Improving the fiscal supervision capacity at the Fiscal Council in Slovenia

Introduction of new model framework and examples of use

June 13th 2024

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Agenda

1. Objectives and ambitions.

2. The components of the model framework.

3. Using the framework for fiscal assessment of policy options.

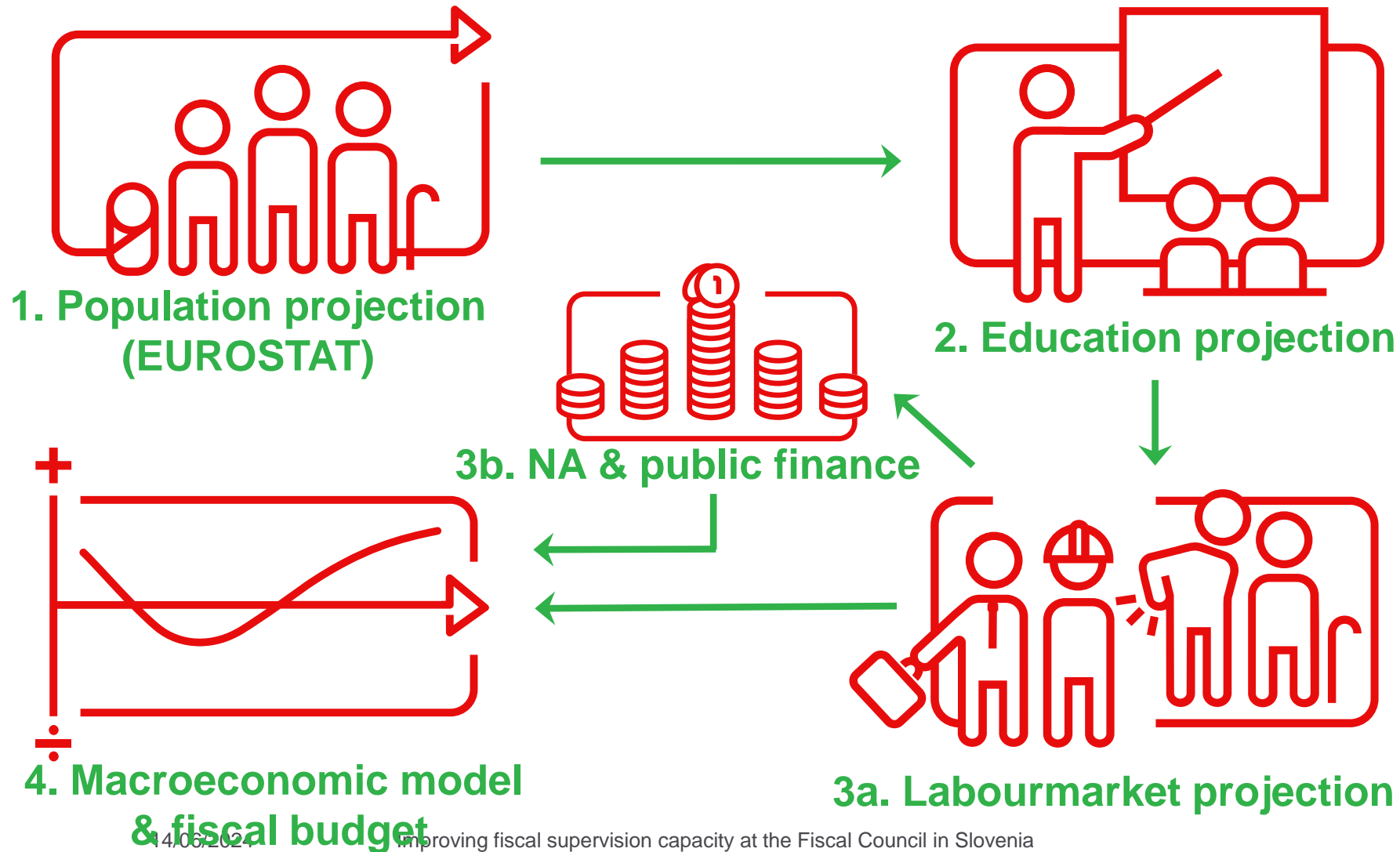4. Lessons learned and future steps.

5. Discussion.

Objectives

- Develop a consistent state-of-the-art model framework / toolbox to improve long-term fiscal supervision.

- Allow for the fiscal assessment of a wide range of policy options, especially the **fiscal challenges related to an ageing population.**

- Capture vital production structures, legislation and institutions of the Slovenian economy.

- The FC should be able to execute marginal experiments evaluating policy options and update model components.

- Complexity should not impair use of framework.

What we ended up with

1. A setup that offers strong options on analyzing the consequences of an ageing population:
   - Focus on the projection of old age and disability pensioners.
   - Transfers to households and individual public consumption.

2. A framework to access reforms that relaxes the fiscal pressure of ageing:
   - Detailed education and labourmarket policy can be assessed.
   - Transfer rates.

3. A framework that captures key structures and legislation of the Slovenian economy.

4. Follow up with the FC regularly during the next year to validate, adjust, and assist with policy experiments.

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Model system overview

1. Population projection (EUROSTAT)

2. Education projection

3b. NA & public finance

3a. Labourmarket projection

4. Macroeconomic model & fiscal budget

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- Sequencial range of models.
- Output from one models serves as input for the next one.
- Demographic models: 1,2, and 3a.
- Macroeconomic model: 4.
- All components can be targeted by policy.

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Education projection

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Main objective and features

Objective

- Distribute future population by gender and age on the level of ongoing (enrollment) and highest level of education. Capture changes in cohort-behaviour to be used in labour projection.

Components and method

- The population projection from EUROSTAT (Europop 2023).

- Estimated transition probabilities describing the change in the educational level and student activity for each combination of gender and age.

- Impute futúre in and out migration (only net is available from EUROSTAT) + distribute each flow on ongoing and highest level of education.

- Based on microdata from SORS.

- Cohort/group-based model.

- Transition probabilities are cohort-specific, but estimated on microdata.

- Policy changes are applied to probabilities.

- Few data years are available → no trends in transitions.

Education levels

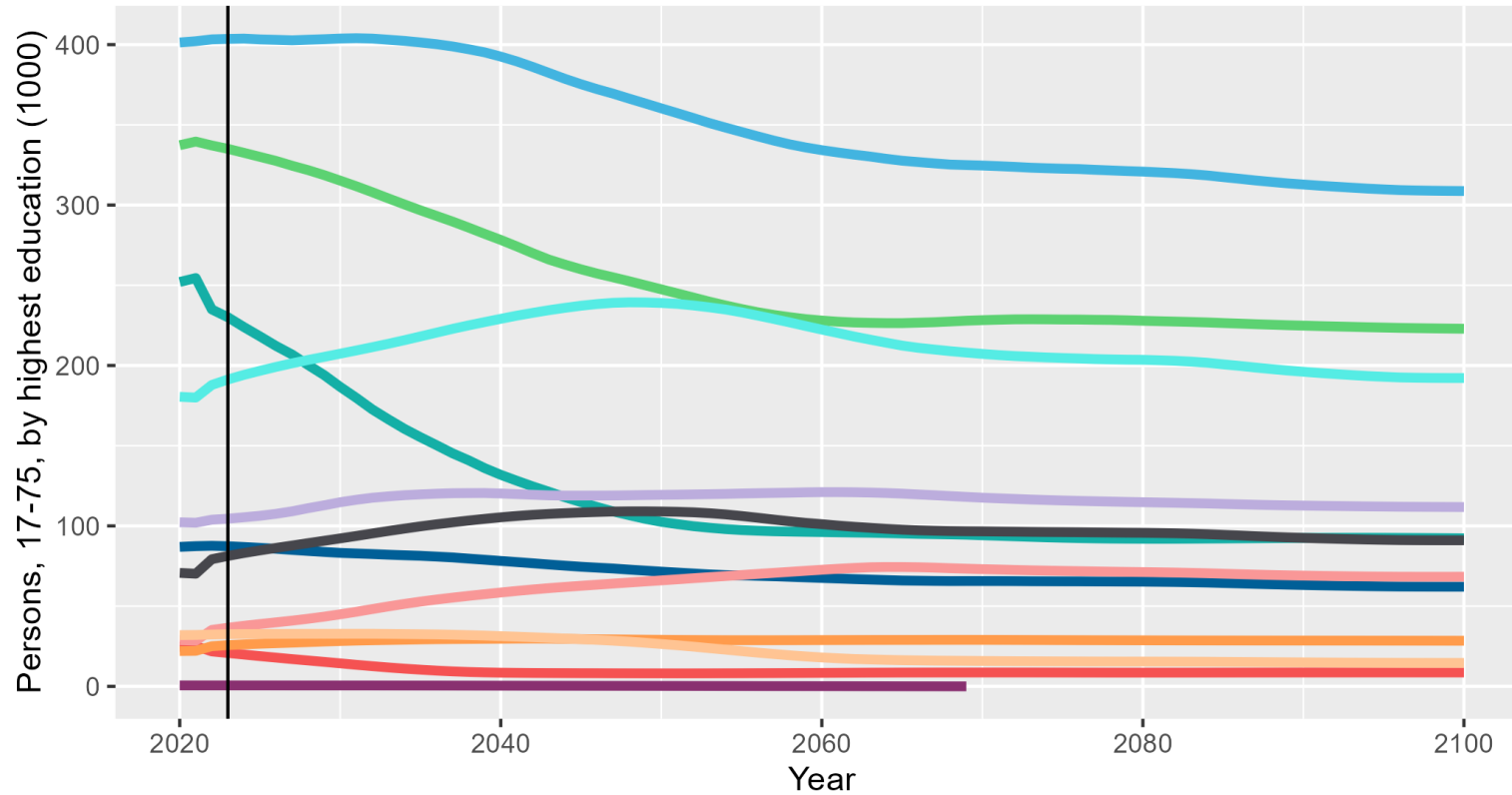| Labour projection	Education projection
Unknown	Unknown
Basic	Basic
	Basic lower Secondary
Upper Secondary	Short Vocational Upper Secondary
	Vocational Upper Secaondary
	Technical Upper Secondary
	General Upper Secondary
Undergraduate	Short Higher Vocational
	Professional Higher
	Academic Higher
Graduate	Master 2nd
	Doctorate

