Future labour force in ageing European societies: the role of human capital and migration

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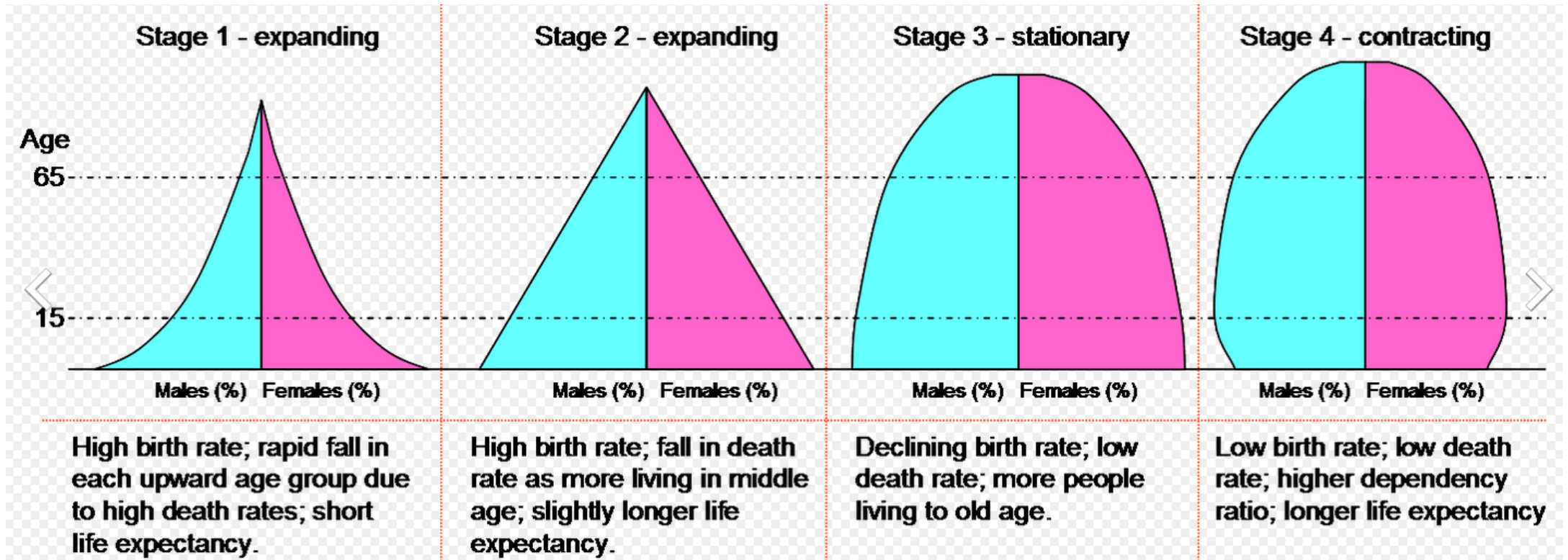External lecturer in Global demography program, University of Vienna

Objective

- Demographic shifts in Europe will affect future population sizes and labor supply, fear of negative consequences of population decline

- Population composition changes -> educational expansion, longevity, working lives

- Immigration often presented as a tool to (partly) mitigate the expected future labour force decline

- How demographic multidimensional population projection methods are being used to explore future changes in populations, labour force (labour supply) and dependency

# What is population ageing and why is it considered a challenge?

Population ageing

Demographic transition

Stage 1 - expanding | Stage 2 - expanding | Stage 3 - stationary | Stage 4 - contracting

Age 65, 15. Males (%) Females (%)

High birth rate; rapid fall in each upward age group due to high death rates; short life expectancy.

High birth rate; fall in death rate as more living in middle age; slightly longer life expectancy.

Declining birth rate; low death rate; more people living to old age.

Low birth rate; low death rate; higher dependency ratio; longer life expectancy

Demographic transition & population ageing

- Declining birth rates and longevity boost population in productive ages, a window of opportunity to harness benefits of expanding working age population and declining dependency-> demographic dividend (stage 3)

- Stage 4: Increase in the elderly due to ageing from the top (increased longevity due to declines in mortality) and from the bottom of the pyramid (low, below-replacement level birth rates)

Population ageing in age pyramid
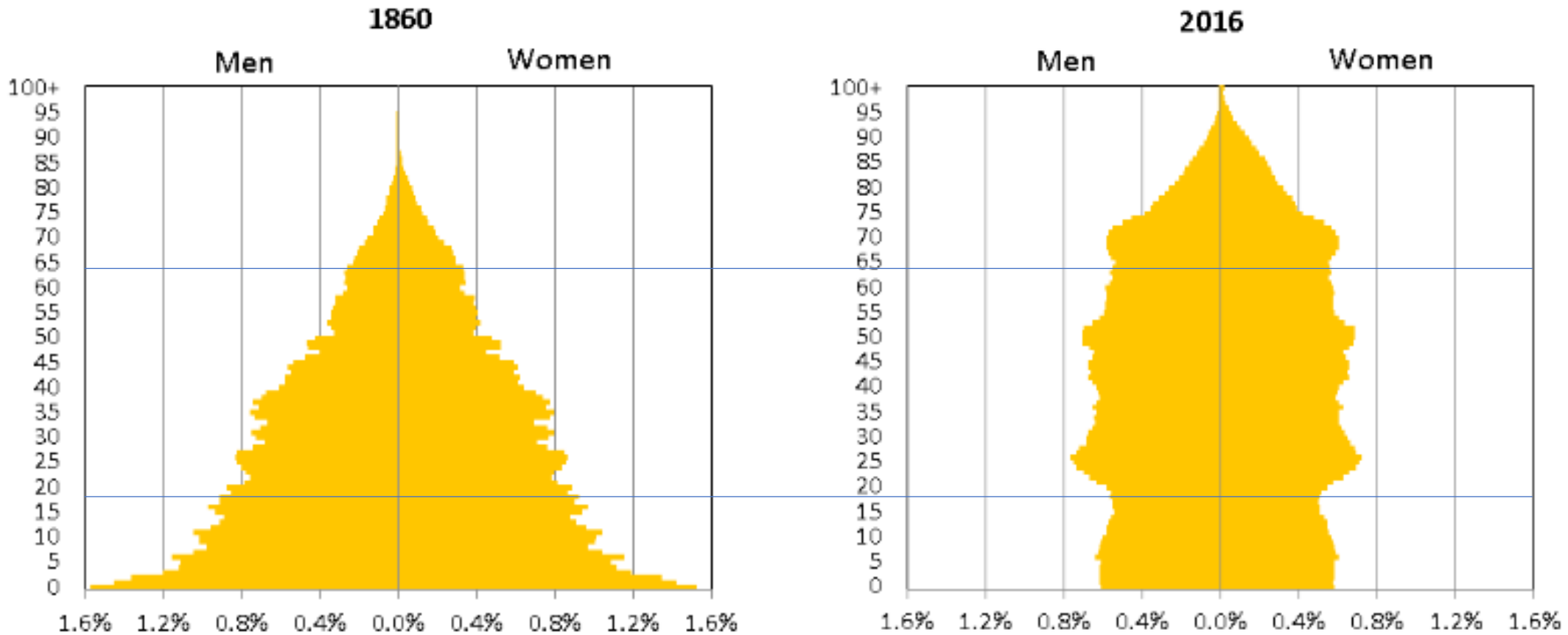
Source: Statistics Sweden

# Demographic transition & population ageing

- Declining population and working-age population in European countries and other industrialised countries

- Increasing share of elderly and dependency
  - posing challenges to the social security systems and the welfare state
  - Posing challenges to public finances through increased health care expenditures
  - deemed detrimental to prosperity, economic growth, productivity

- In common narrative increasing age dependency is something to be mitigated

Singapore's ageing population in 2030

An estimated **1 in 4** Singapore citizens will be aged 65 and above.
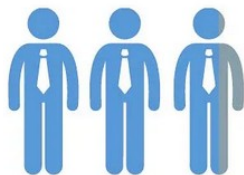
For every senior above 65 years old, there will be **2.7** working adults in the population.

An estimated **83,000** seniors will live alone.

About **100,000** seniors will have at least mild disability.

Ratio of Workers to Pensioners

1900	2000	2025
5.8:1	3.9:1	2.1:1

https://economictranscript.wordpress.com/2017/06/22/ageing-population-of-japan/

Older Australians

Australians enjoy one of the **highest life expectancies** in the world.

55yrs 1901-1910
80yrs 2010-2012

59yrs 1901-1910
84yrs 2010-2012

AN AGEING POPULATION. BY 2050, AROUND ONE QUARTER OF AUSTRALIANS WILL BE AGED 65 YEARS AND OVER

Australians aged 55 years and over contribute **$74.5 billion** each year in unpaid caring and voluntary work

1 in 3 Australians aged 65 years and over come from diverse cultural and linguistic backgrounds.

语言 낙말 Język

Declining Workforce Ratio

Number of workers to support → Australians aged 65yrs and over

Year	per
1970	per
2014	per
2050	per

Australians aged 55 years or over claim that age is a major barrier to finding or getting more hours of paid work.

1 in 5

MORE THAN 1 in 4 OLDER AUSTRALIANS LIVE IN POVERTY.

People aged 65 years and over make up **7%** of the homeless population

**80%** OF ALL AUSTRALIANS AGED 65 YEARS AND OVER RELY ON THE AGE PENSION.

3 in 4 people aged 85 yrs or over live in private dwellings

Demographic shifts in industrialised countries

- Longevity -> longer lives (more survival to higher age)
- Low birth rates
- Population ageing – increase in number and share of older population

-> Smaller populations and labour force

- Increasing human capital – educational expansion, health

-> Qualitatively different populations in the past and future

-> implications for labour force size, population structures (beyond age), labour force participation rates

Demographic Metabolism:
Change of populations structures through generational replacement cohort turnover -> older generations replaced by better educated younger generations

Source: Lutz, et al (2018), http://dataexplorer.wittgensteincentre.org/wcde-v3/
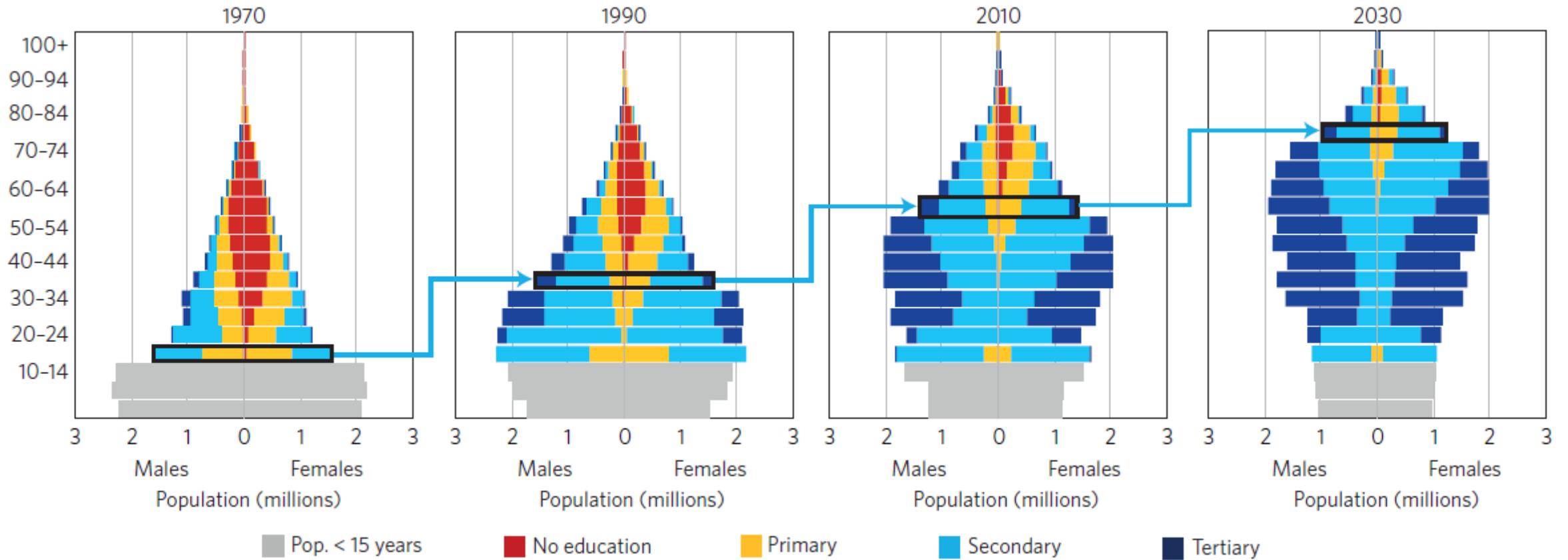
Commonly used measures of population ageing

- Share of population at age 65+

- Age dependency ratio (ADR)
  - $ADR^t = Pop^t \, 0\text{-}14 + Pop^t \, 65+ \, / \, Pop \, 15\text{-}64$
  - $OADR = Pop^t \, 65+ \, / \, Pop \, 15\text{-}64$
  - $YADR = Pop^t \, 0\text{-}14 + Pop^t \, 65+ \, / \, Pop \, 15\text{-}64$

  - Different age limits can be used as cut offs – age 19, age 60
  - Working age population (age 15-64) is not actual labour force, but potential labour force if everyone at that age was active at the labour market -> includes workers and non-workers

