Life-course Heterogeneity and the Future Labor Force - A Dynamic Microsimulation Analysis for Austria

Microdata in Macromodels, MacroABM 2nd Workshop
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Motivation

- Changes in population composition highly relevant for labor force projections (Loichinger, 2015; Marois et al., 2020) and the sustainability of the welfare state.
- Projection of size and composition of the Austrian workforce 2022 - 2080
  - Accounting for demographic change, family, education, migration, health, and institutional settings
- Policy tool: identification of policy levers affecting labor careers; scenario-support
  - Starting point for two Case Studies in SustainWELL Project (migration & retirement / pensions)
- Contribution
  - Longitudinally consistent careers from education, first labor entry until retirement, reflecting the real life heterogeneity of employment careers
  - Detailed pension regulations: types, reforms, eligibility rules based on individual careers

→ Capturing the heterogeneity of individual life courses enhances the accuracy, detail, and policy relevance of population and labor force projections

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Dynamic Microsimulation at WIFO

- Two models at WIFO
  - **microWELT:** Comparative model used as a platform in various international projects based on harmonized or comparable data sources (EU-SILC, LFS,…)
    - E.g. Böheim et al. (2023), Spielauer et al. (2023)
    - www.microwelt.eu
  - **microDEMS:** more detailed model for Austria based on cross-sectional (LFS, STATAT,..) and longitudinal administrative data (ÖGK, DSVS,..)
    - E.g. Horvath et al.(2025), Horvath et al.(2023), Horvath et al. (2023), Angel et al.(2023)

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microDEMS

- Design
  - **Interacting population model** operating in **continuous time** (things can happen at any time); individuals **linked to families**
  - **Support of (optional) alignment to external targets** allowing reproducing official population projections, and scenarios concerning unemployment etc. while maintaining relative differences in risks by individual characteristics.
- Modgen/openM++
- Detailed biographies (schooling, family formation, employment careers, retirement)
- Base Scenario
  - Keep all factors impacting on labor force participation constant (health, age, education, family & job characteristics)
  - but account for changing retirement age of women (old age: +5 years; early +2 years)

  → **Pension law requires full life-time accounting!**

  → **realistic labor market careers**

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microDEMS - Dimensions

- **Fertility**: cohort-specific first birth rates and childlessness by educ, age-specific fertility rates aligned with population projections
- **Mortality**: relative mortality risks by educ, baseline risks aligned to population projections
- **Migration**: immigration and emigration by place of birth, official population projections
- **Education**: Austrian school system in detail; individual careers depending on sex, migration background and parental education
- **Partnerships** and partner matching: woman’s perspective by age, education, having children, child age; assortative matching by age, education, migration background
- **Health status**: binary health limitation indicator by age, sex, education
- **Labour market**: longitudinally consistent individual careers
- **Pension decisions**: cohort-specific minimum retirement ages by type (old-age pensions, corridor pensions, early retirement due to long insurance histories, invalidity pensions) and required contributions and insurance periods

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microDEMS - Labor market model

- Labor market model reflects real-life mobility between labor market states
  - Piecewise constant hazard regressions by duration, age, sex, education, health limitation, child age, sector, place of birth
  - Decision models (logistic regressions, statistics, thresholds, ...)
  - Alignment to external targets
    - Cross sectional imputation models for labor force participation
    - Unemployment rate from external macro model ALMM (Kaniovski et al., 2021)
- Estimated on admin data (and LFS)
  - ~100% population covered
  - Health data
  - Universe of employment spells