- 12 groups in education projection is aggregated to 5 education levels
- Each of the 5 education levels is assumed to have a different labor market affiliation

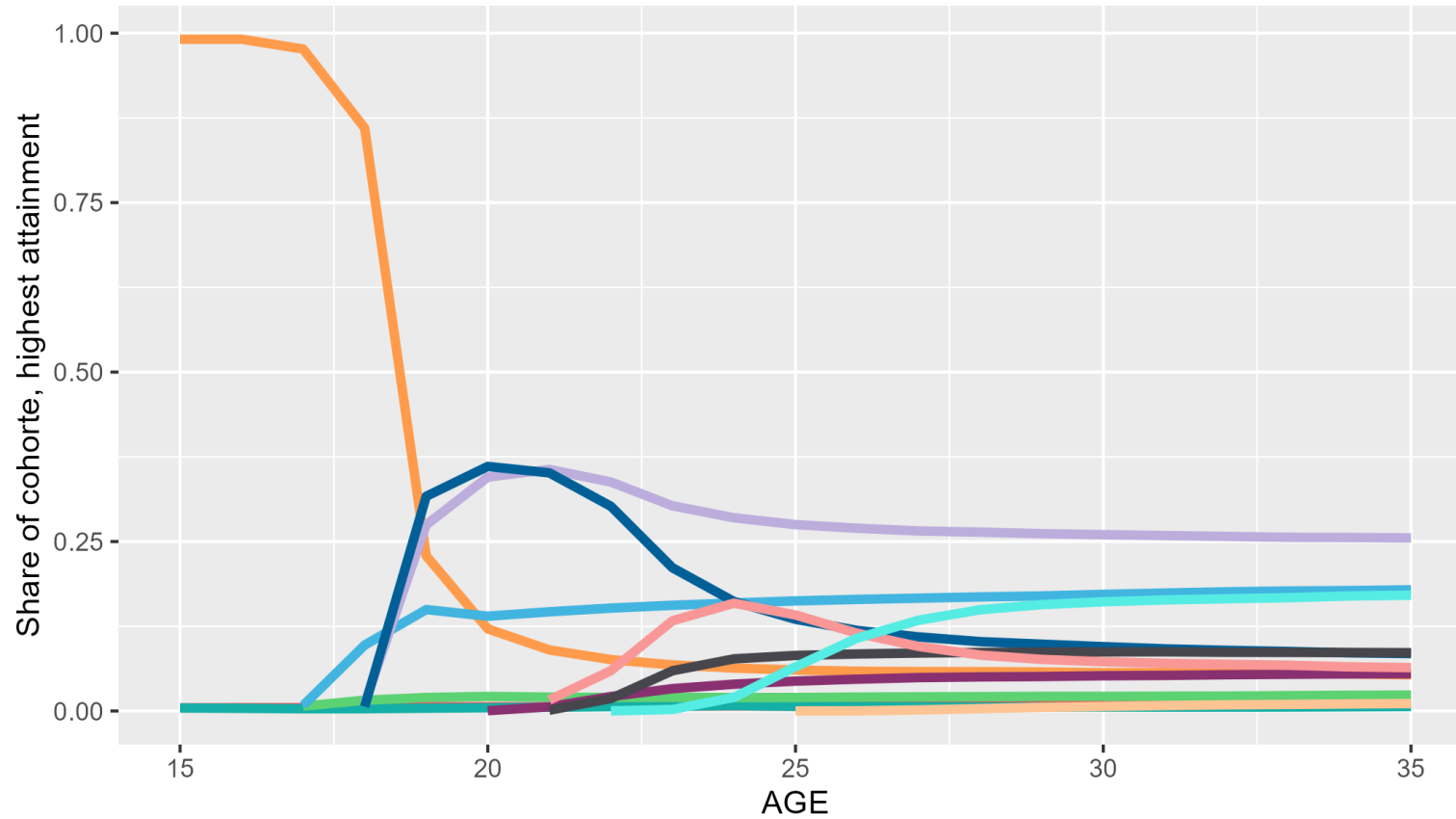# Projected population by ongoing education type
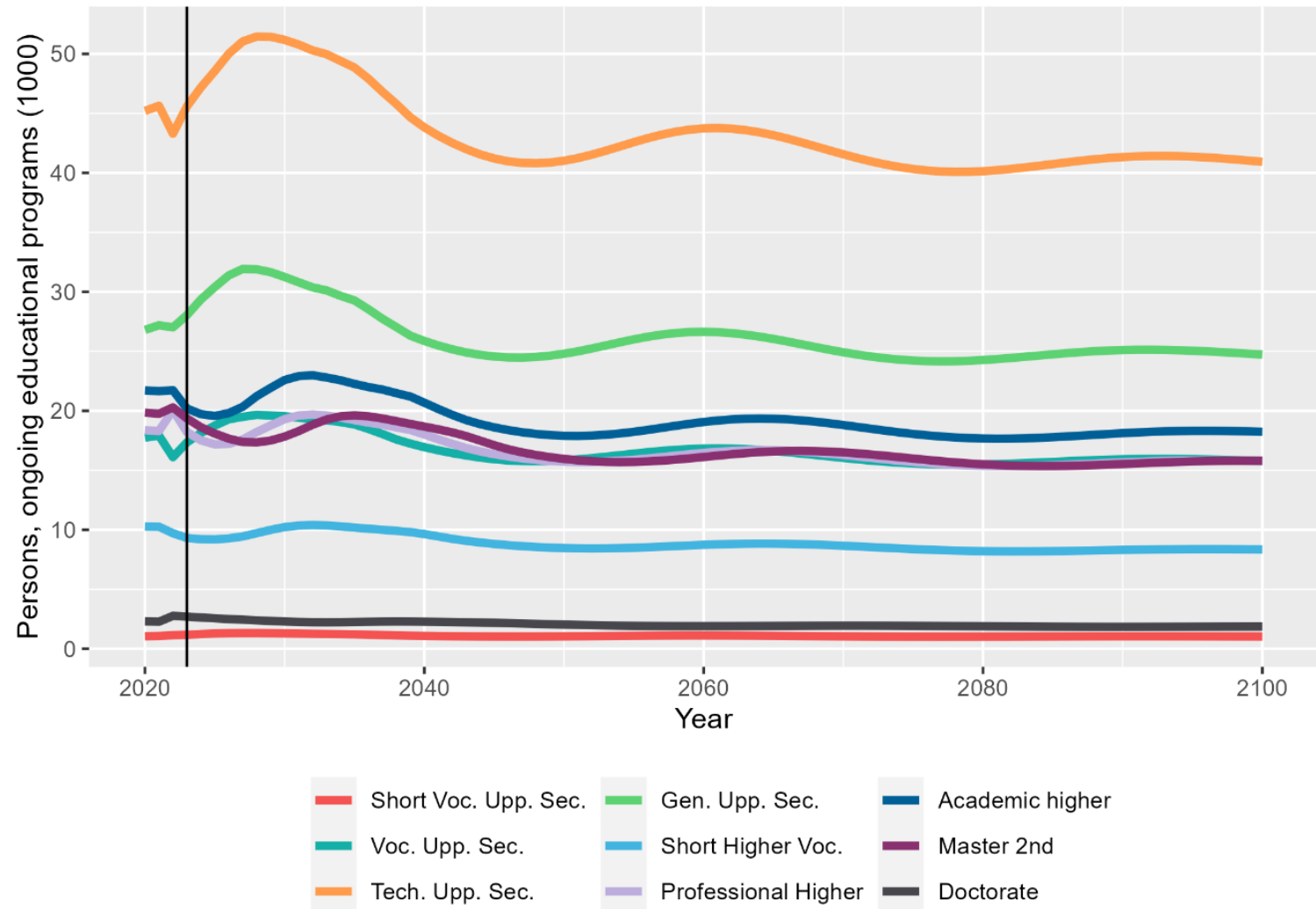
- Technical and general upper secondary most popular.

Projected population by highest level of education
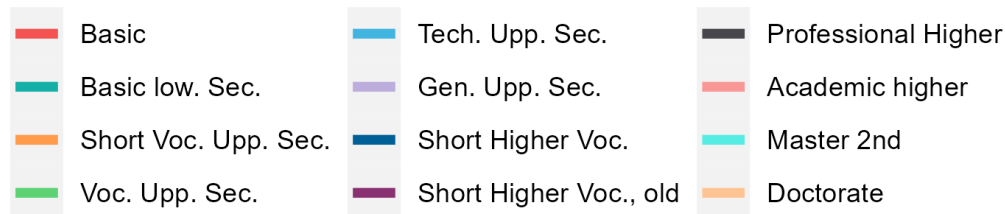
Cohort education structure

- Following a cohort over time.

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Labourmarket projection

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Main objective and features

Objective

- Distribute future population by gender, age, and highest level of education on labourmarket status.

Method

- Participation rates x education projection:

$$N_{g,a,e_h,s,t} = freq_{g,a,e_h,s,t} \cdot N_{g,a,e_h,t}$$

→ Embeds positive participation effect of an increasing education level.

- Number of groups: Data, policy relevance, and linkability to transfers from the public budget (recipients vs costs).

- Participation rates derived from micro data on activity and income.

- Cohort/group-based model.

- Exhaustive categorisation: Each individual can only be in one lsbourmarket group at time of reference.

- Policy is applied to participation rates, e.g. changes in the retirement age.

