + min_x$$

$$\text{and} \quad \tau(y) \equiv (max_y - min_y) \left(\frac{Cx^2 + Dx}{Cx^2 + Dx + 1} \right) + min_y$$

$$\text{where} \quad A, B, C, D, max_x, max_y, shift_x, shift_y > 0 \quad \text{and} \quad \phi \in [0,1]$$

$$\text{and} \quad max_x > min_x \quad \text{and} \quad max_y > min_y$$

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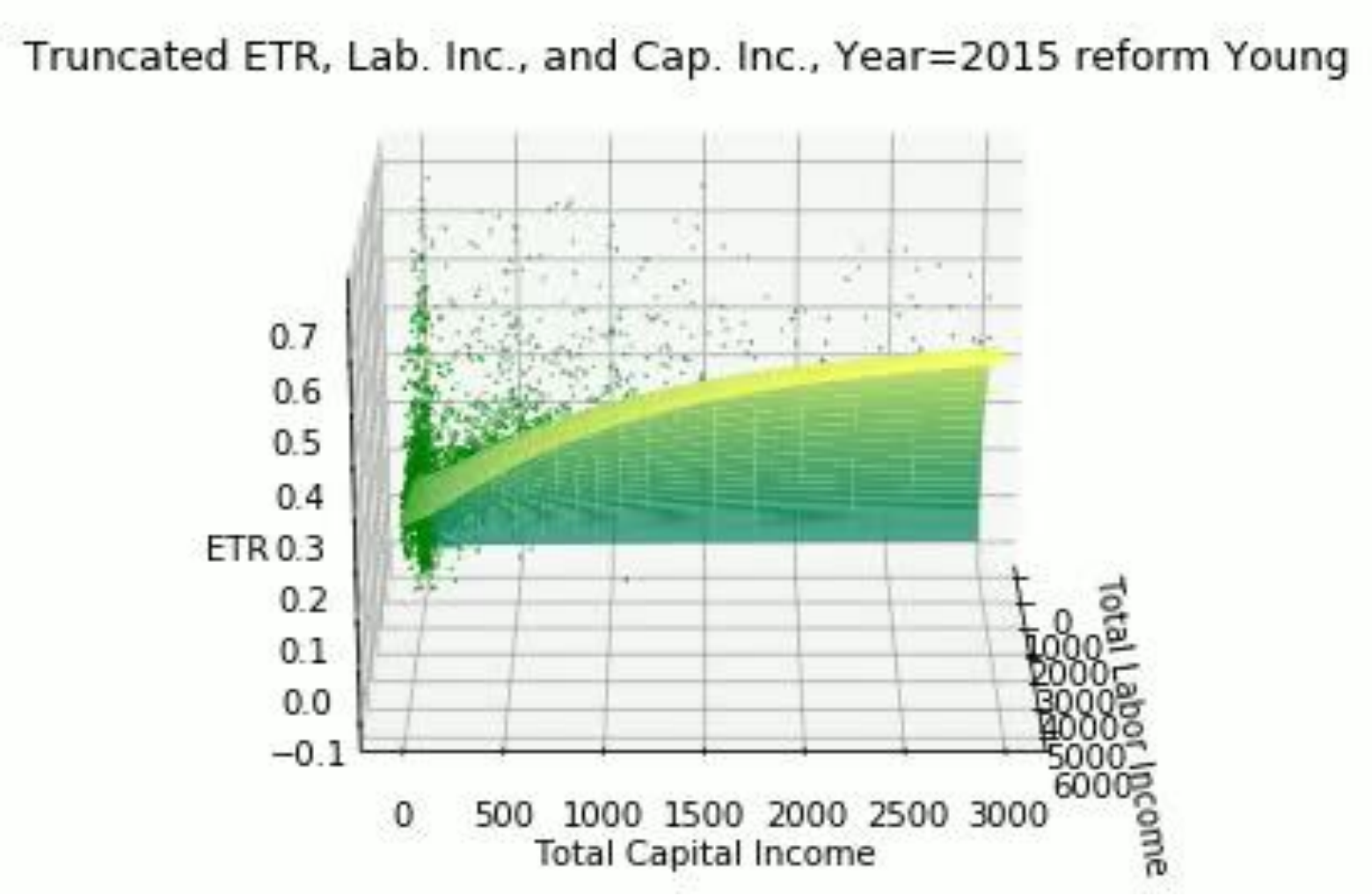
EDGE-M3(IT) – Income tax function



*Calculations from **EUROMOD** using EU-SILC 2015*

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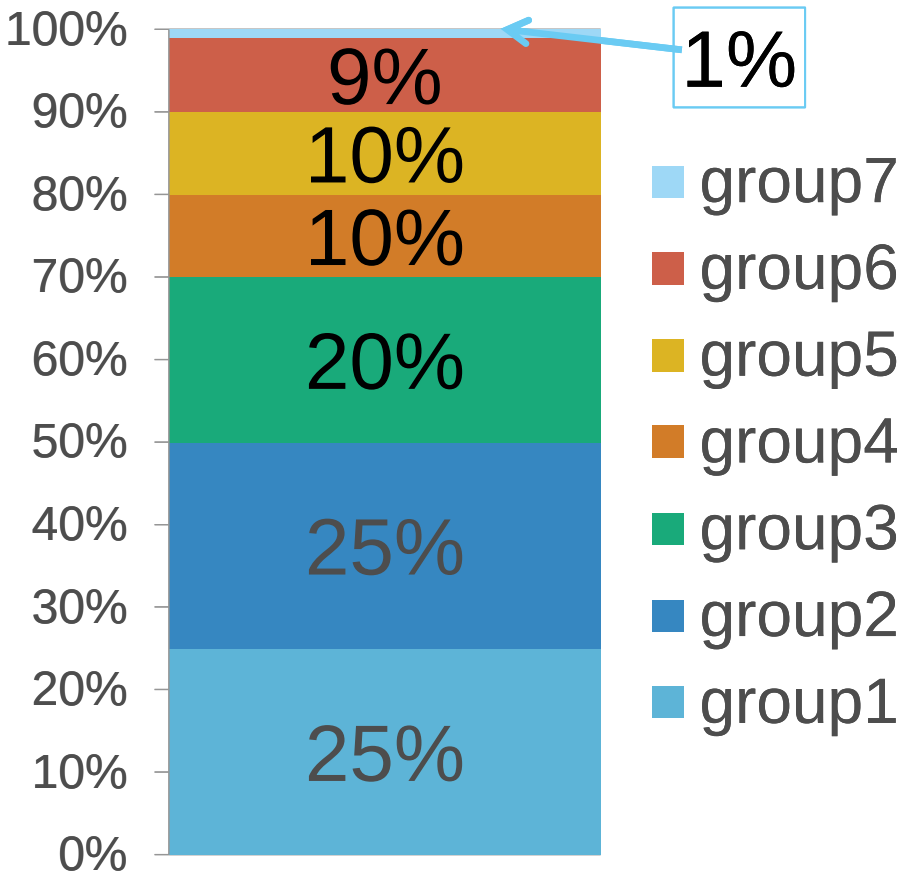
Earnings-ability types



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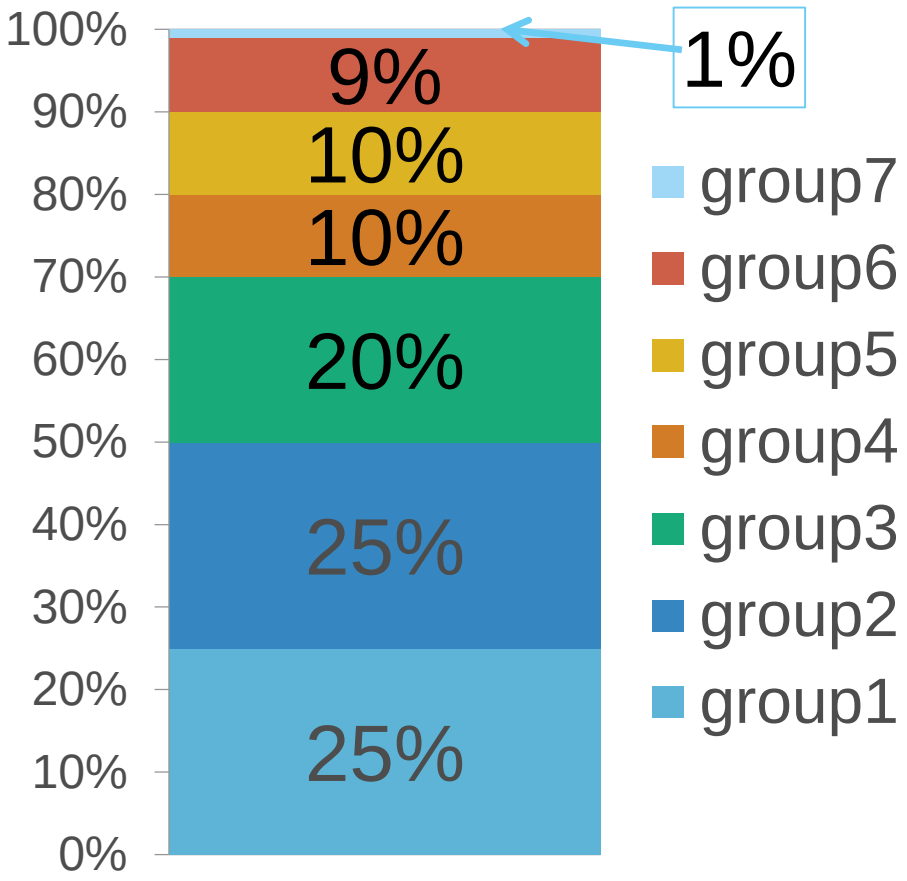
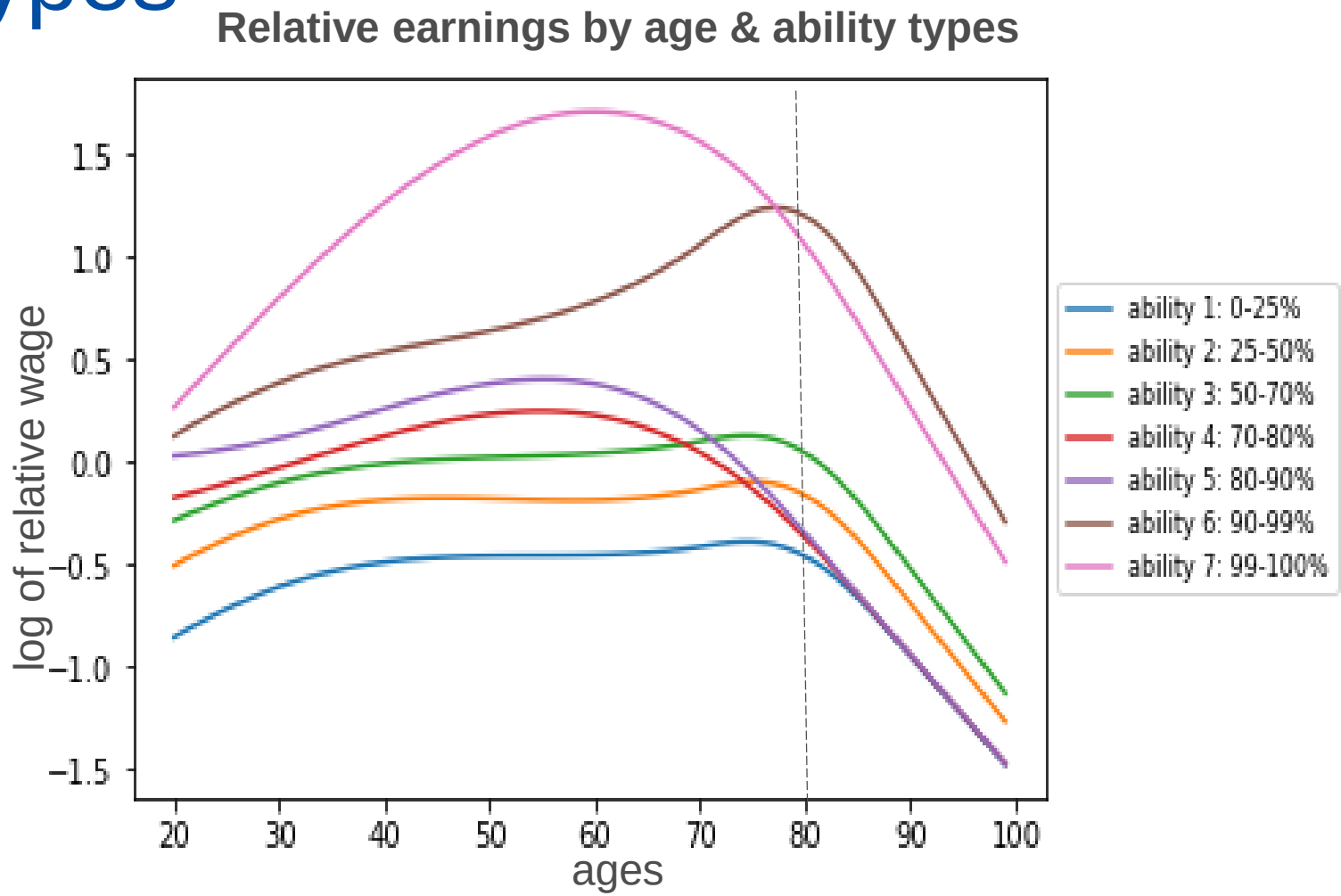
Earnings-ability types





Exogenous life cycle earnings ability paths

estimated from microdata: Banca d'Italia survey (SHIW)