  - Deficiencies / limitations of ADR:
    - does not capture qualitative changes in working age population
    - assumes that everyone at working age participates equally and is equally productive and everyone age 65+ assumed to be inactive and unproductive
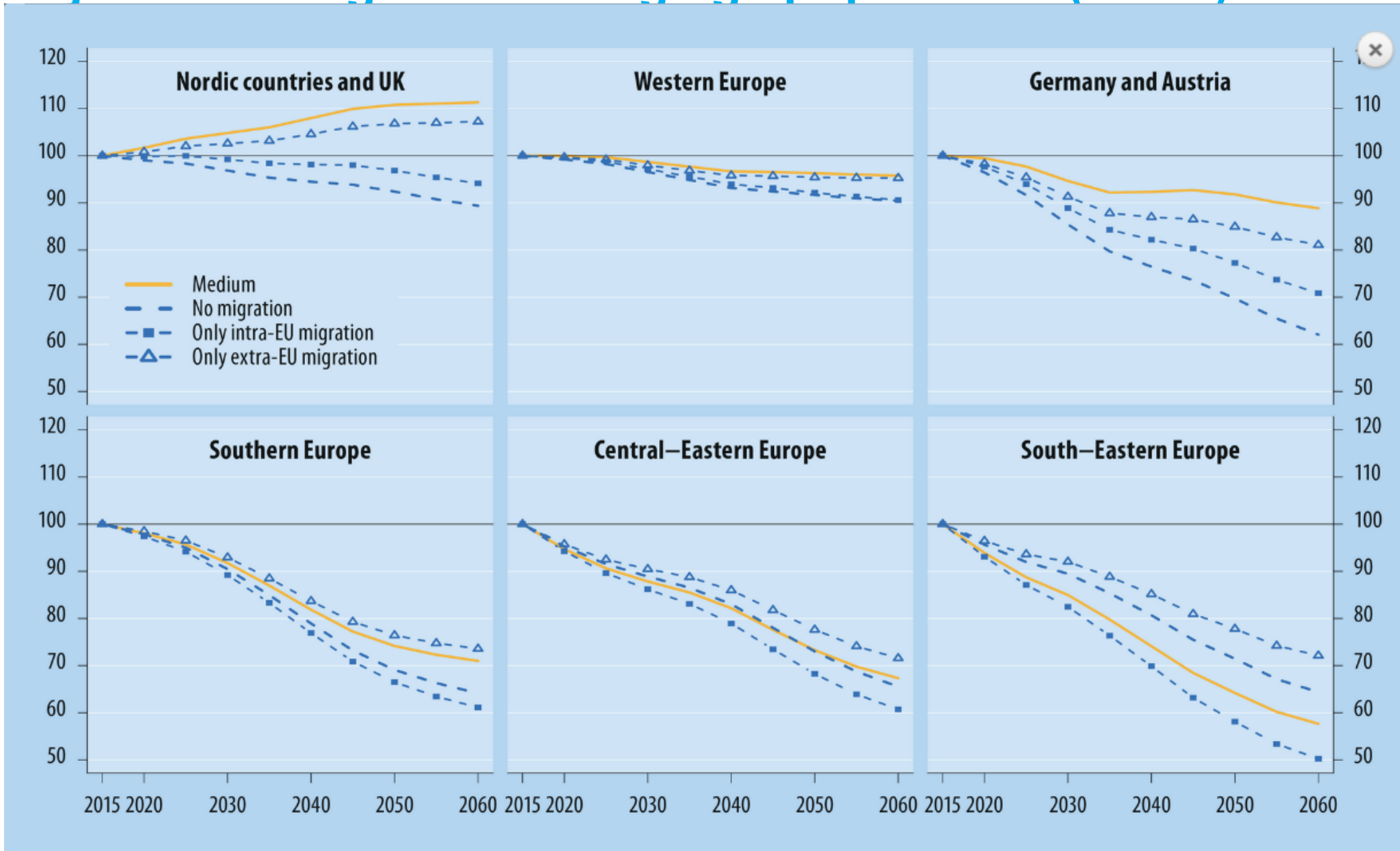
Alternative dependency ratios

- Prospective Age dependency ratio (Scherbov and Sanderson)
  - $POADR^t$ = Pop^t Pop^t with less than 15 remaining years of life / Pop 15-64
  - Captures increases in longevity – 65 year olds 50 years ago different to those now and to people in the same age 50 years from now
  - Improved cognitive skills, health -> potential for longer working lives

- Labour force dependency ratio
  - LFDR = inactive (non-workers)/ active at the labour market (workers)
  - Takes into account that not everyone in working age equally participates in the LF and that not everyone age 65+ is inactive

- Productivity-weighted dependency ratio
  - Adds a weighting factor that approximates differences in productivity by through education-specific wage differentials
  - Takes into account that not everyone is equally productive

Do you think all EU countries will see rapidly shrinking labour force?

Projected change in working age population (20-64)

Relative change in working age population (2015= 100)

Nordic countries and UK

Medium
No migration
Only intra-EU migration
Only extra-EU migration

Western Europe

Germany and Austria

Southern Europe

Central−Eastern Europe

South−Eastern Europe

Multidimensional population projections

- Population projection widely used to inform policy options -> need to go beyond standard population projections by age and sex and to capture population heterogeneity

- A useful tool to simulate future scenarios for better informed evidence-based policies to address demographic challenges and assess their consequences of population ageing in broader perspective

- WiC Global human capital projections: Education stands out as differentiating factor of demographic behaviours

 http://dataexplorer.wittgensteincentre.org/wcde-v3/

- Extensions to demographic modeling of labour supply

- Numerous scenarios and simulations show that reversing or even slowing down population ageing is not a viable policy option

- Extension to migration scenarios (CEPAM, QuantMig) and ongoing work on modelling skills (Liknk4Skills)

Demographic modelling of labour supply

- Option 1: Multistate cohort-component population projection by age, sex, educational attainment and labour force participation
- Option 2: Dynamic microsimulation population projection model with multiple status variables and stochastically modelled transition rates
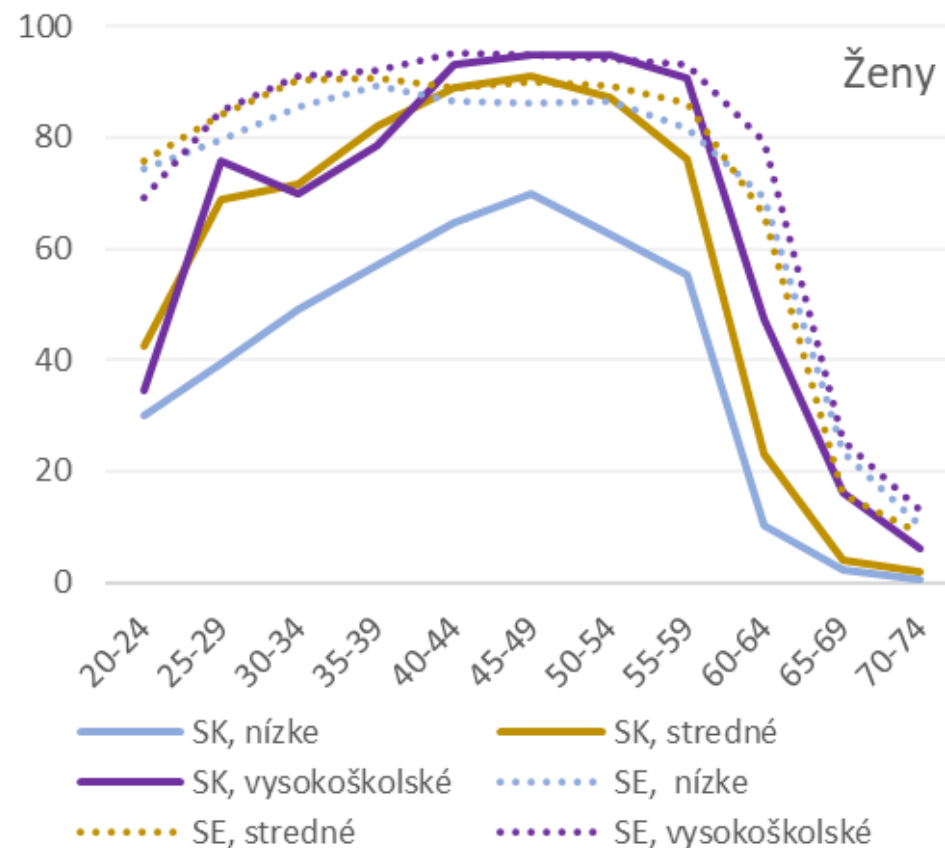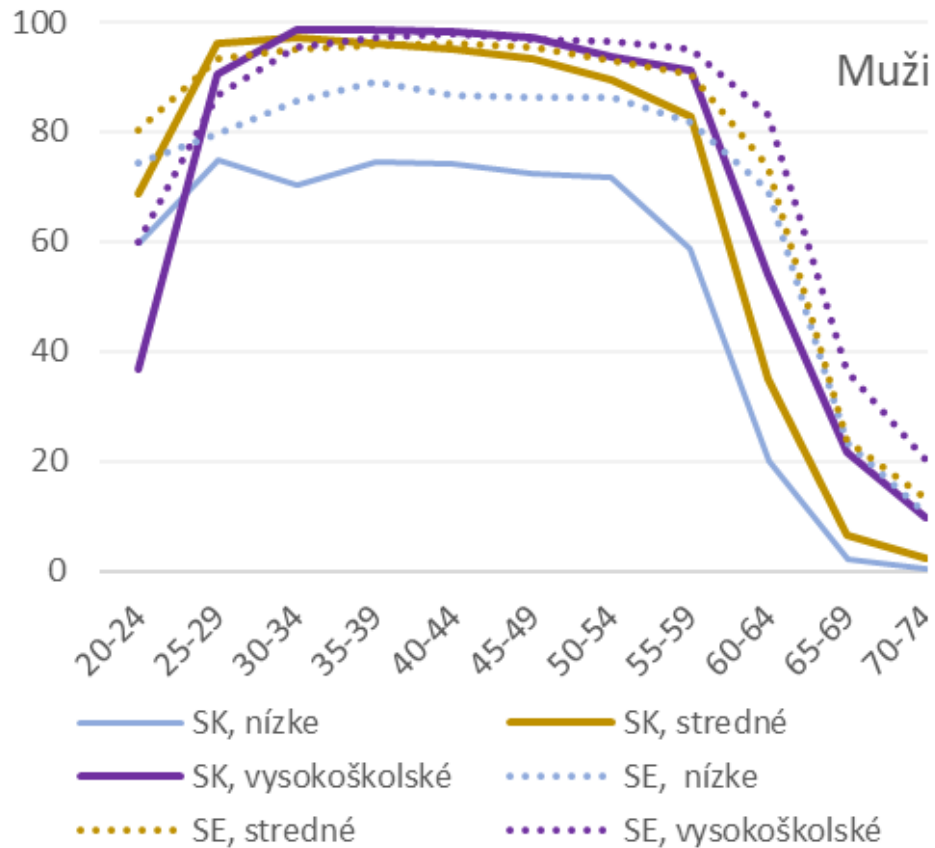
What we take into account in modelling?

- Mortality differentials by education -> higher edu associated with longevity (and better heath)
- Fertility differentials by education -> higher edu associated with higher childlessness and lower fertility (for women)
- Emigration rates by age and immigration volumes as during 2010-2016
- Fixed educational composition of immigrants
- Educational expansion modelled using cohort trends in past educational attainment
- Differences in labour force participation by age, gender and education

What do we know about gaps in labour force participation?

- Depends on age -> lower before age 25 and after age 60

- Depends on gender -> different age patterns due to parental leave

- Depends on educational attainment -> lower for those with lowest qualifications and highest for highly-educated

- Educational attainment is closely associated with LFP and employment
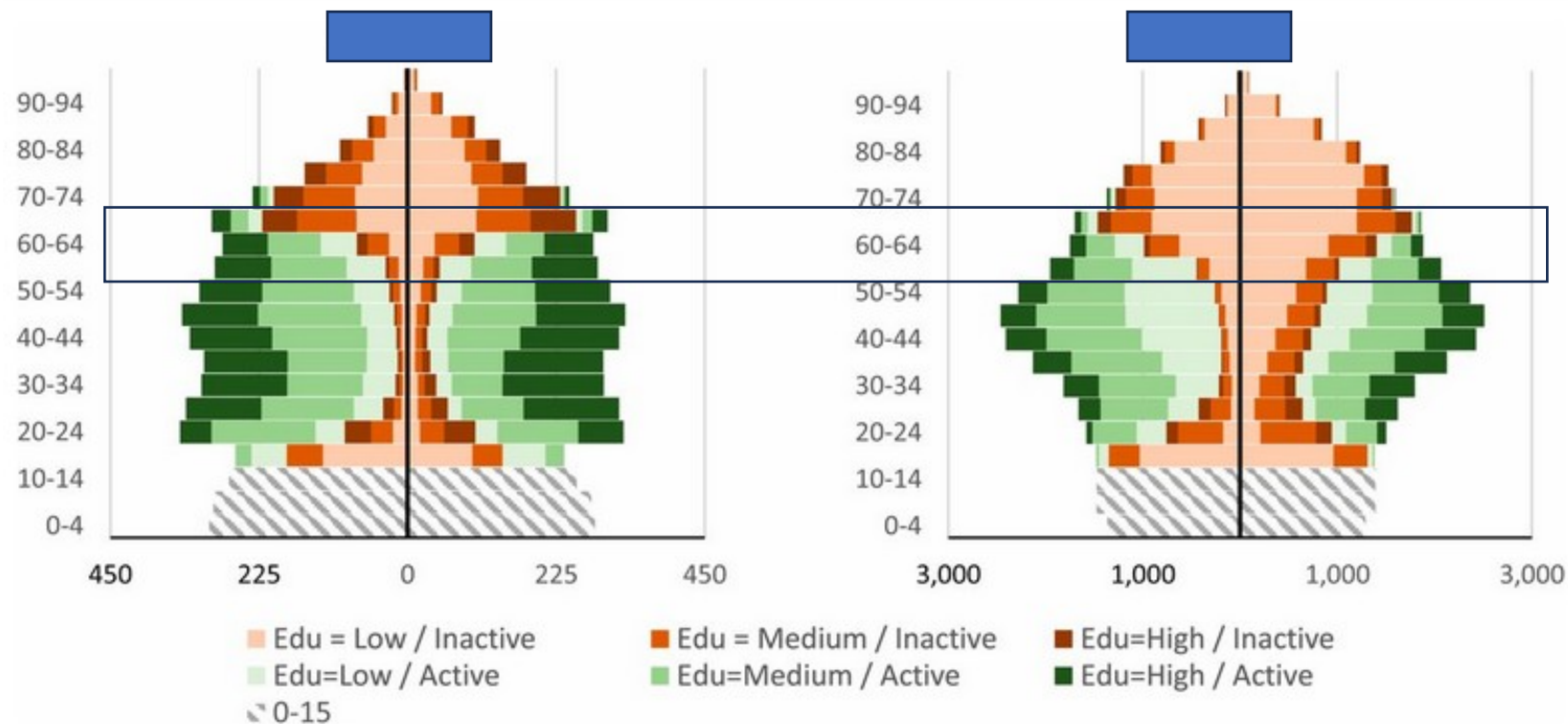
LFPR by age, gender and education, men and women
Slovakia 2014-2019, LFS