Participation rate by education level
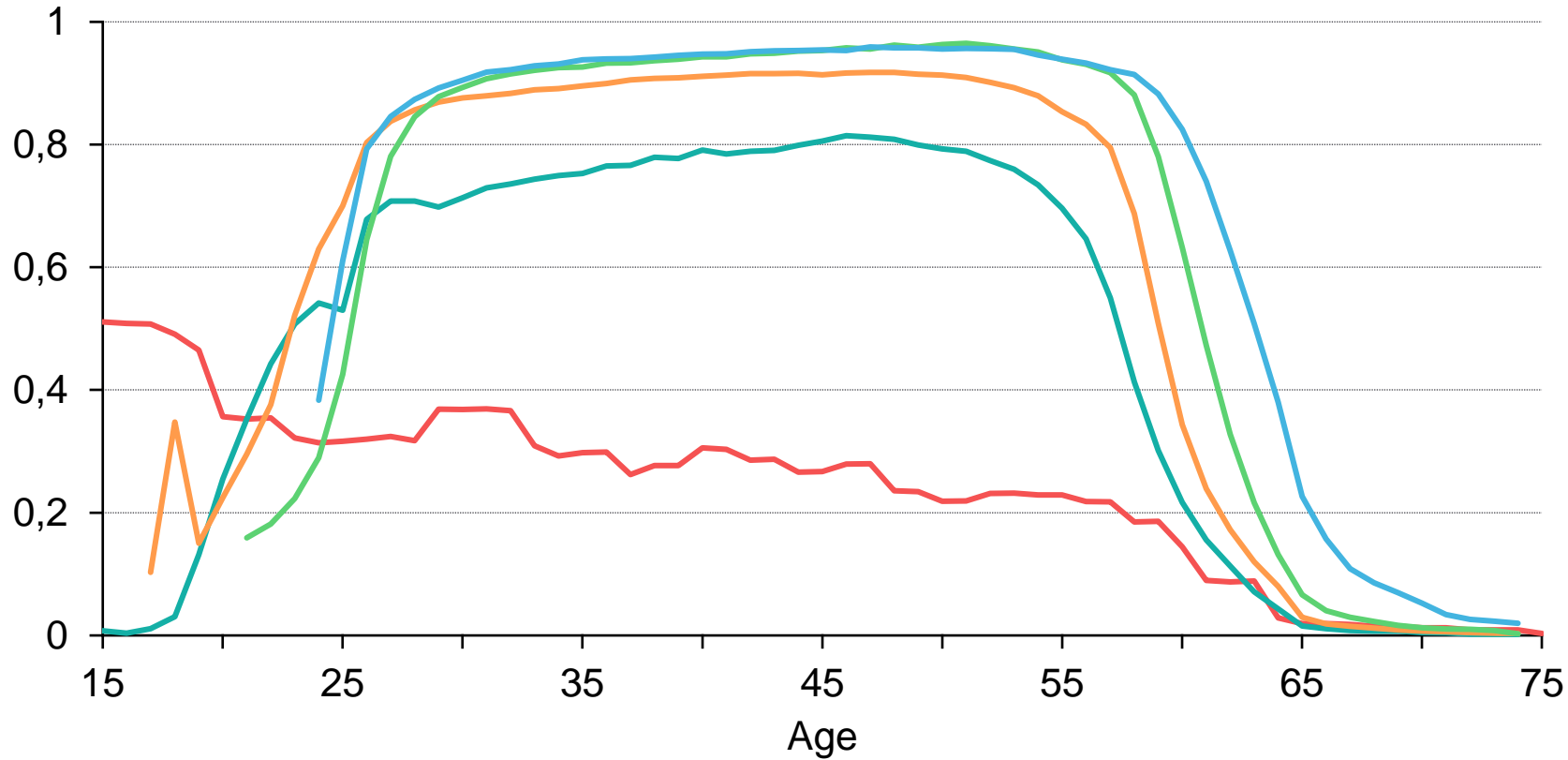
- Average 2017-19

Unknown   **Basic**   **Upper Secondary**   **Undergraduate**   **Graduate**

Labour status categories

	Projection
Labour force	Employed
	Employed maternity leave
	Employed sickness benefits
	Employed student
	Unemployed
Outside	Student
	Student benefits
	Social transfers
	Disability pension
	Old-age pension
	Children 0-14 years
	Others outside the labour force

- Combining microdata on activity with microdata on income allows to identify old-age and disability pensioners, sickness benefit recipients, and students with benefits.

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Labourmarket structure

- Increased number of status categories

- New:
  Employed maternity
  Employed sickness
  Employed students
  Students benefits
  Disability pension
  Old-age pension

- Can handle increased retirement age
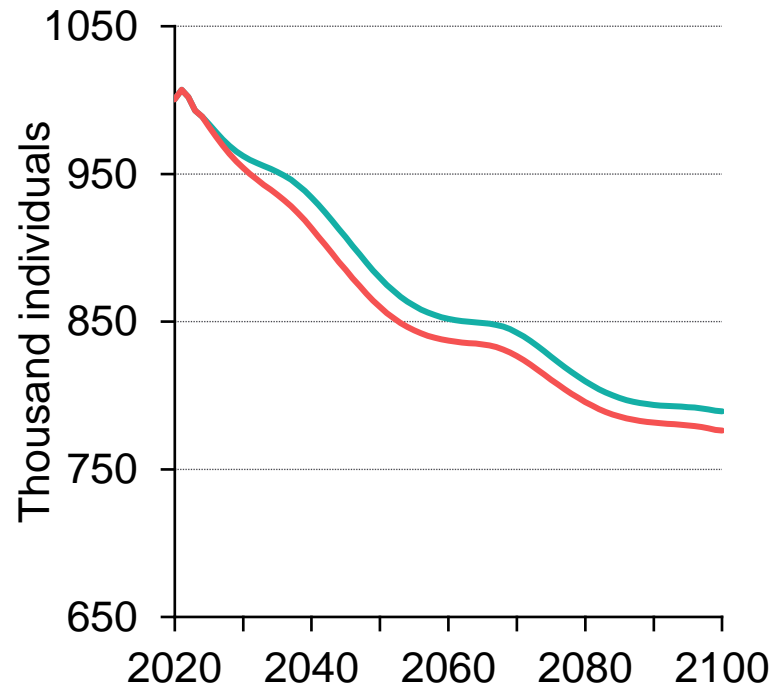
- Unemployment is given exogenously
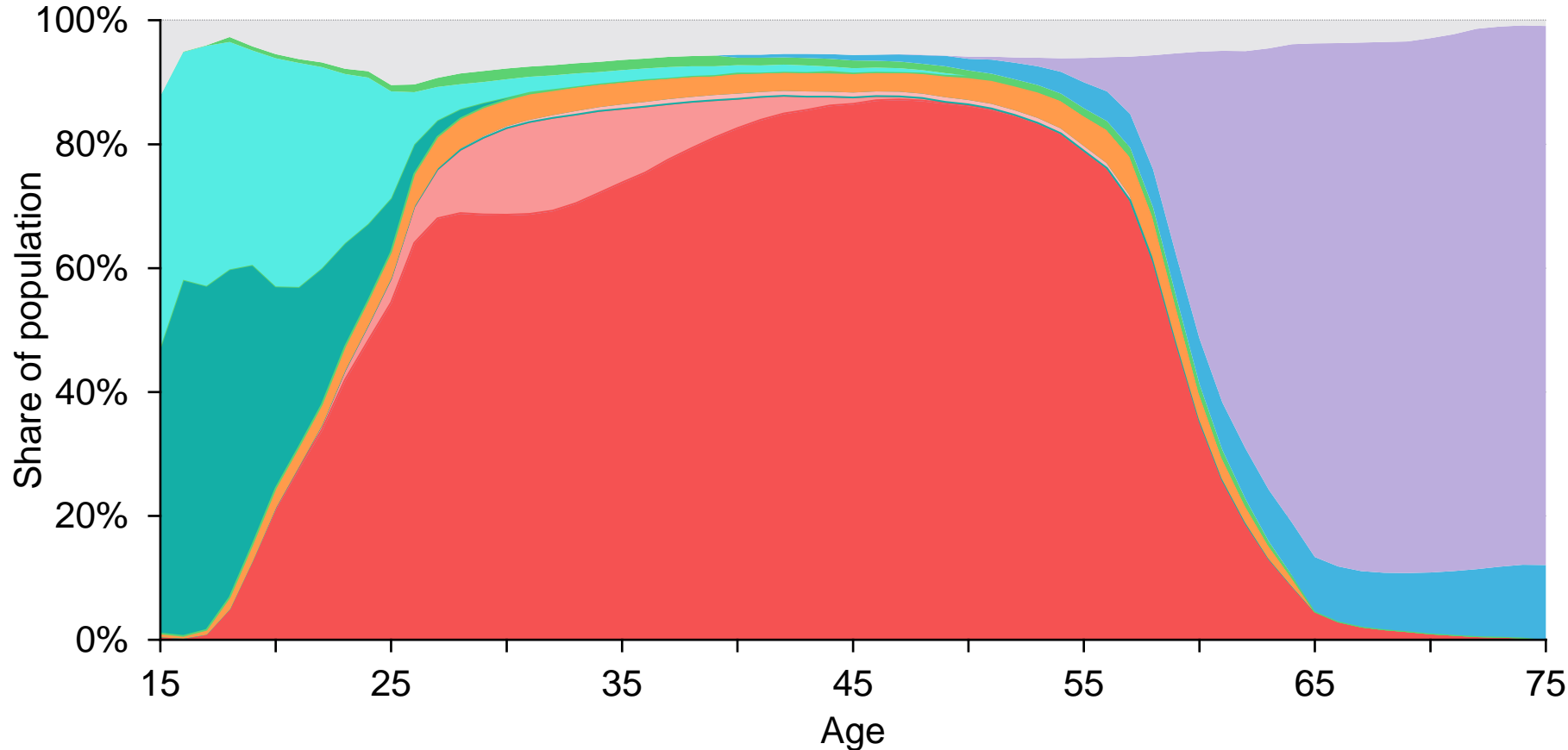
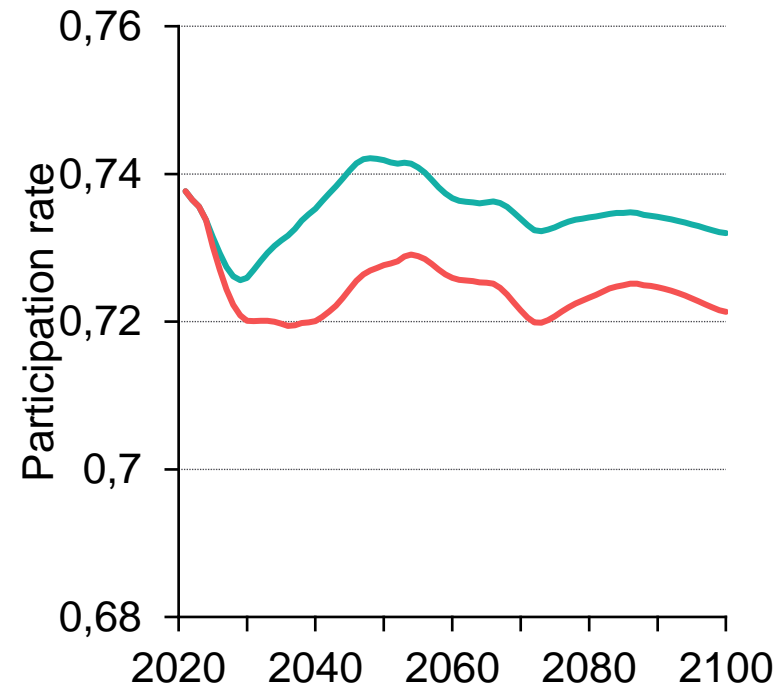**Employed** **Emp. maternity leave** **Emp. sickness benefits** **Emp. students**
Unemployed **Students** **Students with benefits**
Social transfers **Disability pension** **Old-age pension** **Others**