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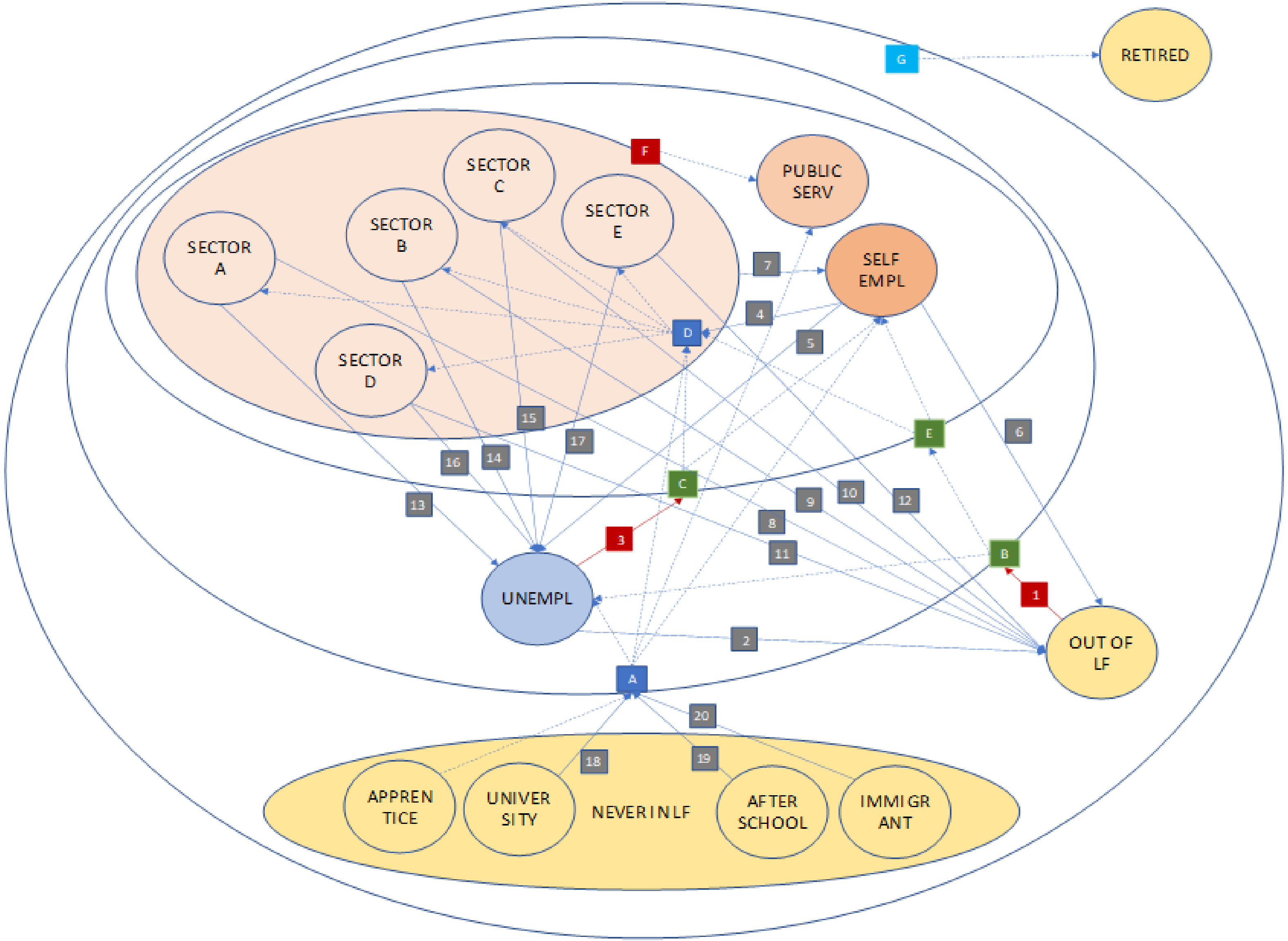
microDEMS – Employment Transitions