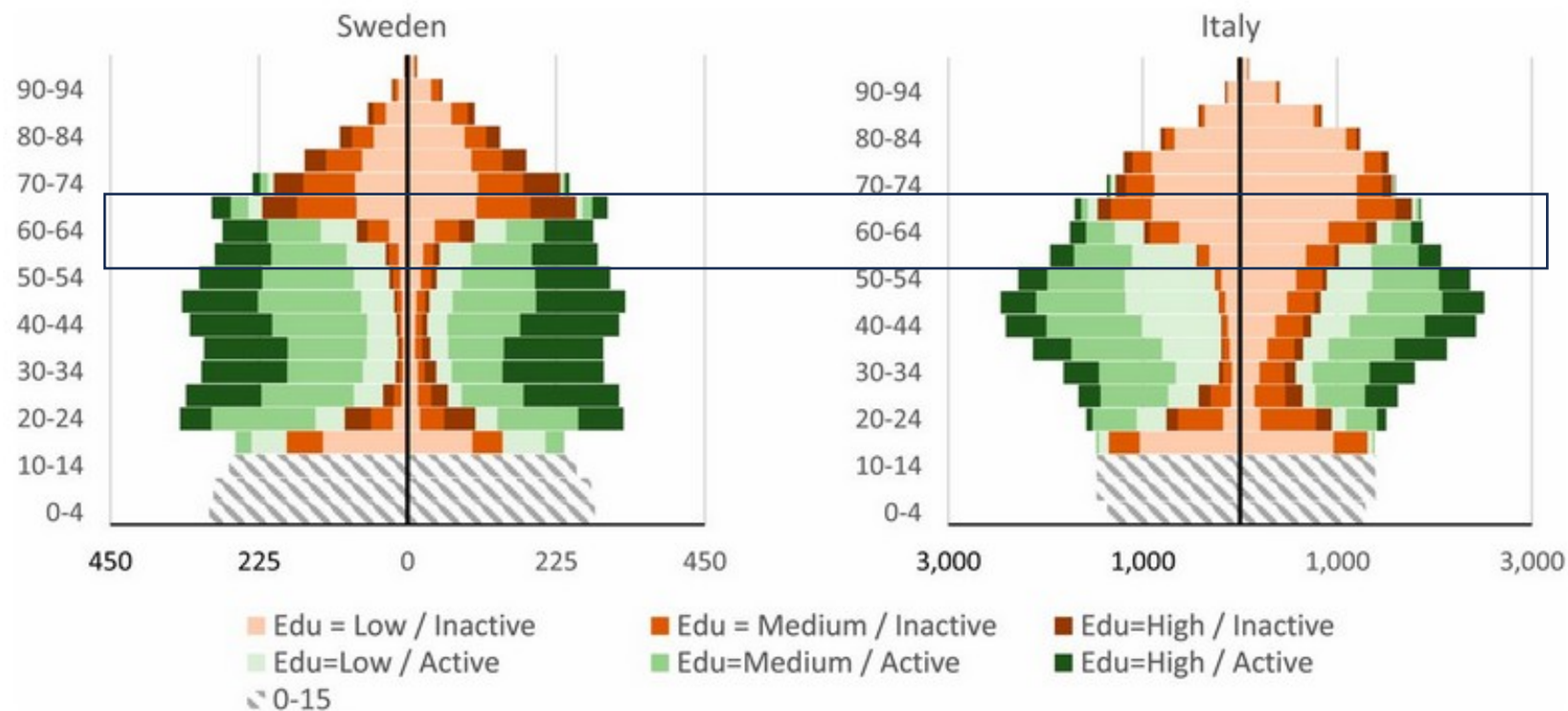# Differences in labour force activity across EU countries

Highest LFPRs   Lowest LFPRs

Source: Marois, Belanger and Lutz (2020)*Population aging, migration, and productivity in Europe. PNAS 117(14)*
https://doi.org/10.1073/pnas.1918988117

19, date

Differences in labour force activity across EU countries

Highest LFPRs   Lowest LFPRs

Age pyramids by labor-force participation and education for Sweden and Italy, 2015 (thousands).

20, date

When we consider educational expansion, higher female labour force participation and longer working lives what are the implications for future labour force sizes?

- Constant scenario: fixed LFPR by age, sex, education

- Equalisation scenario: women reach the same LFPR as men at equivalent age and education

- Swedish scenario: by 2040 men and women in all EU countries will reach labour force participation as in Sweden

When we consider educational expansion, higher female labour force participation and longer working lives can stabilize labour force size in the EU28
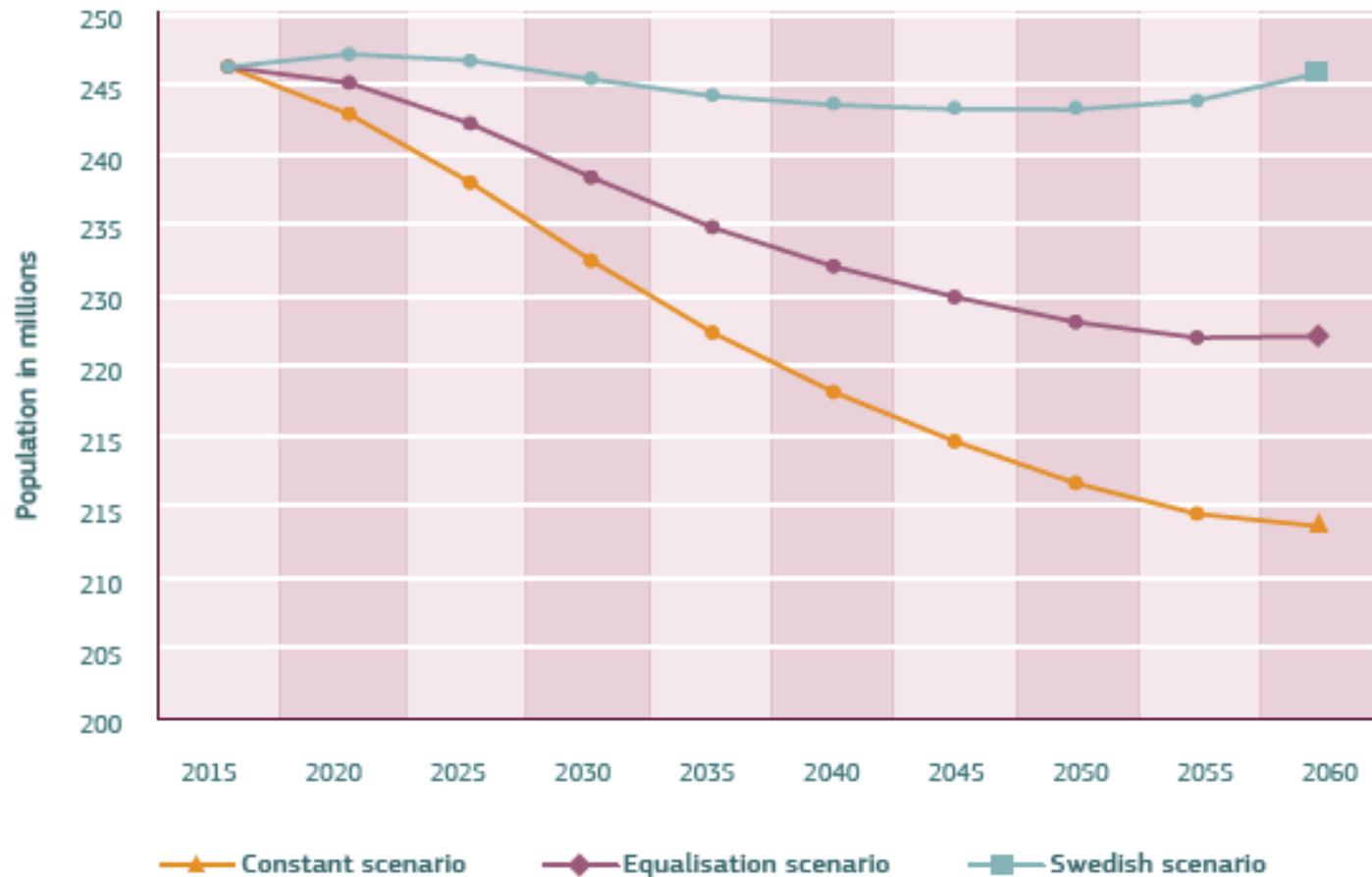
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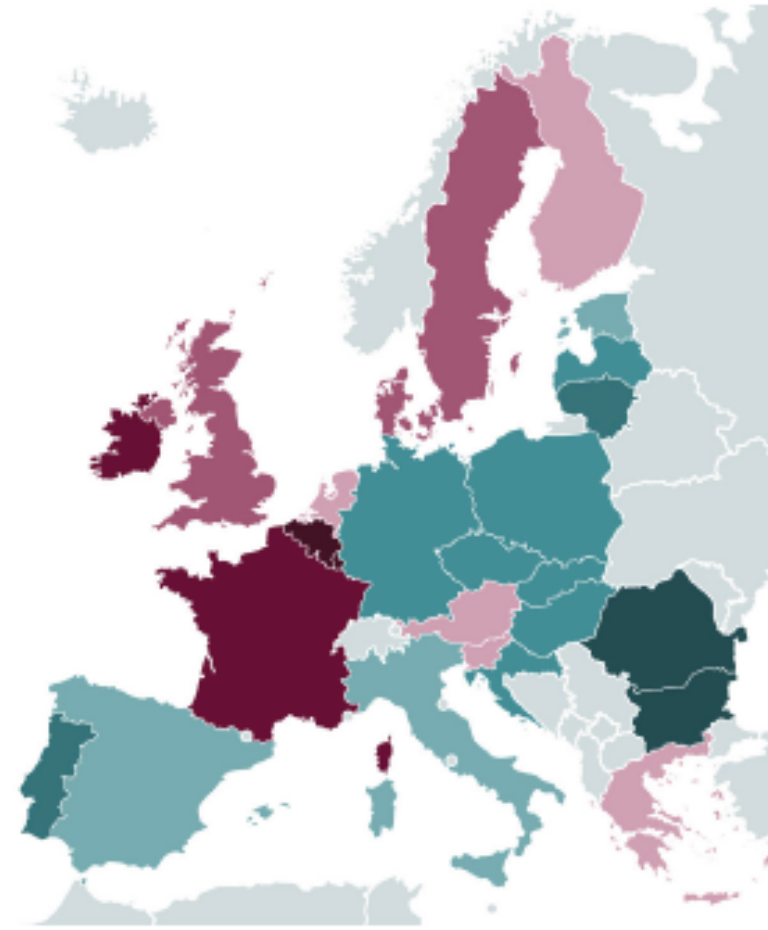
2015-2060 Active Population
Growth Rate, Constant scenario

- 20% to 29.9%
- 10% to 19.9%
- 0% to 9.9%
- 0% to -9.9%
- -10% to -19.9%
- -20% to -29.9%
- -30% or less
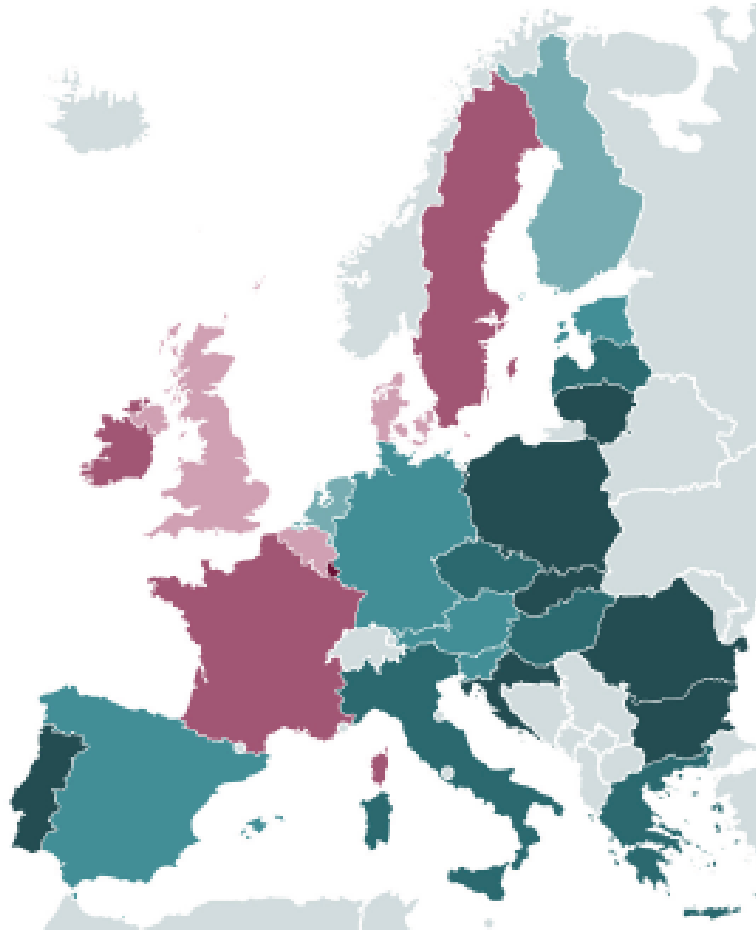
2015-2060 Active Population
Growth Rate, Swedish scenario

- 30% or more
- 20% to 29.9%
- 10% to 19.9%
- 0% to 9.9%
- 0% to -9.9%
- -10% to -19.9%
- -20% or -29.9%
- -30% or less