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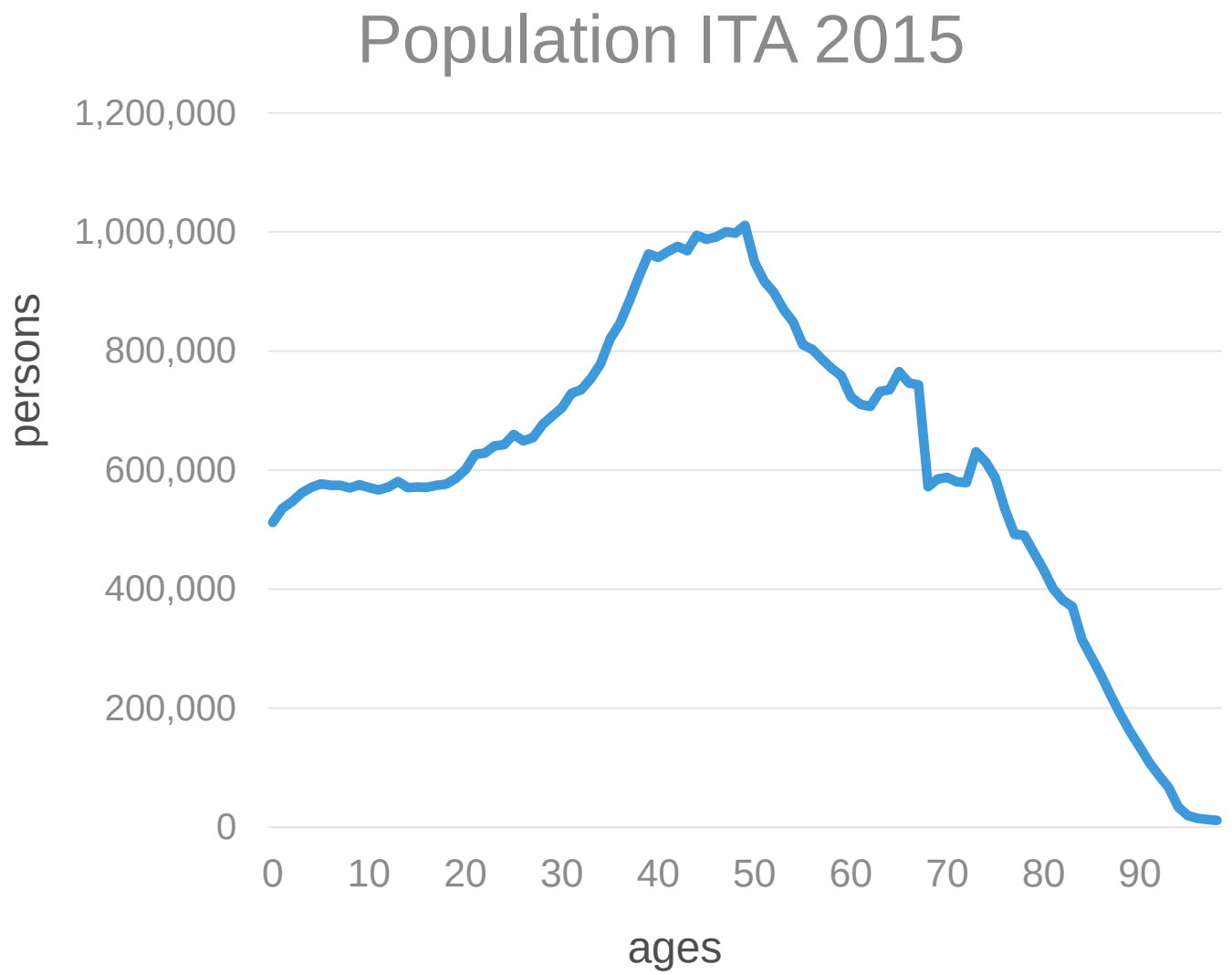
Demographics

Demographics



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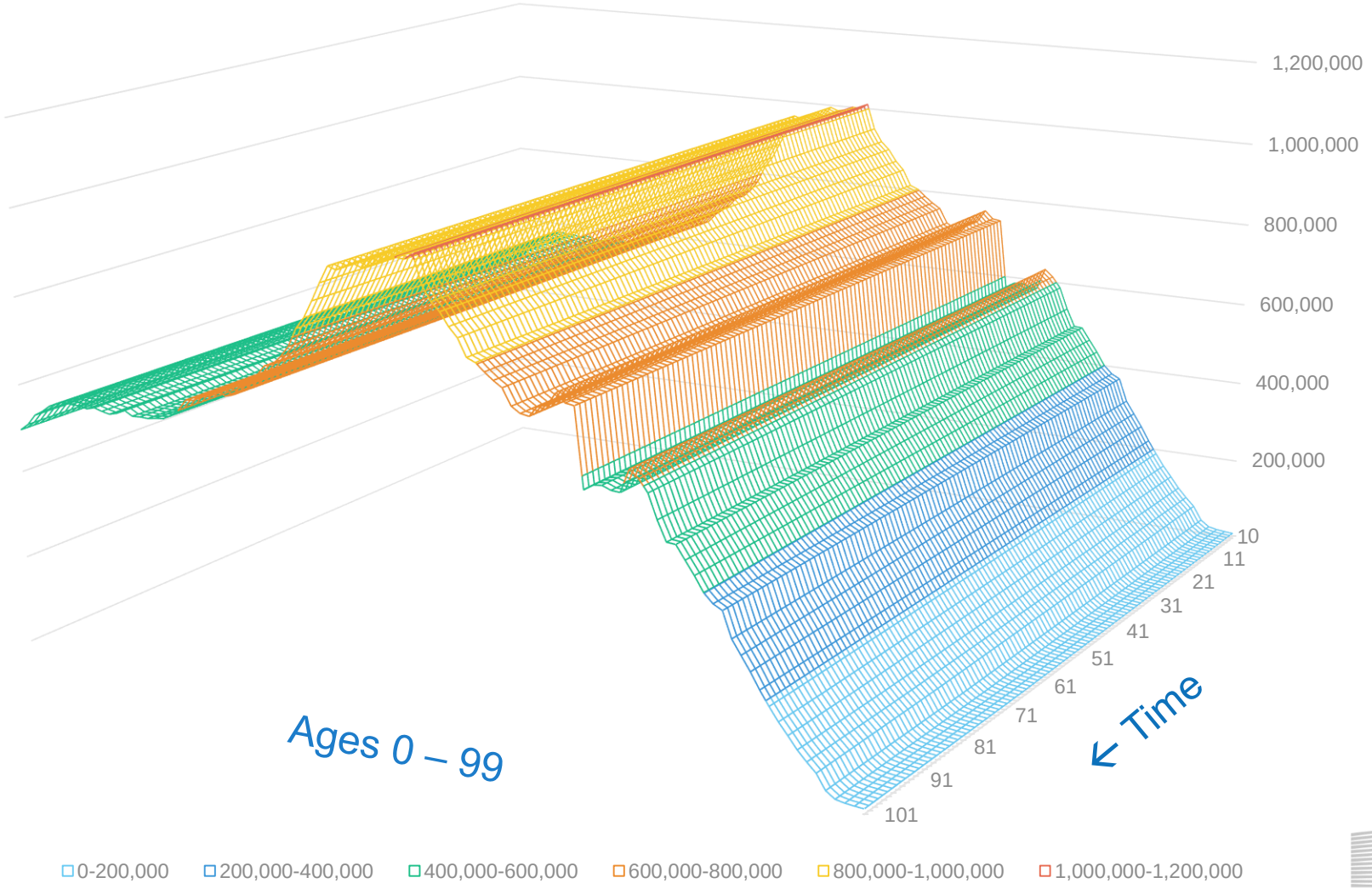
Demographics



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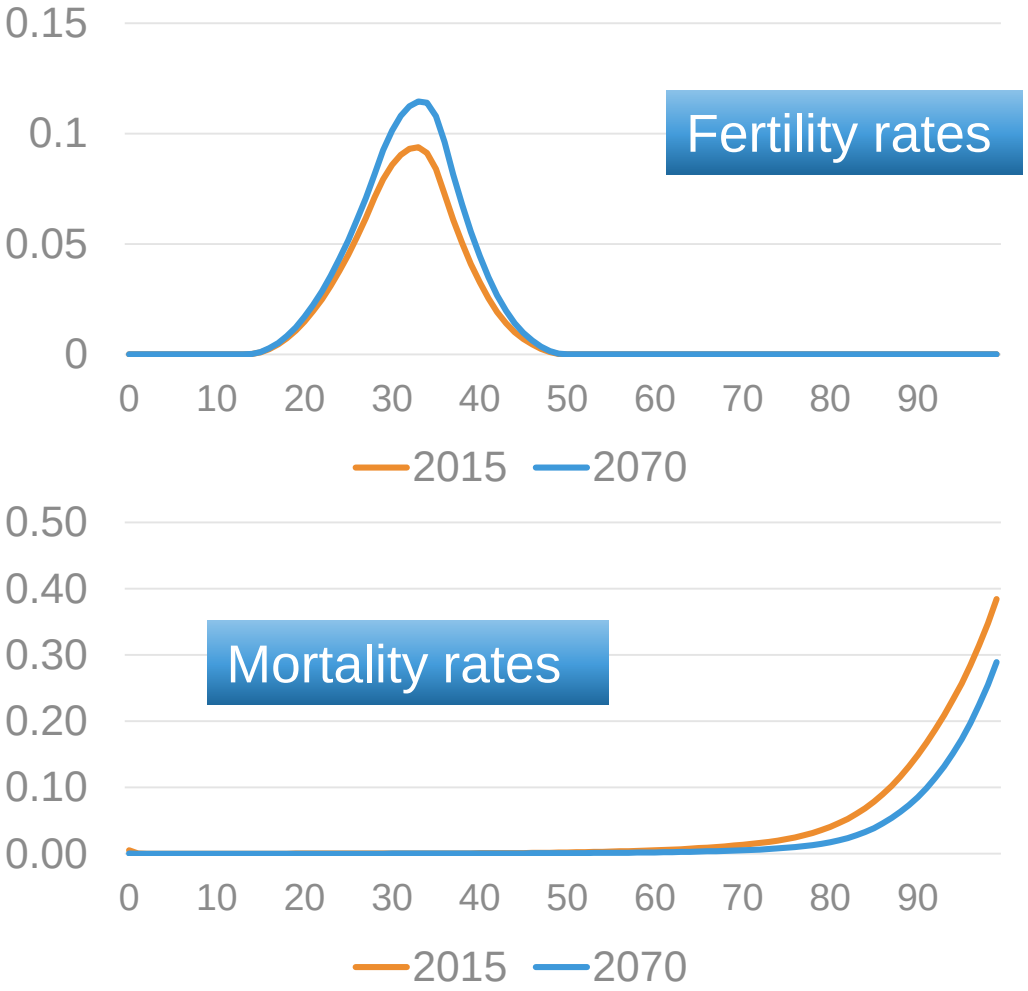
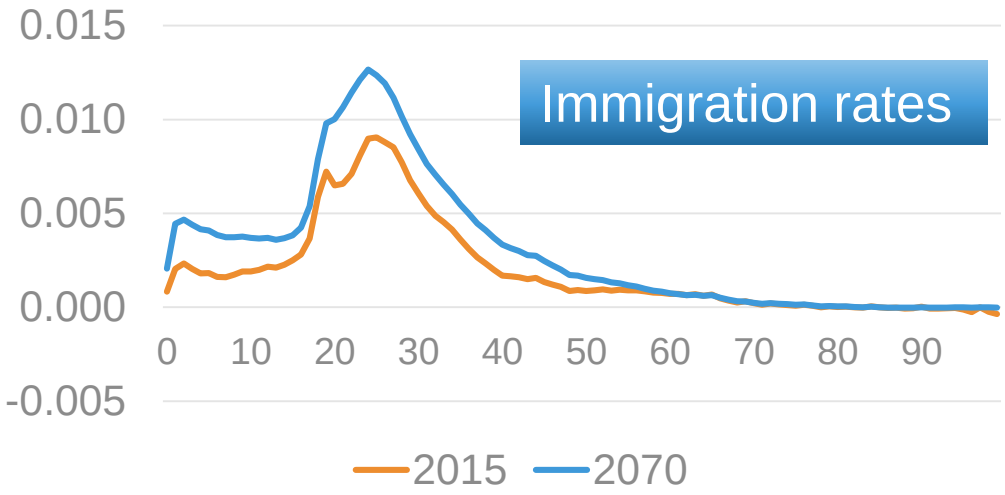
Demographics





