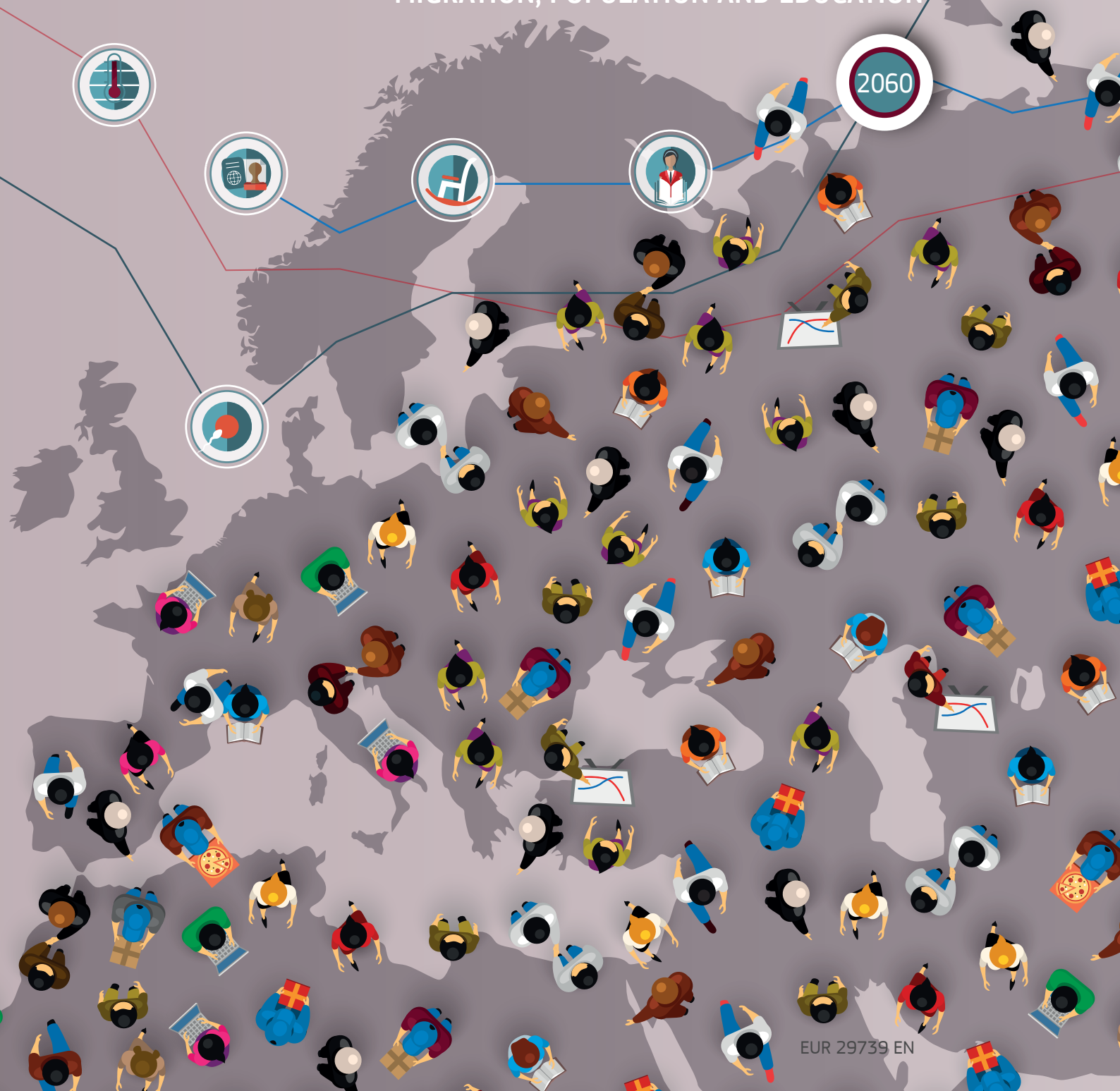


DEMOGRAPHIC SCENARIOS FOR THE EU

MIGRATION, POPULATION AND EDUCATION



This publication is a Science for Policy report by the Joint Research Centre (JRC), the European Commission's science and knowledge service, written in partnership with the International Institute for Applied Systems Analysis (IIASA). It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission or of IIASA. Neither the European Commission, IIASA nor any person acting on behalf of the Commission and IIASA is responsible for the use that might be made of this publication.

Manuscript completed in April 2019

Contact information

IIASA

Wolfgang Lutz (Ed.)

International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, A-2361 Laxenburg, Austria

Email: lutz@iiasa.ac.at

Tel. +43(0) 2236807294

JRC

Delilah Al Khudhairy

European Commission, Joint Research Centre, Rue du Champ de Mars 21, 1050 Brussels, Belgium

Email: Delilah.AL-KHUDHAIRY@ec.europa.eu

Tel. +32 22999158

EU Science Hub

<https://ec.europa.eu/jrc>

JRC116398

EUR 29739 EN

PDF ISBN 978-92-76-03216-8 ISSN 1831-9424 doi:10.2760/590301

Print ISBN 978-92-76-03215-1 ISSN 1018-5593 doi:10.2760/751889

Luxembourg: Publications Office of the European Union, 2019

© European Union, 2019

The reuse policy of the European Commission is implemented by Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39). Reuse is authorised, provided the source of the document is acknowledged and its original meaning or message is not distorted. The European Commission shall not be liable for any consequence stemming from the reuse. For any use or reproduction of photos or other material that is not owned by the EU, permission must be sought directly from the copyright holders.

The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

All content ©European Union, 2019 except: cover ©European Union, 2019 - graphic elaboration from ©hobbitfoot 2019 - AdobeStock, page 7, ©digitalmagus, 2019 - AdobeStock; page 9, ©Denys Argyriou, 2019 - Unsplash; page 11, ©blvdone, 2019 - AdobeStock; page 18, ©Africa Studio, 2019 - AdobeStock; page 24, ©everythingpossible, 2019 - AdobeStock; page 27, ©scharfsinn86, 2019 - AdobeStock; page 31, ©jchizhe, 2019 - AdobeStock; page 35, ©Jan Kranendonk, 2019 - AdobeStock; page 36, ©anyaberkut, 2019 - AdobeStock; page 43, ©srckomkrit, 2019 - AdobeStock; page 44, ©freshidea, 2019 - AdobeStock; page 50, ©tobago77, 2019 - AdobeStock; page 55, ©upixa, 2019 - AdobeStock; page 58, ©thakala, 2019 - AdobeStock; page 63, ©africa, 2019 - AdobeStock; page 66, ©Richtsteiger, 2019 - AdobeStock; page 72, ©steffendia, 2019 - AdobeStock; page 74, ©piyaset, 2019 - AdobeStock.

How to cite this report: Lutz W. (Ed.), Amran G., Bélanger A., Conte A., Gailey N., Ghio D., Grapsa E., Jensen K., Loichinger E., Marois G., Muttarak R., Potančoková M., Sabourin P., Stonawski M., *Demographic Scenarios for the EU - Migration, Population and Education*, EUR 29739 EN, Publications Office, Luxembourg, 2019, ISBN 978-92-76-03216-8, doi:10.2760/590301, JRC116398.



DEMOGRAPHIC SCENARIOS FOR THE EU

MIGRATION, POPULATION AND EDUCATION



TABLE OF CONTENTS

Executive summary	6
Introduction	14
Part A: Demographic structures and migration in the EU	17
1 Population ageing in Europe	18
1.1 Population ageing and old-age dependency	19
1.2 The impact of the scenarios on the total EU population	20
1.3 The impact of the fertility scenarios on the EU's working-age population	22
1.4 The impact of the fertility scenarios on the EU's 65+ population	22
1.5 The impact of the high-immigration scenario on the size of the EU's working-age and 65+ populations	23
1.6 Conclusions	23
2 Size and education levels of the future EU labour force	24
2.1 The demographic transition	25
2.2 A smaller but more-educated labour force	25
2.3 How different rates of labour participation impact on the size of the total labour force	26
2.4 How lower labour-force dependency ratios can reduce the public spending burden	29
2.5 Conclusions	30
3 Impacts of migration on the EU labour force	36
3.1 Migration scenarios	37
3.2 Current labour-force participation of immigrants	37
3.3 The impact of different volumes of migrants on the size of the future EU labour force	38
3.4 The impact of different volumes of immigrants on the educational composition of the future EU labour force	40
3.5 The impact of different volumes of migration on the labour-force dependency ratio	41
3.6 Conclusions	42
4 Impacts of internal EU mobility over time	44
4.1 Intra-EU mobility and EU Member State populations	45





4.2	Intra-EU mobility scenarios	46
4.3	The impact of intra-EU mobility on the EU population	47
4.4	Conclusions	49
5	Demographic consequences of ‘brain drain’	50
5.1	The hypothetical scenario of an EU ‘brain drain’	51
5.2	Consequences of the high-emigration scenario	52
5.3	Conclusions	54
	Part B: Demographic trends and migration in Africa and Western Asia	57
6	World population growth trajectories	58
6.1	The projected population growth of Africa	59
6.2	How female education leads to lower fertility rates	61
6.3	How the expansion of girls' education determines the future population growth in Africa	62
6.4	Conclusions	65
7	Reasons for migration in Africa and Western Asia	66
7.1	Conflict and instability as push-factors	67
7.2	Youth unemployment as a driver of outmigration	69
7.3	Conclusions	71
8	Evidence for climate-related migration	72
8.1	The relationship between environmental change and migration	73
8.2	Conclusions	75
	Report summary and conclusions	76
	The way forward for demographic analysis	77
	Glossary	81
	Endnotes	82
	References	85
	List of boxes and figures	88
	List of tables and maps	89
	Acknowledgements	90

EXECUTIVE SUMMARY

At the very heart of a changing society lies the number and composition of its members. Population growth has shaped the EU over recent decades and now its population is ageing. The slow-moving shift towards longer-living, lower-fertility, higher-educated societies brings the EU to new demographic frontiers, as it does in North America and East Asia.

Facing these developments naturally prompts the questions: Who will live and work in Europe in the coming decades? How many, and with what skills? To answer these, we consider key factors that will influence European demographics over the coming decades.

To move beyond some common misconceptions, this report brings relevant scientific analyses to the forefront by presenting a series of demographic scenarios for the future of the EU. By examining not only the role of migration, fertility and mortality, but also education and labour force participation, we can outline a more comprehensive view of possible futures than conventional demographic projections.

While some of the scenarios indicate probable developments, others are hypothetical and meant to be instructive for understanding the full spectrum of possible futures. The value of these scenarios is to improve our ability to anticipate the coming changes and to guide our responses to them.

The following key messages express the core findings from the work of the Centre of Expertise on Population and Migration.

We are living longer and can lead more productive lives

One of the most important trends in the EU is ageing. Thanks to advances in medicine and quality of life, the average life expectancy at birth in the EU is about 81 years. Shifts to longer lives come as part of the larger, nearly universal process of transitioning from pre-modern to post-industrial demographic patterns.

While it is an important achievement that we are on average living longer, an increasing proportion of people aged 65+ can also bring social and economic challenges. There are concerns about how to provide for the growing proportion of retired citizens who are dependent on a smaller labour force. Yet, absent from the often superficial discussions are reflections on the increasing number of years of active and healthy life, greater productivity, and possible loss of jobs due to technological advancements. All of which have profound implications on what societies will require from their future working populations. Automation alone may significantly cut the need for labour, calling into question conventional assumptions about what policymakers should target as the 'ideal' size of the labour force.

It is important to acknowledge that neither higher fertility nor more migration will stop population ageing because the momentum has been decisively set by past, long-term demographic trends. However, reaching the age of 65 is no longer synonymous with the end of a person's productive life. Overall, we are living more productive lives which, together with flexible retirement ages, can help to alleviate the economic challenges arising from changes in the conventionally defined

working-age population and the increasing ratio of workers to non-workers (known as the dependency ratio).

A smaller, better-educated labour force on the horizon

Another reason for optimism is the fact that the EU's labour force is clearly becoming better educated over time. In almost all scenarios, the EU's future labour force will be more highly skilled and therefore likely to be more productive and adaptive to an ever-changing job market.

The EU labour force is transforming through social development and the ageing process. The total size of the labour force is projected to get smaller over the next four decades, based on the assumption that the current patterns continue. According to this assumption, the projected decrease in the size of the labour force will come from the population with low (from 50.7 to 14.0 million) and middle (from 108.2 to 74.2 million) levels of education.