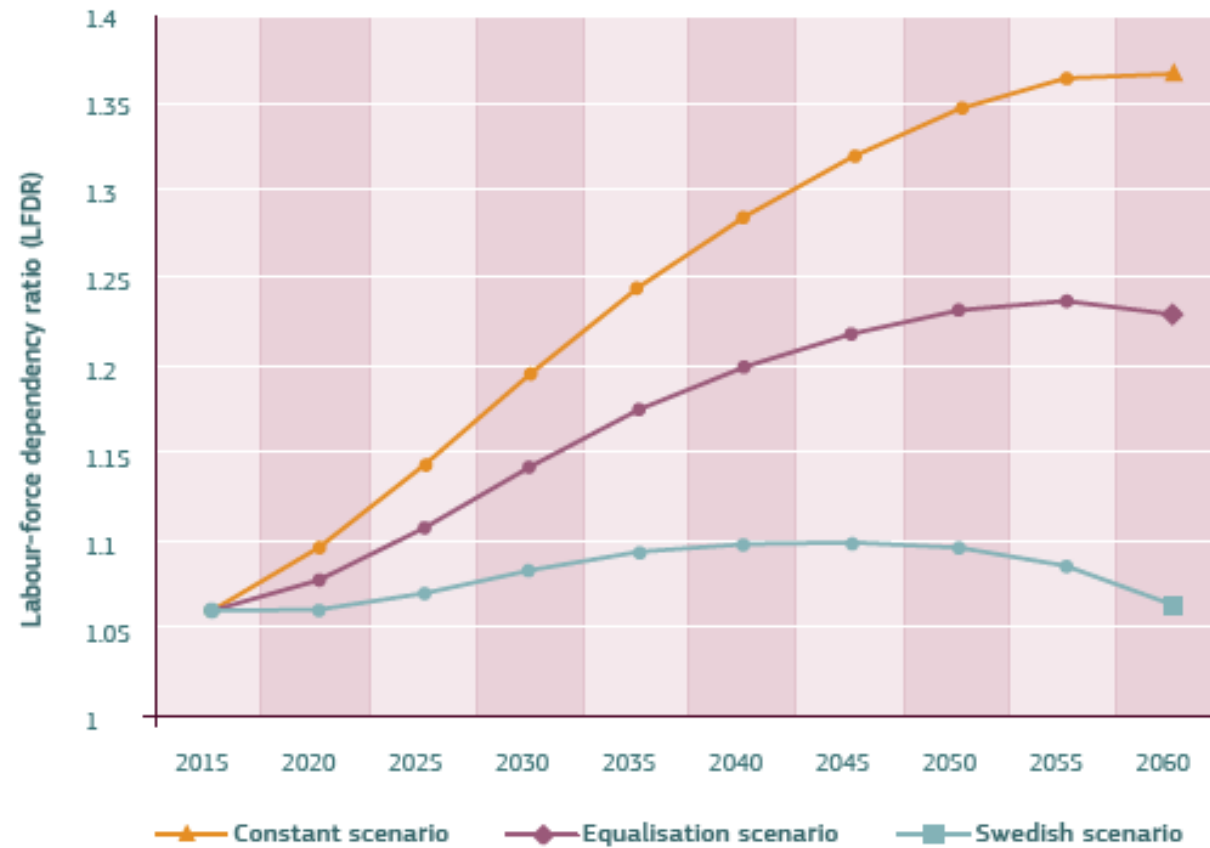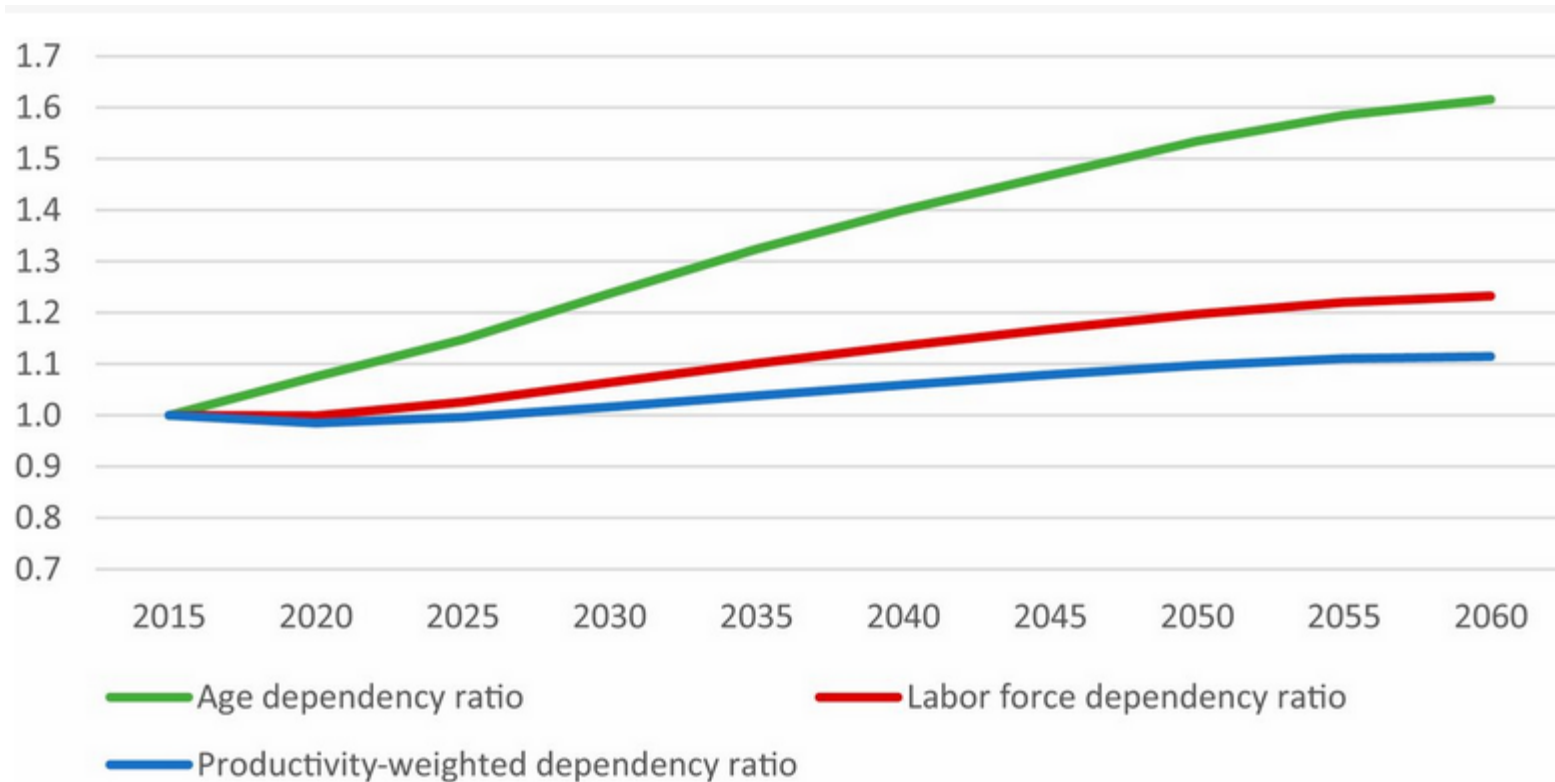# Projected labour force dependency ratio in EU28 (inactive / workers)

Figure 2.3: EU labour-force dependency ratio, by scenario, 2015-2060
Source: CEPAM

When we consider that productivity is associated with educational attainment, future dependency ratios look less daunting for EU-28

Projections of the three different dependency ratios for the EU-28, baseline scenario, 2015–2060.

- Age dependency ratio (ADR)

$$\mathrm{ADR}_c^t = \frac{Pop0-14_c^t + Pop\,65over_c^t}{Pop15-64_c^t}.$$

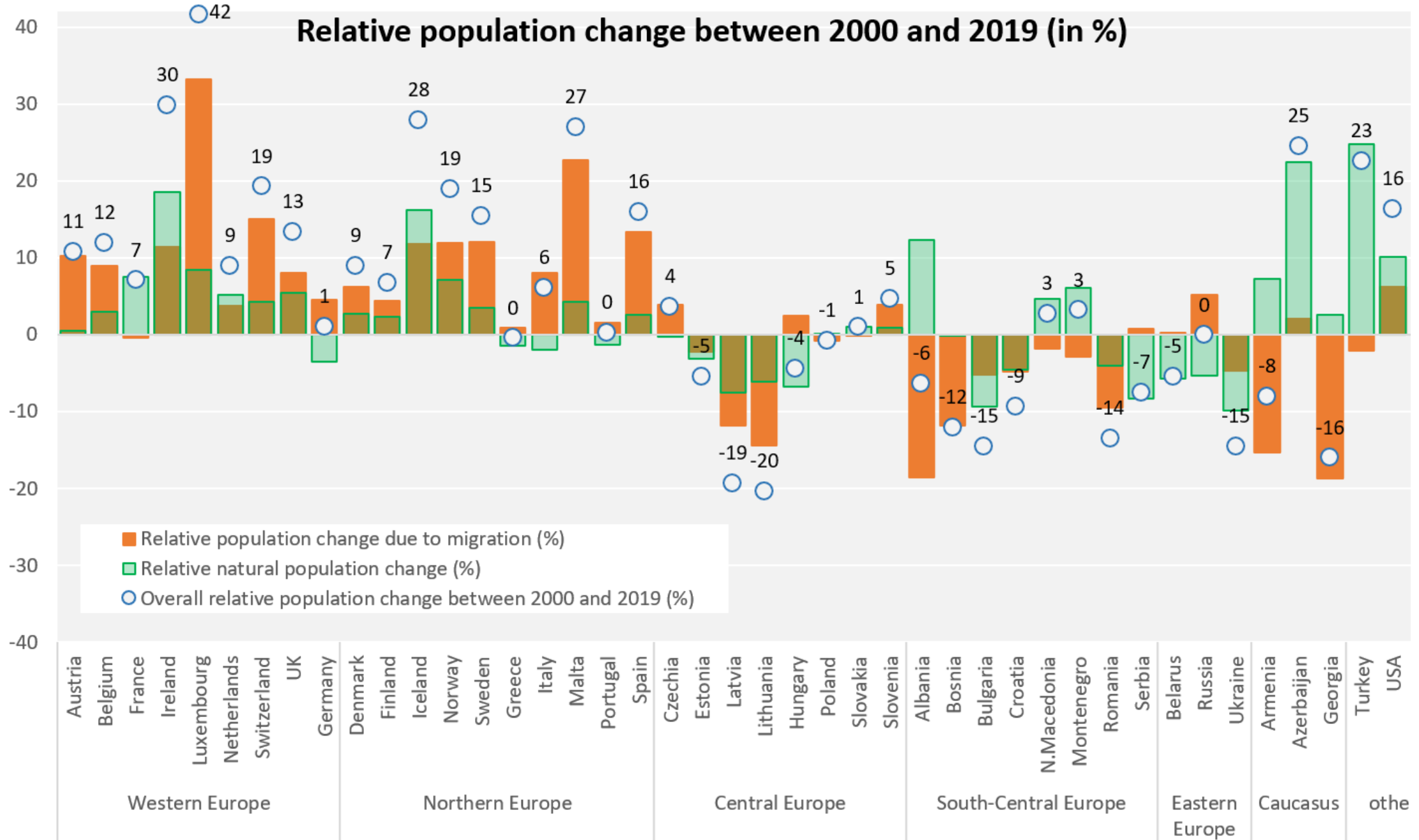- Labour force dependency ratio (LFDR)

$$\mathrm{LFDR}_c^t = \frac{I_c^t}{A_c^t}.$$

- Productivity-weighted dependency ratio:

- estimated productivity weights for Active population are set at 1 for medium education, 1.66 for high education, and 0.62 for low education

Source: Marois, Belanger and Lutz (2020)*Population aging, migration, and productivity in Europe. PNAS 117(14)*
https://doi.org/10.1073/pnas.1918988117

What other feasible ways to address the labour force decline can you think of?

Policy debate

- Increase labour force participation of women
- Longer working lives: higher retirement age, active aging
- Increase birth rates to stabilize and prevent future decline in the labour force
- Activate locally available human capital – activation, reskilling, upskilling
- Immigration
  - Replacement migration – how many immigrants would be needed to stabilize population, working age population, dependency ratios…
  - Skilled labour – recognition of foreign degrees, matching demand and supply
  - Access to labour market for different types of migrants beased on residence permits
- Curb emigration, incentivize return migration

Relative population change between 2000 and 2019 (in %)

Legend:
- Relative population change due to migration (%)
- Relative natural population change (%)
- Overall relative population change between 2000 and 2019 (%)

28

Scenarios of migration impact on future labour force

- Immigration often presented as a tool to improve the expected labour force decline

- But shift towards rights-based migration policy implies a need to remove barriers for better integration of (some groups of) immigrants into labour market

- What would be the long-term impacts of improved or worsened economic integration of immigrants on labour supply and employment?