Eurostat data & projections
2015 vs 2070

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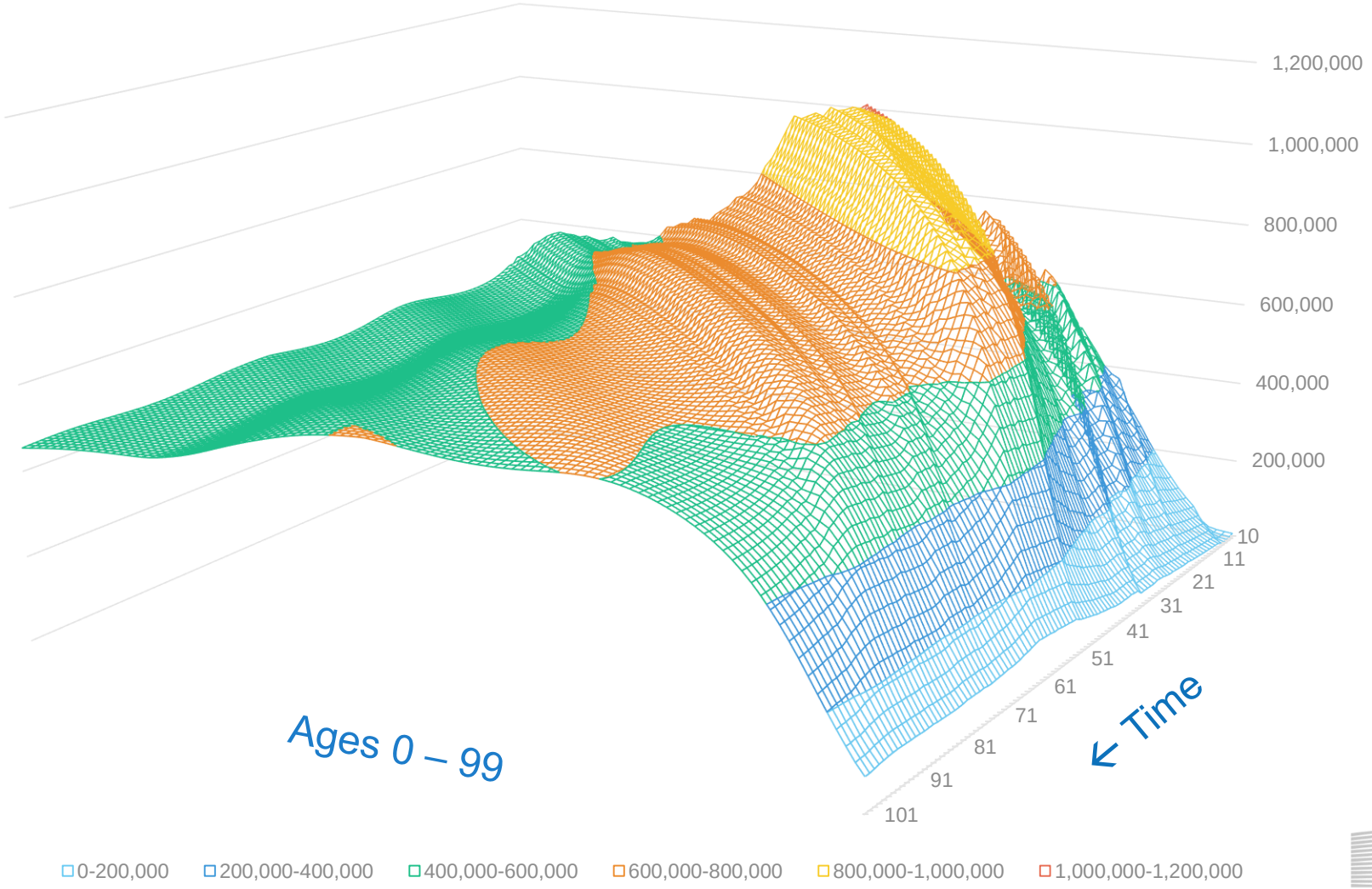
Demographics



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Pension system

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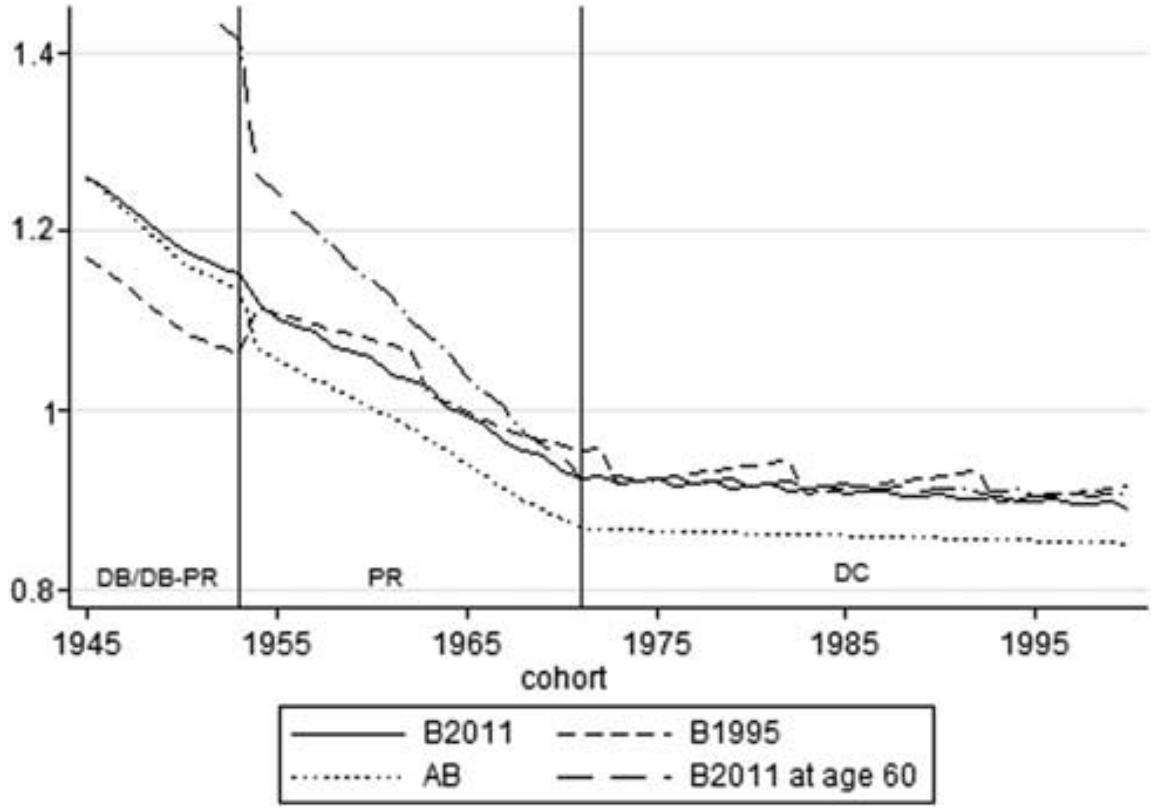
NDC pension system in EDGE-M3(IT)

Monte-Fornero reform (2011): individuals who had more than 18 years of work in 1995 will have their pension benefits calculated **in line with the notional defined contribution (NDC) scheme**



Source: Belloni, Maccheroni (2013)

Collaboration with Michele Belloni, University of Turin

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NDC system in EDGE-M3(IT)

Annual pension = {social security wealth} x {annuity factor}

SIC pension contributions accrued over work life

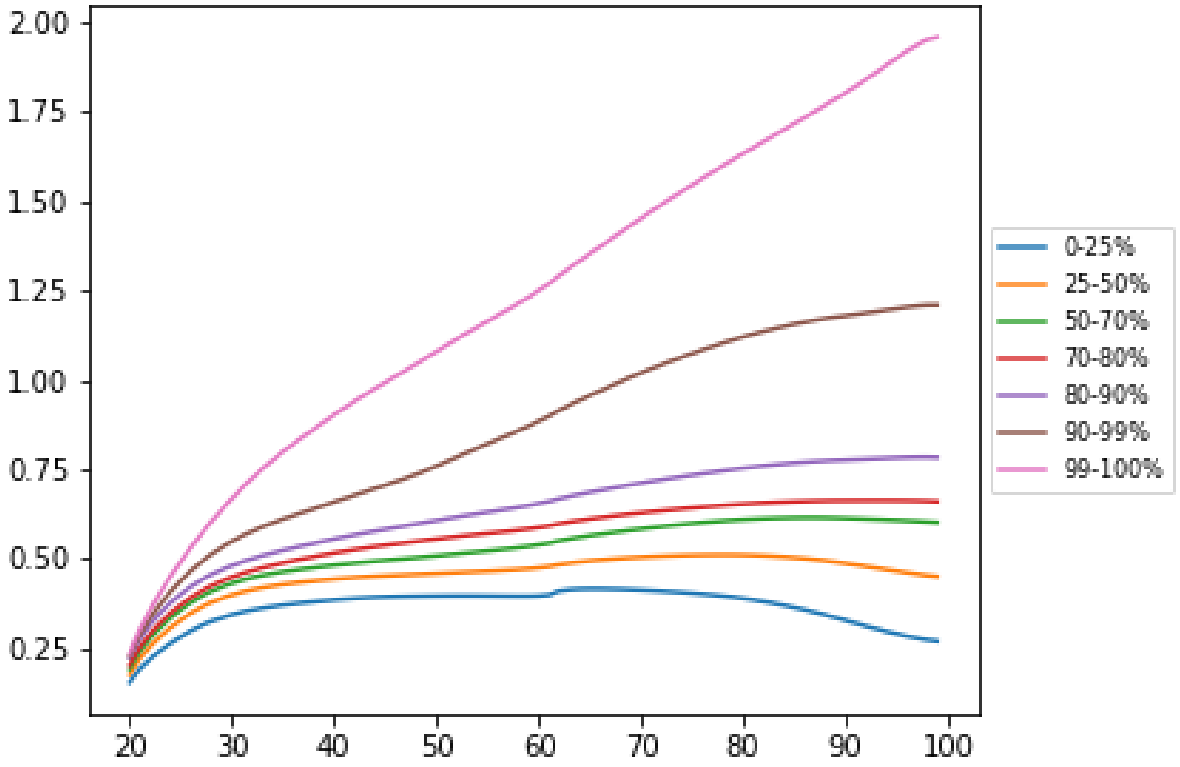
Converts wealth into benefit stream accounting for life expectancy

Scenarios

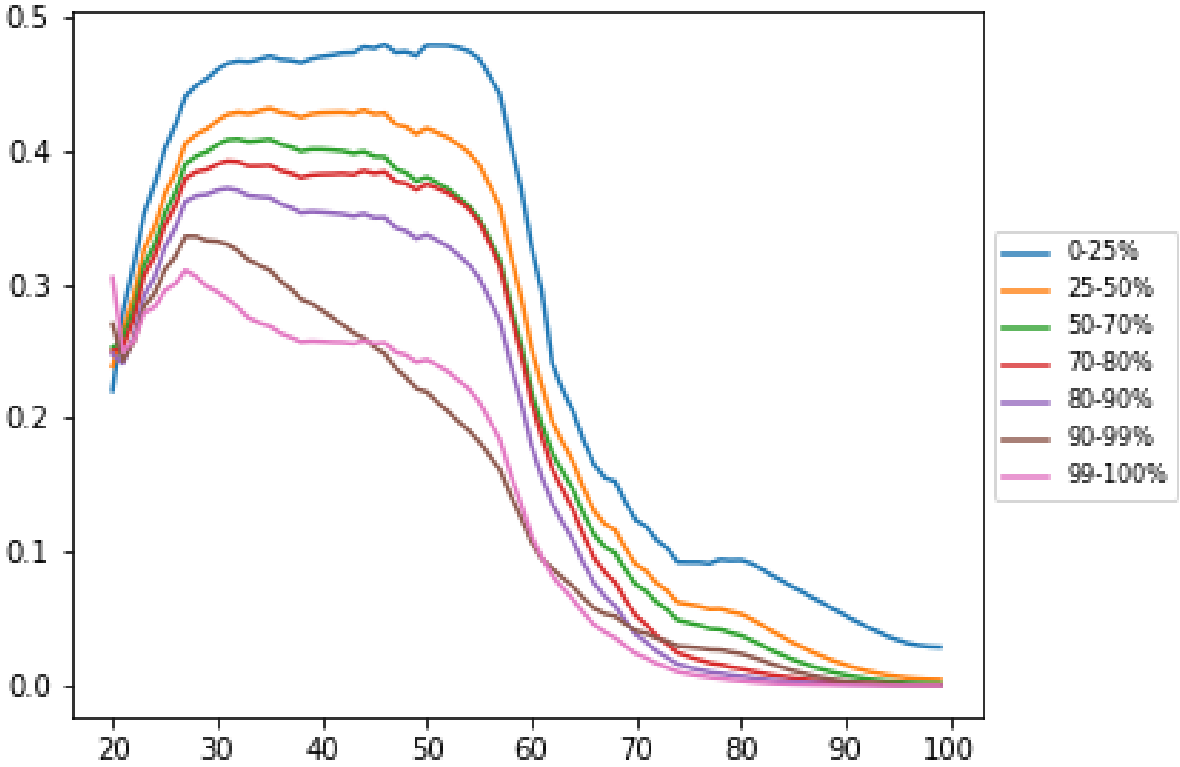
Baseline & simulations

- Baseline: base year demography
- Simulation 1: Eurostat demographic projections
  - How much lower are pensions?
- Simulation 2: Raise retirement age
  - How many years to compensate demographics?