Hazard models

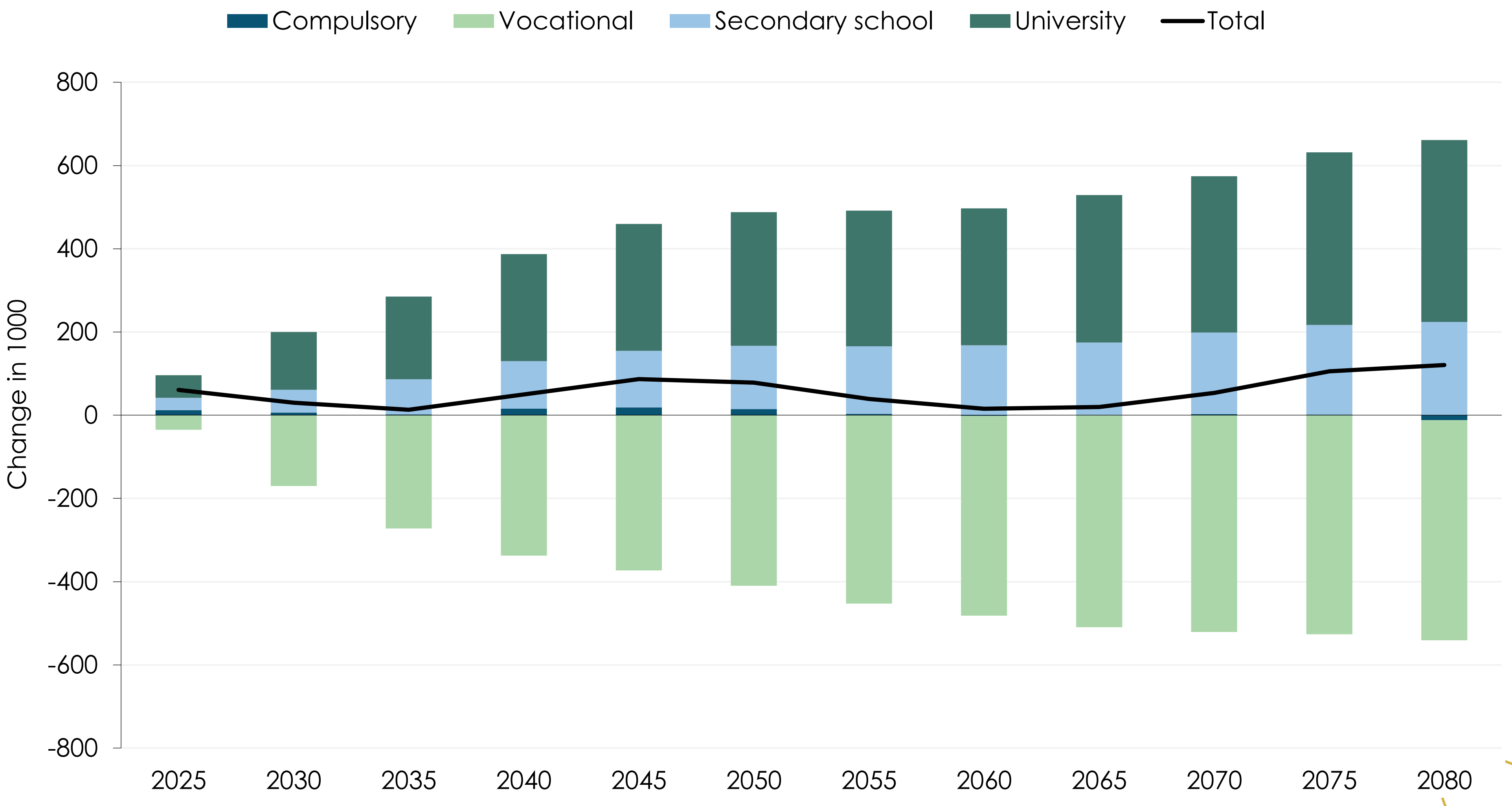
18	Never in LF: University Student	->	Laborforce	A
19	Never in LF: After School	->	Laborforce	A
20	Never in LF: Immigrant	->	Laborforce	A
1	Out of LF	->	Laborforce	B E
2	Unemployed	->	Out of LF	
3	Unemployed	->	Employed	C
4	Selfemployed	->	Employee	D
5	Selfemployed	->	Unemployed	
6	Selfemployed	->	Out of LF	
7	Employee (any sector)	->	Selfemployed	
8	Employee sector A	->	Out of LF	
9	Employee sector B	->	Out of LF	
10	Employee sector C	->	Out of LF	
11	Employee sector D	->	Out of LF	
12	Employee sector E	->	Out of LF	
13	Employee sector A	->	Unemployed	
14	Employee sector B	->	Unemployed	
15	Employee sector C	->	Unemployed	
16	Employee sector D	->	Unemployed	
17	Employee sector E	->	Unemployed	