At the same time, the number of workers with a short post-secondary education (such as technical training), a bachelor's, a master's degree or higher, is rising, not just as regards their

proportion of the overall labour force, but also in absolute terms. In every country, since the younger cohorts are better educated than the older ones, these post-secondary groups are expected to almost double (+45%) over the next 40 years.

Considering the future context, any possible reduction in the size of the labour force may not be an economic problem if future jobs are fewer in number and require more skills. Already today unemployment is generally higher among the lower skilled and there may be even fewer low skills jobs in the future. Regardless of changes in the population's age structure and labour force size, it can be expected that the human capital of future workers of any age, measured by the highest level of their educational attainment, will be higher than it is today.

Labour force participation as a remedy for the challenges of population ageing

Using a set of demographic scenarios of the future that highlight the impact of changes to a variety of factors, it becomes clear that the most feasible and effective remedy to negative consequences of population ageing is neither focusing on higher fertility nor more migration, but rather increasing labour force participation.

Extending constant labour-force participation rates into the future shows the likely path to a smaller labour force and increasing dependency ratio. Scenarios that deviate from this course, following either 1) the equalisation of labour-force participation between men and women, or 2) a gradual convergence of all Member States to the participation rates of men and women already seen in Sweden today, demonstrate the power that improving labour-participation rates has to nullify potential increases in dependency.

In fact, the momentum is on the side of increasing labour-force participation. If it continues to grow in the future, the labour



force size and dependency ratio could stabilise at current levels. In other words, a strong but realistic increase – as is already the reality in Sweden – of labour-force participation over time could compensate for a large part of the anticipated negative economic consequences of population ageing in the future.

Higher immigration volume would increase labour force size, but much less the essential ratio of workers-to-non-workers

To the extent the EU is a destination region for international migration, immigration becomes an influential factor on demographic developments. Policymakers regularly balance migration policy with the best interests of the Member State. Doing so while being mindful of a long-term understanding of demography is crucial. At the core of such considerations are factors including: the volume of immigrants from third countries entering the Member State, their levels of education, how well they will integrate into the labour market and society at large, and how effective the Member State is at enforcing their migration policy.

Migration levels can have a large influence on the total population size and the size of the labour force. With no third country immigration, the natural decline resulting from lower fertility would bring the EU population to 466 million by 2060, the level observed in the 1980s. However, migration levels have a limited effect on changing the EU's age structure, in part because migrants tend to settle for the long term and to age just as the native population does. As such, irrespective of various levels of immigration, the findings of this report show an almost inevitable trend towards continued demographic ageing in the EU.

While a high volume of immigration would increase the overall size of the EU labour force, it would have a limited impact on the proportion

“ Greater labour force participation has more impact on alleviating pressure from ageing than either fertility or migration ”

of workers to non-workers in the long-run. If higher immigration volumes were to coincide with deteriorating economic integration of migrants, it would actually result in a labour force situation that is worse than with medium or low volumes of immigration, which highlights the importance of effective efforts for economic integration.

Westward movement inside the EU has substantial impacts on the population sizes of Member States

In recent decades, intra-EU mobility – the free movement between EU Member States – has facilitated population changes within the EU. Over the past 25 years, some of the Eastern European Member States have lost a large share of their population through a combination of low fertility and, most notably, sizeable emigration.



Dramatically, Bulgaria and the Baltic States lost between 16% and 26%.

Intra-EU mobility has the potential to produce large population shifts within the EU over time. If the movements of recent years persist as they have, the population of Romania would reduce from 19.9 million in 2015 to 13.8 million by 2060 (-30% of the population). Conversely, the losses would be less than half without intra-EU mobility (only -14%). The receiving Member States rely on these flows to help compensate for their own ageing populations, but the effect on their total populations is more limited because they are generally more populous.

Pre-existing economic disparities between Member States have encouraged many citizens to search for work in places other than their country of origin.

These developments have likely been to the economic benefit of the union as a whole, but not necessarily for all sending Member States. This contributes to slowing the convergence between Member States, and impacts areas such as infrastructure, education and even population ageing. This in turn has implications for the goals of economic development and Cohesion Policy, in particular when the movement is disproportionately highly skilled workers educated in the sending Member States.

Differences in wages and living standards continue to drive westward migration within the EU. Targeting economic inequality between Member States can encourage greater cohesion and integration and can help those Member States facing disproportionate population decline, a loss of working-age population, brain drain and more pronounced population ageing. Policies should address practical, labour-force-oriented skills and try to reverse the education selectivity of emigration by offering competitive employment opportunities to the highly skilled and possibly facilitating return migration of some of the talent that has left.

Losing large numbers of highly skilled workers leads to lower productive potential and accelerated population ageing

The loss of talent to comparatively higher-income countries continues to confront some societies within the EU, and many others around the globe. This has demographic implications, whereby sending countries find themselves with a smaller and less-educated workforce. Such changes would coincide with a more rapidly ageing population because emigrants tend to be early-career adults. The high emigration of talent may also negatively impact innovation and economic growth.

As an illustrative example of how high emigration impacts demographics, we use a hypothetical case of the EU falling far behind in future global

competition. By simply extending Spain's financial crisis emigration rates into the future for the EU as a whole, we can see how fast high emigration depletes the working-age population of the EU – 50% by 2050 in this hypothetical case. While not a scenario to be viewed as a likely future for the EU as a whole, it helps demonstrate what some countries are facing and how the currently observed pattern of net migration inflows should not be automatically assumed to continue in the long term.

The question of high emigration by educated citizens, or 'brain drain', highlights the interconnectedness between global migration flows and local demographics. Therefore, to understand the context of the EU's future population, it is also necessary to look beyond the borders of the EU. Neighbouring regions such as Africa and Western Asia face very different demographic and migratory trends.

Actual realised migration to the EU will, in part, depend on its attractiveness as a destination – that is, the pull factors created by Member States. At the same time, socio-economic development in third countries may also increase the propensity to undertake migration journeys. Creating a system which does not undermine the development of human capital in countries of origin by making it harder for third countries to retain their highest-skilled workers is one of many dilemmas.

Pressure from continued population growth in Africa and Western Asia can lead to an increase in push factors for migration

Africa's population is projected to increase by a factor of two to three over the coming decades, or possibly even more in the event of stalled socio-economic development. In addition, population growth in Western Asia will also be significant. For example, the population of Afghanistan is likely to triple and that of Pakistan to almost double. Such massive

projected population increases require consideration of the future job opportunities and economic growth.

The peace and stability necessary to facilitate such opportunities may also be challenged by population growth. These challenges can contribute to creating push factors for migration, that is, conditions that drive people to emigrate from their home countries. Conflict and insecurity are central push factors. Emigration is also linked to people deciding to migrate because of a lack of opportunities to thrive in their own country, for instance due to high youth unemployment and too few appropriate jobs.

Similarly, climate change can influence migration by affecting other push factors of migration such as political and economic conditions. For example, climate change can be a possible trigger of conflict, which in turn would lead to migration. When direct climate-change-related migration does occur, we find that it tends to be mostly intra-regional.

“Regardless of changes in the size of the labour force, *the human capital of future workers in the EU will be higher than it is today*”

This is in line with the fact that intra-regional migration, for example within Africa, makes up by far the largest share of migration globally.

The prospect of climate change and the expected population growth in Africa and Western Asia are likely to present important challenges. Thus, pursuing policies that enhance general resilience and local employment opportunities and foster stability and security are critical to building sustainable alternatives to migration in the countries of origin.

Girls' education matters greatly for the future of population growth in Africa

While Africa and Western Asia are facing high population growth, many regions of the world have progressed towards late stages of the demographic transition with low rates of both mortality and fertility, notably East Asia, North America and

Europe. During the second half of the century, world population may even eventually peak and start to reduce slightly, depending largely on how fast fertility levels in Africa fall to moderate levels.

Rapid population growth creates an urgent need for expanding education in Africa. Education expansion must keep pace with the pressure coming from rapid population growth, as it holds the key to accelerating the demographic transition and bringing development successes within reach. Achieving such goals depends, in particular, on giving girls access to education, as education and family planning are closely intertwined. Education broadens horizons and helps bring fertility into the realm of conscious choice for both women and men. Evidence from educational sub-populations within countries indicates that higher living standards and decisions for moderate fertility levels accompany higher education and the associated wider range of life choices.



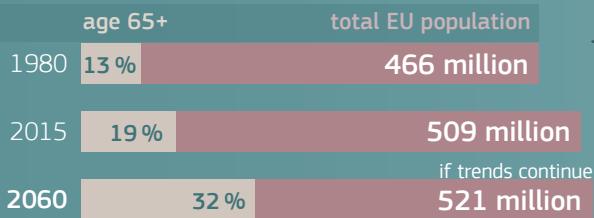
Demographic changes are long term and occur at a steady and predictable pace. This provides us with a unique opportunity for foresight because it enables us to study how certain trends are likely to impact the future populations of EU Member States and the world. In this way, the scenarios examined in this report help to enable evidence-based planning for the future.

DEMOGRAPHIC SCENARIOS FOR THE EU

MIGRATION, POPULATION AND EDUCATION

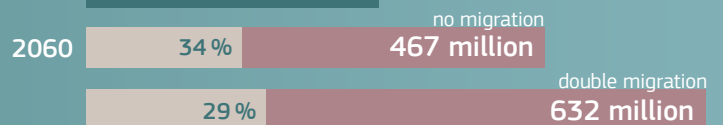
KEY MESSAGES

The share of the *population over age 65* is bound to *increase*



How can we *avoid overburdening our social system with population ageing?*

increase migration?



or **increase fertility?**



Even much higher immigration or fertility *will not change the pace of population ageing significantly* by 2060



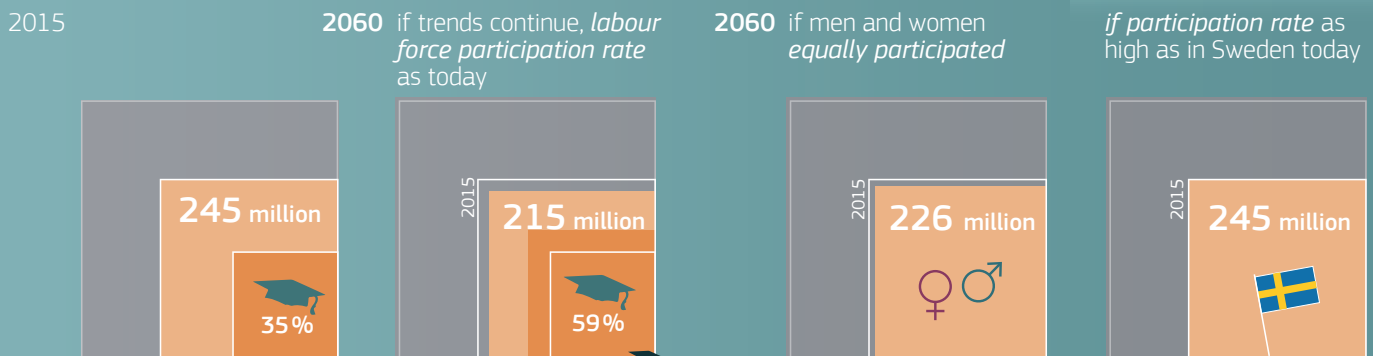
Population ageing and a smaller labour force means that *European workers will need to support more dependents* in the future

The EU's future *labour force* will be *smaller and better educated*

EU labour force over total population



Increasing labour force participation is the most effective way to cope with *population ageing*



A *smaller, better-educated labour force* may prove to be *more adaptable* to the changing nature of work, automation and artificial intelligence



123 / 100

106 / 100 lowest ratio of dependents to workers



Migration increases the EU's total labour force size, but has a limited effect on the ratio of dependents to workers



Even *doubling migration* has *little effect* compared to continuing current trends. In fact, the effect is the *same as if immigrants were better integrated* and participated at the same rate as Europeans