Figure 8: Refugees and dependent family members are not easily integrating into our labour markets

Employment rates by type of initial residency permit and duration of residence in the EU, ages 15-64, 2014, in %
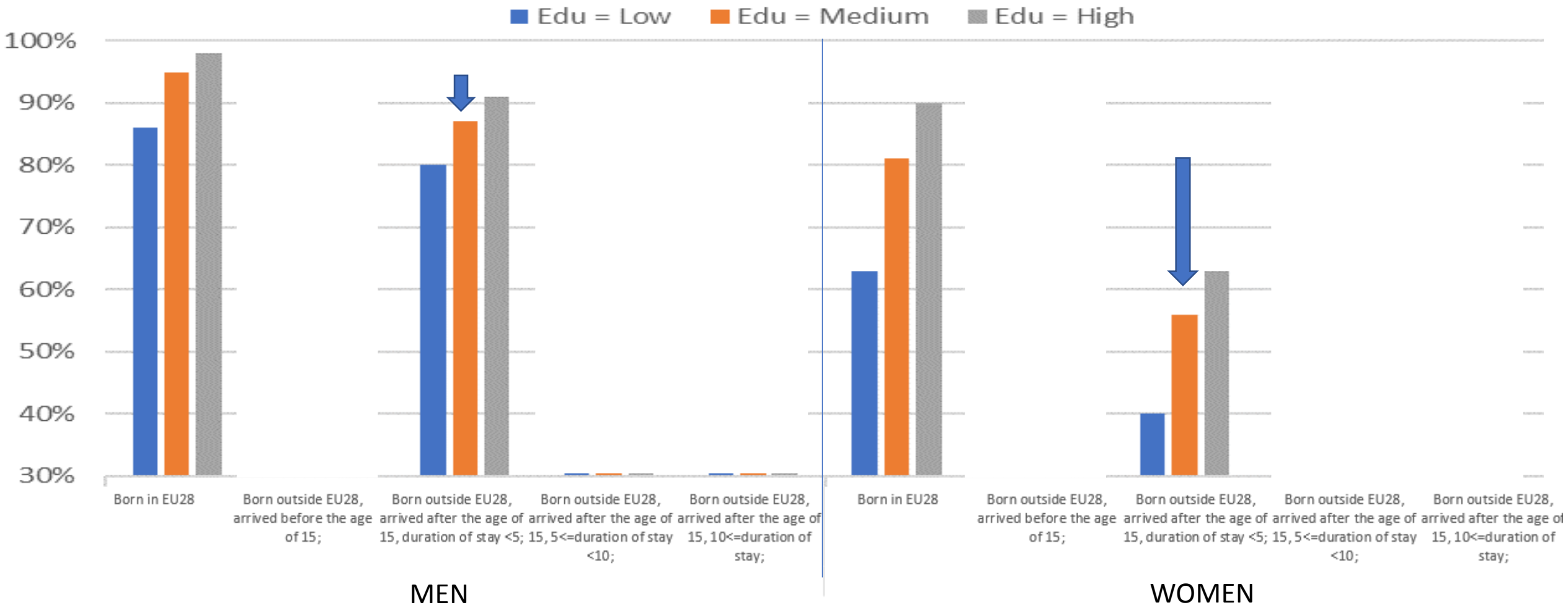
Employment or study ∙ Family ∙ Refugees ∙ Native-born
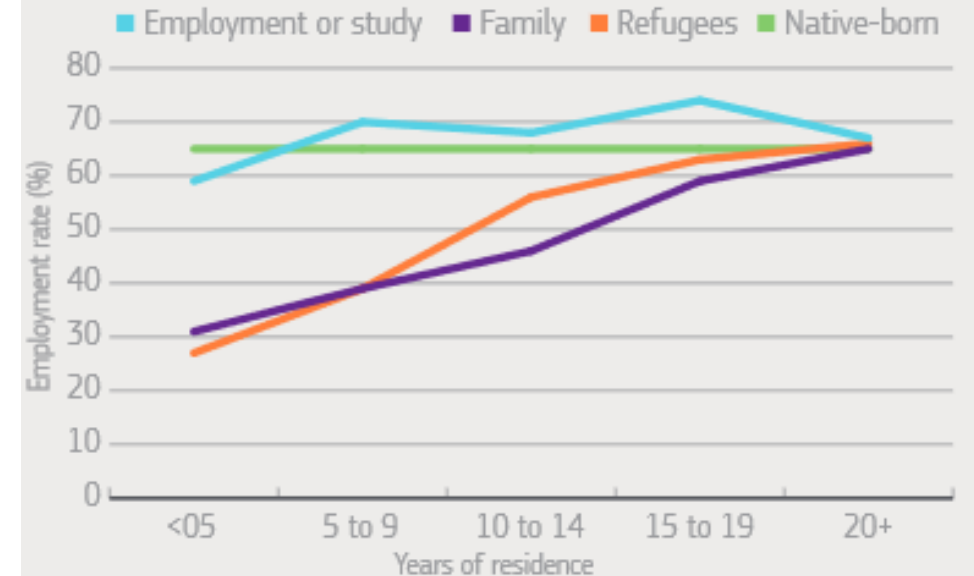
Source: Source: OECD, EU-LFS 2014 ad-hoc module
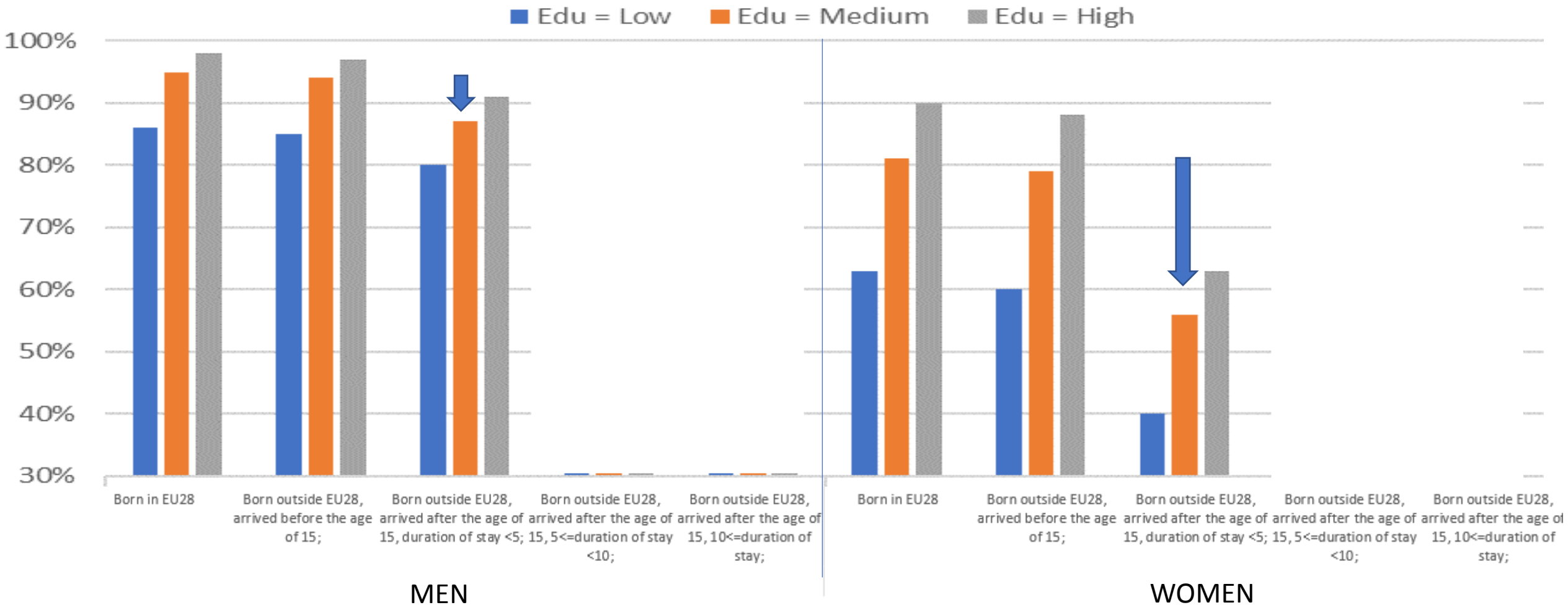
Source: EPSC (2018)

What do we know about gaps in labour force participation of immigrants?

- Labour force participation differs between EU-born and (different groups of) immigrants

Labour force participation rates at age 35-39, EU28

Labour force participation rates at age 35-39, EU28

Data: EU-LFS 2010-2016

Labour force participation rates at age 35-39, EU28

What do we know about gaps in labour force participation of immigrants?

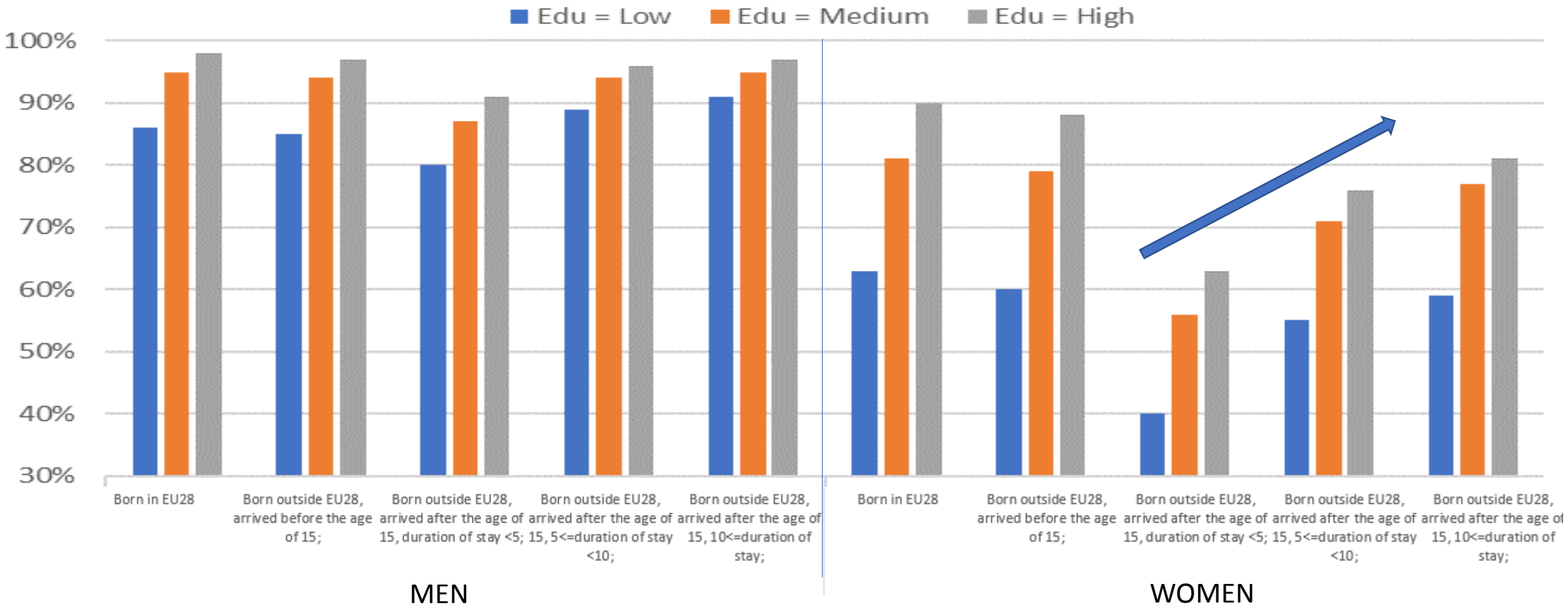- Labour force participation differs between EU-born and (different groups of) immigrants
- LFP associated with educational attainment for both natives and immigrants
- For immigrants increases with duration of stay -> catching up native levels
- Immigrants who arrived as children similar outcomes as native-born
- Gaps to natives more pronounced for women
- Educational attainment matters but the gap never closes for immigrant women even, even after controlling for education
- Women face higher unemployment in addition to lower activity rates

Scenarios of economic integration of immigrants from outside the EU28

- Scenarios to help assess the long-term impact of better or worsened economic integration of immigrants

- Not predictions or plausible scenarios but stylized situations (what-if scenarios) representing a range of policy outcomes

- Assumptions on LFPR at fixed demographic and educational trends, and at fixed volume and composition of immigrantion flows
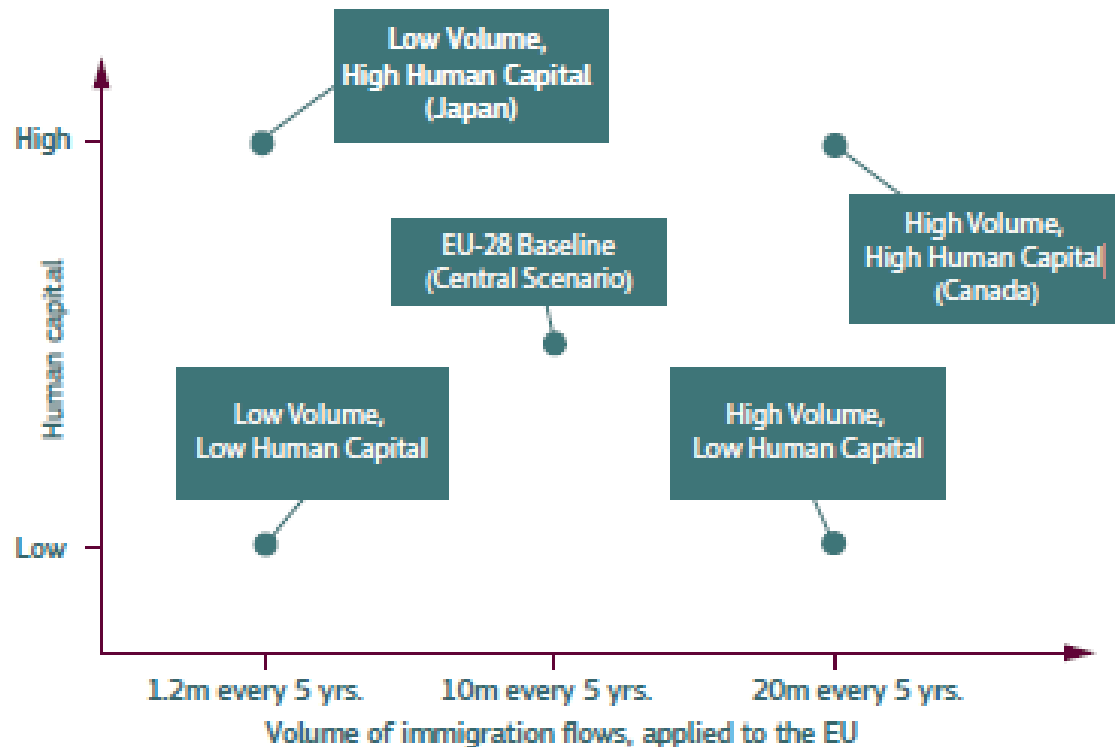
What we take into account in modelling?