Baseline (base year demography)



Consumption
by age & ability



Labour supply
by age & ability

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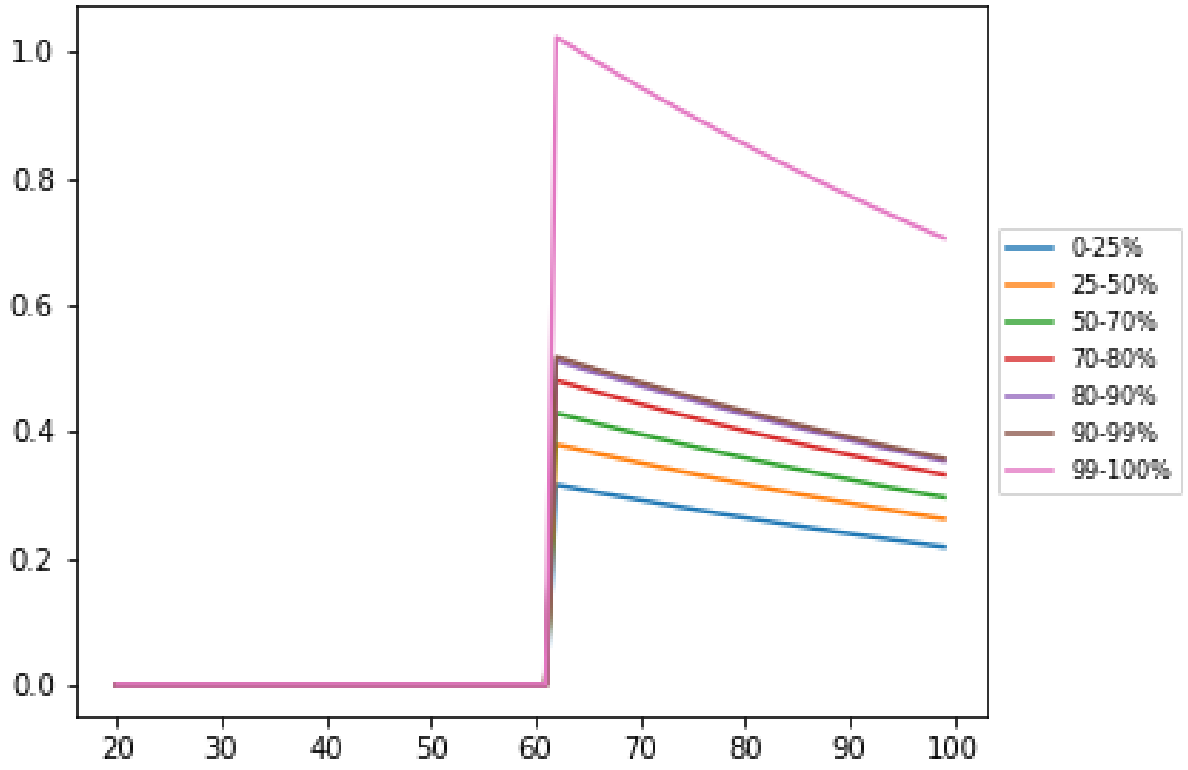
Baseline (base year demography)



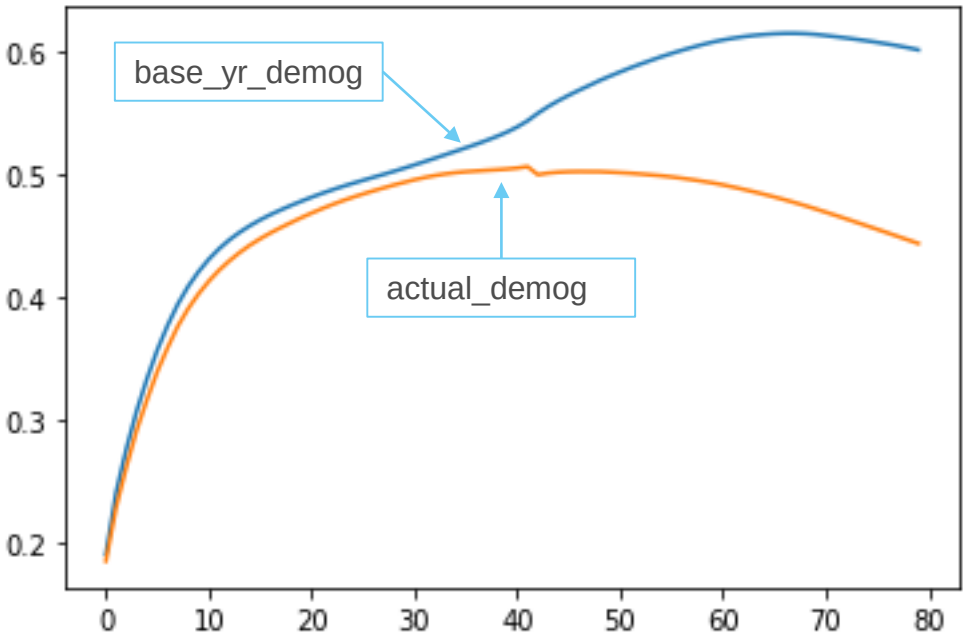
Pensions by age & ability

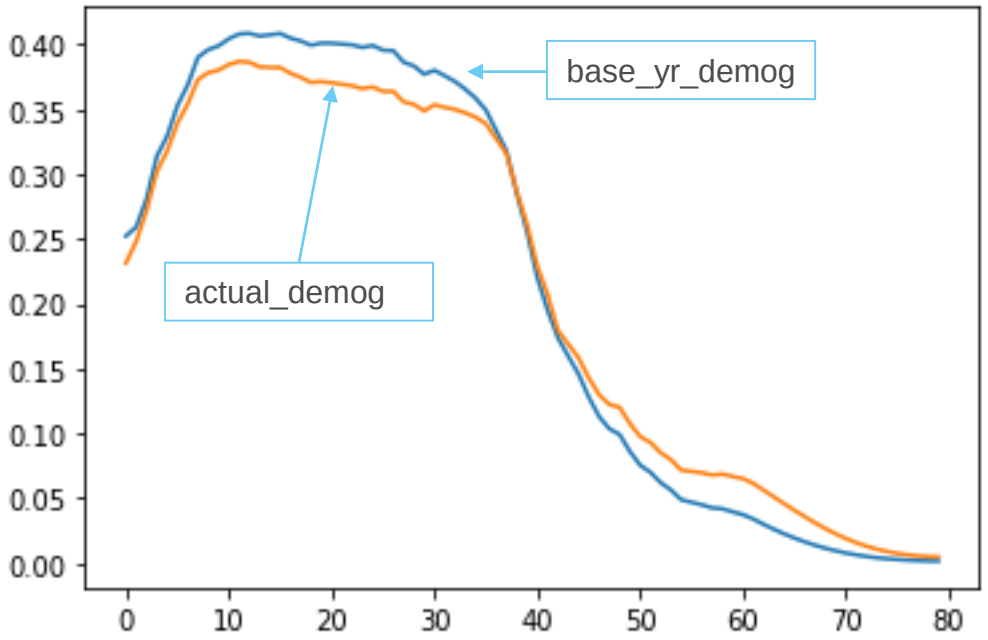
- Falls by age due to rising wages over time - explanation

Results 1: Eurostat demographic projections

Steady state change vs base year demographics	Actual demographic trends (percent change)
Consumption	-7.7
Output	-11.3
Capital	-2.6
Labour	-16.7
Interest rate	-0.8
Wage	6.5
Tax revenue	-11.3
Pension expenditure	12.6

Results 1: Eurostat demographic projections





Consumption (abil3)

falls, esp. older ages

Labour supply (abil3)

falls in main working periods

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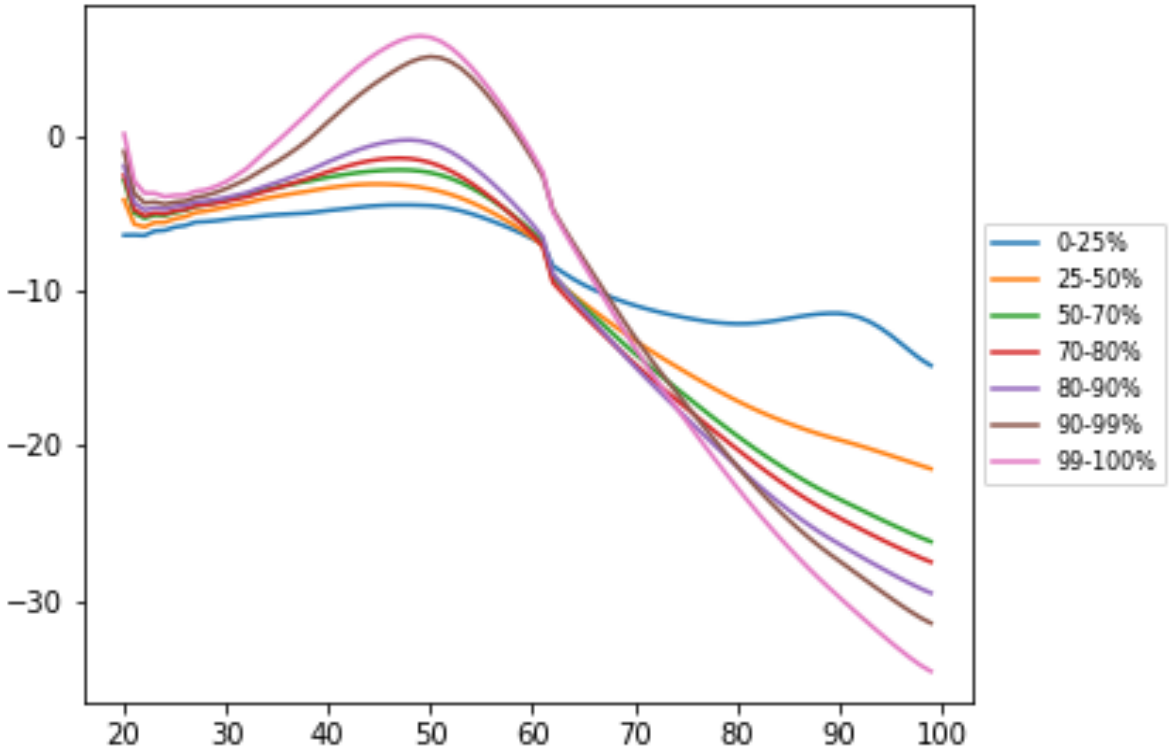
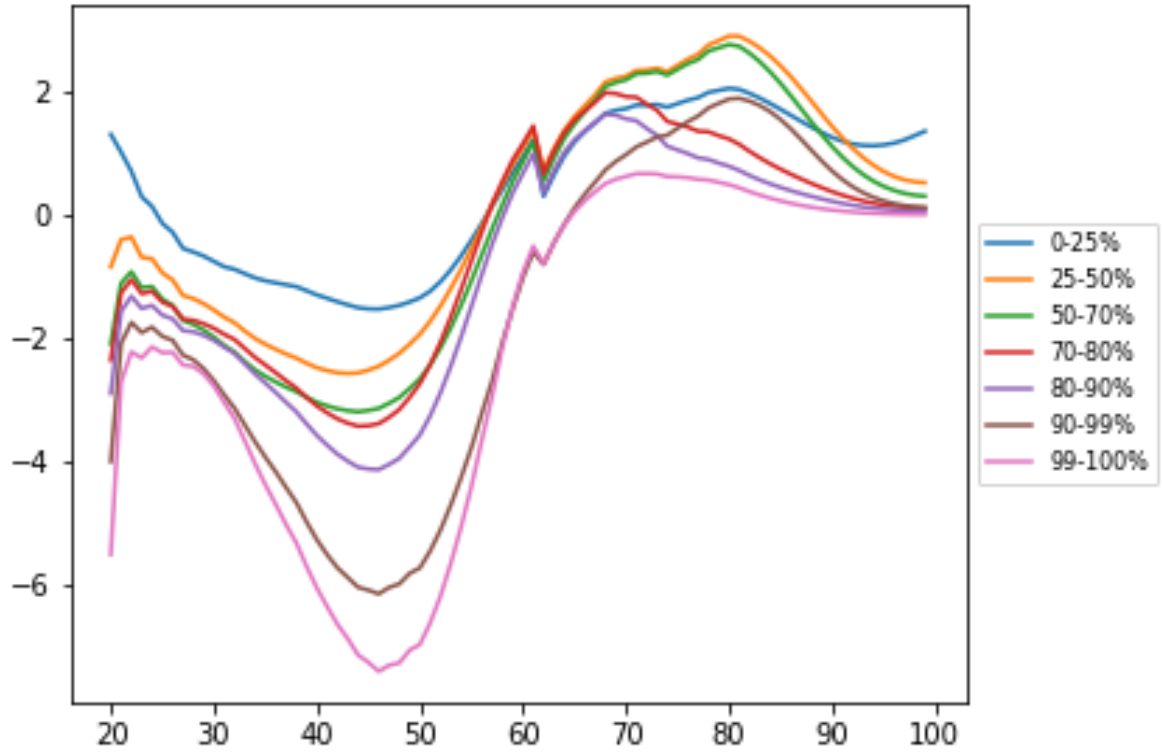
Results 1: Eurostat demographic projections





Consumption

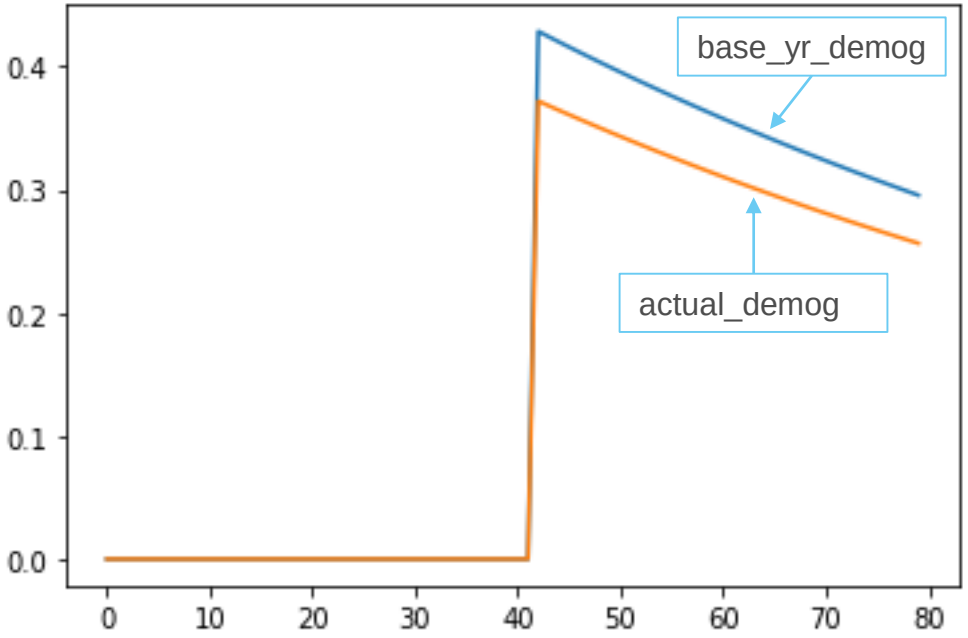
falls, esp. older ages

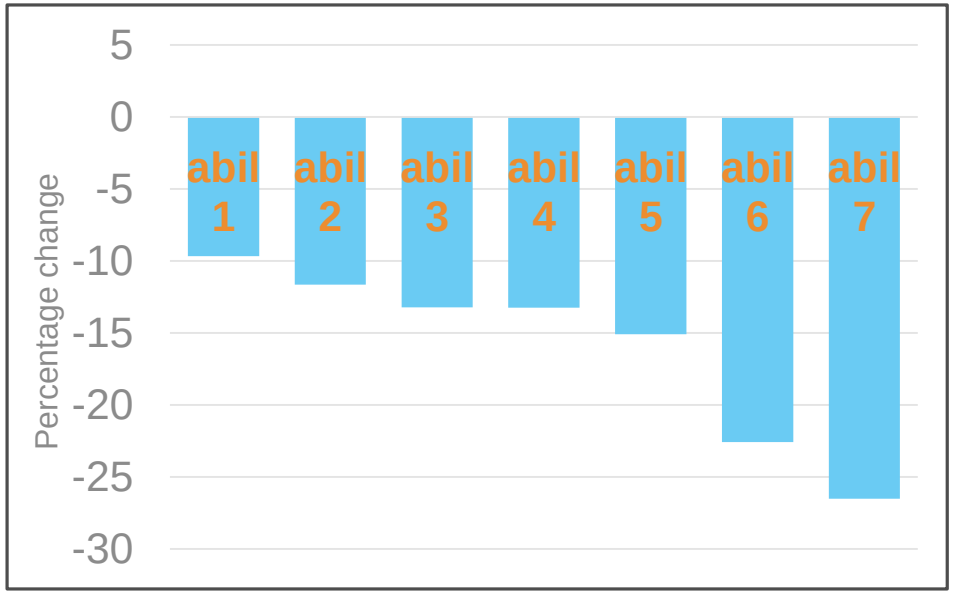
Labour supply

falls in main working periods, less for low ability

European Commission

Results 1: Eurostat demographic projections





Pensions (abil3)