Baseline projection

a) Labour force

b) Participation rate, 15-64 years

Demographic projection

Increasing educational level

Baseline projection

a) Benefits
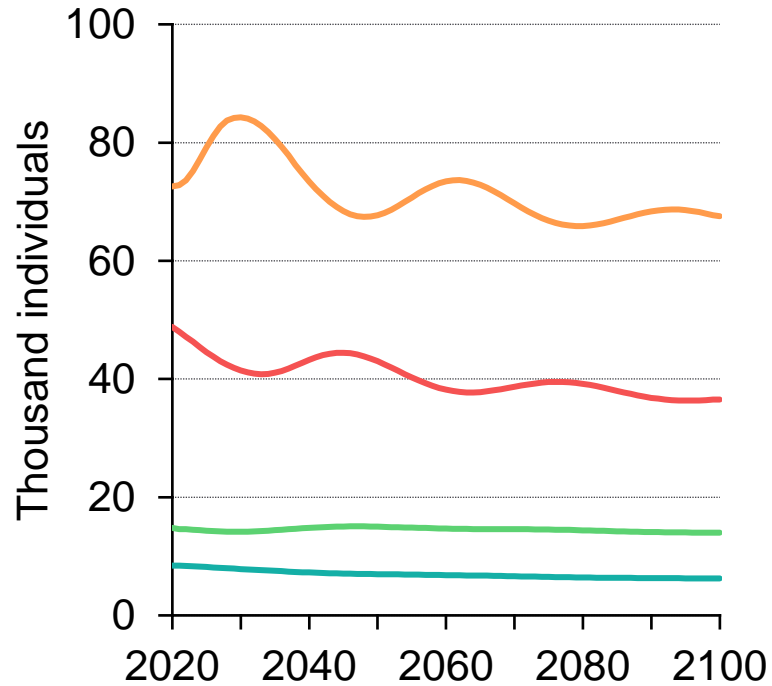
b) Pensioners
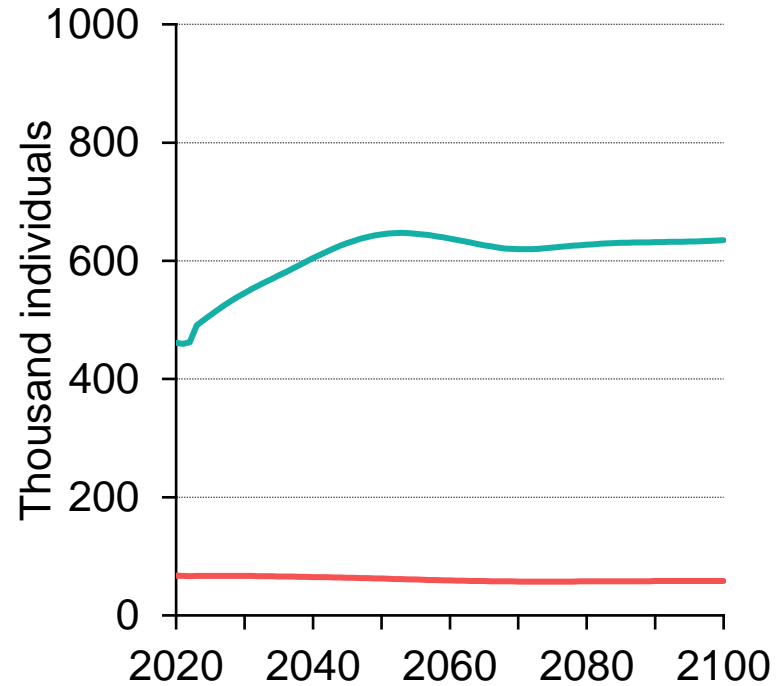
Maternity leave   **Emp. sickness**

Students benefits   **Social transfers**

Disability pension

Old-age pension

Dependency ratio
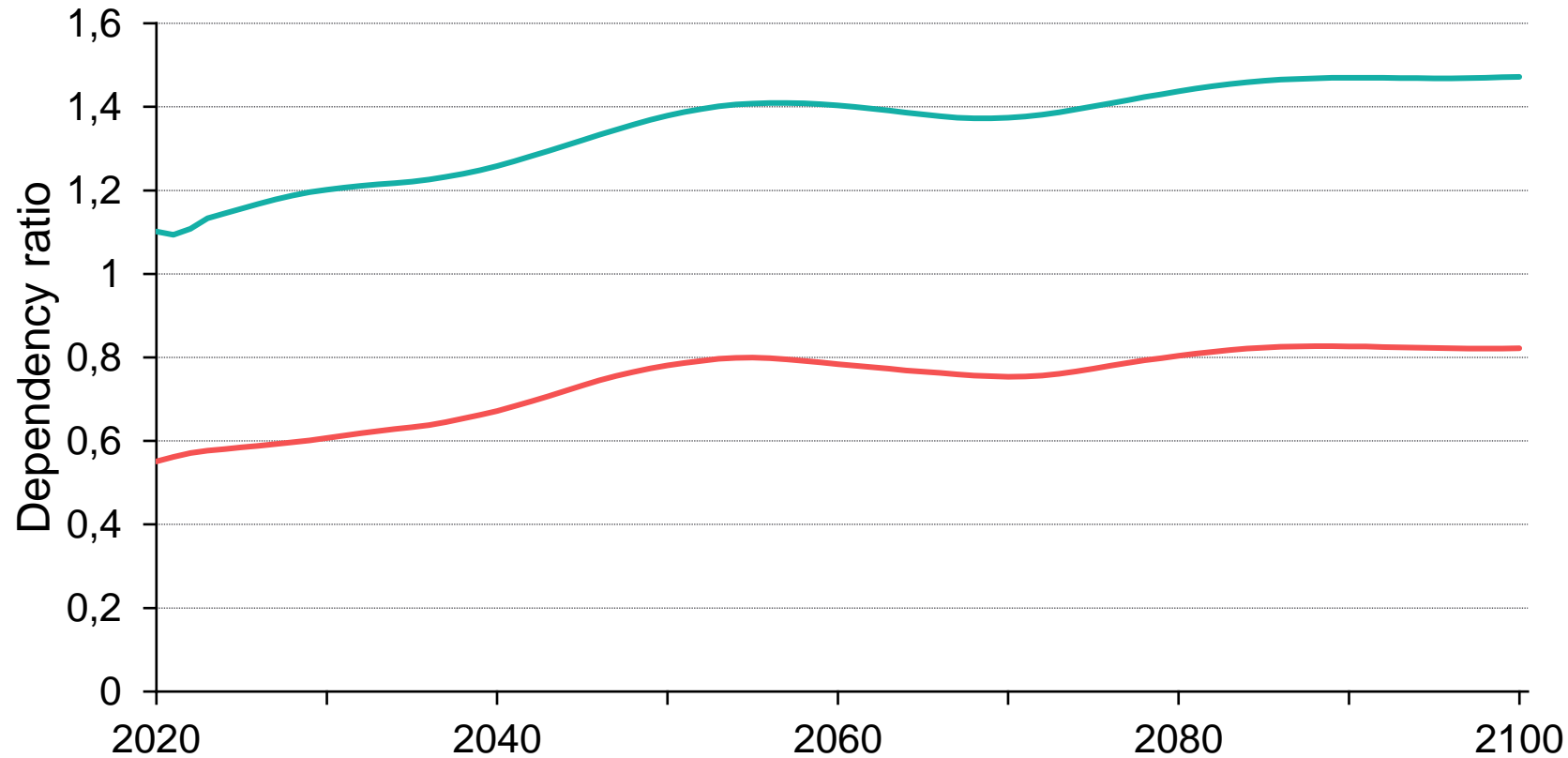
Demographic dependency ratio

$$\frac{0-14 \text{ y/o } + 65+ \text{ y/o}}{15-64 \text{ y/o}}$$

Economic dependency ratio

$$\frac{\text{outside labour force}}{\text{labour force}}$$

Demographic dependency ratio   **Economic dependency ratio**

The macroeconomic model

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Model structure and basic assumptions I

- Structural macro model for fiscal sustainability assessment.

- Projection until year 2100.

- Agents: Households, firms, and a public sector.

- Based on aggegated National Accounts: 10 sectors and 10 domestic goods.

- Growth: Labour-augmenting technical progress.

- Exogenous parameters: e.g. growth rate, nominal interest rate, inflation rate, elasticities of substitution, implicit tax rates.

Model structure and basic assumptions II

- Demographic expectations: EUROSTAT population projection.

- Exogenous labour supply and benefit attainment: labourmarket projection.

- Homogenous labourmarket with one wage. Sector specific labour demand given by NA-structure.

- Public budget (selected assumptions):
  - Household transfers linked to labourmarket affiliation or change in population size and structure.
  - Individual public consumption linked to demography and longeveity gains.
  - Taxes on various types of income.

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- No fiscal response function:

- In the case of a public def. debt is allowed to grow indef.

- Oppositely, in case of public surplus no transfers are made to households.

- Instead the underlying assumption is that a sustain. problem will require a trasnfer from abroad.