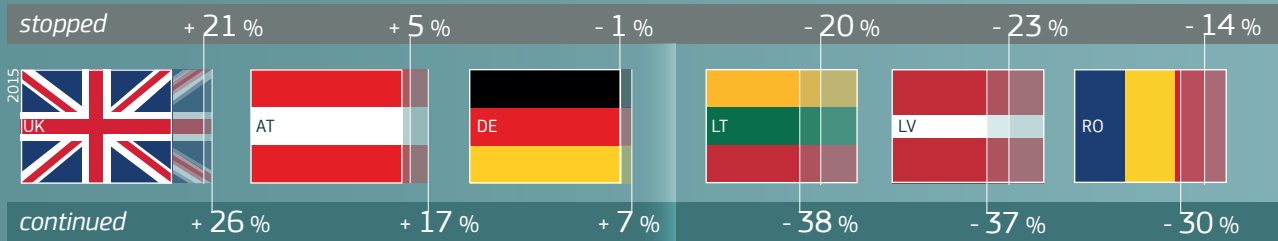


The movement of workers towards wealthier EU states speeds up ageing and population decline in eastern Member States



In 2015, **54 %** of EU-28 population lived in western Member States. If trends continue, by 2060 that share will be **59 %**

2060 if intra-EU mobility



In 2015, the share of *people aged 65+* was the same in both country groups, but it will *grow faster* in the *eastern Member States* by 2060

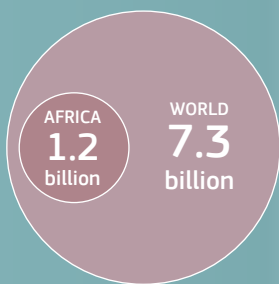


Girls' education matters greatly for the future of world population growth

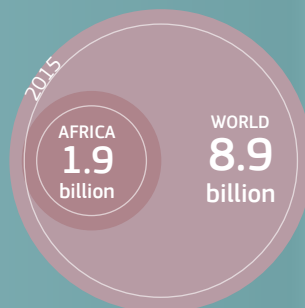


If trends continue, by 2060 the world population will be **2.3 billion larger** than today, with *Africa* contributing **57 % (1.3 billion)** of this growth

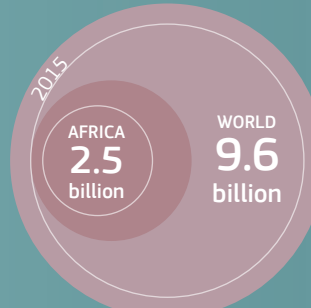
2015



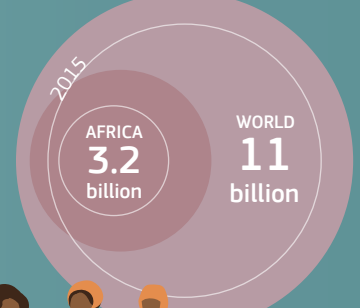
2060 rapid education development



education trends continued



stalled education development



The education of *girls* has the strongest and most consistent connection to *moderate fertility rates*

Total fertility rate - number of children per woman in Africa



2060 rapid education development



education trends continued



stalled education development



Women with less than primary education in Africa

44 %

0 %

10 %

37 %

INTRODUCTION

The Centre of Expertise on Population and Migration (CEPAM)¹ was founded by the European Commission and the International Institute for Applied Systems Analysis (IIASA) in response to the migration events of 2015. Despite its origins in the dramatic scenes that seized global attention, CEPAM's mission has been to focus on the long term, providing analyses of the gradual, but consequential demographic changes taking place across the EU and wider world.

The sections

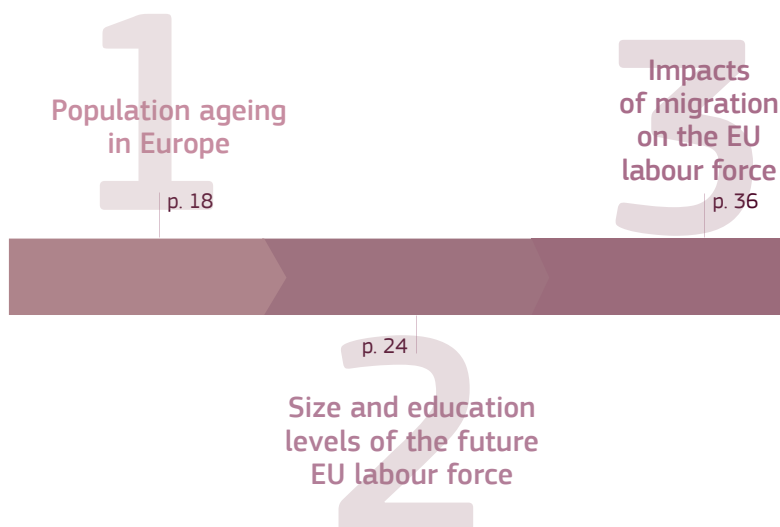
The first five sections focus on demographic challenges inside the EU, such as population ageing, a shrinking labour force, more non-working people being dependent on working people, and showing the impact of high levels of emigration in some EU Member States. With these challenges in mind, the report looks towards 2060 to understand the long-term effects of alternative scenarios for the future, and whether undesirable consequences can be limited or counteracted.

As the EU and its demographics do not exist in isolation, Sections 6 to 8 explore relevant world demographic trends. The topics covered include the future of global population growth and the potential divergent trajectories. Then, moving from human numbers to qualitative decisions about migration, the reports looks at push factors such as conflict, instability and climate change.

Finally, the report covers the current limitations of demographic data and research capacity for demographic modelling. Overcoming these limitations is essential to providing a solid scientific basis for the development of future policies.

The scenarios and narratives

Due to the inertia of demographic processes, demographers are able to project changing population sizes and structures for decades into the future. We can consider the impact of future EU demographic changes by using demographic scenarios. The projections are based on a few clearly identifiable quantitative assumptions which refer to future forces of change, such as fertility, mortality, migration or changes in education and labour-force participation. Different combinations of such assumptions are called demographic scenarios.



In this report, we use a number of demographic scenarios to study different, possible migration flows into the EU. The scenarios are described in each section. Reference points for all these scenarios are the 'central', 'medium', or 'SSP2'² scenarios which make middle-of-the-road assumptions on future trends, closest to what is considered likely from today's perspective.

In addition to the central or medium scenario, we have developed a set of scenarios, which are used in Sections 1-6, based around certain parameters (e.g. 'zero' or no migration; a 25% increase in the fertility rates, or the equal participation of men and women in the labour force). Such parameter-based scenarios are useful for unpacking the forces that shape future demographic trends and thus also have immediate policy relevance.

For Section 3, we use alternative narratives concerning the characteristics of migration to the EU, and build scenarios around them to show the different effects of changing variables. The scenarios range from high and low volumes of migration to high and low educational attainment of migrants. These migration narratives have been formed around real-life examples by looking at migration to specific countries, such

We used multidimensional macro models of population dynamics as well as micro-simulation models to be able to project such scenarios for multiple human characteristics over many decades in the future. The macro models divide populations by age, sex, levels of education, labour-force participation and place of residence. However, beyond a certain number of subdivisions, it becomes more feasible to use micro-simulation rather than macro-simulation. Such simulations generate large numbers of virtual individuals for whom many more different characteristics can be captured and their future distribution modelled. For this report, an important example of analysis that could only be carried out by micro-simulation is immigrants' duration of stay in the country, which is essential for forecasting their integration into the labour market (see Section 3).

5 Illustrating the consequences of 'brain drain'

p. 50

7 Reasons for migration in Africa and Western Asia

p. 66

4 Impacts of internal EU mobility over time

p. 44

6 World population growth trajectories

p. 58

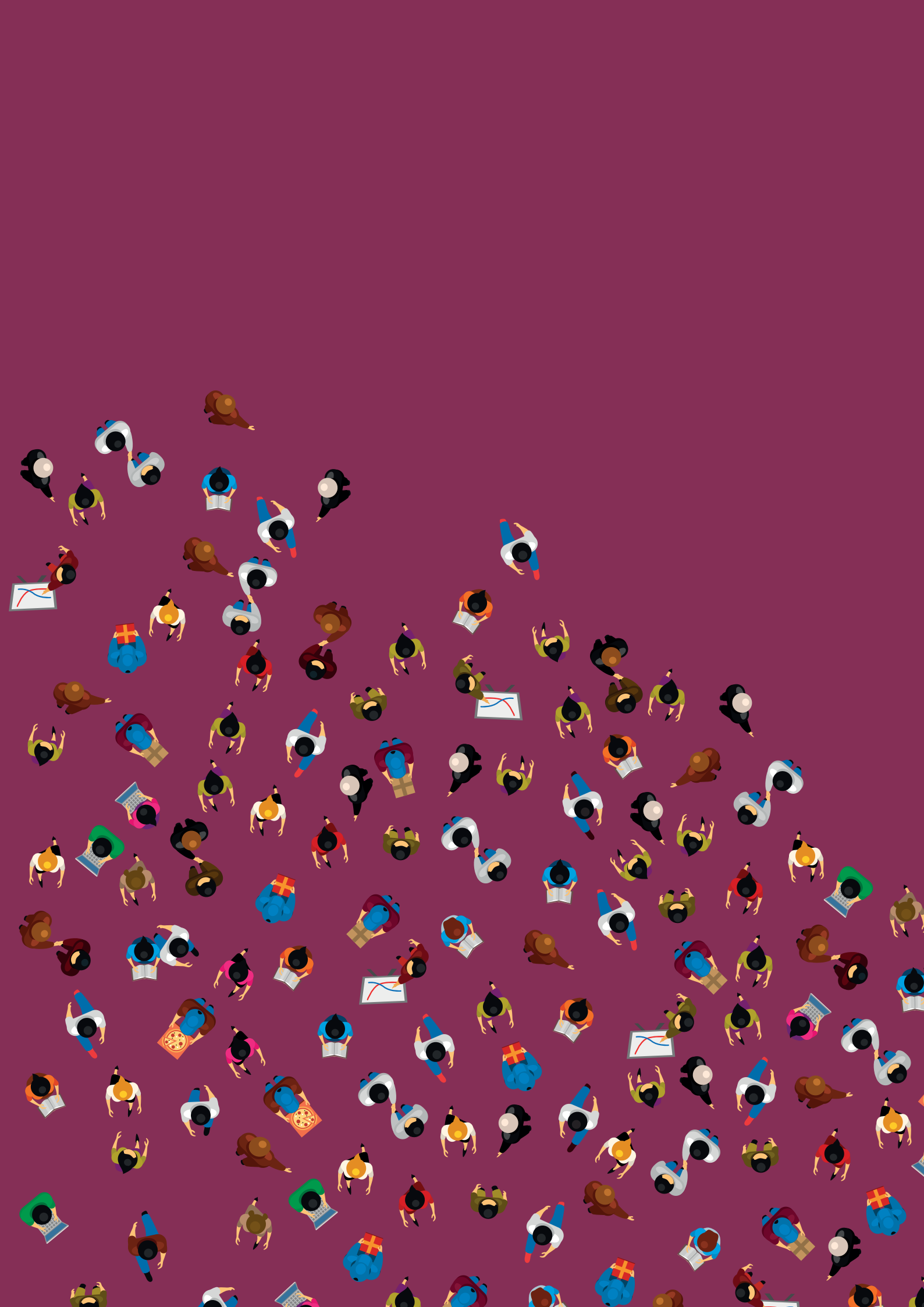
8 Evidence for climate-related migration

p. 72

as Canada or Japan. The narratives have been developed over the past year in a consultation process with different European Commission Directorates-General and external experts. The report also builds on the research on migration conducted by the Joint Research Centre (JRC).³

The terminology

A glossary of demographic terms is listed at the end of the report.



PART A: DEMOGRAPHIC STRUCTURES AND MIGRATION IN THE EU





SUMMARY

The dominant demographic challenge facing the EU comes from population ageing, commonly understood as an increasing proportion of people aged 65 and above. This section looks at possible measures to counteract associated concerns – particularly that more elderly people will depend on a smaller working population – by looking at how different scenarios change the EU's total population, the size of its potential labour force, and the population that will be 65+ by 2060.

Neither higher fertility nor more immigration will stop population ageing, as the momentum has been decisively set from past, long-term trends. At the same time, we are living more productive lives which, together with flexible retirement ages, will help to cope with ageing-related challenges.

BOX 1: SCENARIOS FEATURED IN SECTION 1

Central scenario: This represents the future of the EU-28 population assuming slightly increasing fertility⁴ and flows of approximately 2 000 000 immigrants from third countries into the EU every year. Medium assumptions on mortality and education levels, includes intra-EU mobility and uses the recent average for migration rates (2013-2016).