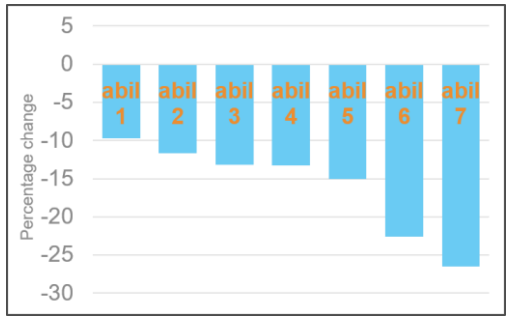
falls by 13 percent

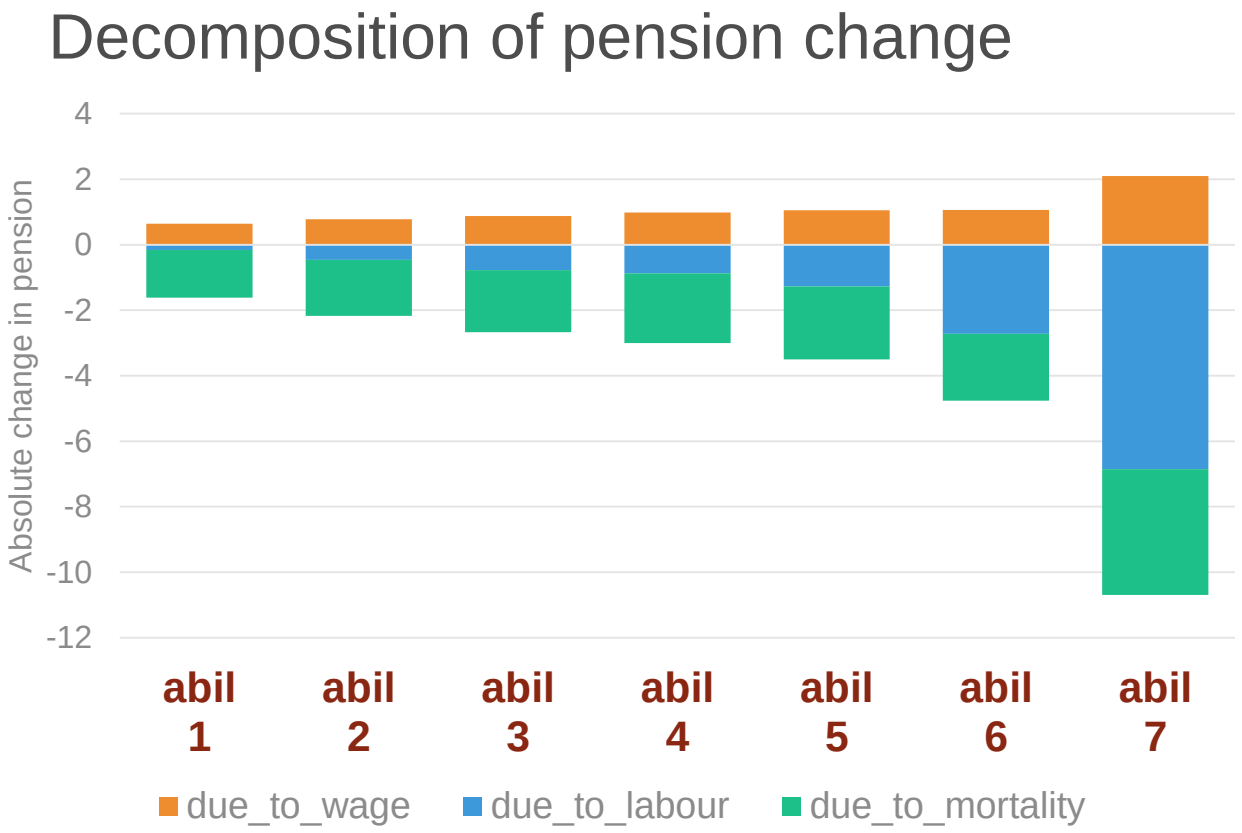
Pensions (all abil)

larger percentage fall for higher ability

European Commission

Results 1: Eurostat demographic projections





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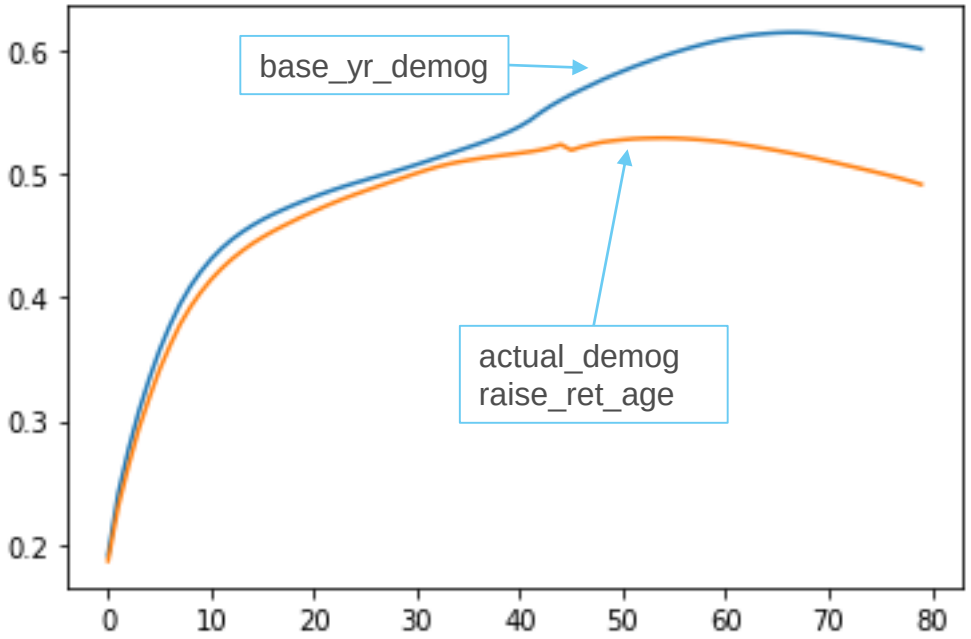
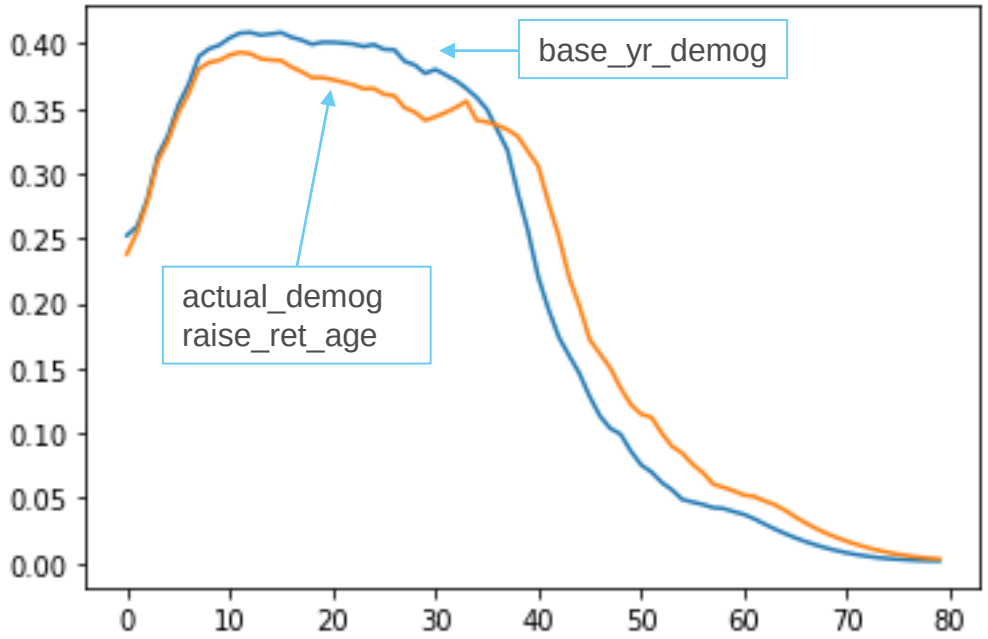
Results 2: Raise retirement age & Eurostat demographic projections

Steady state change vs base year demographics	Actual demographic trends (percent change)	Actual demographic trends + raise retirement age by 3 years (percent change)
Consumption	-7.7	-4.5
Output	-11.3	-8.8
Capital	-2.6	-1.4
Labour	-16.7	-13.4
Interest rate	-0.8	-0.7
Wage	6.5	5.3
Tax revenue	-11.3	-8.6
Pension expenditure	12.6	19.6

Results 2: Raise retirement age
& Eurostat demographic projections





Consumption (abil3)

falls, esp. older ages
(but less)

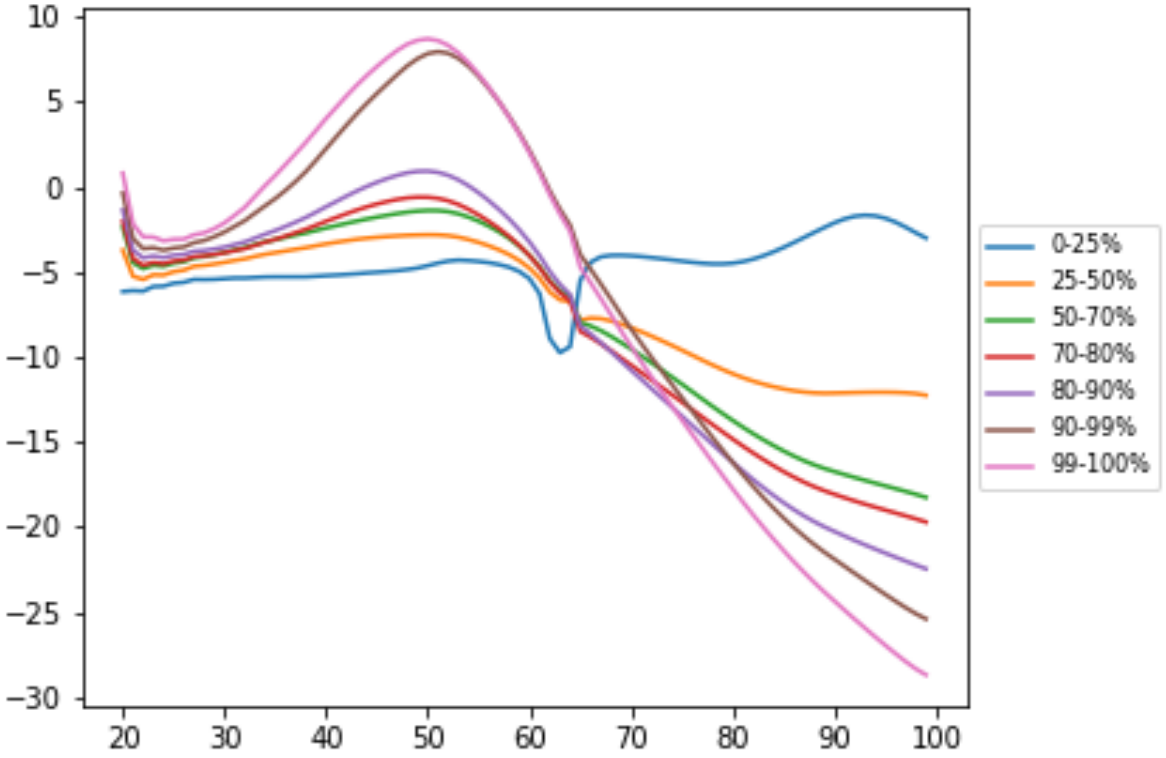
Labour supply (abil3)