- Fertility differentials by education, region of birth, migration status and duration of stay in the country

- Differences in labour force participation by age, gender, education, region of birth and duration of stay

- Differences in migration rates between the native-born, born in the EU+ and born outside the EU+

- Immigrants pulled into destinations along established migration corridors

CEPAM scenarios to examine the impact of immigration on future labour force in the EU
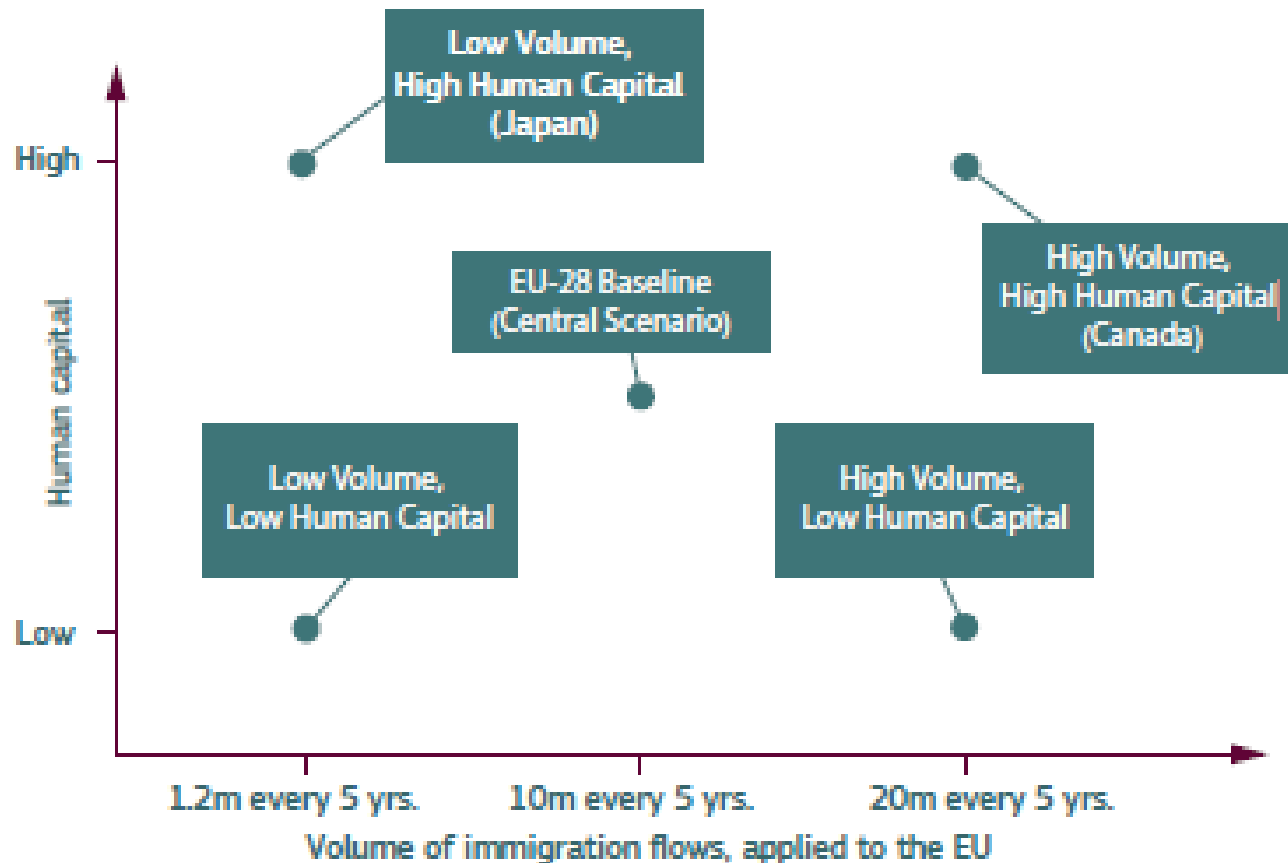
Source: Lutz et al (2019)

Scenarios to examine the impact of immigration on future labour force in the EU

High

Human capital

Low Volume,
High Human Capital
(Japan)

EU-28 Baseline
(Central Scenario)

High Volume,
High Human Capital
(Canada)

Low Volume,
Low Human Capital

High Volume,
Low Human Capital

Low

1.2m every 5 yrs.   10m every 5 yrs.   20m every 5 yrs.

Volume of immigration flows, applied to the EU

Baseline labour-force integration scenario: Uses gender- and country-specific parameters for migrants (by education, duration of stay and age at arrival) and native-born, as observed for the period 2010-2015.

Low integration scenario: Assumes that by 2040 all countries will have converged to the worst labour-force integration observed in the EU-28.

High integration scenario: Assumes that the labour-force participation rate for immigrants will equal that of the native-born by 2040.

Baseline volume scenario: Uses the short-term average for migration to the EU; medium assumptions of mortality, education levels, and intra-EU mobility.

Source: Lutz et al (2019)

41

What-if scenarios of improved or failed integration:

Component	1-Volume of immigration into EU+UK	2-Educational composition of immigrants	3-Integration of immigrants in the labor force	4-Labor force participation trends for EU-born
i. Baseline	10M/5 years	Same as recent immigrants	Average of 2010-2016	Constant entry and exit rates
ii. Baseline/Swedish_LFP	10M/5 years	Same as recent immigrants	Average of 2010-2016	Rates reach those of Sweden
iii. Baseline/high integration	10M/5 years	Same as recent immigrants	Rates reach those of native-born by 2040	Constant entry and exit rates
iv. Baseline/low integration	10M/5 years	Same as recent immigrants	Rates reach those of immigrants in Denmark by 2040	Constant entry and exit rates
v. Canadian	20M/5 years	Same as recent immigrants in Canada (53% highly educated)	Average of 2010-2015	Constant entry and exit rates

- Projected labour force size in EU28

- Projected labour force dependency ratio in EU28

Immigration volume	Educational composition of immigrants	Integration assumptions		
		Low	Baseline	High
Low	Low	168	170	171
	Medium	168	170	171
	High	168	171	172
Baseline	Low	212	224	231
	Medium	214	226	233
	High	217	229	237
High	Low	264	287	300
	Medium	265	289	302
	High	271	295	310
LABOUR FORCE IN 2015 = 245				

Table 3.1: Projected labour force size (in millions) of the EU in 2060
Source: CEPAM

Immigration volume	Educational composition of immigrants	Integration assumptions		
		Low	Baseline	High
Low	Low	1.44	1.41	1.39
	Medium	1.44	1.41	1.39
	High	1.43	1.41	1.39
Baseline	Low	1.47	1.34	1.28
	Medium	1.46	1.33	1.26
	High	1.43	1.30	1.22
High	Low	1.50	1.29	1.20
	Medium	1.48	1.27	1.17
	High	1.43	1.24	1.12
VALUE IN 2015 = 1.08				

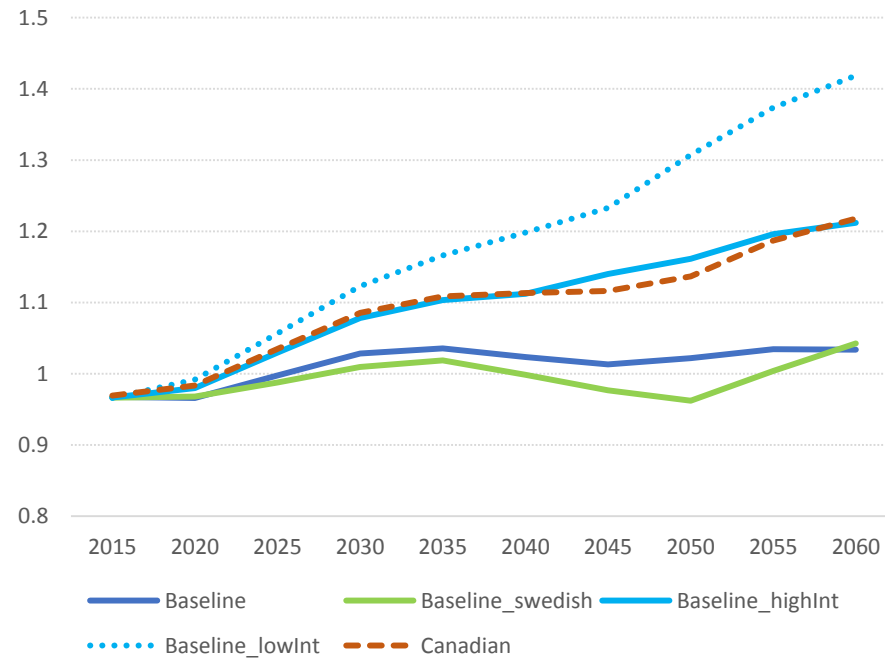Table 3.3: Projected EU labour-force dependency ratio in 2060
Source: CEPAM

Projected labour force by integration scenarios
(constant educational attainment of immigrants as in recent past)

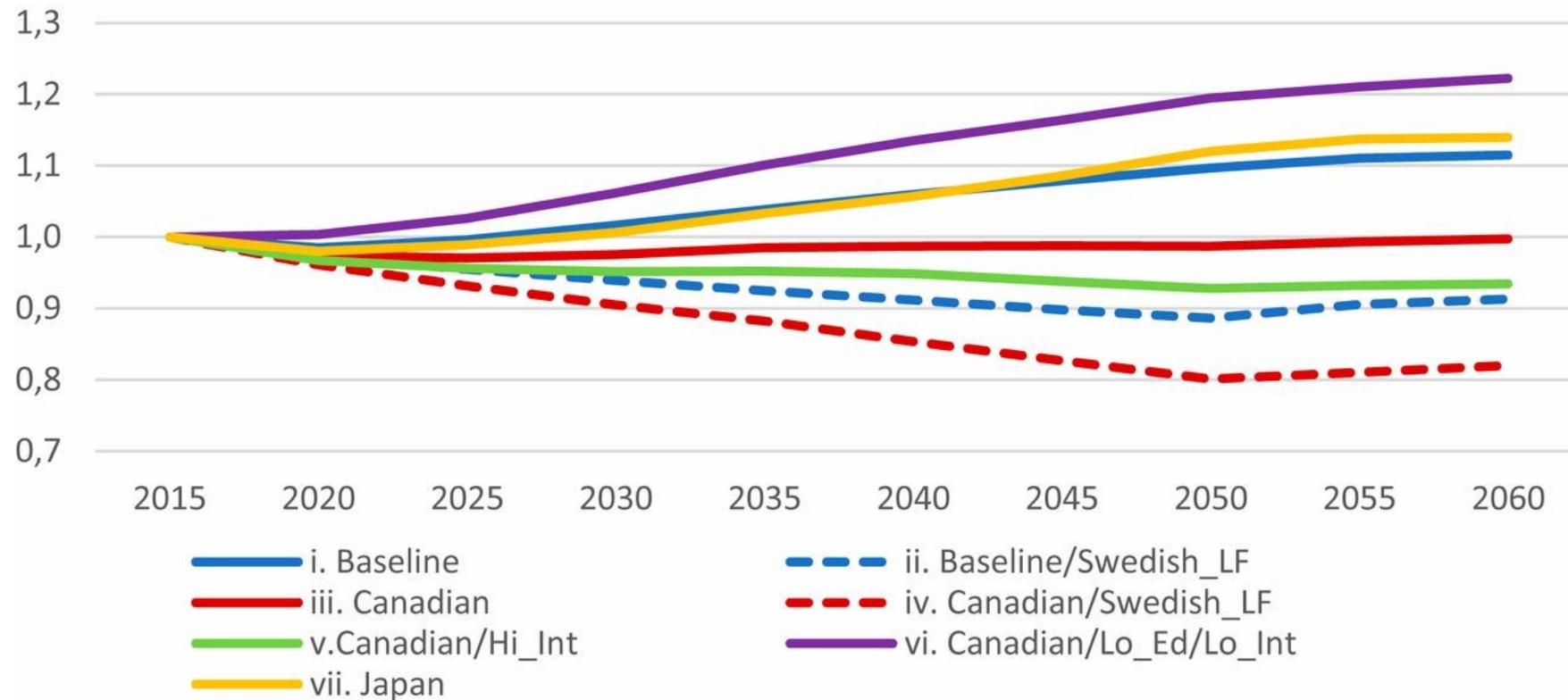Relative change in projected total labour force, Austria
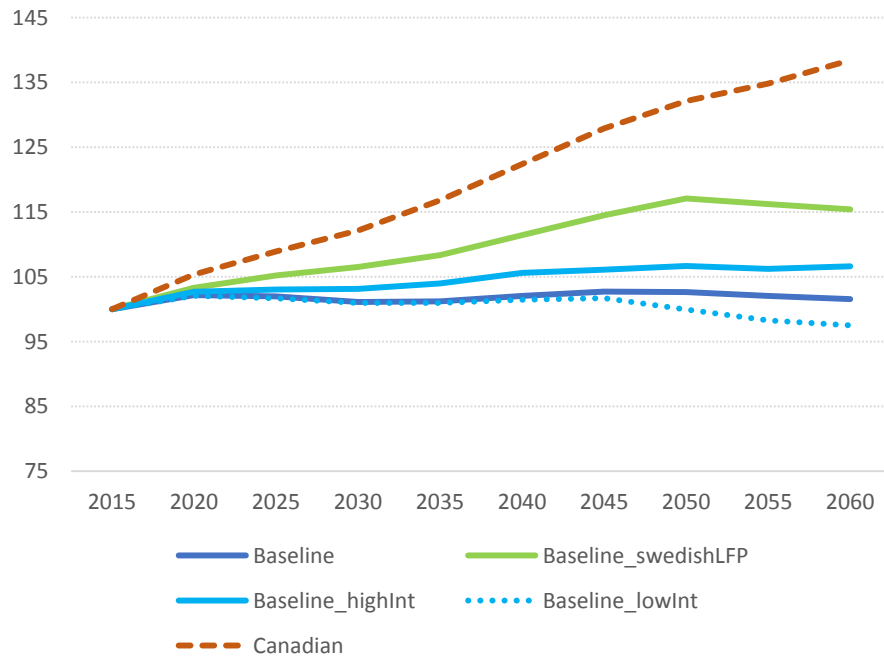
Projected labour force dependency ratio, Austria
(inactive/active)

Legend (left chart): Baseline, Baseline_swedishLFP, Baseline_highInt, Baseline_lowInt, Canadian

Legend (right chart): Baseline, Baseline_swedish, Baseline_highInt, Baseline_lowInt, Canadian

Labour force dependency ratio in the EU28 – improved economic integration is paramount under high migration flows

**Projection of the productivity-weighted labor-force dependency ratio (inactive / active) for the EU-28 under different scenarios, 2015–2060**

Legend:
- i. Baseline
- ii. Baseline/Swedish_LF
- iii. Canadian
- iv. Canadian/Swedish_LF
- v. Canadian/Hi_Int
- vi. Canadian/Lo_Ed/Lo_Int
- vii. Japan

Negative impacts of population ageing on labour supply can be mitigated by changes in **migration** (education-selective & high integration) AND increased **labor force participation**

Age pyramids disaggregated by labor force participation and education for the EU-28 in 2015 and 2060 under different scenarios