Zero international migration scenario (ZIM): No migration to/from the EU; intra-EU mobility between EU-28 countries is included.

High immigration scenario: Immigration from third countries to the EU is doubled compared to the central scenario. It assumes an immigration level of 4 000 000 people every year, which is about two times the 2013-2016 level. Emigration rates are the same as in the central scenario.

ZIM plus 10%, 25% and 50% fertility: This is the zero international migration scenario, plus an increase (10%, 25% and 50%) in the fertility rate of the central scenario after 2020.

POPULATION AGEING IN EUROPE

■ 1.1 Population ageing and old-age dependency

Population ageing is widely considered a challenge for the future of the EU's economic and social security systems. Specifically, the EU would face a growing burden from care and pensions as well as a projected decrease in the labour force size. Population ageing results from the combined effects of trends in fertility, mortality and migration. Increasing longevity is unquestionably a valuable achievement of human development, and continuing improvement in life expectancy is without doubt a universally supported target. Life expectancy at birth in the EU averages about 81 years, nine years more than the global average.

While measures of population ageing typically use age 65 as the 'elderly' threshold, it has recently been suggested that the age range in which people are considered active should be raised as people are living longer and are more productive for longer. Moreover, in several Member States, the statutory retirement age is already over 65 and it is expected to increase further on the basis of current legislation. In line with this approach, people would not be considered 'elderly' when they reach 65, but rather when they reach the age at which remaining life expectancy is 15 years or less (Sanderson and Scherbov 2005, 2007, 2010, 2013). In this report, for simplicity's sake, we still refer to the conventional definition of working age as being 20-64 years.

Neither higher fertility nor more migration will stop population ageing, but more productive lives are helping to meet the related challenges.

Could either more migrants or more children slow down the process of population ageing in the long run? In political discussions, some see migration as a remedy for the perceived problems of population ageing, whilst others believe the remedy lies in higher birth rates and support for larger families. As we will show in this section, these two remedies appear to have different consequences on population size and age structure. For example, although substantial immigration has an immediate impact on the size of the working-age population, its impact on the age structure is less significant in the long run because immigrants also grow older. While some immigrants may return to their countries of origin, past experience indicates that a majority of retiring immigrants in the EU will remain in the long term.

In contrast, policies aimed at directly or indirectly increasing fertility (for example, by promoting work-life balance), if effective, would offer the labour force long-term benefits taking effect in 20-25 years. In the short-term, higher fertility leads to greater dependency on the labour force by increasing the share of dependent children in the population. This can create a temporary decline in labour-force participation if parents leave work to take on childcare. For comparison, an increase in the total fertility rate (TFR) by 0.1 child per woman in the EU-25 would have nearly the same effect on the old-age dependency ratio as an additional 375 000 immigrants per year by 2050 (Lutz and Scherbov 2007).

Bearing in mind these considerations, we use six scenarios to demonstrate the impact of different fertility and migration trajectories on the EU's total and working-age population until 2060. These scenarios are: a **central scenario**, a **zero international migration scenario (ZIM)**, a **high immigration scenario**, and three fertility scenarios (**ZIM +10%**, **ZIM +25%**, **ZIM +50%**), as described

in box 1. By juxtaposing the three assumptions of fertility: 10%, 25% and 50% higher fertility than the central and ZIM scenarios, we can measure the effect of increased fertility and distinguish it from the effect of migration. To measure the effect of migration, we compare the ZIM scenario with the central and high immigration scenarios. In this section, the focus is on the impact of the amount of immigration and the fertility rates. Other factors, such as the immigrants' educational composition and labour-market participation, are examined later in Sections 2 and 3.

1.2 The impact of the scenarios on the total EU population

Despite perceptions of a shrinking population, the EU is expected to grow further if recent trends continue. As shown in figure 1.1, under the **central scenario**, the EU's population would grow from 508.5 million in 2015 to around 521 million by 2060, which is an increase of 2.5%.⁵ The working-age population would decrease from 306 to 256 million people – a decrease of 16% –

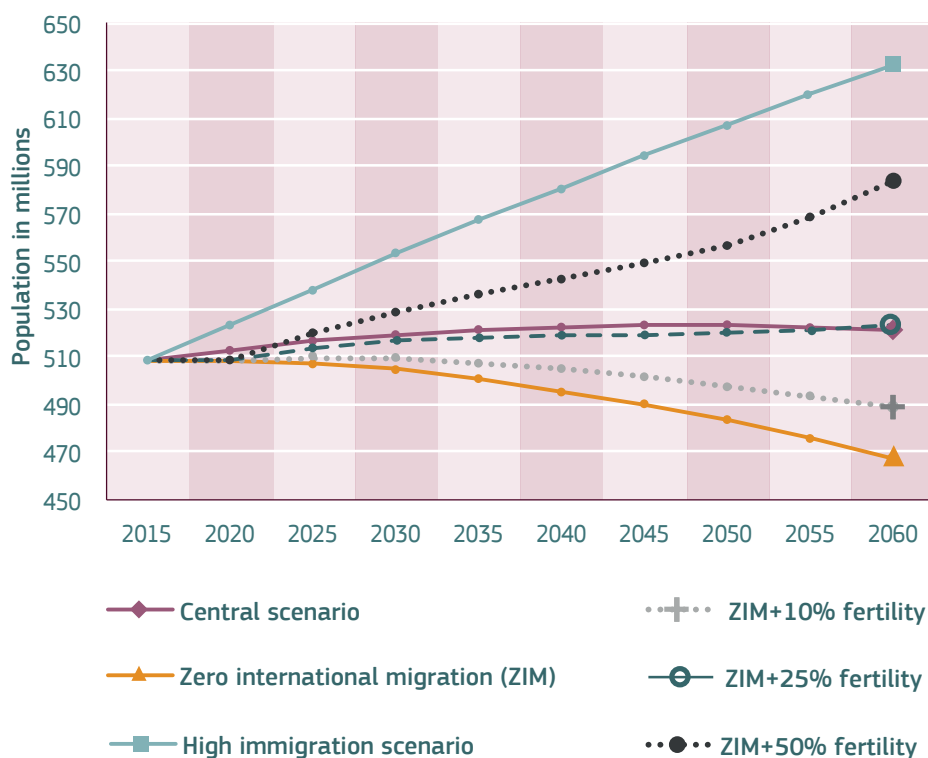


Figure 1.1: Population size of EU-28 in 2015-2060, by scenario

Source: CEPAM

and the proportion of the population aged 65 and over would grow from 19% to 32%. This means that by 2060, for every 100 people of working age there would be 114 of non-working age, predominantly 65 years and older. Under the central scenario, the number of births would decrease from 26 million in 2015-2020 to 24 million in 2055-2060, given the lower number of women of childbearing age.

In the **ZIM scenario**, the EU population would reduce by roughly 9%, to 466 million people by 2060,

bringing it to the same size as in the 1980s. In the short term, the scenario would produce a smaller working-age population by almost 30% (to 222 million by 2060), as shown in figure 1.2. However, in the long term, the difference between the central and the ZIM scenario is only minor because migrants also age. With zero international migration the share of 65+ would be 34% in 2060, which is only 2 percentage points higher than the central scenario. For every 100 people of working age, there would be 118 of non-working age, which is 4 percentage points higher than in the central scenario.

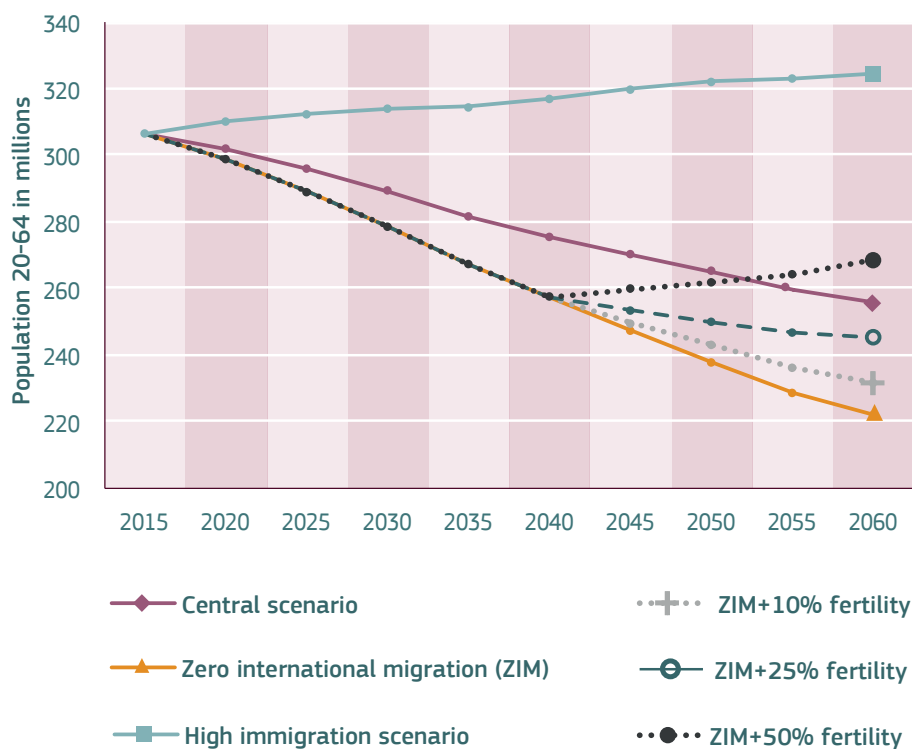


Figure 1.2: Working-age population (20-64) of EU-28 in 2015-2060, by scenario

Source: CEPAM

As regards the **fertility scenarios**, increasing fertility by 10% (approximately 0.2 children per woman) while assuming zero migration generates a smaller total population than in the central scenario. A 25% increase in fertility (approx. 0.4 children per woman), bringing the TFR to *replacement level*⁶, means that the EU population would increase by 2.8% to reach 521 million people in 2060 (a similar trend to the central scenario). A 50% increase in fertility (about 0.85,

increasing the TFR to a rather unlikely 2.6 children per woman) would generate a faster population increase than the central scenario and would encounter a steeper increase after 2050 when the larger cohorts of births would reach reproductive age. By 2060, this scenario would see around 580 million people living in the EU.

1.3 The impact of the fertility scenarios on the EU's working-age population

In terms of the effect on the size of the working-age population, the **three fertility scenarios** in figure 1.2 show that the size would decline at the same pace until 2040 – that is, until babies currently being born start to reach working age. Only the ZIM +50% scenario would have a larger working-age population than the central scenario, and then only after 2050. Under this scenario, the total EU population would grow by nearly 75 million people by 2060. However, such a fertility rate has not been seen in most EU countries since the 1970s.

1.4 The impact of the fertility scenarios on the EU's 65+ population

Table 1.1 compares the population structure indicators in all six scenarios: the share of 65+ in the total population and the total age-dependency ratios. For ZIM +50%, the share of 65+ would increase from 19% to 27% in 2040 and remain stable until 2060. The total age-dependency ratio would reach 130, which means that for every person of working age there would be 1.3 dependants. This is because it also includes an increase in the number of births by almost 70% to 43.5 million in 2060.

Year	Central scenario	ZIM	ZIM +10% fertility	ZIM +25% fertility	ZIM +50% fertility	High immigration scenario
% POPULATION 65+						
2015	19	19	19	19	19	19
2040	28	30	29	28	27	26
2060	32	34	33	30	27	29
TOTAL AGE-DEPENDENCY RATIO						
2015	76	76	76	76	76	76
2040	99	103	106	112	121	93
2060	114	118	122	125	130	104

Table 1.1: Share of population aged 65 and above and the total age-dependency ratio in 2015, 2040 and 2060 in the EU-28, by scenario.

ZIM = Zero International Migration

Total age dependency ratio = a ratio between the economically inactive (age 0-19 and 65+) and working age population (age 20-64)

Source: CEPAM

1.5 Impact of the high immigration scenario on the size of the EU's working-age and 65+ populations

Therefore, it appears that even with higher fertility, the non-working-age population would be above the current levels while the working-age population would continue to decline. Can more migration counteract such a decline? The **high immigration scenario**, which is equivalent to doubling 2013-2016 migration flows to 20 million coming into the EU every 5 years, would increase the EU's population size by almost 25%, reaching about 632 million people by 2060 (see figure 1.1). There would also be a higher number of births due to more people of reproductive age, from 27 million in 2015-2020 to almost 30 million in 2055-2060. With high immigration, the total age-dependency ratio would reach 104 people by 2060 compared to 114 in the central scenario. However, the high immigration scenario would only moderately reduce the pace of ageing. The proportion of the 65+ population will increase, from 19% in 2015 to 29% in 2060. This is only 2 percentage points lower than the proportion obtained under the central scenario assumptions.