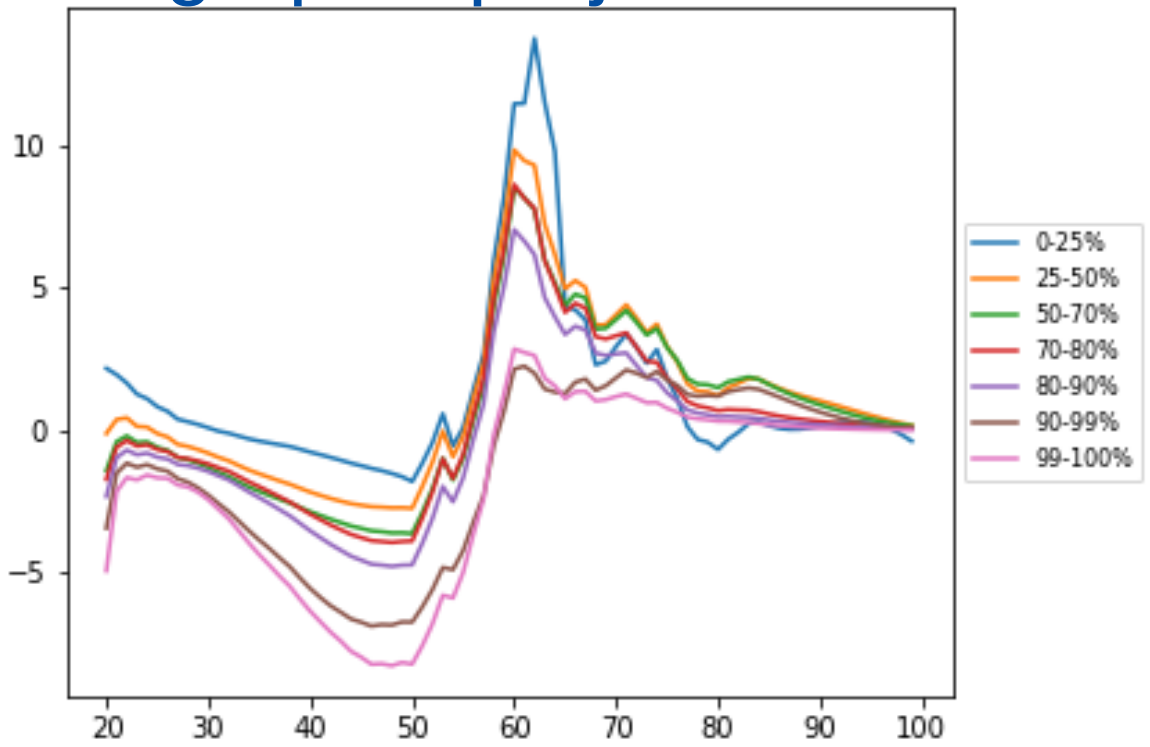
falls in main working periods,
main working period extended

European Commission

Results 2: Raise retirement age

& Eurostat demographic projections





Consumption

falls for older ages,
lowest ability type constrained

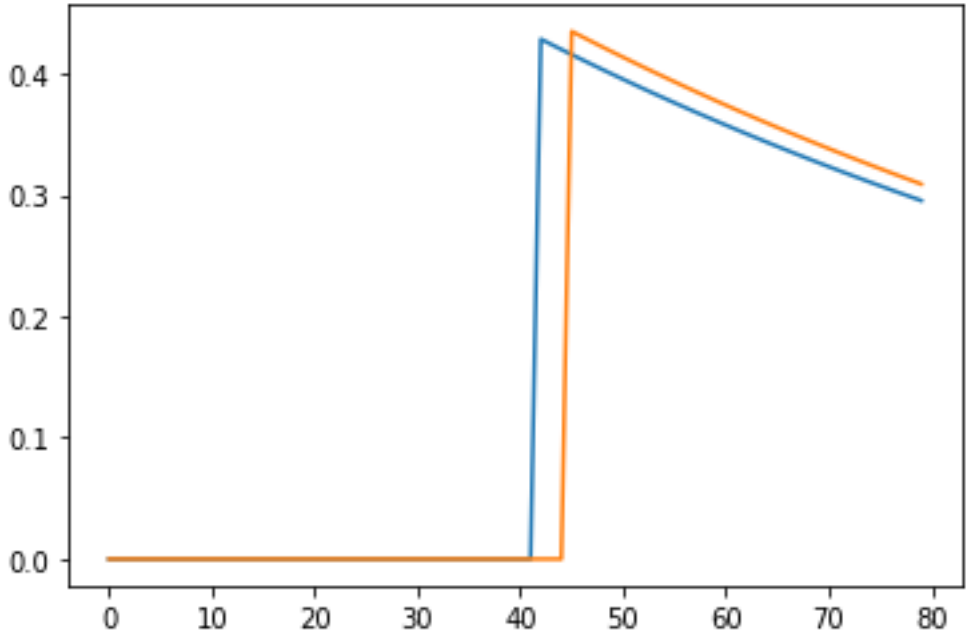
Labour supply

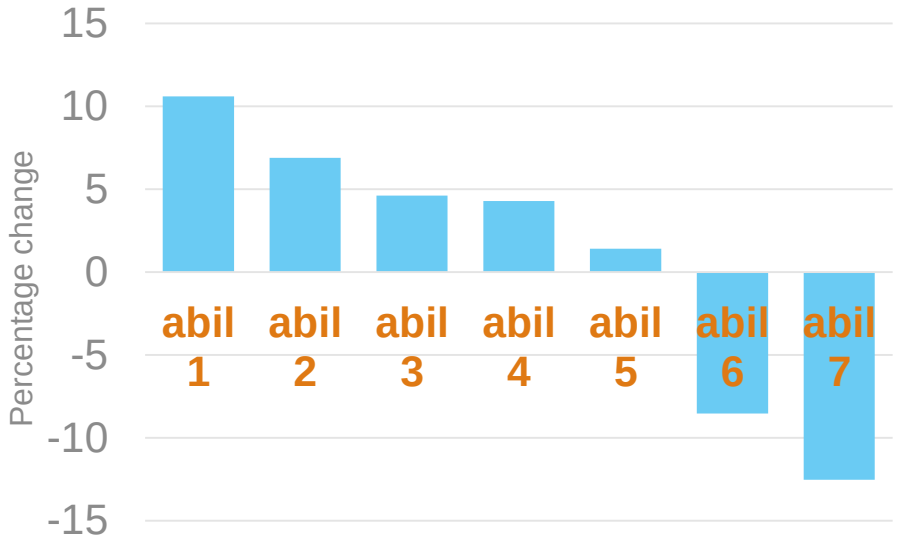
falls in main working periods,
rise in delayed ret. years (age 62-64)

European Commission

Results 2: Raise retirement age

& Eurostat demographic projections





Pensions (abil3)

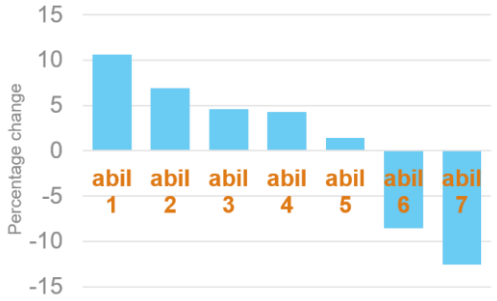
rises by 5 percent for same age

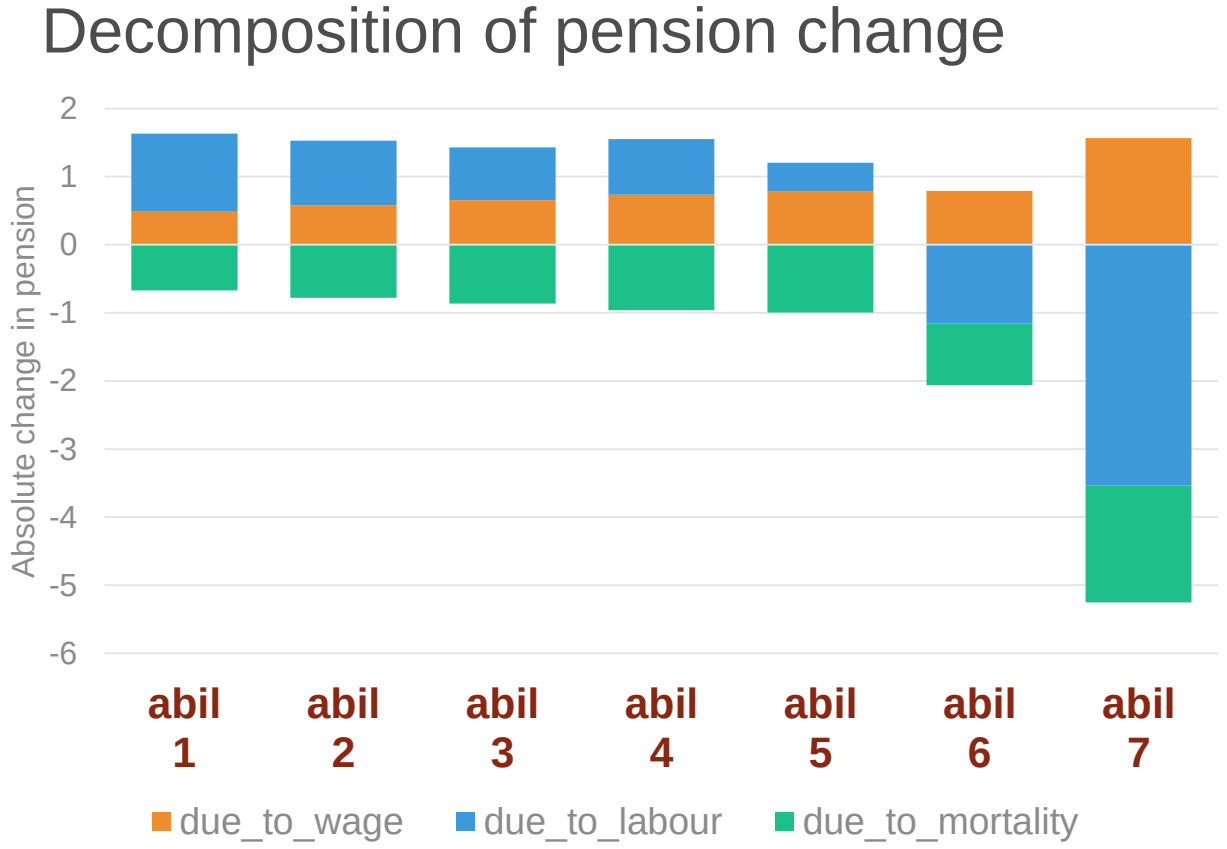
Pensions (all abil)

larger percentage fall for higher ability

European Commission

Results 2: Raise retirement age & Eurostat demographic projections





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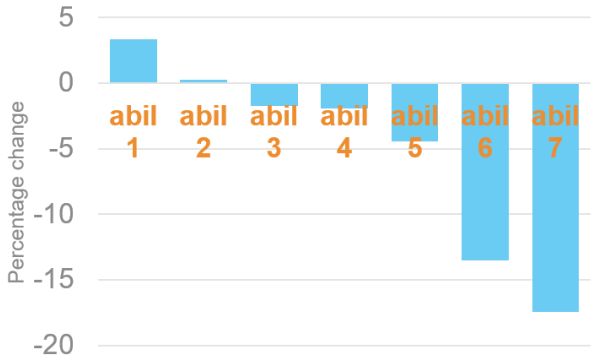
Results 2: Raise retirement age
& Eurostat demographic projections

- How many years to compensate pensions by ability type?

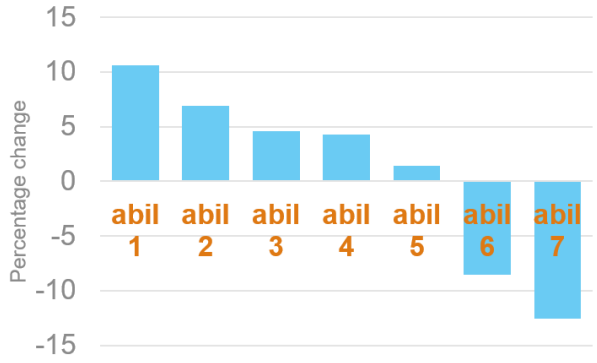
Raise retirement age by …

+2 years



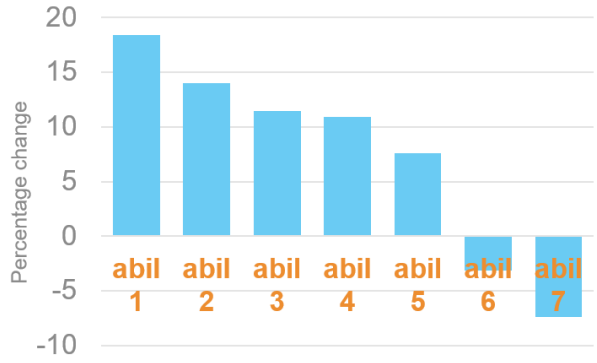
abil 1 & 2

+3 years



abil 3, 4 & 5

+4 years



still **not** abil 6 & 7

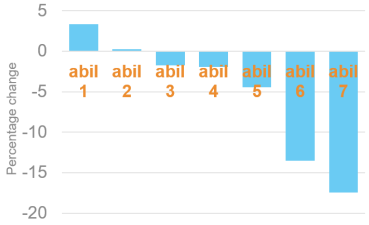
European Commission

Results 2: Raise retirement age
& Eurostat demographic projections

- How many years to compensate pensions by ability type?