Source: Marois, Bélanger and Lutz (2020) *PNAS*.
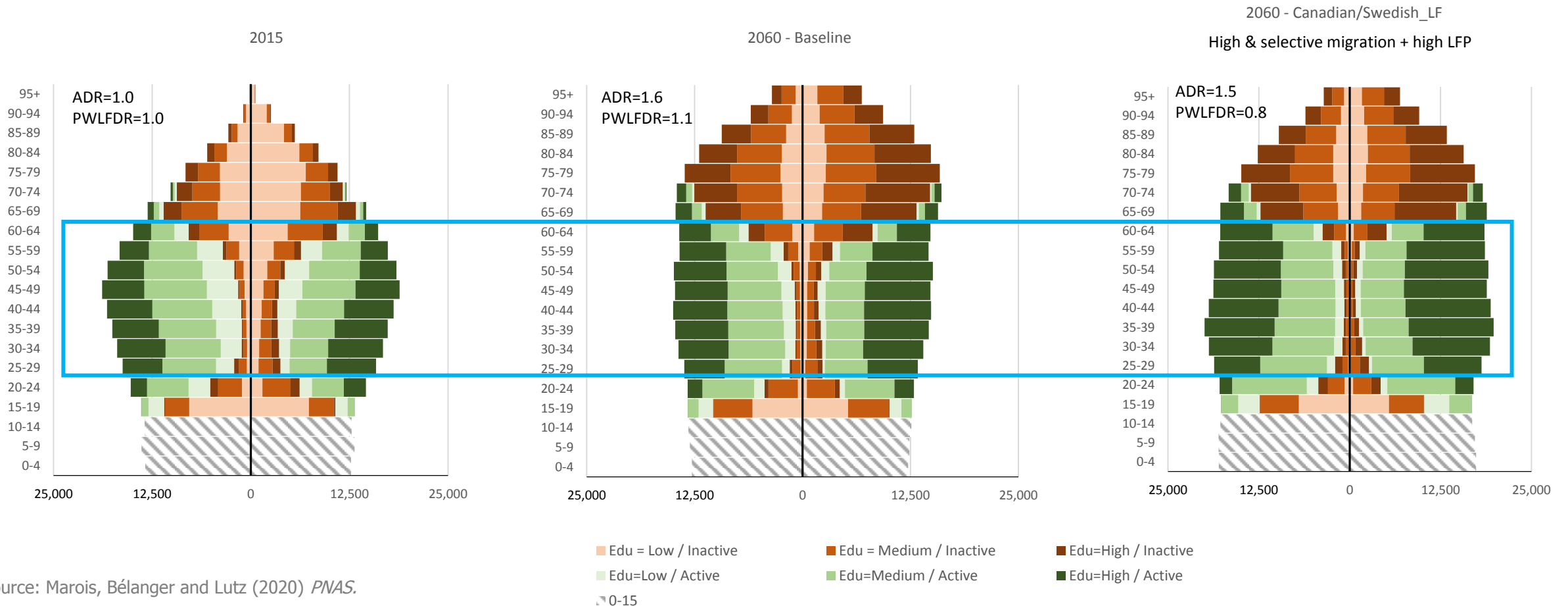
How would high immigration events impact future demographic trends and labour force?

- Volatility and unpredictability of migration

- Past political events linked to large migration events to Europe

- Uncertainty about future migration quickly increases already in short time horizons (Baker and Bijak 2021)

- Much of uncertainty about future migration is irreducible and driver environments are complex (Bijak and Czaika 2020)

- How to reflect the uncertainty against the backdrop of the past unexpected large immigration, such as from Syria and Ukraine, in scenarios?

- What would be long-term demographic impacts of High migration events emerging from different origins ?

Immigrantion to Austria

Data source: Statistik Austria
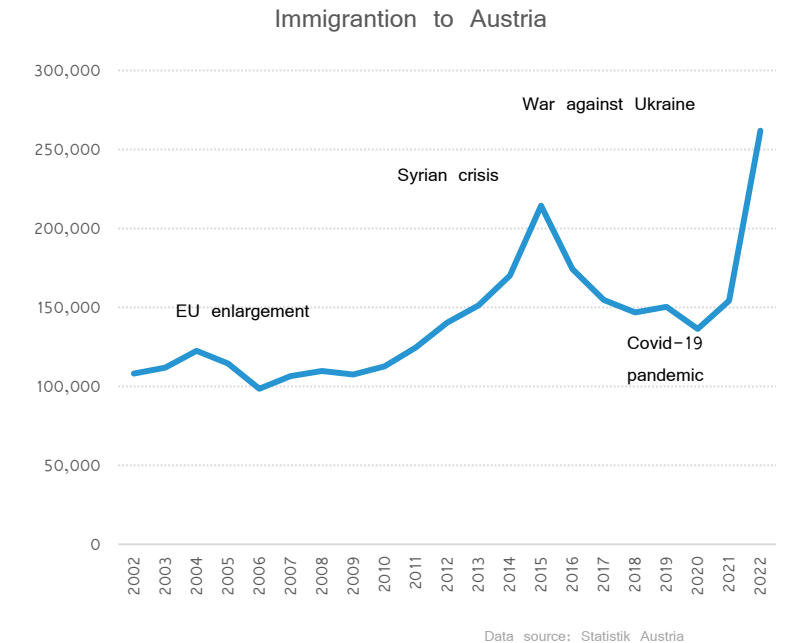
Framework for quantifying rare migration events

- We cannot predict but we can simulate what-if scenario

- To predict we would need to know/assume: onset, magnitude, duration and origin

- Inspiration from contingency planning -> Bijak (2023) pioneers use of selected quantiles from the upper tails of the heavy-tailed probability distributions that approximate volumes of migration for selected frequency of occurrence of a migration event

- The method is based on statistical approaches to modelling rare events, including the extreme value theory (Coles 2001)

- Rare / extreme events have certain frequency of occurrence and magnitudes

- In this presentation: migration corresponding to twice-in-a-century event (0.98 quantiles from Pareto distribution) fitted to harmonised origin-destination-specific migration flows estimates between EU+ countries and 8 world regions (by Aristotelous et al. 2022)
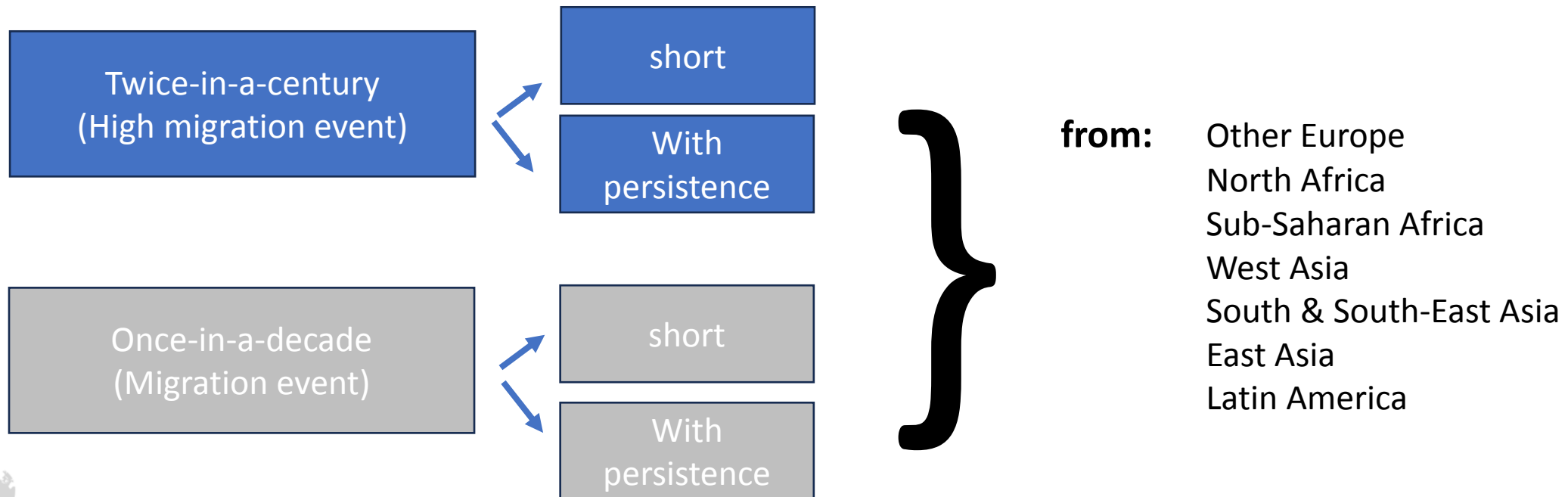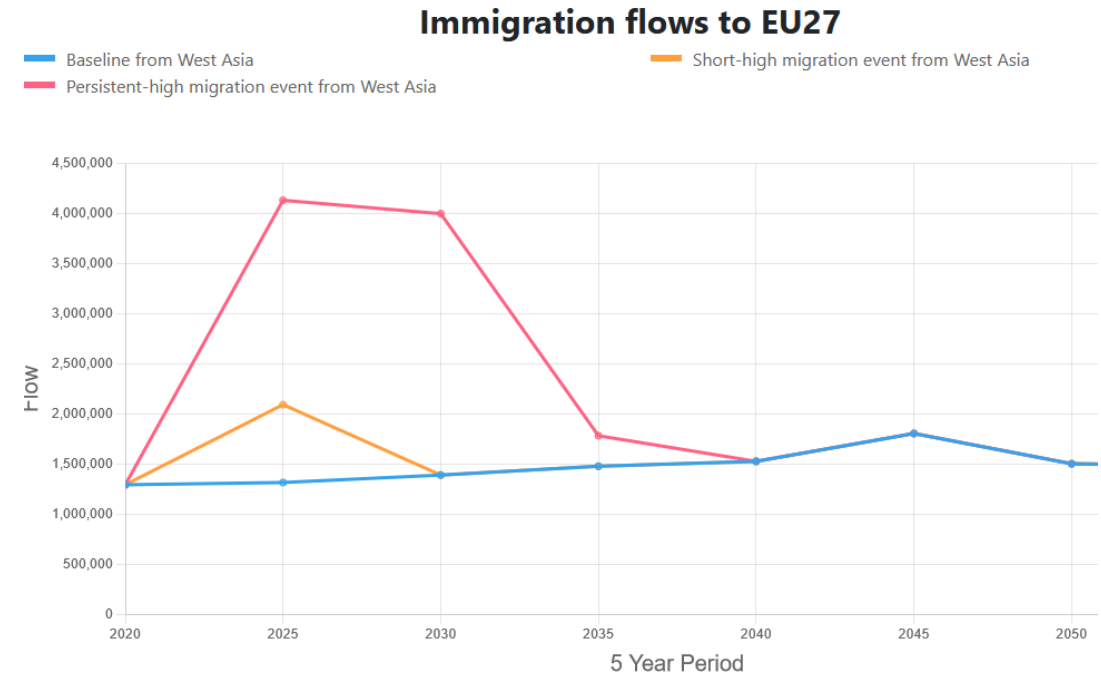
High migration events scenarios

What-if scenarios simulated one by one as either short or persistent immigration event from each world region
Short event: twice-in a century flows in one single year in 2025-2029 period
Persistent event: increased immigration from High migration event region follows for 10 years, with gradually declining intensity due to family reunifications, migration networks and other reasons (after 10 yeas same flows from that region as in the baseline scenario)

| Twice-in-a-century (High migration event) | short |
| | With persistence |

| Once-in-a-decade (Migration event) | short |
| | With persistence |

from: Other Europe
North Africa
Sub-Saharan Africa
West Asia
South & South-East Asia
East Asia
Latin America

High migration events scenarios

What-if scenarios simulated one by one as either short or persistent immigration event from each world region