Decision models

A Placement at first laborforce entry
B Decision employed versus unemployed at laborforce re-entry
C Decision selfemployed versus worker at re-employment after unemployment
D Placement into sectors
E Decision selfemployed versus worker at re-employment after Out of LF
F Entry into public sector at a specific age
G Retirement decisions

Change in labor force by education attainment

Absolut difference to 2022



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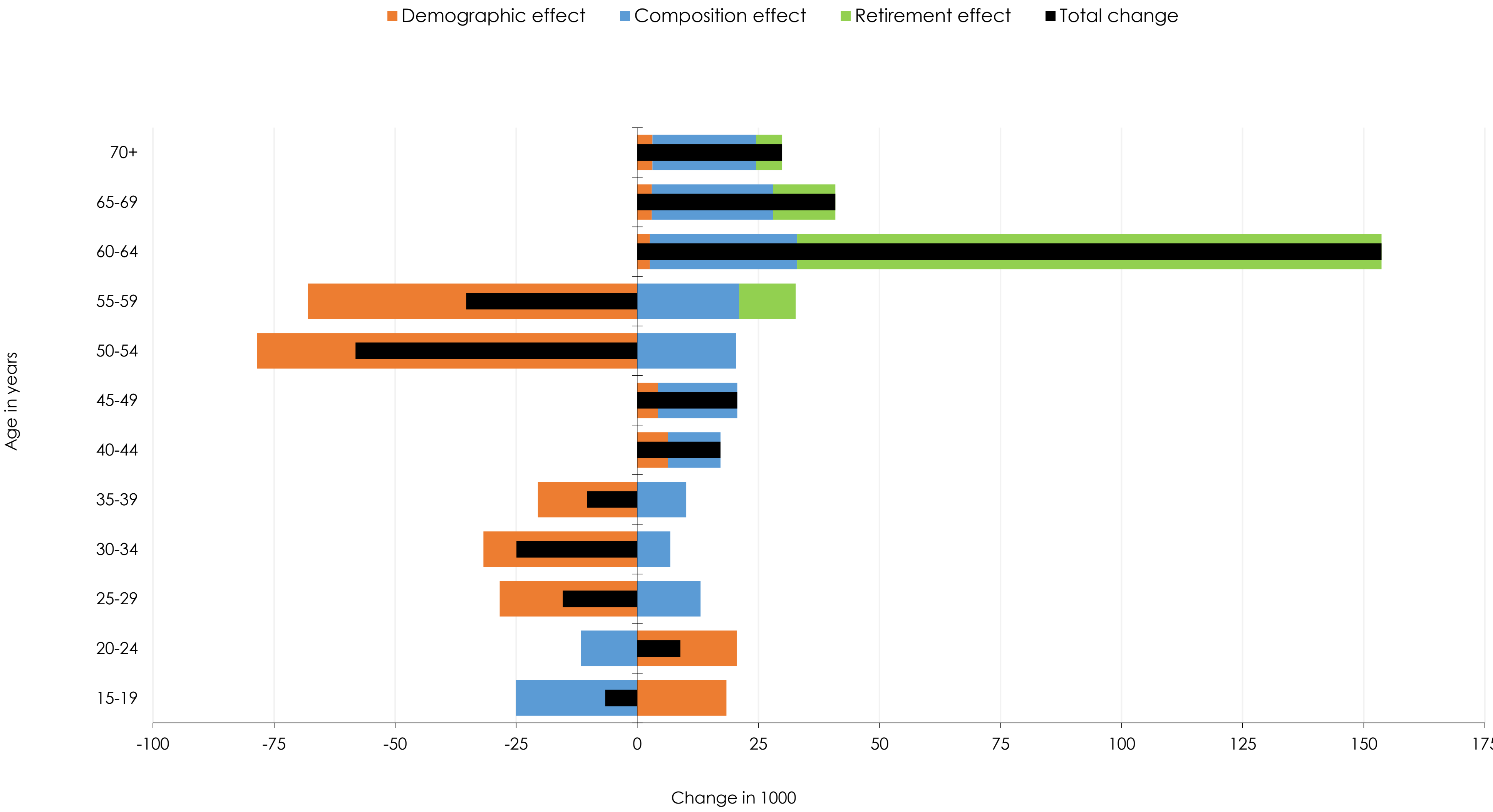
Components of total change in labor force 2022 to 2080
Decomposition of Baseline Scenario