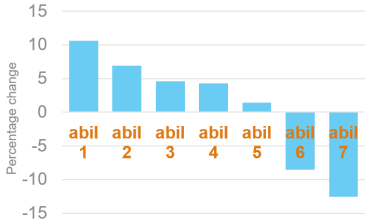
Raise retirement age by …

+2 years



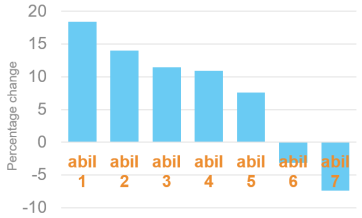
abil 1 & 2

+3 years

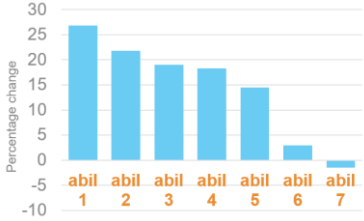


abil 3, 4 & 5

+4 years

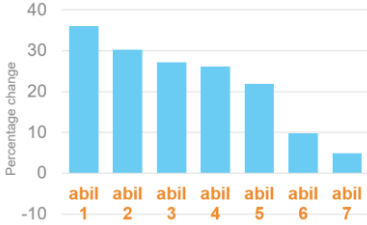


+5 years



abil 6

+6 years



abil 7

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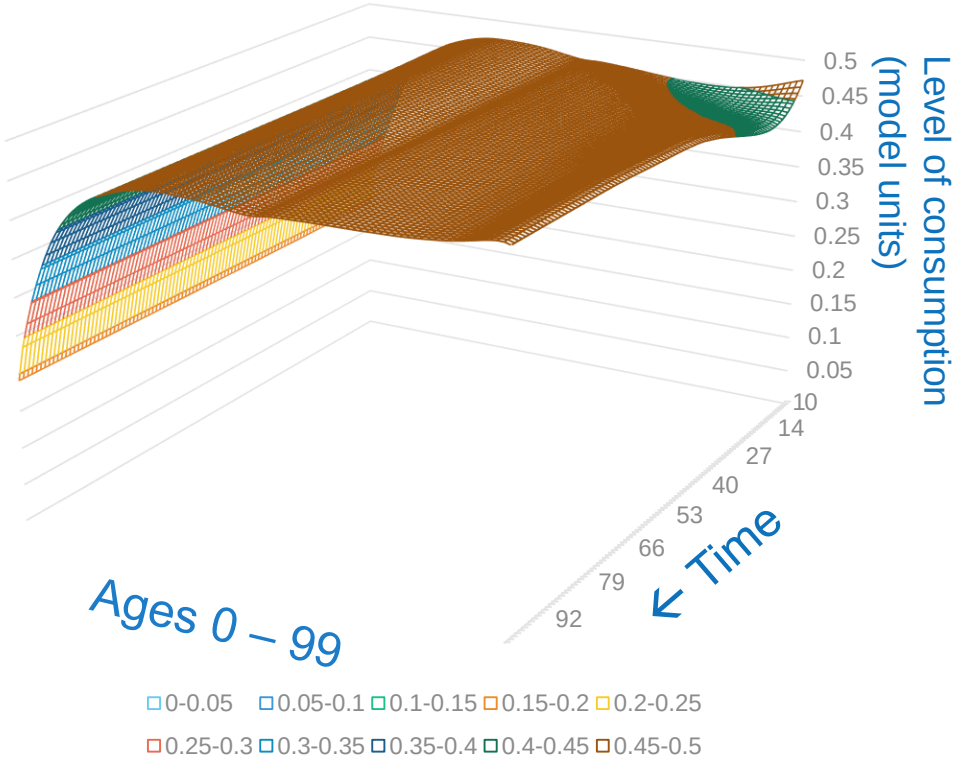
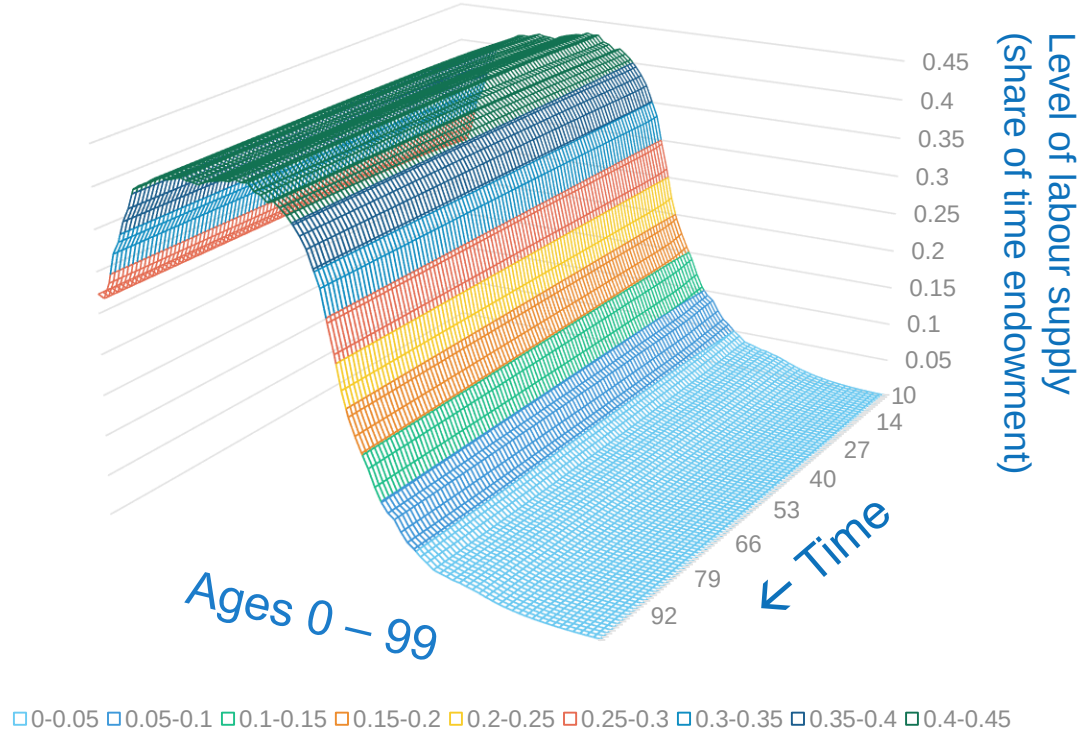
Baseline (base year demography)