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Firms

	Private sectors (and the public sector)
A	Agriculture, forestry and fishing
B-E	Manufacturing, mining and other industrial activities
F	Construction
G-I	Wholesale and retail trade, transportation and storage, accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M-N	Professional, scientific, technical, administrative and support service activities
O-R	Public administration and defence, education, human health and social work activities
S	Other service activities

- The number of private sectors should be chosen to capture vital heterogeneity of the economy.

- + allow for relevant policy options.

- + not too complicated.

- Framework is extendable, cf. Input-output table dimensions.

Firms

- Each sector produces one good using materials, capital, and labour.

- One type of labour and capital.

- Foreign and domestic materials.

- Production functions have constant returns to scale. Sector output prices are determined by factor costs.

- Social security contributions part of wage compensation.

- Elasticities of substitution between production factors are assumed identical across sectors.

- Imperfect competition

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Exports

- Slovenia is a small open economy → modelling of export is very important.

- Export is modelled by Armington-functions: Foreign demand after a domestic good is determined by the domestic price and the foreign (exogenous) level of demand.

- How strong does foreign demand react to price changes?: Export elasticity.

- Export elasticity = 5.

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Households

- One representative age-independent household.

- But cohort effects are considered when calculating labour supply, income transfers, and individual public consumption.

- Types of income: wages, transfers/benefits, and capital income.

- Supply labour (exogenously), pay taxes and css, receive transfers.

- Aggregated private consumption based on a constant MPC, which can vary across income types.

- CES-demand: 10 domestic and 1 foreign good.

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Public sector

- Produces public consumption, pays tranfers to households, collects taxes and social security contributions..

- Value of public production ≈ value of public consumption

- No technical progress in the public sector →

- Cost disease: unit costs track wages leading to the price of the public good increasing more than price of private goods.

- Important consequence: Shocks affecting wages will be reflected in the price of the public good.

- Public sector described by inputs: Also used in other macro models, e.g. Danish MoF. No prod.function.

- No technical progress: a new technology will not lead to a decrease in public labour

- Wages increase more than price of private goods due to technical progress in private sectors.

Individual public consumption

- Project average individual public consumption per person by:
  - Functions: *Health*, *social protection*, *education*, and *recreation, culture and religion*.
  - Gender and age.

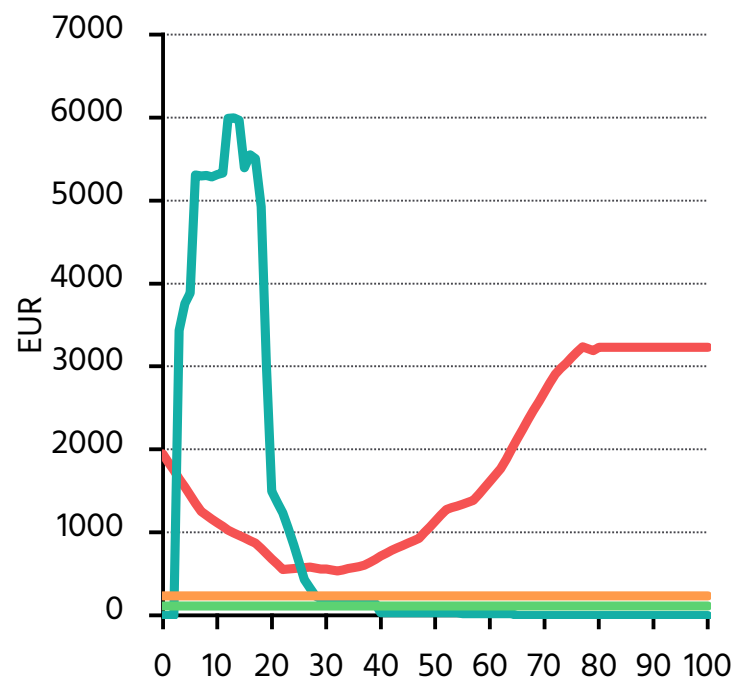- Total expenditure is projected by demography:

$$Total(type, y) = \sum_{g,a} average\ cost(g, a, type) \times pop(g, a, y)$$

- Variation in average costs across gender and age depends on data availability.

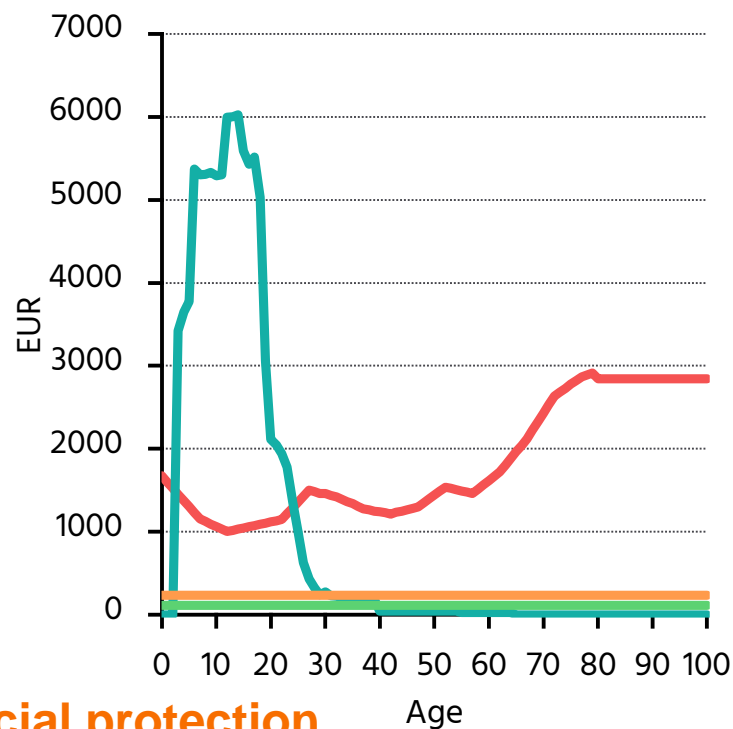- Average costs are constant over time except health costs.

- Healthy ageing: Costs related to health are linked to gains in life expectancy.

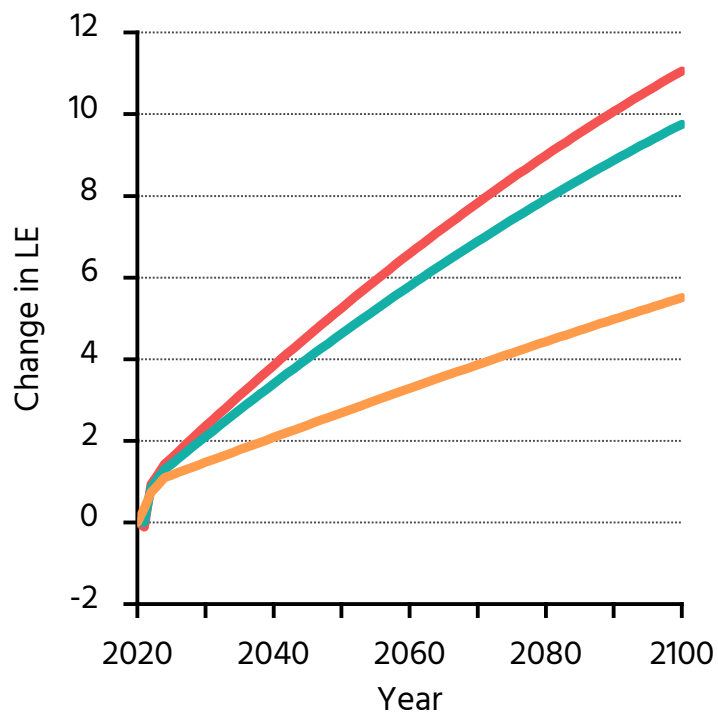# Average costs by gender, age and function in the base year

- Male
- Female

Health **Education** **Social protection**
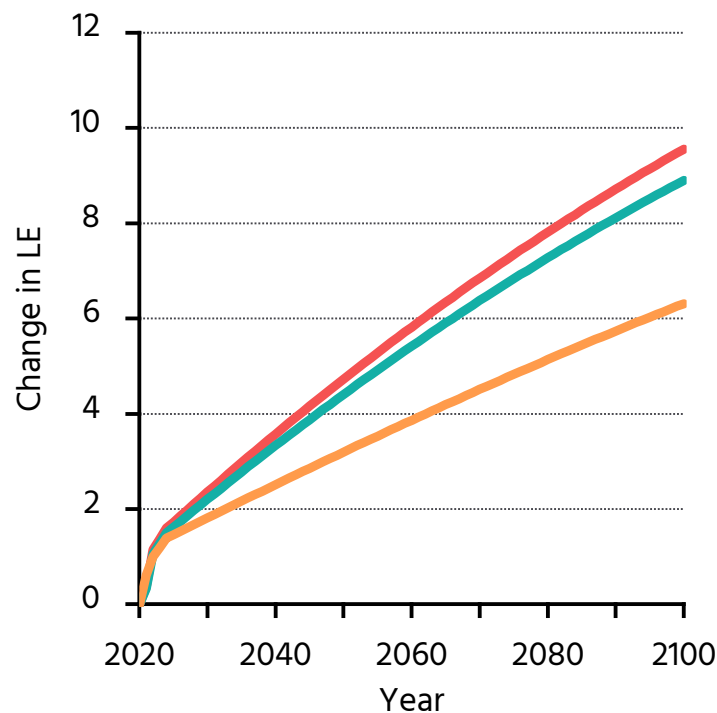**Recreation, culture and religion**

30

Source: Calculations based on Istenič, T., Hammer, B., Šeme, A., Lotrič Dolinar, A., & Sambt, J. (2016). European National Transfer Accounts. Available at: http://www.wittgensteincentre.org/ntadata.