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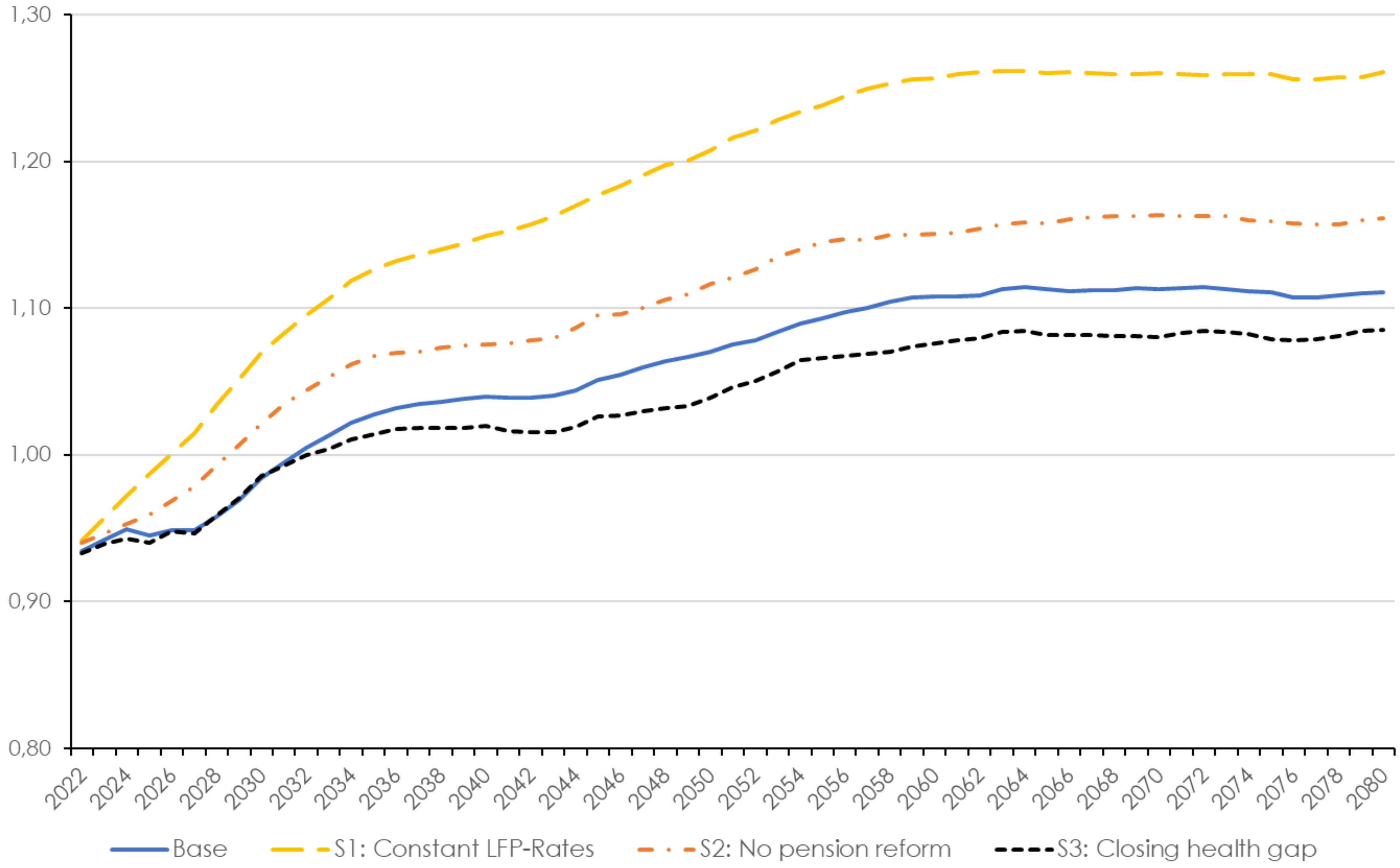
Inactive vs. active population