1.6 Conclusions

A number of conclusions can be made from our findings. First, increasing the number of births, even by means of successful government initiatives, is not an instant remedy for population ageing in the EU. An increase in fertility to the replacement level of about 2 children per woman from 2020 onwards would not completely prevent the EU working-age population from declining in size. Although the pace of ageing would be slower and the total population size would stabilise, such an increase would still lead to higher total dependency ratios.

Secondly, more immigration from third countries into the EU would have an immediate effect on the total size of the EU population and the working-age population. However, even with double the immigration levels of 2013-16, immigration

would make little improvement in the long-term on reducing the proportion of people of non-working age relative to those of working age (as conventionally defined by ages 20-64). This is due to the fact that immigrants inevitably grow older, retire from work and require social benefits (e.g. pensions), just like non-immigrants. In short, increasing immigration or fertility will not stop the population from ageing, reflecting a trend that is happening not only in the EU, but in almost every country worldwide.

These two conclusions can help to illustrate the impact of possible policy options. For example, substantial investment in work-life balance initiatives (including tax incentives, child allowances, day-care access and family-friendly work arrangements) sustained over time have created an environment conducive to higher fertility close to the replacement level in some EU Member States, such as France. Similarly, increasing the number of immigrants would theoretically be possible. For this, there would be political, social and economic issues to consider, and well-designed integration policies would be required to enable smooth immigration and successful job matching.

Bearing in mind that the above options are based on scenarios, it is important for policymakers today to consider the possibility that neither increased fertility rates nor migration are the panacea for the perceived problems associated with Europe's ageing population. Solutions must have a broader, multidimensional demographic perspective, taking into account levels of education and labour-force participation. In fact, the most effective remedy would be to increase labour-force participation, rather than looking to either migration or fertility. The next section goes in this direction by showing how higher labour-force participation can compensate for a decreasing working-age population – an unavoidable demographic reality EU Member States will have to face in the coming decades.



SUMMARY

The EU labour force is transforming amid social development and the ageing process. This section projects a smaller and more educated labour force in the future. In light of the context, a possible decline in labour force size may not be an economic problem if future jobs are fewer in number and require higher skills. At the same time, this section considers scenarios that test how greater labour-force participation could not only stem the tide of a decreasing working-age population, but also reduce the expected increase in the dependency ratio.

The constant participation scenario acts as the reference trajectory, which charts the expected path of a shrinking labour force and a rising dependency ratio. We then introduce the equalisation and Swedish scenarios to see how increasing labour-participation rates in the EU can help offset this trajectory. An increase in female labour-force participation and longer productive lives could stabilise the size of the labour force and dependency ratio at current levels.

BOX 2: SCENARIOS FEATURED IN SECTION 2, BASED ON CEPAM'S SSP DEVELOPMENT PATHWAYS (PAGE 58)

Constant participation scenario: Participation rates of the EU's labour force by age, sex, country, and education level are at current levels. Assumes medium fertility, mortality, education development, and migration (long-term average).

Equalisation scenario: Member State-specific labour force participation rates of women reach those of men by 2060.

Swedish scenario: All labour-force participation rates in all EU Member States gradually converge to those currently in Sweden by 2060.

SIZE AND EDUCATION LEVELS OF THE FUTURE EU LABOUR FORCE

■ 2.1 The demographic transition

Historically, the EU population has gone from having high fertility and high mortality rates to stable, below replacement fertility and low mortality, as part of the universal process known as the *demographic transition*. At the end of the transition, population growth rates either stabilise or reverse. While there are fewer births and longer life expectancies, young people are becoming more educated and entering the labour market later. Such developments will inevitably shape the size of the EU's future labour force and its distribution by level of education.

Despite population ageing, a smaller, higher-skilled labour force may be poised to complement the possible changing needs of the future labour market (Cedefop 2016). Furthermore, getting more women into the labour force and having longer working lives as Swedes already have today, has the potential to nullify the shrinking of the working-age population over time.

■ 2.2 A smaller but more-educated labour force

Under the **constant participation scenario**, the total size of the labour force is projected

Higher female labour-force participation and longer productive lives have the power to stabilise the labour-force size and dependency ratio.

to change from 245.8 million to 214.1 million over the next four decades, as illustrated in figure 2.1. This decrease is solely attributable to there being fewer workers with low (primary education) and middle education (upper secondary and below). Projected decreases in the size of the labour force come from the population with low (from 50.7 to 14.0 million) and middle (from 108.2 to 74.2 million) levels of education.

At the same time, the number of workers with a short post-secondary education (such as

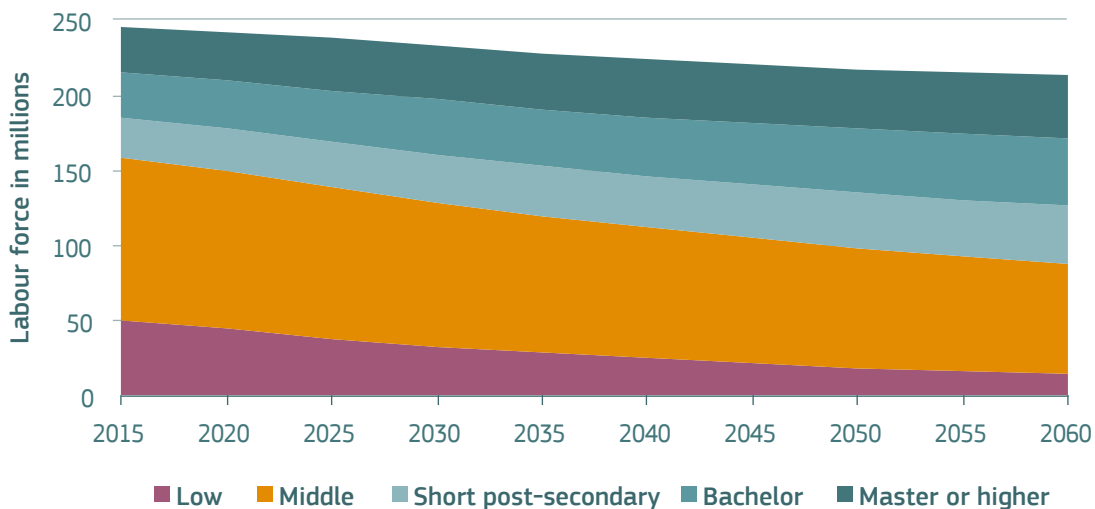


Figure 2.1: EU labour force by education level, the constant participation scenario, 2015-2060

Source: CEPAM

technical training), a bachelor's, a master's degree or higher, are rising, not just in relation to their proportion to the overall labour force, but also in absolute terms. Significantly, these post-secondary groups are expected to increase by almost a half (+45%) over the next 40 years.

Therefore, irrespective of changes in the population's age structure and labour force sizes, it can be expected that the human capital of future workers of any age, measured by the highest level of their educational attainment, will be higher than today. This is because in all Member States, young people are already better educated than their elders and will gradually replace them through the process called 'demographic metabolism'.

2.3 How different rates of labour participation impact on the size of the total labour force

The three scenarios in figure 2.2 illustrate how the divergent labour force participation rates influence the size of the labour force over time. All three assume the same demographic future as the constant participation scenario (see figure 2.1). Under the **constant participation scenario**, the labour force size would be about 13% smaller than it is today (from 245 million to just under 215

million). Under the **equalisation scenario**, the size of the labour force would decline to 227.2 million in 2060, which represents about 13 million more workers than under the constant participation scenario. Furthermore, if participation rates rise to the levels currently observed in Sweden (**the Swedish scenario**), the labour force size would stabilise at 245 million workers, avoiding any decline. Both the **equalisation** and the **Swedish scenarios** express the high capacity that participation rates – in particular female participation – have to affect the labour force size. In fact, participation rates can impact the size of the labour force notably more than increasing migration flows.⁷

Looking at EU Member States more closely, under the constant participation and Swedish scenarios, map 2.1 shows that under the former, the size of the labour force in many Western Member States would remain stable, due in part to gaining working-age nationals from Eastern Member States. In turn, Eastern and Southern EU Member States would continue to see reductions in the size of their labour force.⁸



Figure 2.2: The three scenarios influencing the size of the EU's total labour force, 2015-2060

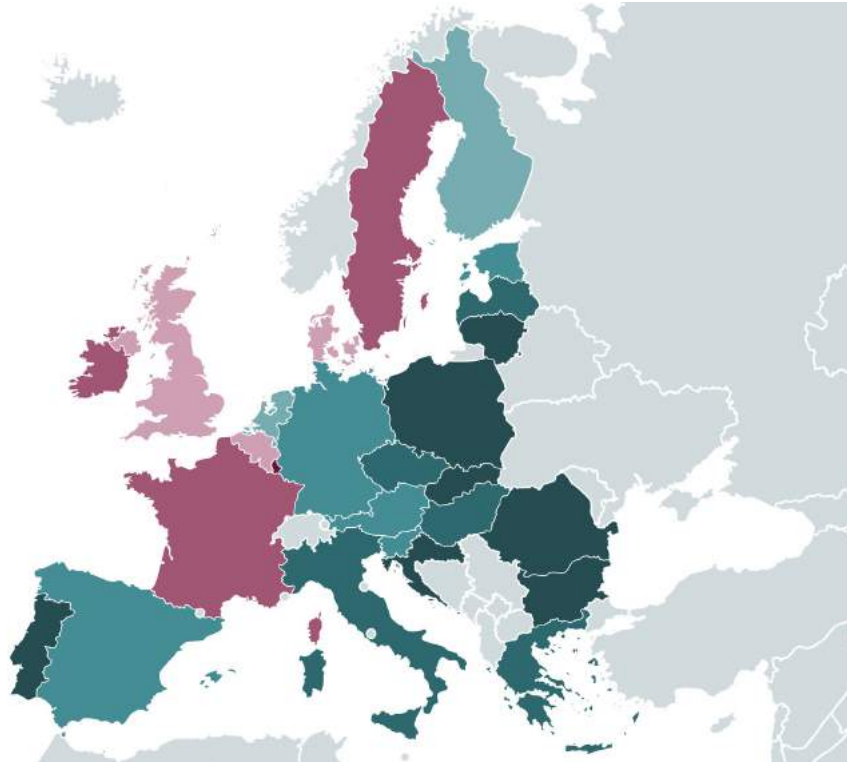
Source: CEPAM

“Increasing labour-force participation rates – particularly of females – has a high capacity to affect labour-force size”



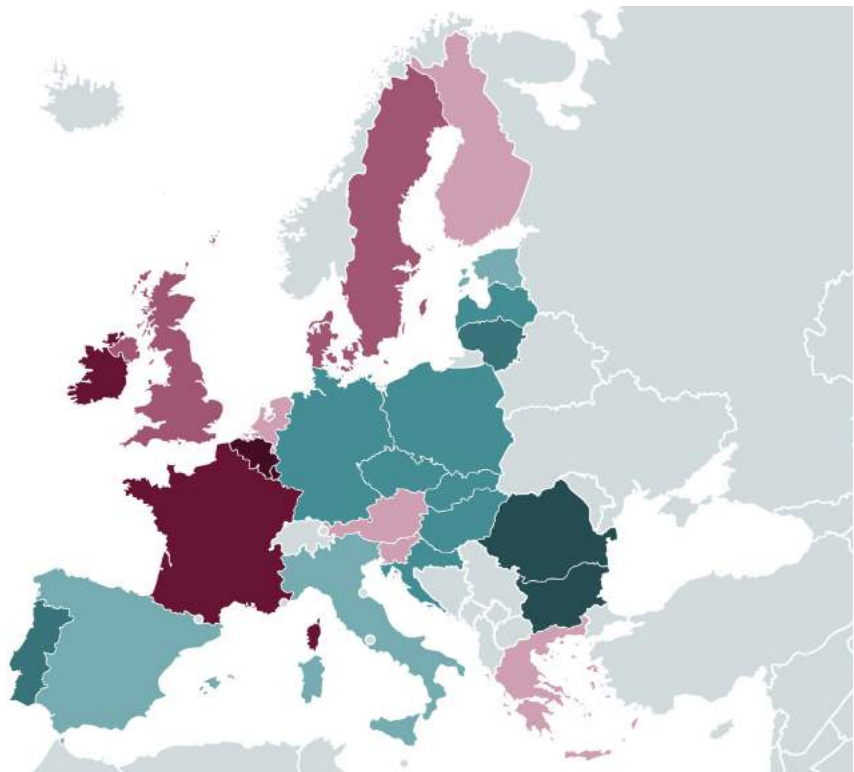
2015-2060 Active Population
Growth Rate, Constant scenario

- 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



Map 2.1: Changes in the size of the labour force 2015-2060 under the constant participation and Swedish scenarios

Source: CEPAM

Created with mapchart.net©

2.4 How lower labour-force dependency ratios can reduce the public spending burden

When it comes to considering future public spending on pensions, social services, etc. for the non-working population, it is important to look at the *labour-force dependency ratio* (LFDR). This measure is important for understanding the potential economic impact of population ageing, since the higher the ratio, the more challenges there are to labour markets, government tax, government spending and the wider economy.