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Change in life expectancy since 2020 for selected ages
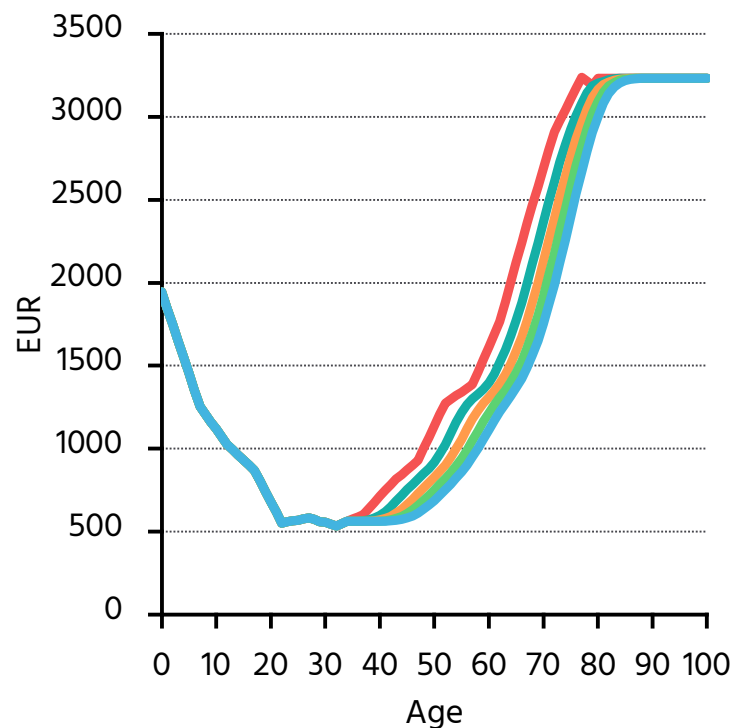
- Male

- Female

Age 40   Age 60   Age 80

- Life expectancy is calculated from historic and projected mortality rates according to the life table methodology used by EUROSTAT.

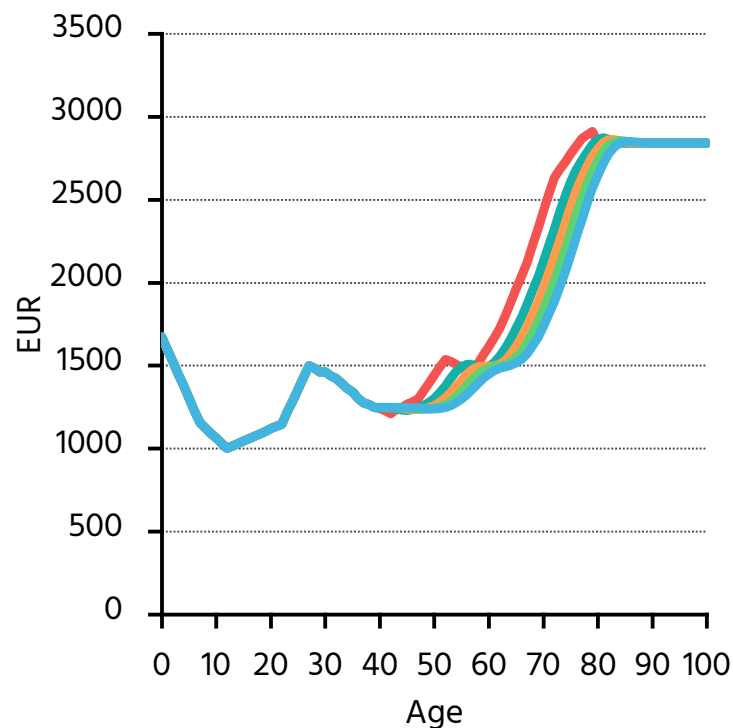- Relative change increases with age.

Adjusting age profiles for longevity gains

- Male

- Female

2020 2040 2060 2080 2100

- Applied from baseyear + 1.
- Initial profiles match the 2010, i.e. no adjustment from 2010 to the base year.
- Males: 35+
- Females: 40+
- There is some uncertainty of whether the effect exists → assumes morbidity compression.

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Implicit transfer rates linked to labour market affiliation or population growth

Overall two types of transfers:

a) Income compensating

- Transfers associated with labourmarket activities.
- Implicit rate: transfer / recipients. Linkage important.
- Identical across gender and age.

b) Non-income compensating

- Other transfers not conditional on labour market affiliation
- Implicit rate: transfer / person.
- Varies across gender and age depending on availability. Link between transfer types and microdata on income.

Income comp.

- Unemp. ben.
- Old-age pension
- Disablity pension
- Maternity/paternity leave.
- Scholarship

Non-income comp.

- Family & child ben.
- Care and large family allowances.
- Widows pension.

Transfers / social benefits

- Average agents in macro model → No eligibility by means-testing, familiy size or housing structure.

- Pensions: No qualifying or insurance periods

- Some benefits are exempt from income tax.

- Indeaxation by CPI and/or gross wage growth.

- **Income-compensating:**
  - Recipients: Given from labourmarket projection.
  - Total expenditure: Implicit rate × recipients × rate indexation.

- **Non-income compensating:**
  - Recipients: Given by demographic projection.
  - Total expenditure: Implicit rates × population × rate indexation

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Income comp.

- Unemp. ben.

- Old-age pension

- Disablity pension

- Maternity/paternity leave.

- Scholarship

Non-income comp.

- Family & child ben.

- Care and large family allowances.

Using the framework for fiscal assessment of policy options

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Policy options

Assess the macroeconomic and fiscal consequnces of

- **Population:**
  - Predefined projections from EUROSTAT. E.g. higher migration.
- **Education:**
  - Upgrading population skills by changing transitions
    - increase share of cohort to continue in the education system.
    - Decrease the share not completing an edu. cycle.
    - Lowering outmigration of individuals with a high education level – substitute with lower educated.
    - Upgrade immigration education profile.
    - Assume that higher migration has a high level of education.

- The framework fascilitates fiscal assessment of policy options within a wide range of topics.
- Non-exhaustive list.
- **Can be assessed individually or combined.**
- The model does not address the cost or means used to off-set a change in policy.

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Policy options

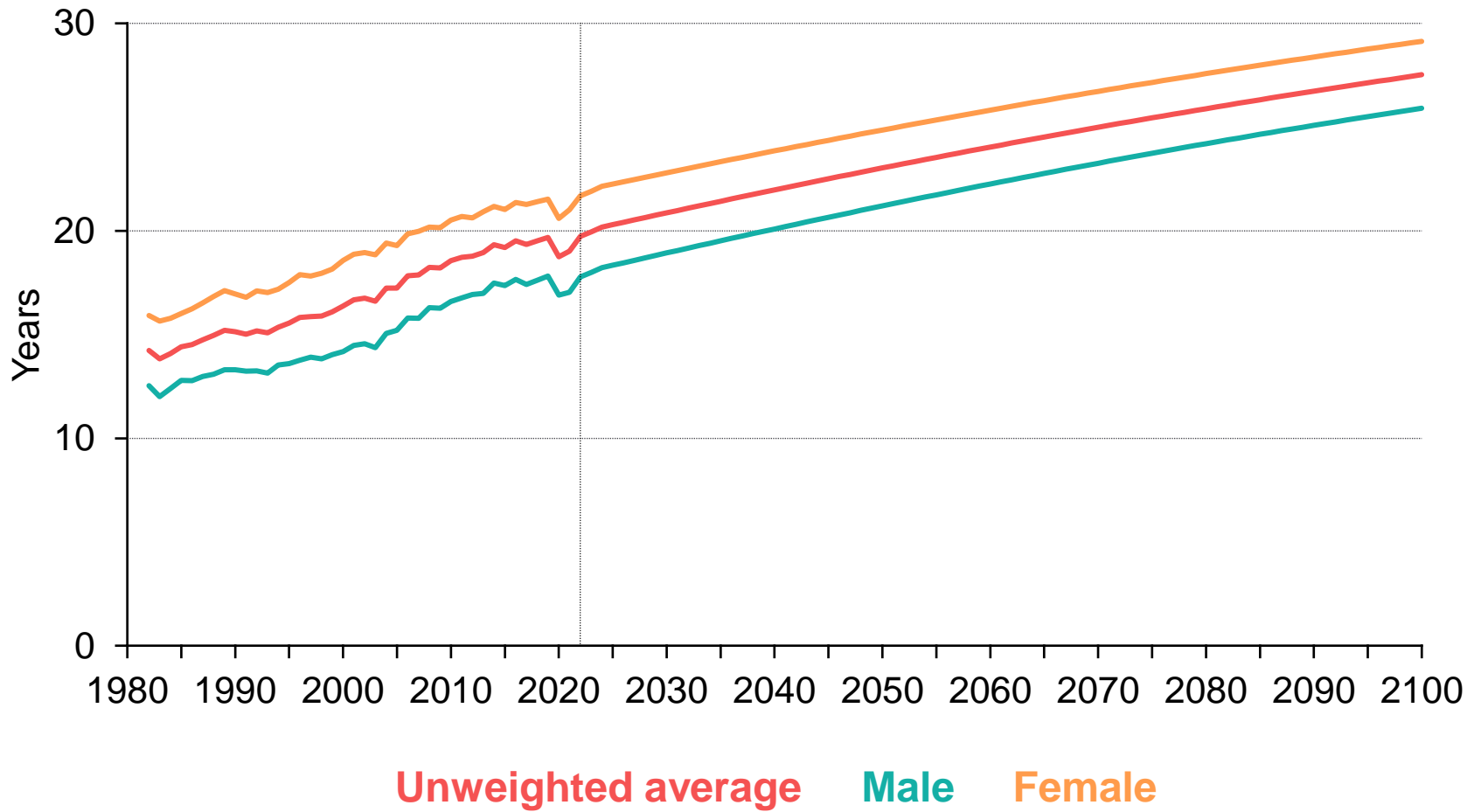Assess the macroeconomic and fiscal consequnces of

- **Labourmarket:**
  - Retirement age reforms, e.g. change with increase in LE.
  - Changing eligibility regulations to specific transfers.
  - Assume that immigration changes lead to more high skilled workers.

- **Macromodel:**
  - Changes in tax rates
  - Changes in implicit transfer rates or/and rate regulation.
  - Changes in sector productivity.

- **Note: Some behaviour has to be introduced exogenously, e.g. participation incentives following from lowering tax on wage income.**

- The framework fascilitates fiscal assessment of policy options within a wide range of topics.

- Non-exhaustive list.

- Can be assessed individually or combined.