Short event: twice-in a century flows in one single year in 2025-2029 period

Persistent event: increased immigration from High migration event region follows for 10 years, with gradually declining intensity due to family reunifications, migration networks and other reasons (after 10 yeas same flows from that region as in the baseline scenario)
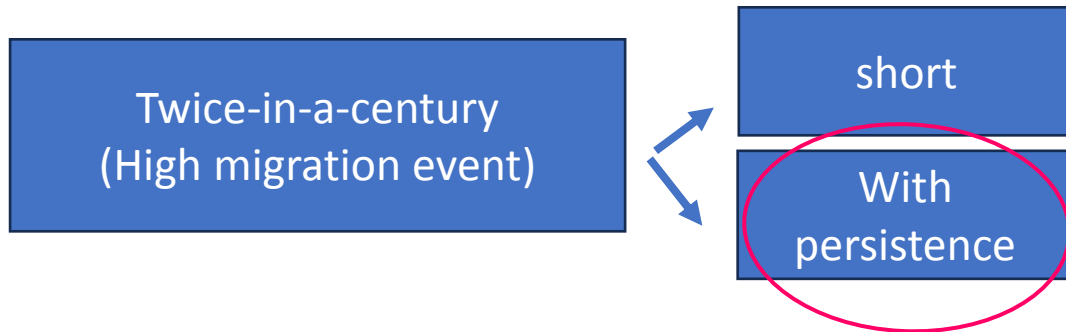
High-migration events projection scenarios key results
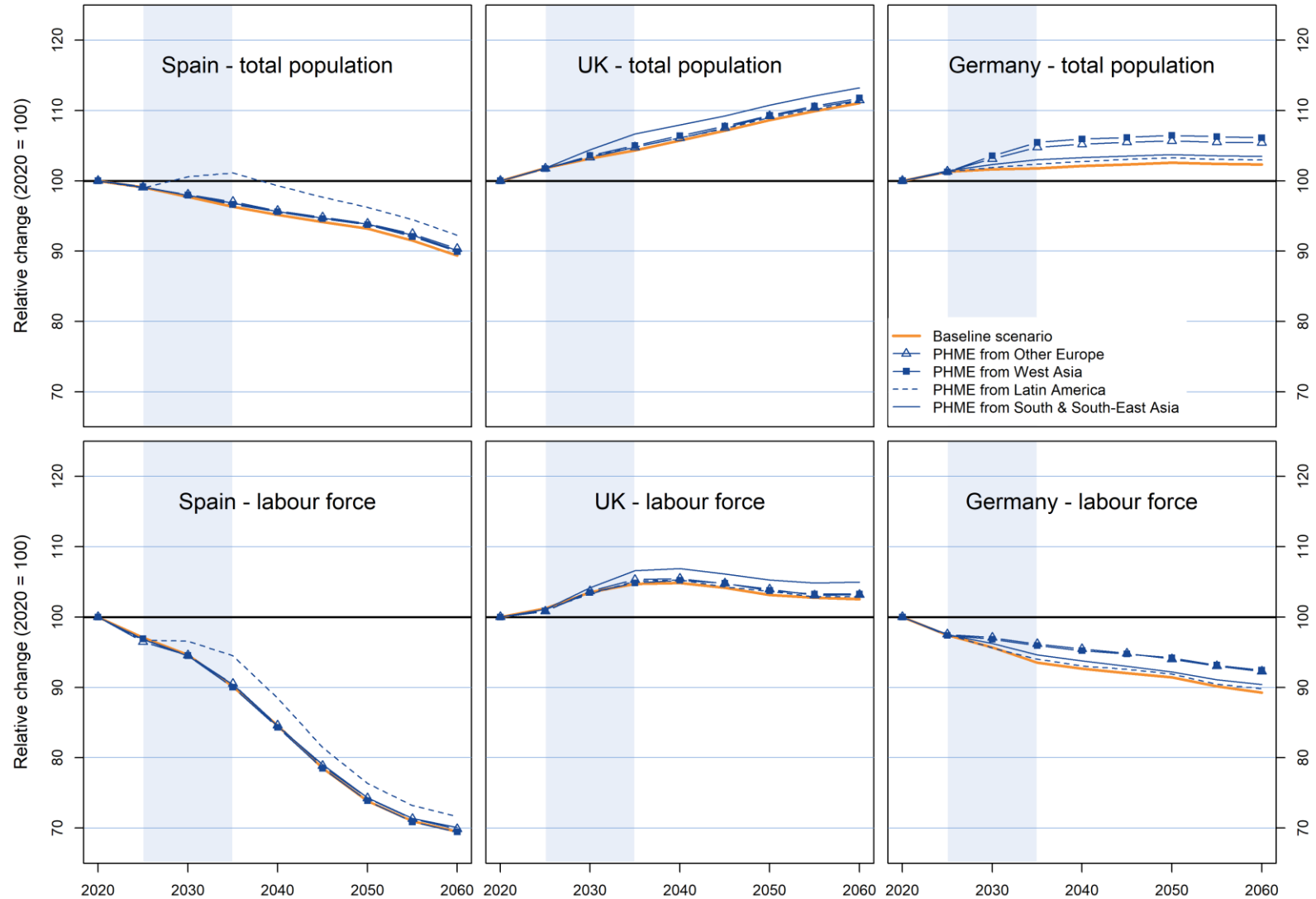
Projected total labour force – Twice-in-a-century immigration with persistence
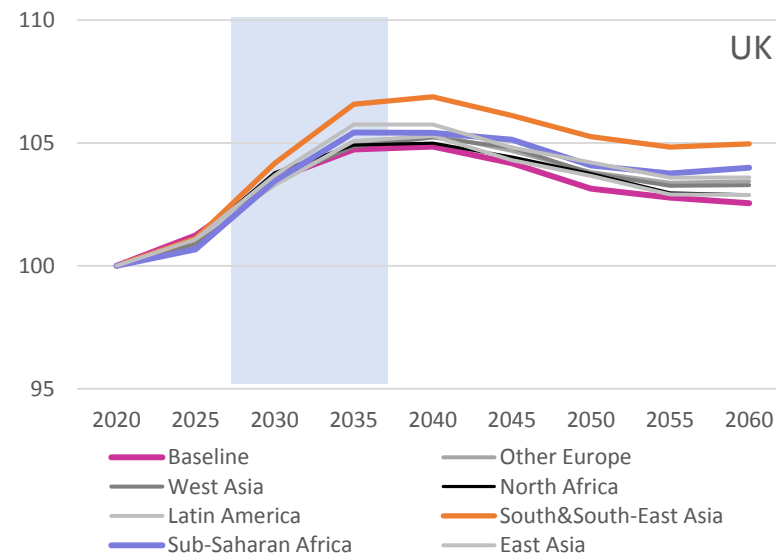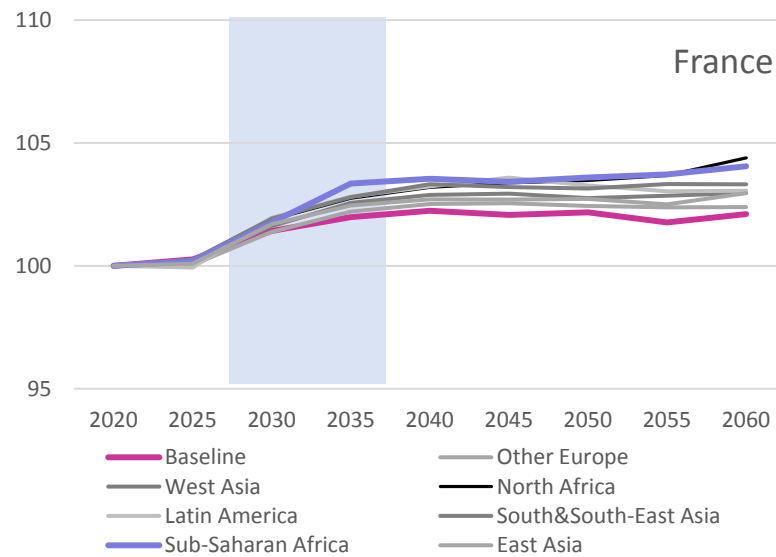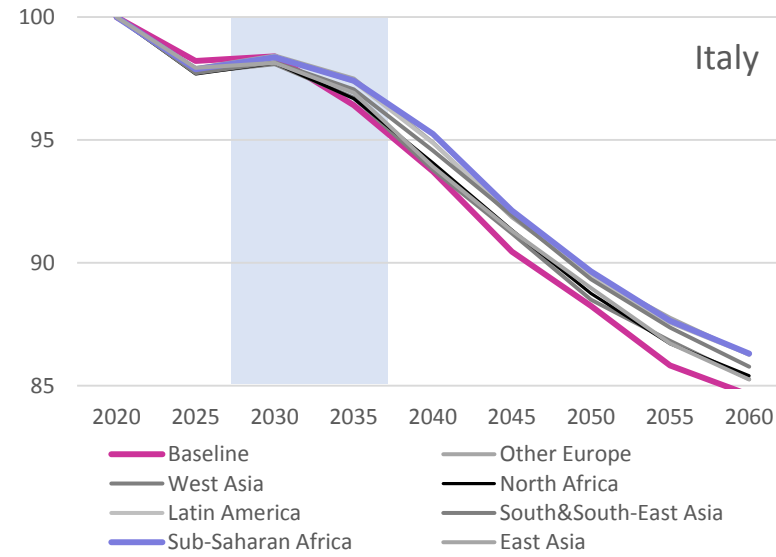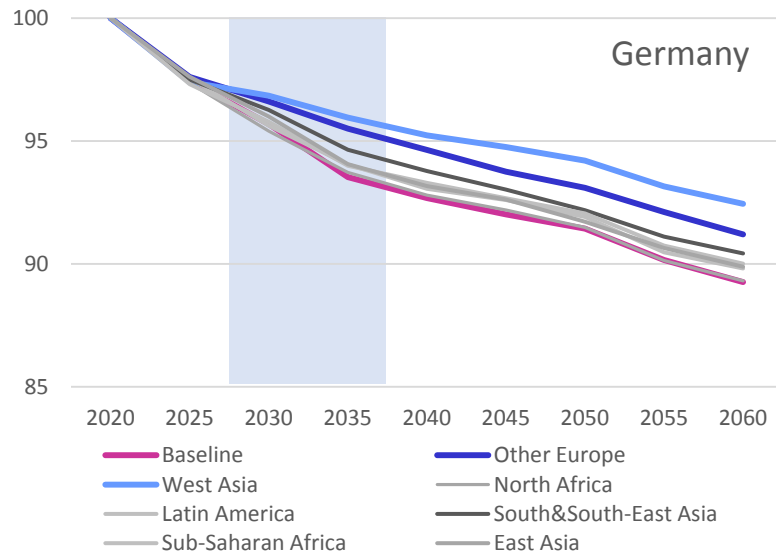
Key messages and recommendations

- Most EU countries will experience sizeable labour force declines in future

- Positive effect of educational expansion – better educated LF but also better educated elderly -> potential for longer working lifes

- Impacts of population ageing not as grim as when only LF size and age dependency considered

- Inclusive policies that nurture human capital and remove barriers to labour force participation are feasible policy options that must be considered vis a vis immigration

- Increased LF participation of women (and in particular immigrangt women) to LF would boost LF and can stabilize LFDR

- Unrealistically sustained immigration would be needed to slow down population ageing and stabilize age dependency ratios -> not a feasible migration policy target

- A lot is at stake if immigration is high but LF integration and inequality in educational achievent among migrant'children must be tackled

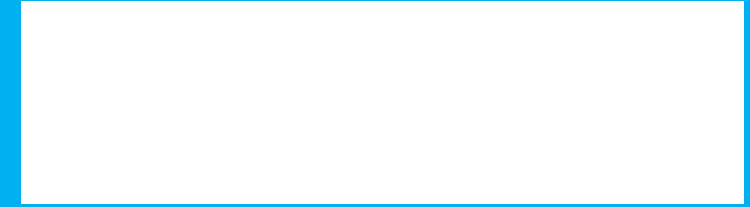# How to interpret / understand demographic scenarios

- Not predictions
- Some are forecasts – best guess at most plausible future given the knowledge at the time of creation
- What-if scenarios – modify assumptions and provide an outlook given those assumptions
- Medium / baseline scenario – business as usual, can be a forecast
- Alternative scenarios – usually try to cover scenario space given a rage of possible future developments
- Quantitative, narrative-based
- Understanding assumptions crucial to their interpretation
- Long-term scenarios for better preparedness and assessment of policy options

Limitations

- Demographic scenarios based on characteristics approach - > how compositional changes in populations affect the outcome indicator

- Abstract from the economic cycle

- The association between the characteristic and the outcome can change in the future

- Focus on labour supply, not linked to labour demand

- How to account or automation, changing nature or work, skills matching

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Thank you

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Microsimulation model dimensions

| Events	Age	Sex	Place of residence	Place of birth	Immigration status	Age at immigration or duration in country	Language	Religion	Education	Mother's education	Methods to estimate parameters
Fertility	X		X	X	X	X			X		Vital statistics, logistic regression
Mortality	X	X	X						X		Population estimates, Cox regression
Domestic migration	X	X	X								Logistic regression; O/D matrices
Emigration	X	X	X	X							Population estimates, relative risks
Language used at home	X				X						Survival curves, O/D matrices
Religion	X	X	X						X		O/D matrices
Education attainment	X	X	X	X	X		X	X		X	Multinomial logit
Labour force participation	X	X	X	X	X	X			X		Logistic regression

State variables

Native-born, born in other EU+ country, 8 world regions
(EU+ = EU27, UK & EFTA)

Assumptions on migration in QuantMig-mic

- Emigration rates differ by place of birth

- Share or emigration to other EU+ country and to the rest of the world differs by place of birth

- Intra-EU+ migration: emigration rates of native-born and EU+ born converge to average of EU15 in 2011-2019 -> declining migration rates from Eastern and Southern EU+ and slight increase for migrants from Western EU+

- Declining volumes of intra-EU+ migrants also because of ageing -> smaller cohorts of young adults

- Immigration from the rest of the world regions to EU+ countries follows scenarios

- Destinations follow established migration corridors

Estimated emigration rates by country of birth, 2011-2019
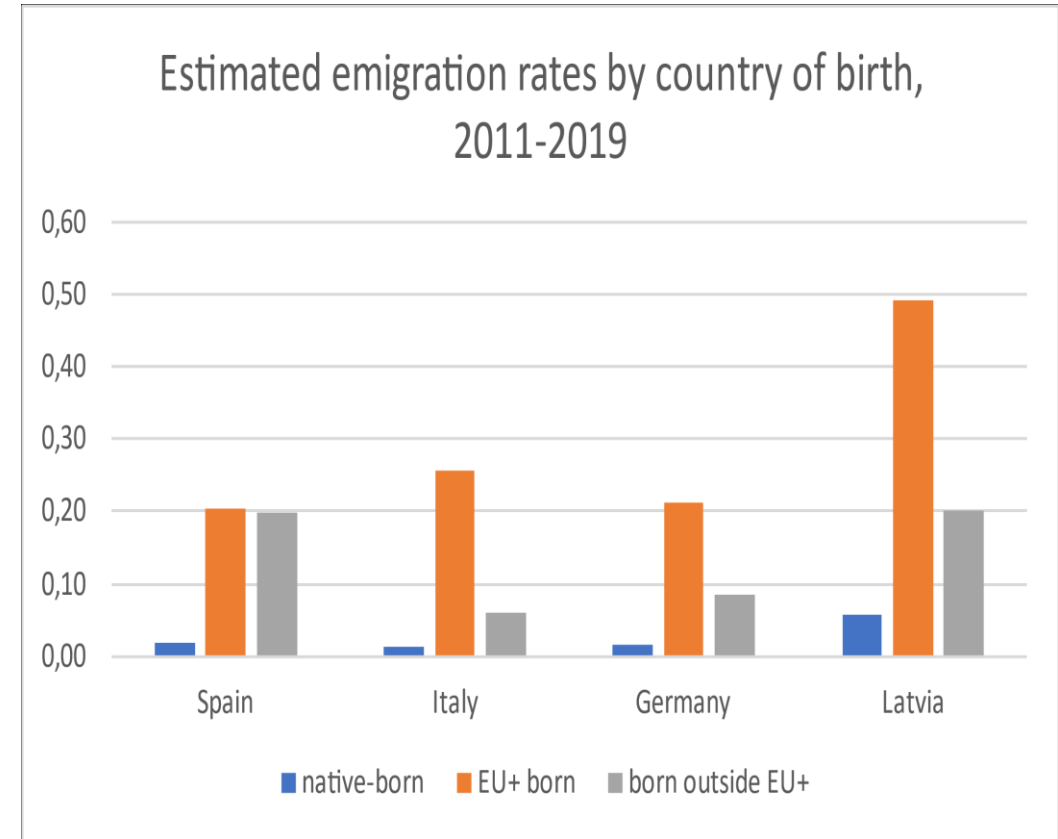
Scenario assumptions

Scenarios of economic integration of immigrants

1. **Baseline integration** - no change in the integration of immigrants in labour force and employment compared to what was observed in recent years.

2. **High integration –** integration improves and by 2040 immigrants have the same activity and employment rates as their native-born peers.

3. **Low integration** -deterioration of the labour force participation and employment rates of immigrants.

4. **High employment** - only employment rates improve to those of native-born peers by 2040, activity rates stay the same as observed in the recent years