In 2015, the LFDR was 1.05, meaning that there were about 105 inactive people for every 100 workers. With the **constant participation scenario**, in figure 2.3, the LFDR would reach 1.36 in 2060. However, ratios would vary a lot by Member State, as seen in map 2.2. They would be much higher in Member States experiencing low fertility, higher life expectancy and low

labour-force participation, such as Greece (1.69) and Italy (1.72). On the other hand, Member States with medium or high fertility and a higher labour-force participation rate would have more favourable ratios, such as Sweden (1.04) and Denmark (1.05).

Changes in labour-force participation rates could significantly impact the projected LFDR. In the **equalisation scenario** in figure 2.3, the ratio would stabilise at about 1.2, which reduces to half the expected increases compared to the constant participation scenario, meaning it is a more favourable scenario. In the **Swedish scenario**, the ratio would stabilise to the level of what it was in 2015. In other words, a strong but realistic increase – it is already reality in Sweden – of labour force participation over time could nullify a large part of the negative future economic consequences of population ageing. So, it is clear that labour force participation rates have the highest potential to mitigate the challenges of population ageing.

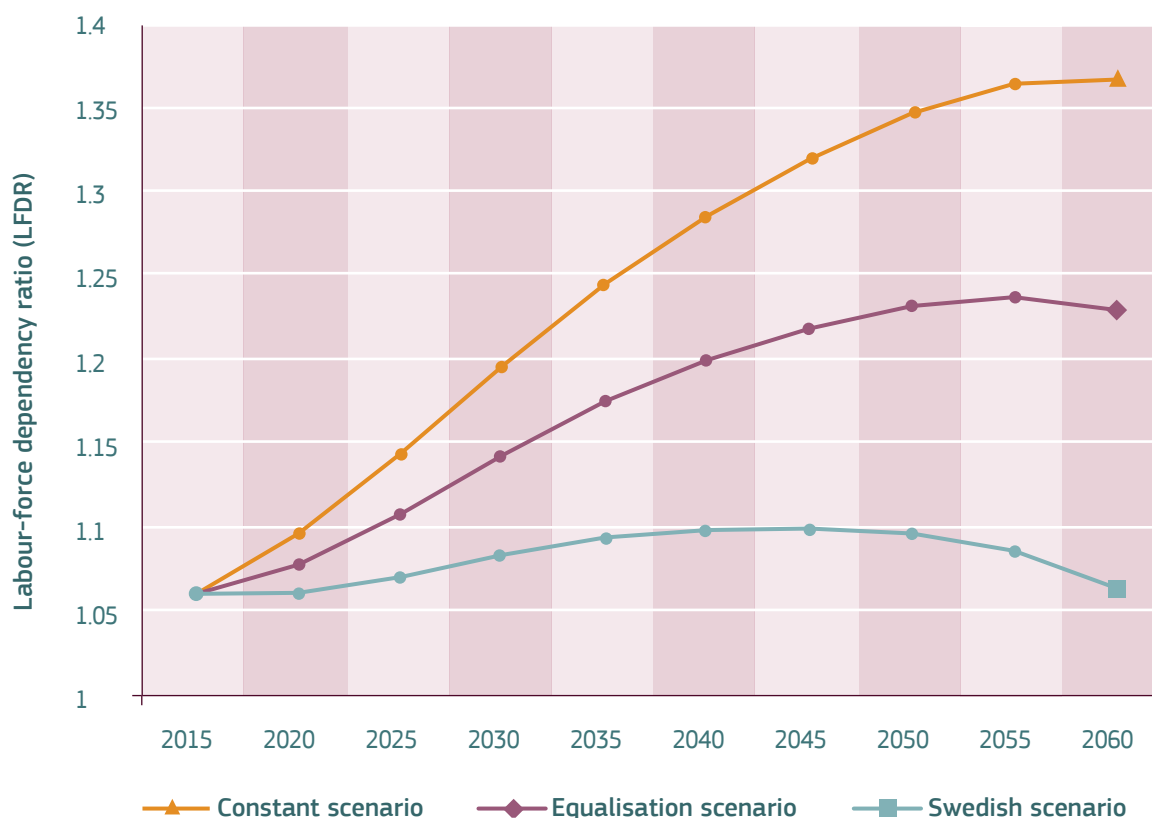
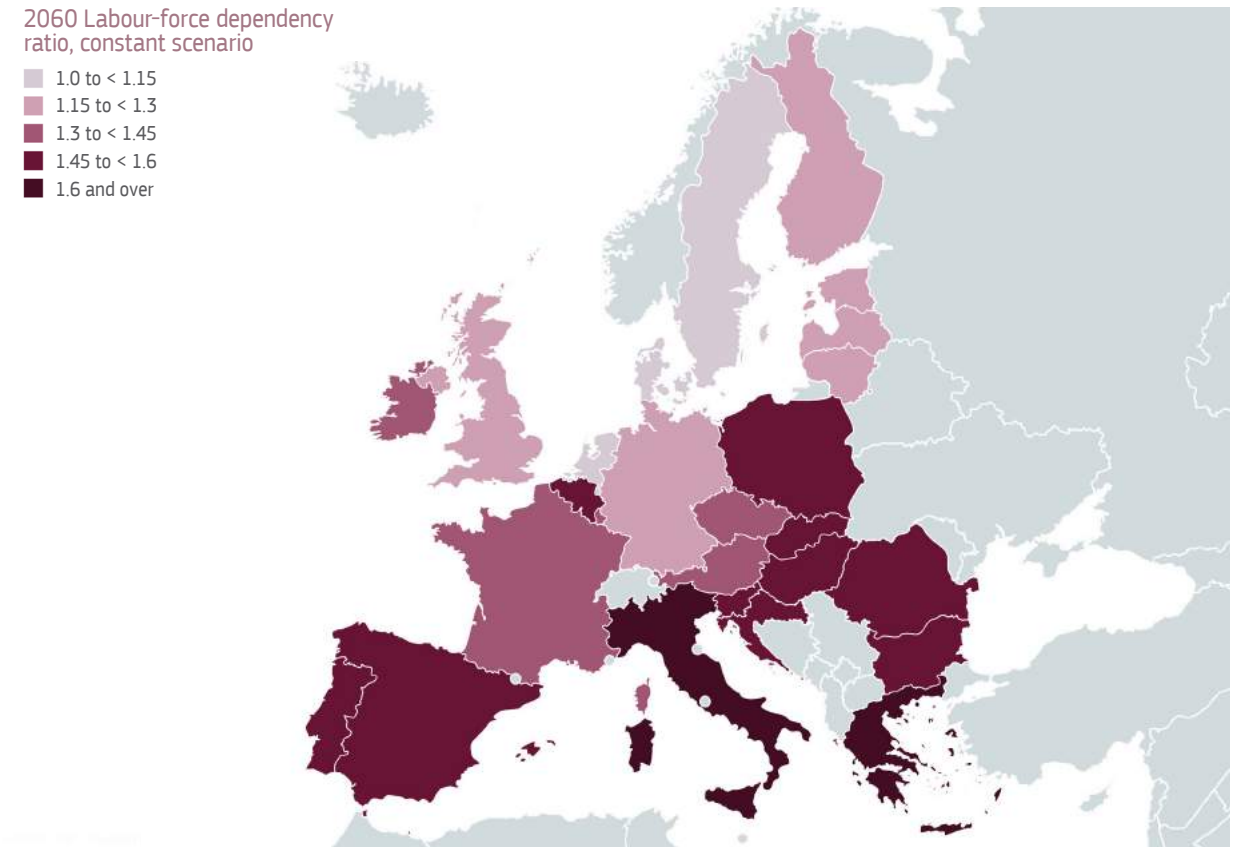
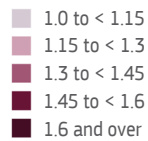


Figure 2.3: EU labour-force dependency ratio, by scenario, 2015-2060

Source: CEPAM

2060 Labour-force dependency ratio, constant scenario



Map 2.2: Labour-force dependency ratio, constant participation scenario, 2060

Source: CEPAM

Labour-force dependency ratio (LFDR) = a ratio between people in the labour force and people not in the labour force.

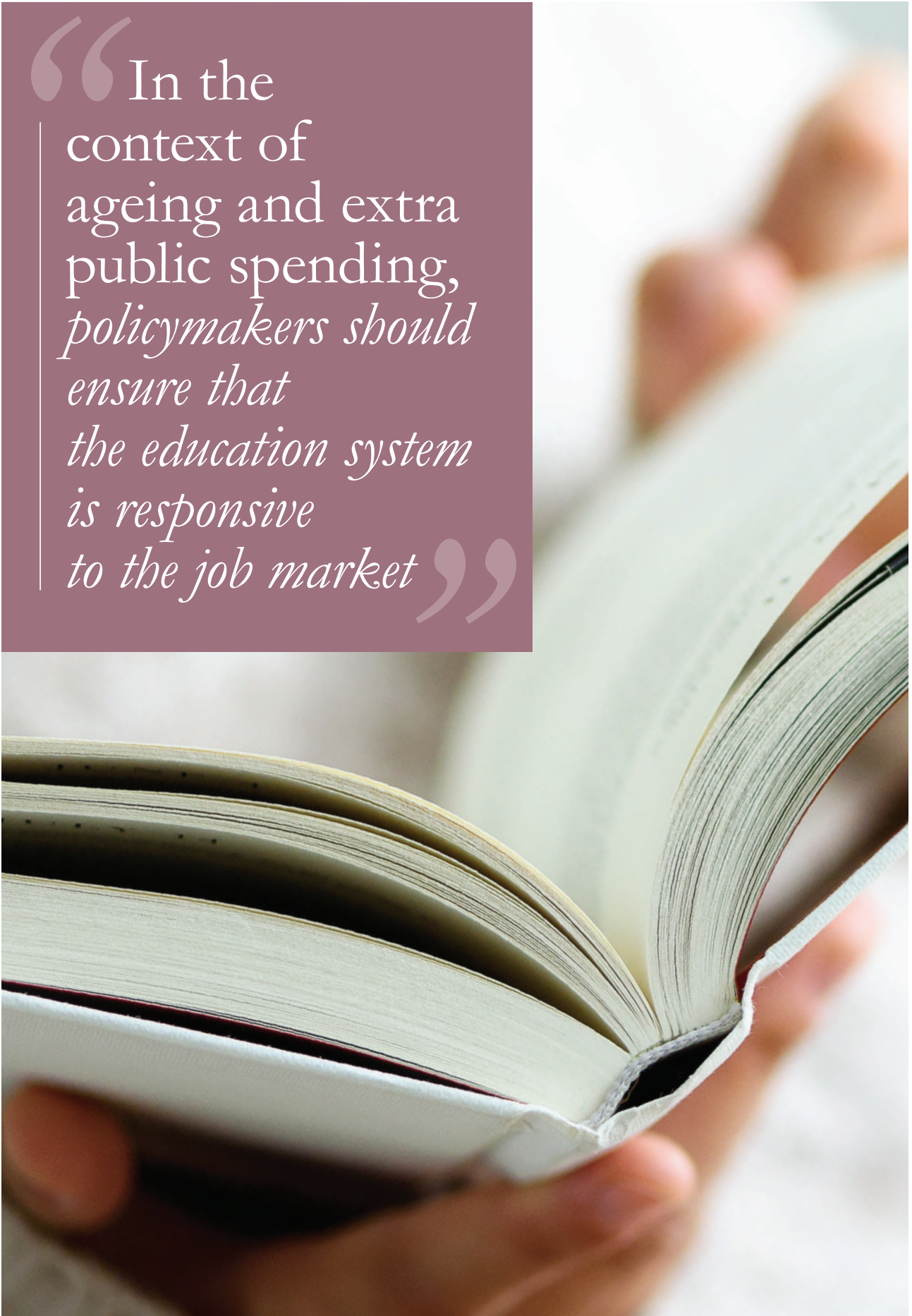
Created with mapchart.net©

2.5 Conclusions

The EU's future labour force is likely to be smaller but better educated. The impact of the decline in the size of the labour force could be lessened by an increase in productivity thanks to a more educated labour force. Plus, incentives to encourage more women to participate in the labour force and to get everybody to participate in the labour force, as observed in Sweden, could also prevent its decline and could stabilise the LFDR. The combined effect of increasing labour-force participation and worker productivity could enable economic growth to continue, thereby offsetting public spending on dependant people.