Base scenario and alternative scenarios



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Conclusions

- Departing from official population projections, we are able to simulate the evolution of the population and it's workforce in detail
- We find substantial mitigating effects of improvements in education and already adopted changes in pension legislation, which together reduce the impact of ageing on the economic dependency ratio by 55%
- microDEMS allows to assess how changes in the underlying parameters affect results
- As an ex-ante policy tool our model facilitates the evaluation of different policy measures on socio-economic outcomes in the medium and long term

https://www.microWELT.eu

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Rethinking the roles of **family, market & state**

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https://www.microwelt.eu

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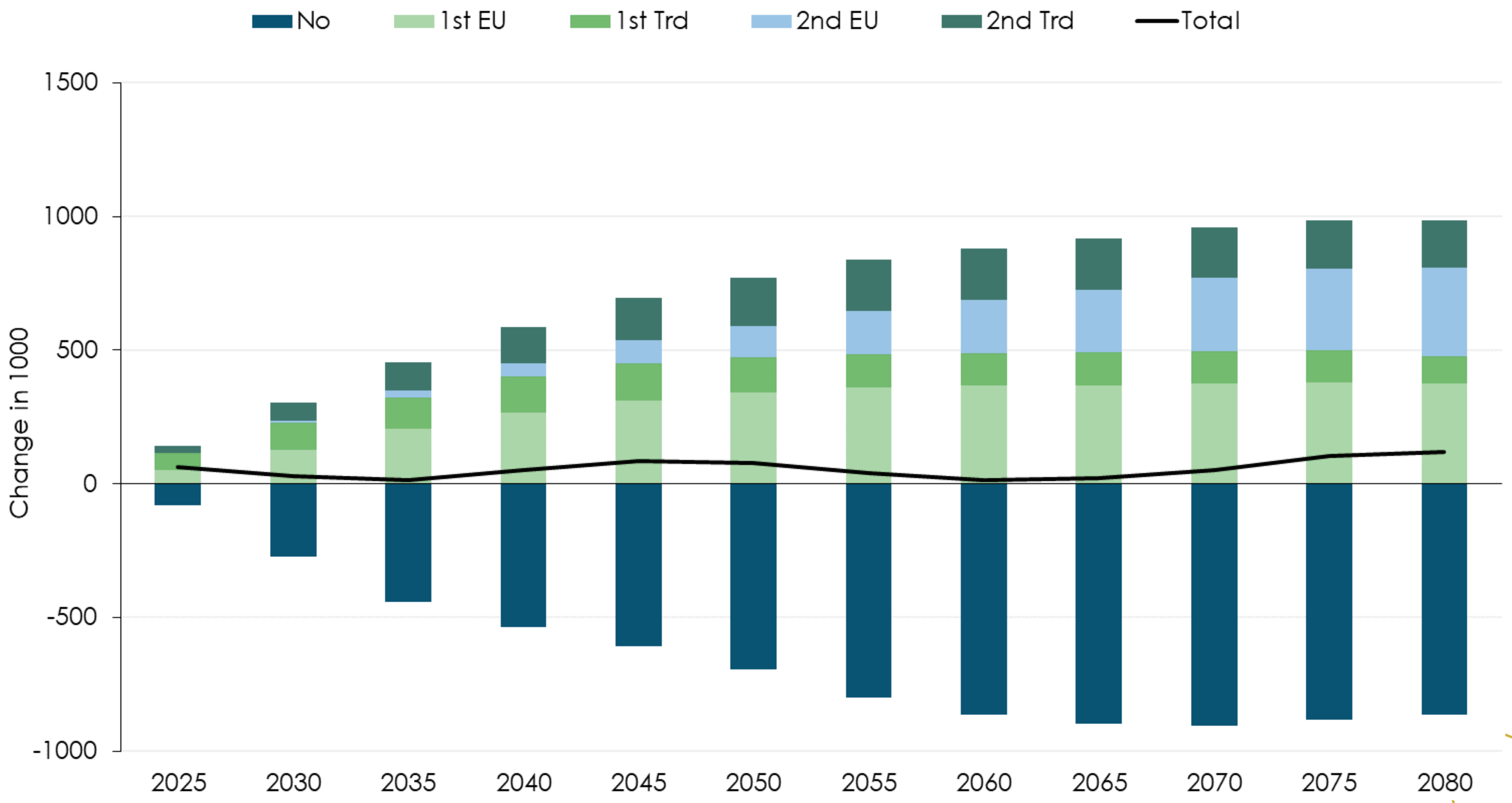
Change in labor force by migration background
Absolut difference to 2022