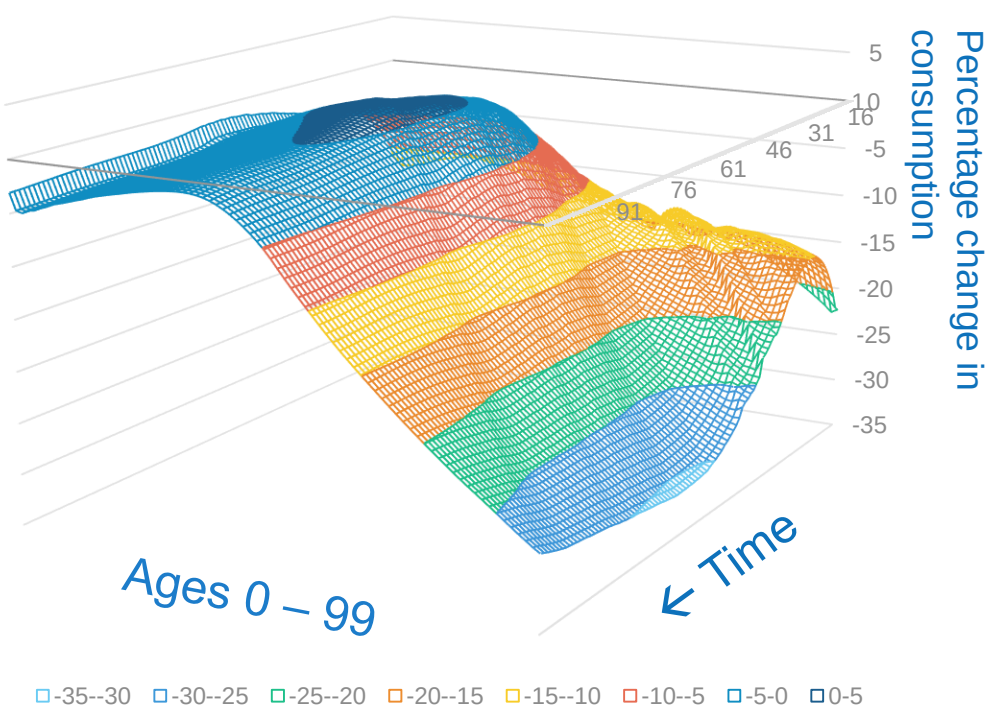


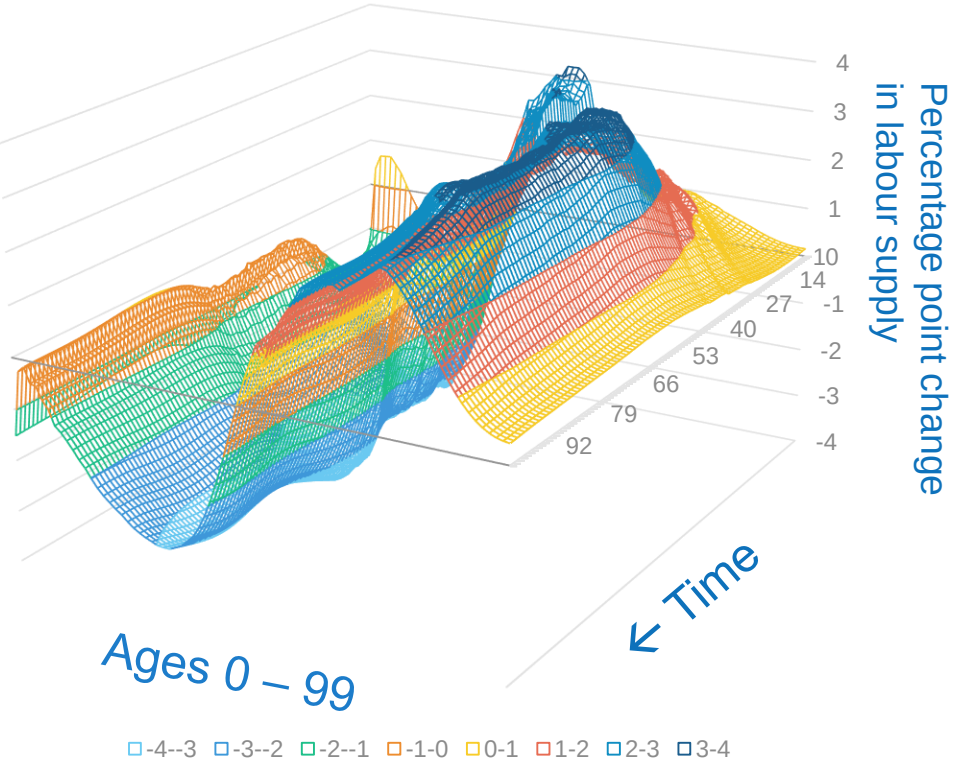
Consumption by age, ability 3

Labour supply by age, ability 3

European Commission

Results 1: Eurostat demographic projections





Consumption

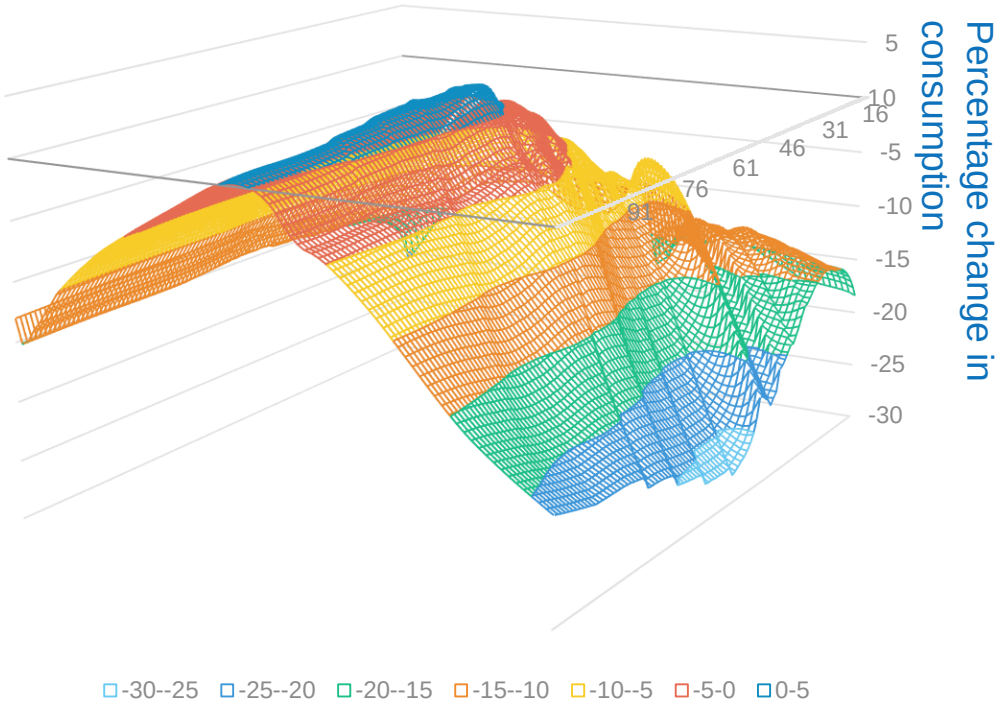
falls, esp. older ages

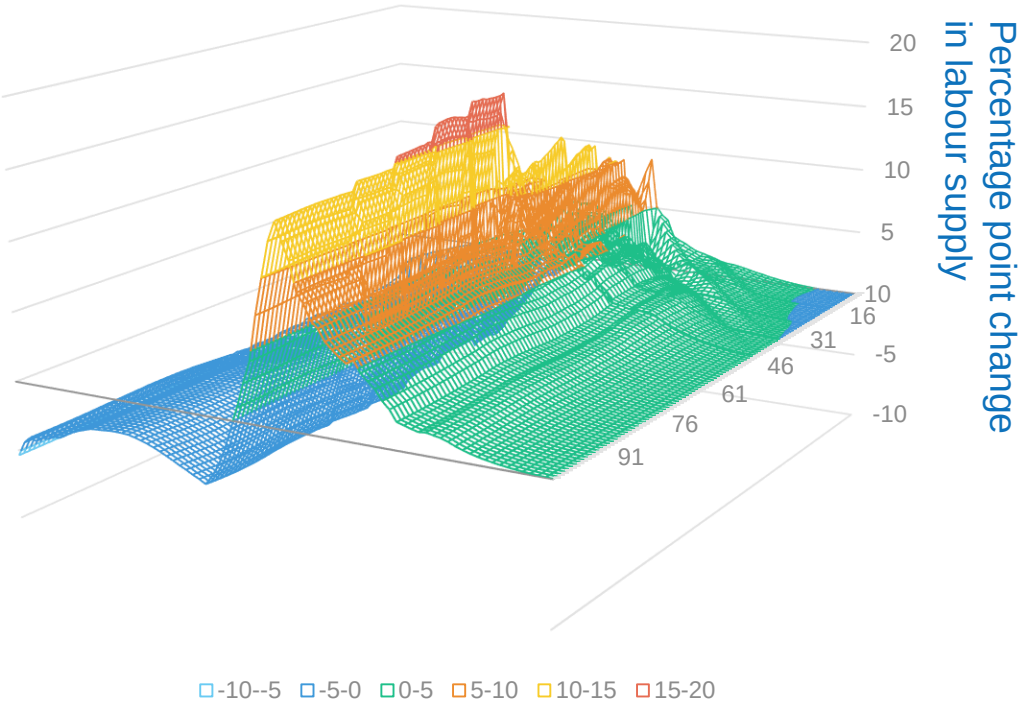
Labour supply

falls in main working periods, rises in older age

European Commission

Results 2: Raise retirement age
& Eurostat demographic projections





Consumption

falls (less), esp. older ages

Labour supply

falls in main working periods,
large rise from delayed retirement

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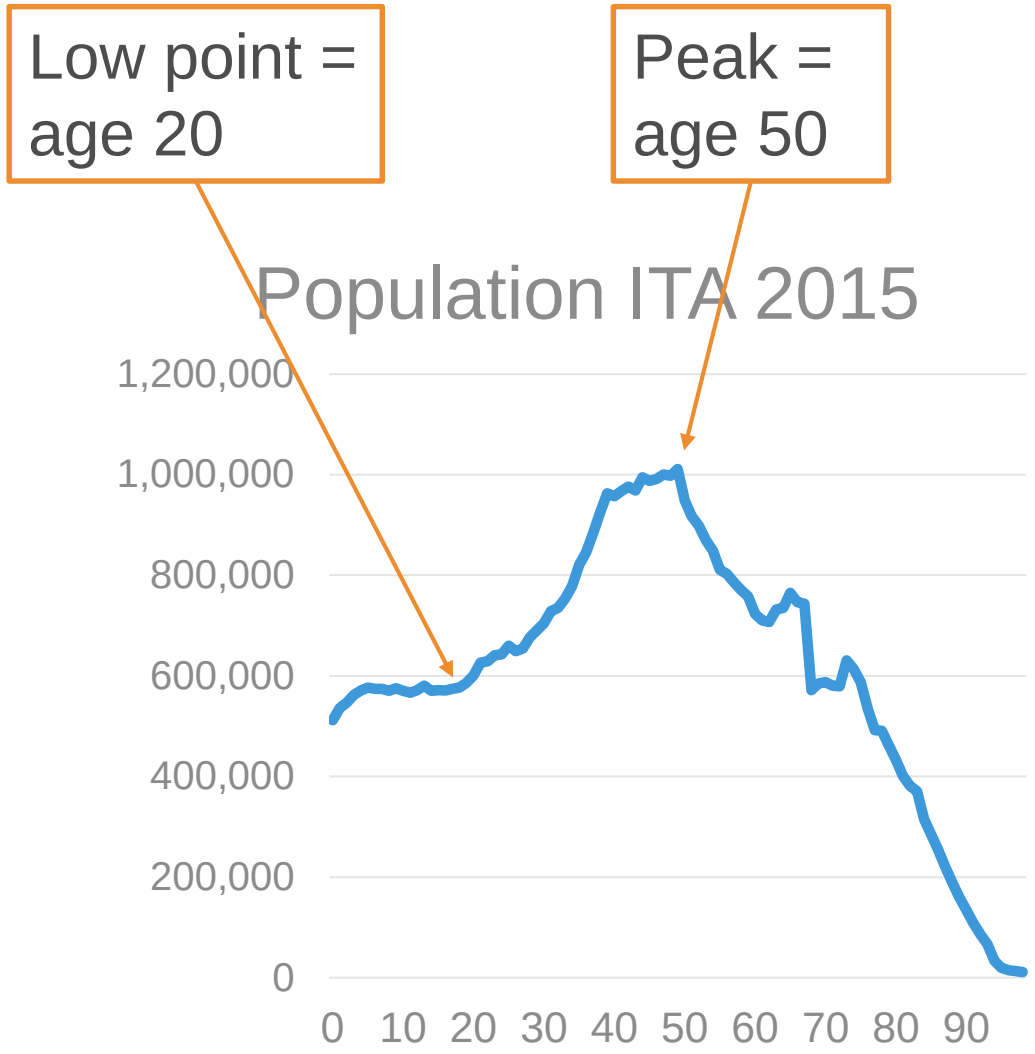
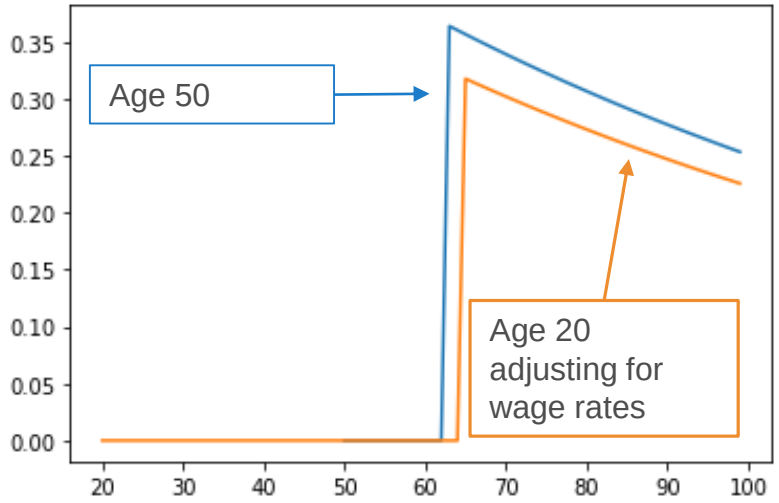
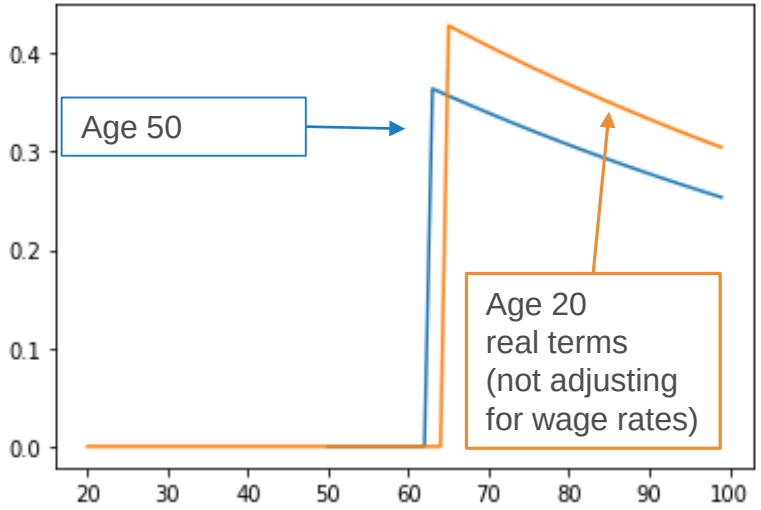
Comparing generations







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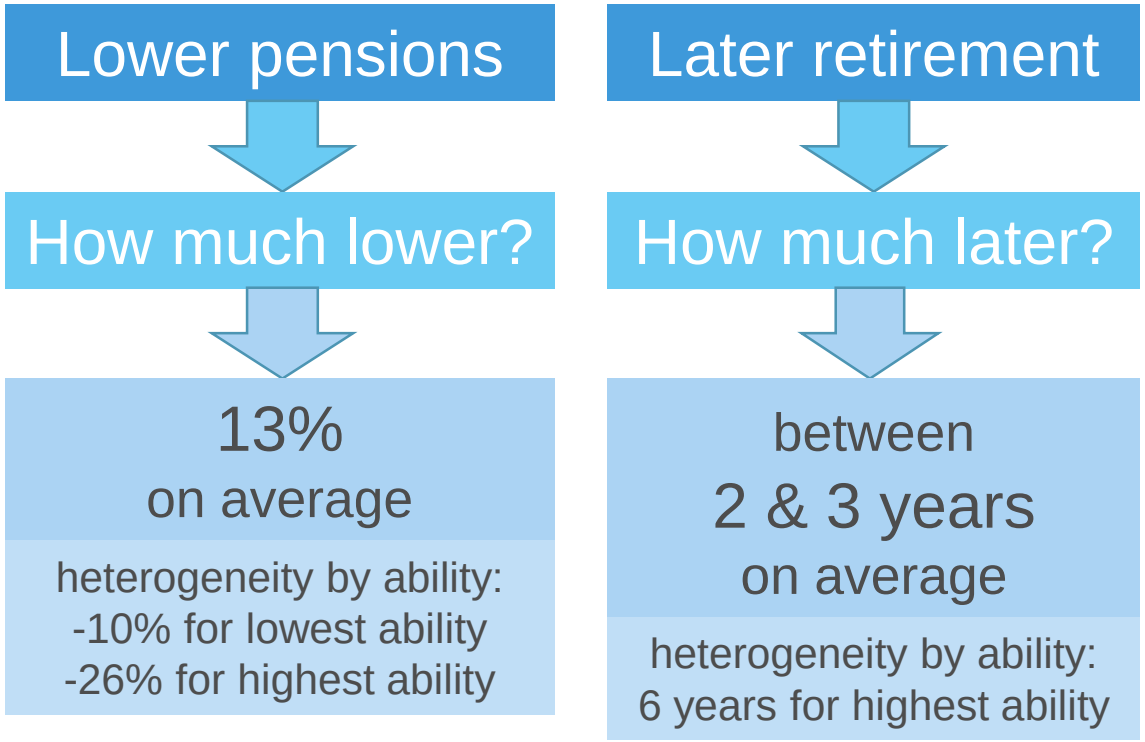
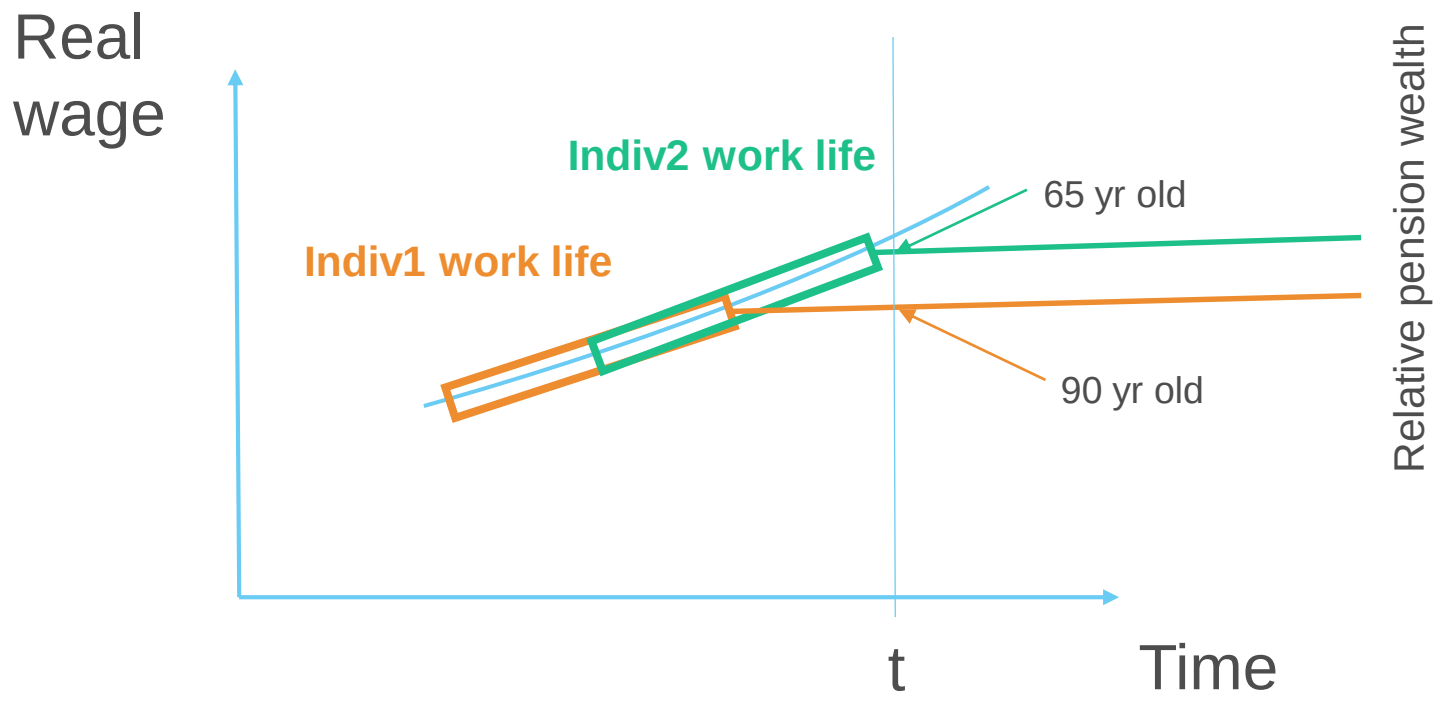
Summary



Extra Slides

Falling pensions in steady state



Keep in touch

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Thank you

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