Overall in the EU, the total cost of ageing (public spending on pensions, health care, long-term care, education and unemployment benefits) is expected to increase by 1.7 percentage points to 26.7% of GDP between 2016 and 2070 (European Commission, 2018a). Thus, the scenarios projected in this section are important for EU policymakers to consider. In the context of this challenge and covering the extra 1.7% of GDP, a higher educated labour force will need to be utilised. Policymakers should ensure that the education system is responsive to the needs of the job market and the changing nature of work, so that increasingly highly educated young people can contribute to the economy and actualise the higher potential productivity that comes with education.

“ In the context of ageing and extra public spending, *policymakers should ensure that the education system is responsive to the job market* ”



MIGRATION NARRATIVES FOR SECTION 3 SCENARIOS



Low Volume – High Human Capital of Immigrants (similar to Japan in recent years)

EU Member States adopt more selective migration policies to both emphasise skills and substantially reduce the overall volume of flows. Immigrants are admitted primarily based on their potential for contributing to the economy, using a points system to target highly specialised and needed skills.

The number of immigrants settling in the EU amounts to approximately 1.2 million every 5 years (corresponding to the recent immigration rate in Japan, which would mean that flows reduce to about

12% of the volume of the past 5 years). Integration into the labour market is facilitated by the highly skilled profiles and screening for other criteria. Member States maintain the system's integrity by enforcing rules on employment and penalising businesses for unlawful hiring practices.

Dealing with an ageing workforce, policymakers in this narrative address challenges by investing in automation and mechanisation. The new focus intends to use emerging technologies to improve production efficiency and reduce the dependence of various sectors (agriculture, heavy industry, etc.) on repetitive, low-skilled labour, suitable for automation. Similarly, the health-care system reduces the risks of labour shortages by using technologies to improve health-care services, emulating existing best practices used abroad.



Low Volume – Low Human Capital of Immigrants (low-skilled, circular system)

A reform of the education system benefits EU Member States by successfully linking university and technical programmes to economic needs. With a more efficient education-to-labour-force path, Member States do not aim to supplement their labour force by recruiting large numbers of immigrants from third countries. Instead, the primary focus of migration policy shifts

to temporary refugee assistance and filling remaining low-skilled jobs, with flows at around 1.2 million every 5 years.

A new migration system is implemented with a focus on work permits of a temporary and seasonal nature. Such changes to labour migration create more circular, rather than permanent movement, in part to address mounting concerns from developing countries of 'brain drain' losses. Member States also adjust asylum policies accordingly.

The general orderly management and low volume of immigrants do not overload



relevant support resources. At the same time, permits for low-skilled immigrants and temporary workers are calibrated to match unfilled jobs, facilitating their entry into the labour force. The new system depends on

regular monitoring of the economy, efficient administration of set migration levels, and ensuring that those employing temporary workers fulfil legal work requirements as protection against fraud.



High Volume – High Human Capital of Immigrants

EU Member States begin recruiting increasing numbers of highly skilled workers from countries around the world to address economic concerns. The introduction of a new high-volume, highly skilled immigration system brings approximately 20 million migrants into the EU every five years (corresponding to the recent immigration rate in Canada, which would mean that flows double the volume of the past five years). Maintaining its highly selective nature, the system relies on the enforcement of work permits and border checks as the EU becomes an increasingly prominent immigration destination.

Most of the new immigrants originate from middle-income countries with relatively strong education systems, although the system also attracts the highly educated elite from low-income countries. In turn, sending countries struggle with the losses of their most talented and educated citizens as the EU's appetite for skilled workers persists.

Integration into the economic system comes without significant barriers, since the admission of migrants is a function of scoring highly on criteria for education, skills, language ability and work experience.

A large proportion of immigrants pursue opportunities in the urban economic hubs of Western and Northern EU, given the greater demand for highly skilled workers as well as their own personal preferences and existing migrant networks. This narrative is similar to the model currently used in Canada.

- *The Canadian immigration programme is a merit-based system that recognises three broad classes of immigrants: economic migrants, sponsored family and refugees. Immigration targets are established for all immigration categories and subcategories, and are set at the federal level, in agreement with provincial authorities. Targets are estimations of future immigration influx and as such are not considered as quotas.¹¹*
- *Between 2007 and 2016, the Canadian government granted permanent residency to 2 600 000 immigrants, 60% of whom were economic migrants chosen for their potential ability to integrate in the Canadian labour market.¹² In this context, dependants of economic migrants are also classified as economic migrants.*
- *Most economic migrants are admitted based on a selection grid assessing their skills and human capital, such as education level, previous work experience and fluency in Canada's official*

languages, French and English. Furthermore, economic migrants may be admitted as permanent residents under sub-programmes targeted at individuals with specific characteristics, such as investors, entrepreneurs or individuals with previous work experience in Canada.

- Aside from programmes leading to permanent residency, Canada has schemes to provide temporary work permits to foreign nationals. The number of holders of temporary work permits increased significantly during the last decade, doubling from 173 000 in 2007 to 340 000 in 2016.¹³

- There are two programmes for refugees. The first is the Refugee and Humanitarian Resettlement Program, for people requiring protection from outside Canada (about 65% of refugees according to the 2019 target). The second one is the In-Canada Asylum Program for people making refugee protection claims from within Canada. The United Nations Refugee Agency (UNHCR), along with private sponsors, identifies refugees for resettlement. A person cannot apply directly to Canada for resettlement. In 2019, refugees are expected to account for approximately 15% of the total number of migrants.



High Volume – Low Human Capital of Immigrants

In the face of persistent conflict, instability and poverty in the EU neighbourhood, and increasing costs of securing the external borders, EU Member States decide to expand the intake of low-skilled labour and adopt more generous asylum policies (in terms of determining safe countries, allocating resources and acceptance rates). Many Member States aim for the highest migration-granting rates of recent years, focusing less on skill selection or border enforcement.

Intensifying push factors create conditions for a constant supply of immigrants as tens of millions of the developing world's impoverished look abroad to make their livelihoods.

Furthermore, the EU is seen as an ever-more viable destination by prospective immigrants, encouraging a sustained exodus. Overall, migrant flows into the EU as a whole reach 20 million every 5 years (about double the volume compared to the past 5 years), progressively characterised by greater proportions of low-skilled workers, as well as refugees and family reunification cases.

Integrating them into the labour market becomes an important topic in public discourse as record numbers of immigrants are given permission to live and work in the EU. Most arriving immigrants tend to have a lower skills profile compared to the EU average, presenting barriers to their potential labour-market participation. Due to more plentiful economic opportunities, personal preferences, historical links and existing communities, the majority of migrants choose to live in Western, Northern, and a couple of Southern Member States.







SUMMARY

Policymakers regularly balance migration policy with a Member State's best interests – doing so while being mindful of the fact that a long-term understanding of demography is crucial. At the core of such considerations are factors including: the volume of immigrants from third countries entering the Member State, their levels of education, how well they will integrate into the labour market, and how effective the Member State is at enforcing migration policy. This section shows how different volumes of immigration and the integration by immigrants into the labour market change the educational composition of the future EU labour force and the LFDR ratio.

Whilst a high volume of immigration would increase the size of the EU's total labour force, it would have a limited impact on the proportion of workers to non-workers in the long-run. Larger inflows combined with deteriorating economic integration could actually result in a labour force situation that is worse than that with medium or low volumes of immigration, highlighting the importance of effective integration efforts.

BOX 3: ADD-ON SCENARIOS TO THE MIGRATION NARRATIVES FEATURED IN SECTION 3 (SEE PAGES: 32-34)

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.

IMPACTS OF MIGRATION ON THE EU LABOUR FORCE

■ 3.1 Migration scenarios

First, to assess the different volumes of immigrants and their human capital, we constructed four migration scenarios which are based on different qualitative narratives (see box 3) : (a) **low volume – high human capital of immigrants**; (b) **low volume – low human capital of immigrants**; (c) **high volume – high human capital of immigrants**; and (d) **high volume – low human capital of immigrants**.⁹ These scenarios are illustrated in figure 3.1. Then we combined them with three different labour-force integration scenarios: baseline, low integration and the high integration scenario (defined in box 3).

By combining these migration scenarios with labour-force integration scenarios it is possible to analyse the impact of the volume of immigrants, their levels of education and of integration on the EU's labour force size, its educational composition, and its LFDR

■ 3.2 Current labour-force participation of immigrants

To understand how the integration scenarios affect the EU labour force, we first need to look at the current levels of participation by immigrants in the labour market, as shown in figure 3.2.

High migration volumes increase labour-force size but have a limited effect on the number of dependent people per worker in the EU.

Recently arrived male immigrants tend to participate much less than native-born populations. Over time, their labour force participation rate (LFPR) tends to increase as the duration of stay in the host country increases. On average, after a 10-year stay, participation rates for male immigrants are only slightly lower than those of the native-born.

The dynamics of labour-force integration vary widely among EU Member States. In Germany, Belgium, Denmark and the Netherlands there is a large gap in LFPR between the native-born and immigrants, even for those who have been in their host country for a decade. Conversely, LFPR

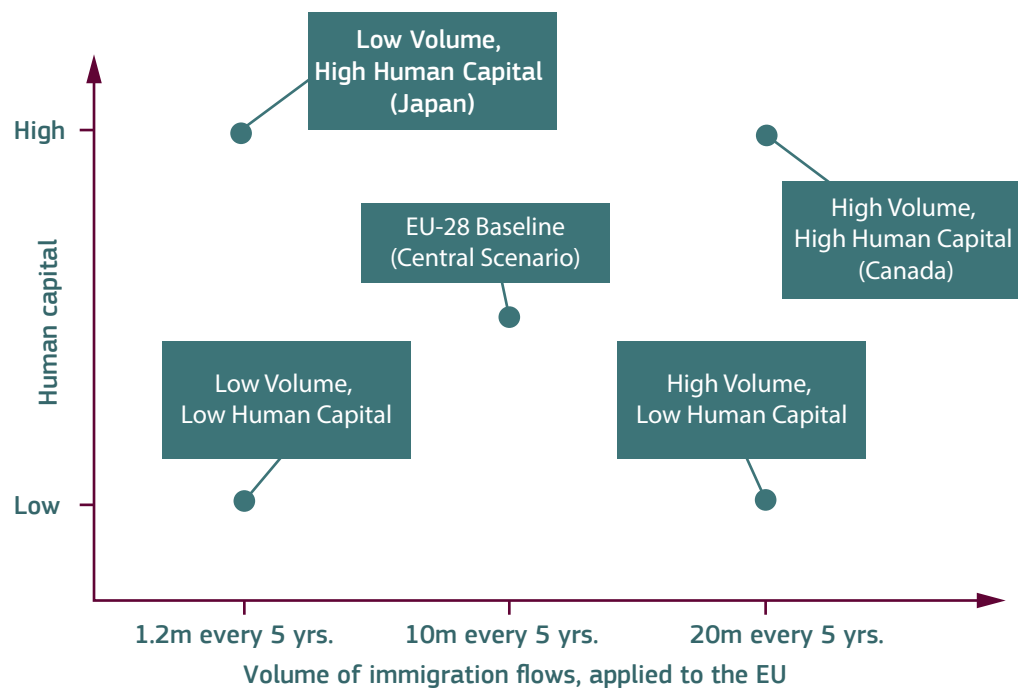


Figure 3.1: The migration scenarios, contrasting volumes of migrants with their level of human capital

Source: CEPAM

for the native-born and male immigrants, even recent ones, are similar to one another in Greece, Spain and Portugal.