- The model does not address the cost or means used to off-set a change in policy.
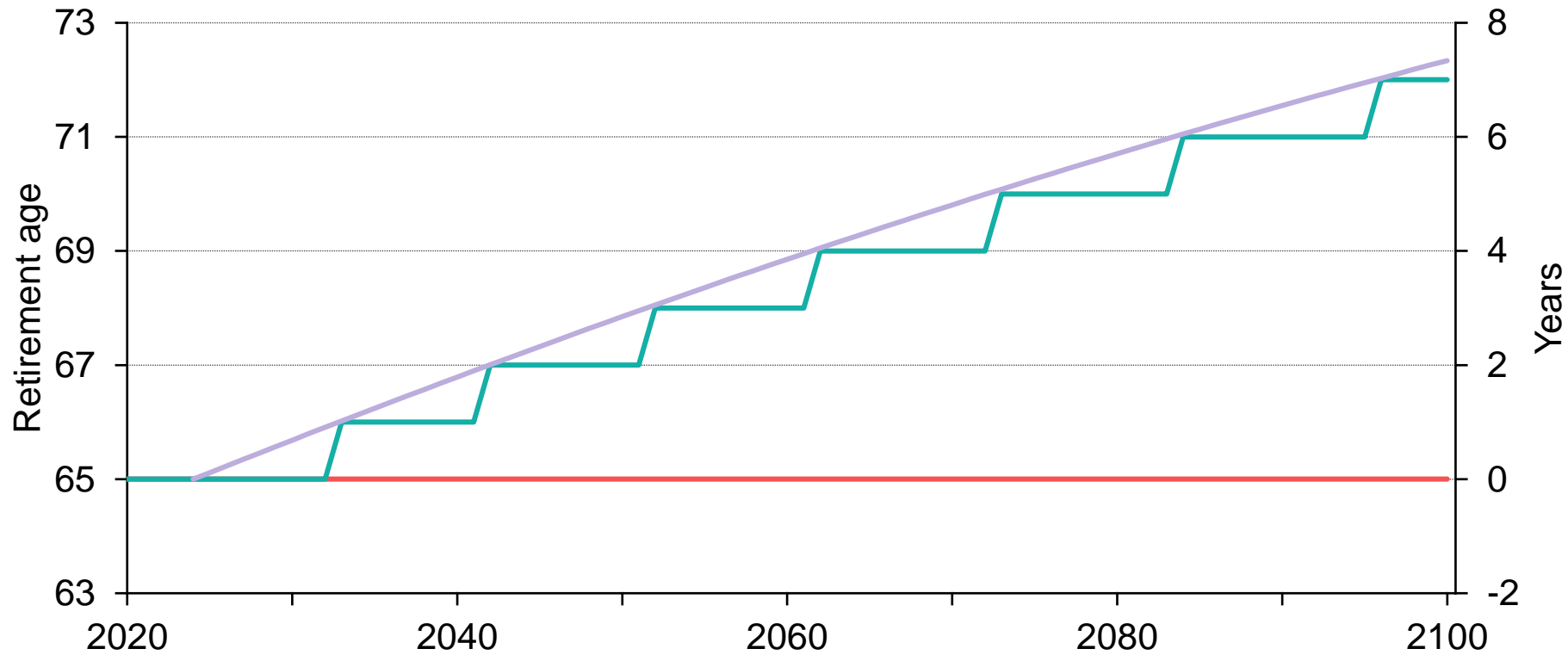
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Example: Linking the old age pension age to the change in life expectancy

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Life expectancy at age 65

Unweighted average   **Male**   **Female**

11 June 2024   Increased retirement age

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Old-age pension age

Life expectancy at age 65, change compared to 2024 (right axis)
Retirement age: baseline   1-to-1 increase

- **1-to-1 increase**
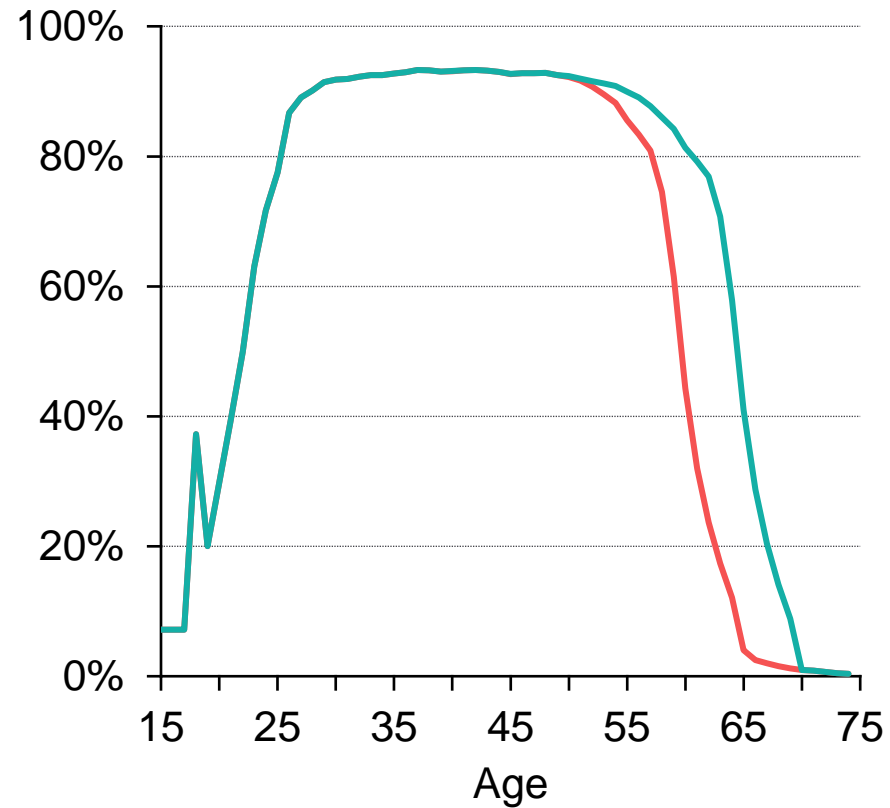 If average lifetime at age 65 increases 1 year, the old-age pension age is increased 1 year

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Labour behaviour

a) Disability pension

b) Participation rate
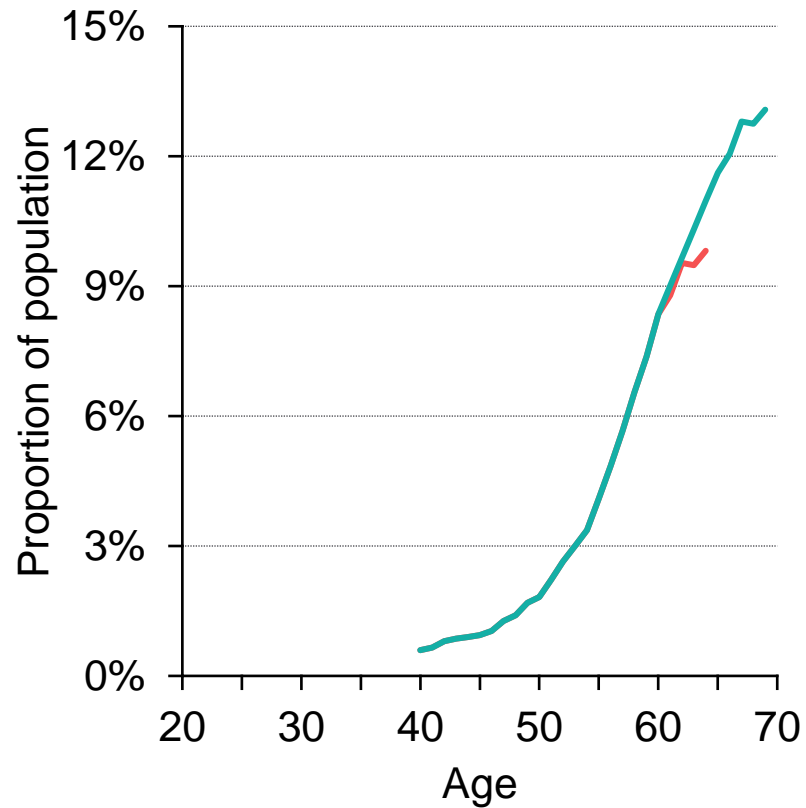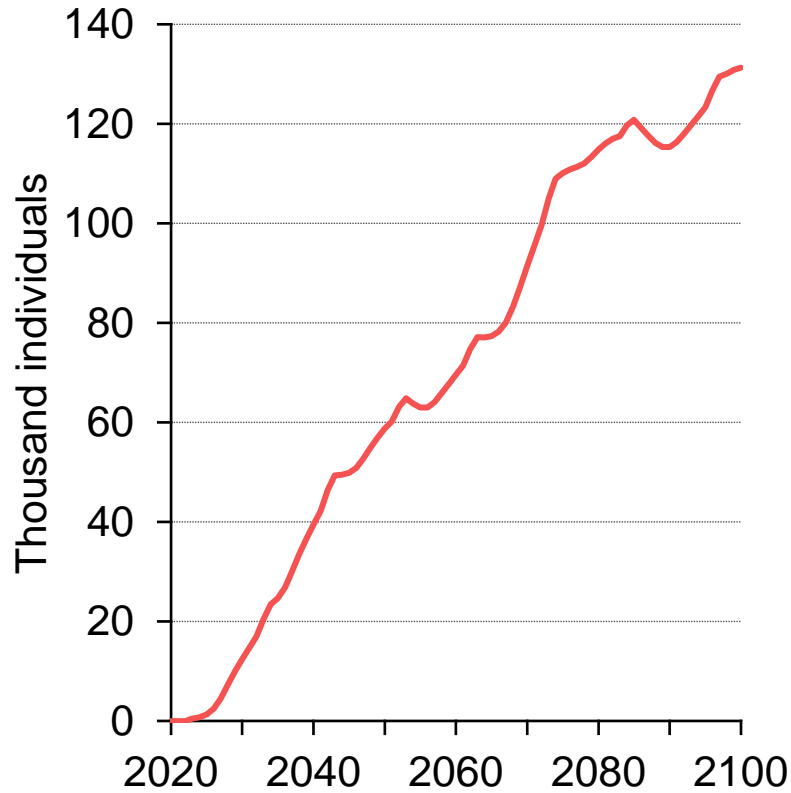