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Alternative scenarios

- Existing Alternative scenarios:
  - Migration (low / high migration; changing composition)
  - Education scenarios (Basic education / life long learning)
  - Improved labor market integration of mothers
  - Improved integration of persons with impaired health

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Population by migration background
Baseline Scenario

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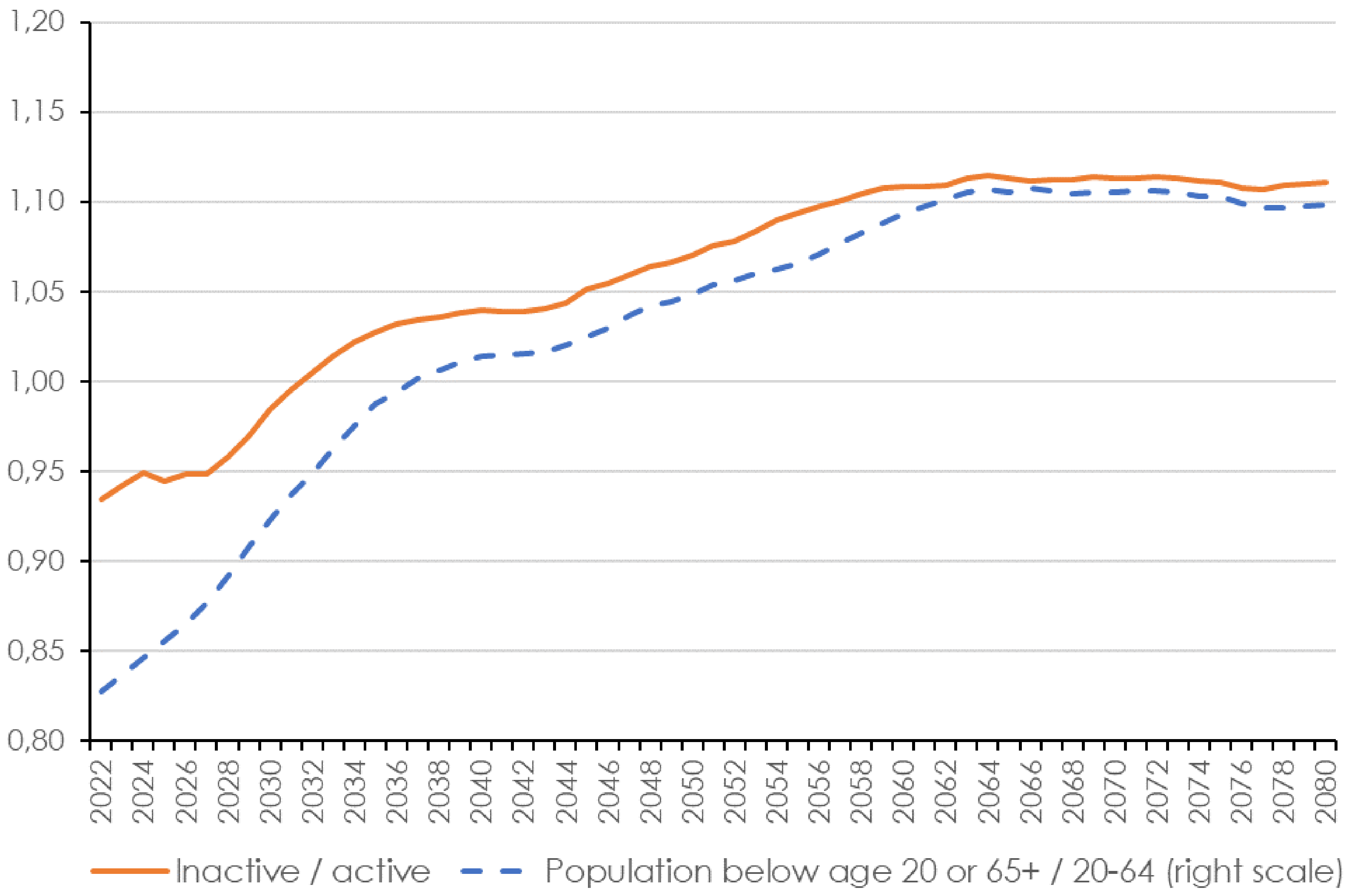
Demographic and economic dependency
Baseline Scenario



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Case Studies for Austria

- 3.4. Explicit modeling of pensions for Austria
  - Contrasting stylized NTA-based pension benefit model (3.3.)
  - Based on admin data / longitudinal employment careers
- 3.6. Projections for selected policy counterfactuals
  - Austria - "Detailed simulations concerning the characteristics of migrants"

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microDEMS - Status

- **microDEMS**: Detailed Austrian version of comparative model microWELT
- **Detailed modelling of migration**: In- and outmigration by origin, sex and age (in line with current population projection of Statistics Austria which are as well produced by microsimulation)
- **Integration of immigrants** in education and labor market
- **Public health costs** by education
  - Horvath, Leoni, Reschenhofer, Spielauer (2023) Socio-economic Inequality and Healthcare Costs Over the Life Course – A Dynamic Microsimulation Approach. Public Health, (219), pp.124-130
- **Longitudinal employment careers** accounting for education and health
- Detailed modeling of Austrian **Pension Law** (cohort specific retirement rules, diverse pension types)
- "Cleaned up consolidated" starting version for SustainWELL project

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microDEMS – Next Steps

Pensions

- **Wages:**
  - Consistent implementation from longitudinal and cross-sectional perspective
  - Replacement incomes (parental leave, unemployment, sick-leave)
- **Pension accounts:**
  - Imputation of starting values
  - Updating accounts in simulation according to Pension Law
- Overlap to Slovenian Pension Model (Dypensi)

International migration

- Consistency with new Statistics Austria Approaches and projections
- Nationals living abroad and back migration: Overlap to Slovenian model

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