Old-age pension age 65   **Old-age pension age 70**

- The figure shows men with education level upper secondary
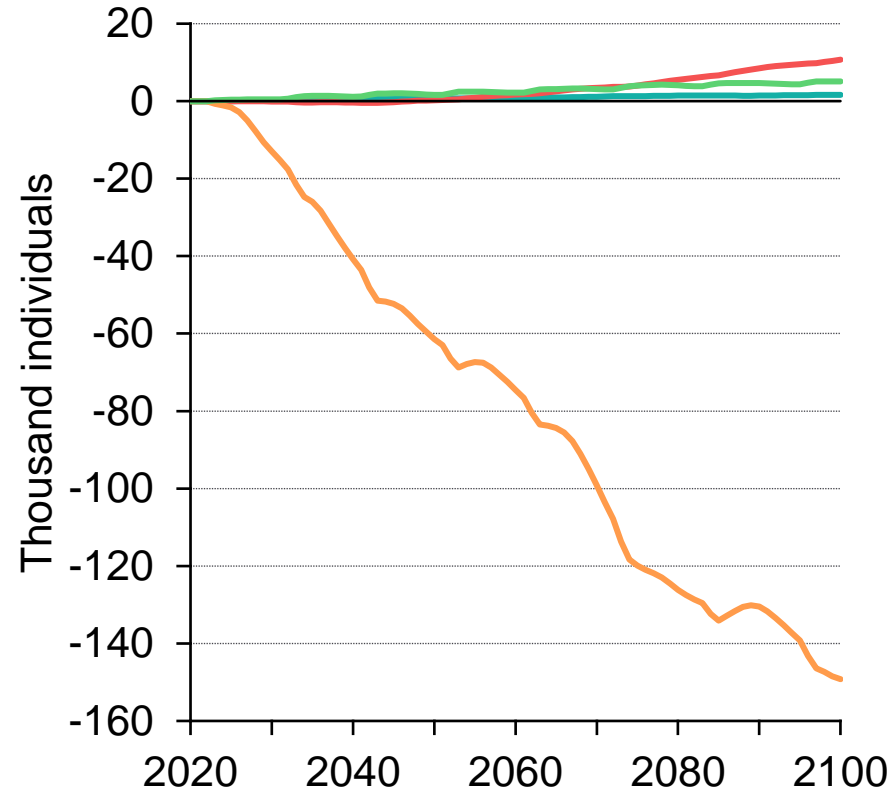- Change from 2022 to 2072.
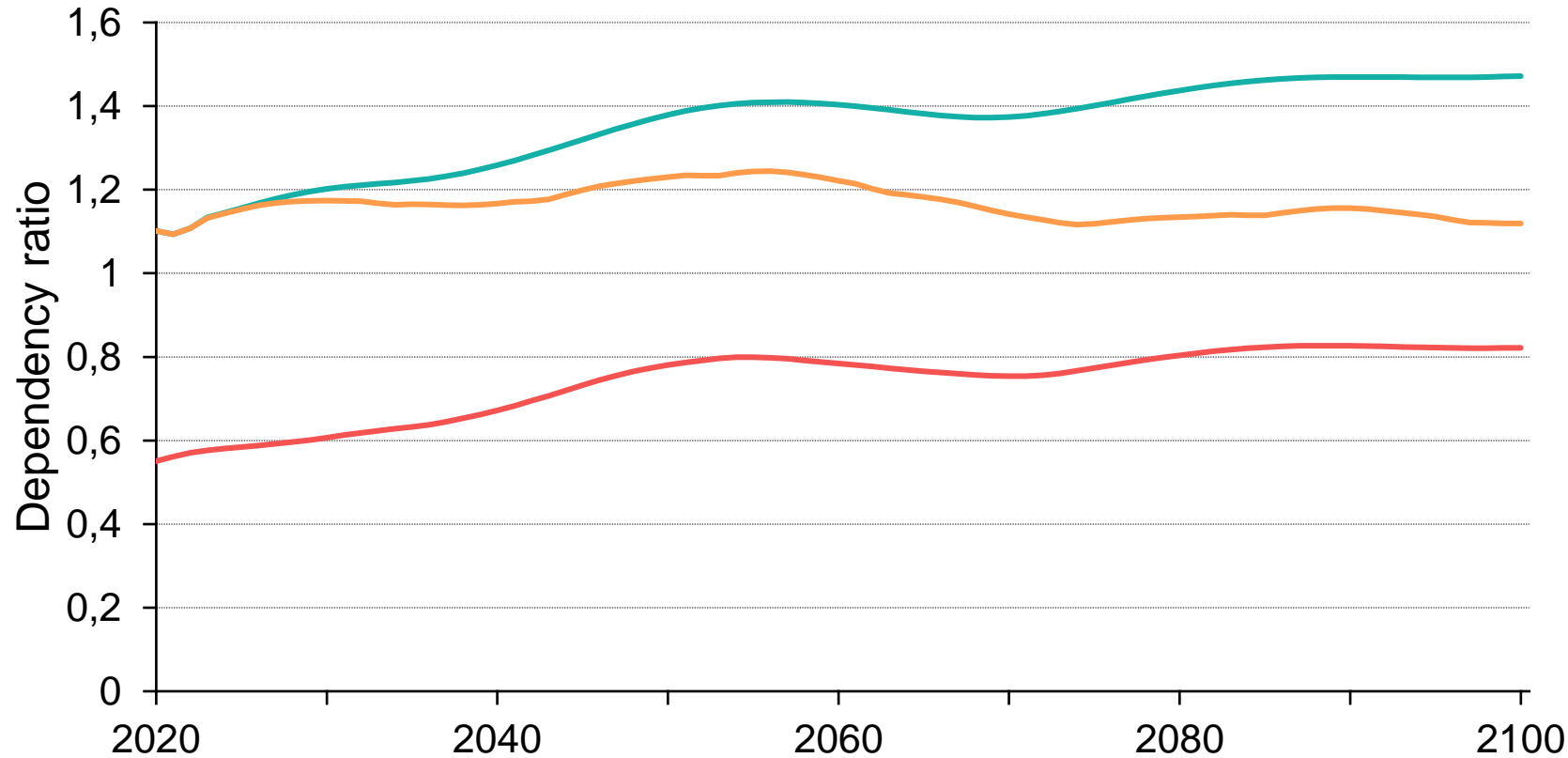
Labour activity

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a) Labour force

d) Outside labour force (selected)

- The figure shows the change relative to the baseline scenario

Disability pension   **Sickness benefits**
Old-age pension age 70   **Others outside**
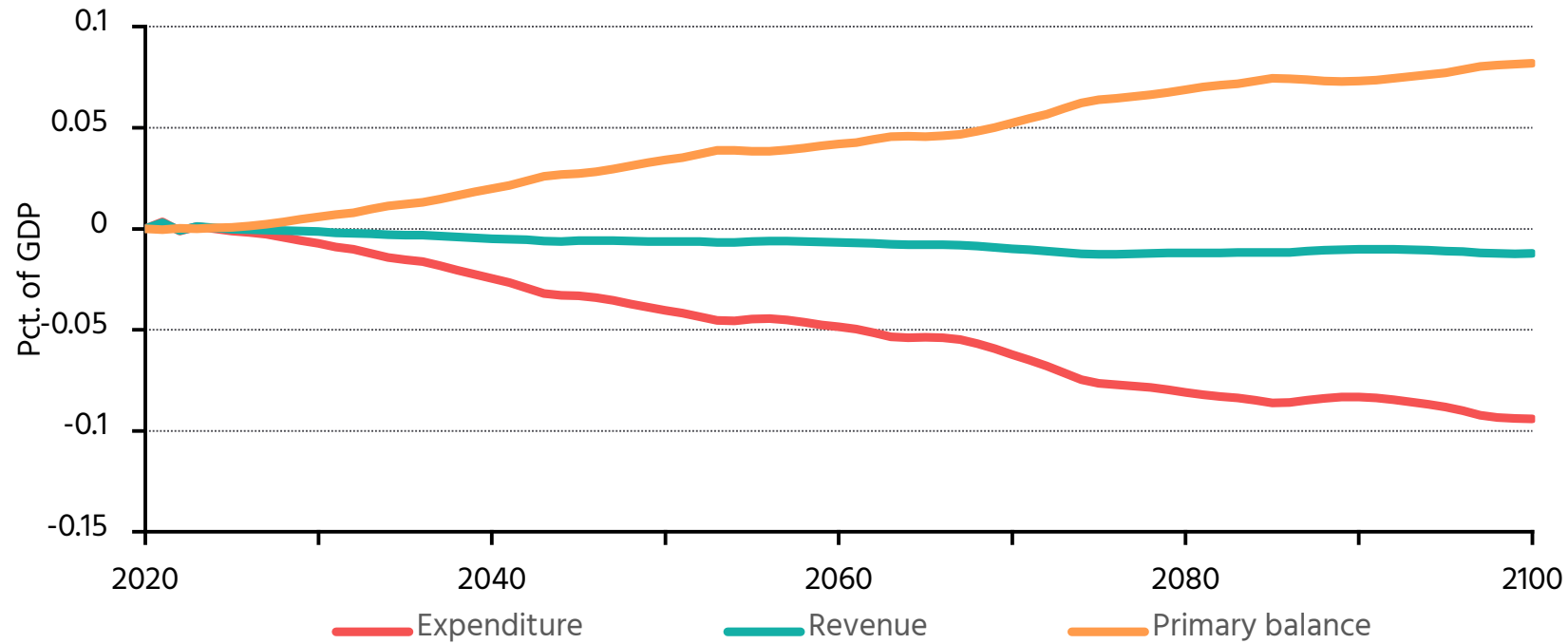
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Dependency ratio

Demographic dependency ratio

$$\frac{0\!-\!14 \text{ y/o } + \text{ 65+ y/o}}{15\!-\!64 \text{ y/o}}$$

Economic dependency ratio

$$\frac{\text{outside labour force}}{\text{labour force}}$$

Demographic dependency ratio   **Economic dependency ratio baseline**
Economic dependency ratio alternative scenario

Fiscal impact

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Lessons learned and future steps

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Lessons learned and next steps I

- Using microdata from SORS has **delayed the project lauch** but **enhanced the quality** of the models and **extended the scope** of policy options.

- Workshops tend to aid the introduction to the model system.

- A long test and validation period with regular use is vital to tune model assumptions and gain confidence in using the system → Collaborate with the FC on this.

- The framework is extendable.

- Testing functionality and assumptions in the model.

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