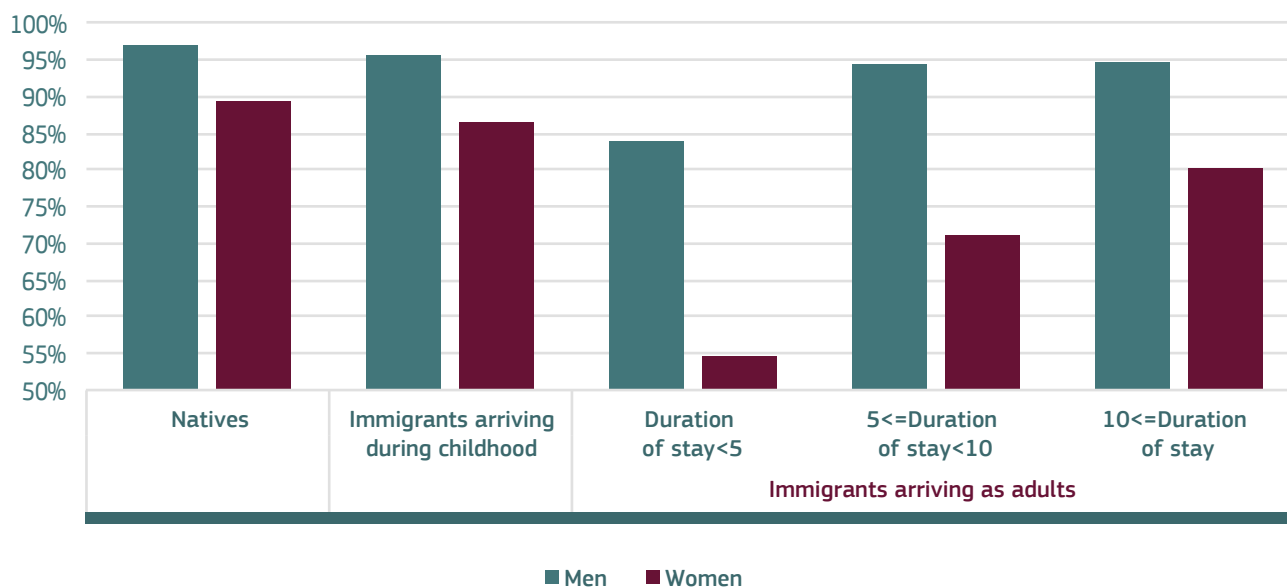
Gender disparities in LFPR are more prominent among immigrants than between native-born men and women. Female immigrants are the least likely to participate in the labour force as their LFPRs are lower than both male immigrants and native-born men. Moreover, **female immigrants have not yet caught up with the LFPR of native-born women in any EU Member State.**

The positive relationship that education has with LFPR is weaker for immigrants than for those who are native-born, especially for female immigrants. Immigrants who arrived during childhood, however, tend to have more similar outcomes to those who are native-born, having gone through schooling in the host Member State.

3.3 The impact of different volumes of immigrants on the size of the future EU labour force

The number of immigrants admitted into the EU would strongly alter the overall population size and thus the labour-force size. As shown in table 3.1, where the volume of immigrants is high (and there is high integration), there could be around 30% more workers in the labour force by 2060 compared to the baseline scenario, and 60% more workers compared to the low-volume scenarios. This high volume of migration would lead to significant growth in the labour force size in terms of absolute numbers.

In addition to migration volume, integration dynamics have a significant impact on the EU's future labour force size. If migration volumes are high, the stakes of integrating into the labour force are much higher. For instance, table 3.1 shows that the difference between the high volume of immigrants and high integration (between 300-310 million people) and high immigration and low



*Statistical control for age (30-34) and education (post-secondary education)

Figure 3.2: Labour-force participation rate* in the EU by migration status, age at arrival and duration of stay, 2010-2015

Source: CEPAM

integration (264-271 million people) can vary by around 14%, whereas the difference between the low volume of immigrants and high integration (between 171-172 million) and low immigration and low integration (168-169 million) is far less at around 2%.

Because immigrants' labour-force participation varies much less according to education than it does for a Member State's native-born (or host population), the effect of the immigrants' level of education on the projected labour-force size is limited. Under both a medium volume and baseline integration situation, the high-education assumption (of 229 million people) only results in 3 million more workers (1.3%) relative to the medium-education assumption (226 million).

As table 3.1 indicates, a high volume of immigration will lead to more people in the labour force than the number currently, irrespective of their level of education or how well they integrate into the labour market. However, not only does this mean that there will be a larger

labour force, but that there would also be a larger non-working population, partly because immigrants tend to have lower participation rates than natives, particularly female immigrants. Immigration also causes growth of the non-active population in the long run as immigrants age and leave the workforce. Most importantly, as discussed later in this section, it must be noted that the size of the labour force is neither a good indicator of economic health nor a way to address population ageing.

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

3.4 The impact of different volumes of immigrants on the educational composition of the future EU labour force

In Section 2, it has been projected that, by 2060, the EU's labour force will be better educated than it is now. Table 3.2 shows that the proportion of workers with post-secondary education could reach between 40% and 52% in 2060, compared to 35% in 2015.

Unless migrants are highly prioritised according to their education level, higher volumes of migration tend to decrease the proportion of workers with post-secondary education.¹⁰ As shown in table 3.2, in cases where migrants' educational composition is at the medium level, the EU's proportion of post-secondary workers is highest (51%) when the volume of migrants is low; 48% when the volume is at its baseline; and 45% when the volume is high. The declining proportion of post-secondary workers in the EU – moving from low to high volumes of immigrants – is because, on average, immigrants

tend to have a lower level of education than those who are native-born.

When the volume of immigrants is high, their educational composition would significantly alter the future educational composition of the labour force in the EU as a whole. For example, within the high-volume scenarios in table 3.2, a strong selection for highly educated immigrants would lead to 53% of workers in the EU with post-secondary education. However, if a high volume of immigrants with low education entered the EU labour force, the proportion of the labour force with post-secondary education would decrease to 41%. In contrast, where immigrant educational levels are more moderate and the volume of immigrants is low, this would have a smaller impact on the overall education composition of the EU labour force with post-secondary education.

Furthermore, the integration assumptions (high and low) influence the absolute number of workers with post-secondary education to an extent, but have a very limited impact on their

Immigration volume	Educational composition of immigrants	Integration assumptions		
		Low	Baseline	High
Low	Low	51%	50%	50%
	Medium	51%	51%	51%
	High	52%	52%	52%
Baseline	Low	46%	45%	44%
	Medium	48%	48%	47%
	High	52%	53%	53%
High	Low	42%	41%	40%
	Medium	46%	45%	45%
	High	53%	53%	54%
PROPORTION IN 2015 = 35%				

Table 3.2: Projected proportion of the labour force with post-secondary education in the EU in 2060

Source: CEPAM

proportion relative to other education groups in the overall workforce.

3.5 The impact of different volumes of migration on the labour-force dependency ratio

Although higher immigration volumes have a large impact on increasing the labour-force size, their impact on the LFDR is much smaller. Table 3.3 shows that under the medium-education composition and baseline integration assumptions, a high volume of immigrants only manages to decrease the LFDR by 0.06, compared to the baseline scenario (1.27 vs. 1.33).

Under all combinations of immigrant volumes, levels of education and integration assumptions, the LFDR would be higher than in 2015 (1.08) due to the unstoppable momentum of an increasing average age. This is partially because immigrants make up a relatively small proportion of the population and therefore have limited ability to affect the overall population, age structure or lower

participation rates. In any case, as table 3.3 shows, migrants add to both the overall active and inactive populations in the long-run.

The integration assumptions, however, have a larger impact on the LFDR than the actual volumes of immigrants. Table 3.3 shows that, under the high-volume and medium-level educational compositions, the ratio reaches 1.17 with high integration and climbs to 1.48 if integration is unsuccessful. Furthermore, low immigration and high integration yields a better LFDR than high immigration and low integration (1.39 vs. 1.48). Similarly, **moving from medium to high integration has a similar effect on the LFDR as high-volume immigration flows with baseline integration rates (1.26 vs. 1.27)**. In other words, the impact of immigration on the labour force depends largely on the immigrants' ability to access the labour market rather than on the volume of immigrants.

Variations in the educational composition of the volumes of immigrants have a smaller impact on the LFDR. For most combinations concerning

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

the volumes of immigration and integration assumptions, the three educational composition variants do not significantly influence the LFDR. However, they matter for the productivity-weighted LFDR (not shown here) which takes account of the fact that more educated people tend to earn higher salaries and thus pay more into the system. These economic aspects go beyond the scope of this scenario exercise but deserve in-depth follow-up research.

3.6 Conclusions

This section has considered how the different volumes of immigration and their various levels of integration into the labour force impact the size of the EU's future labour force, the proportion of post-secondary education in the future EU labour force, and the LFDR by 2060.

A number of key findings can be asserted. First, high volumes of immigration would increase labour force size in the EU, but would have a very limited impact on the LFDR, which is in line with

the findings of a recent OECD study (Spielvogel and Meghnagi 2018). Therefore, **a larger labour force size will not necessarily curb or reduce the number of non-working people depending on the labour force**, which undoubtedly has repercussions on economic growth and public spending, as mentioned in Section 2.

Even though immigrants tend to be younger on average than those who are native-born, the positive effect on the labour market is short-lived, in part because the participation rate of immigrants is lower than that of native-born, particularly for female immigrants. In the long run – regardless of the LFDRs – higher volumes of immigration would not only increase the working population but also the population of non-workers too as immigrants inevitably age, leave the labour force and require social assistance, as do native-born workers.

Integration dynamics have a significant impact on the EU's future labour force size. Consequently, to maximise the possible impact of immigration on lowering the LFDR, any increase in the

volume of immigration accepted must come with successful policies to improve immigrants' access to the labour market, especially for female immigrants. Otherwise, higher inflows combined with deteriorating participation rates could result in a situation that is worse than that with medium or low volumes of immigrants.

Finally, while a careful selection of immigrants in terms of levels of education would only have

a limited impact on both the size of the labour force and the LFDR in the EU, this matters greatly for the human capital of the immigrant population and thus for the productivity and income levels earned by immigrants as a group. Also, for other aspects of social, linguistic and cultural integration that are beyond the scope of this study, immigrants' education level tends to matter greatly because of a steeper learning curve in adjusting to new conditions.





SUMMARY

Movement between EU Member States, or intra-EU mobility, has facilitated population changes within the EU in recent decades. Pre-existing economic disparities between Member States have encouraged many citizens to search for work in places other than their country of origin, likely to the economic benefit of the union as a whole, but not necessarily for all sending Member States.

This section focuses on the potential for change in total population sizes over time, leaving the topic of the education-selective nature of such emigration for Section 5. If flow patterns from the east and south continue, some Member States will see significant reductions in their total population. This raises important implications for economic development and Cohesion Policy goals.

BOX 4: SCENARIOS FEATURED IN SECTION 4

Central scenario: Flows of approximately 2 000 000 immigrants from third countries into the EU every year. Medium assumptions of mortality, education levels, and uses the recent average for migration. Intra-EU mobility rates are held constant leading to fewer emigrants from the main sending Member States, due to their smaller and ageing populations. For example, emigration to other EU countries from Poland is projected to decline from 903,000 in 2015-2019 to 604 000 in 2055-2060 under this assumption of constant age-specific emigration rates.

No intra-EU mobility scenario: The assumption of no EU intra-mobility between Member States.

Double intra-EU mobility scenario: This scenario doubles the intra-EU mobility rates used in the central scenario.

IMPACTS OF INTERNAL EU MOBILITY OVER TIME

■ 4.1 Intra-EU mobility and EU Member State populations

Between 1991 and 2015, the population of the current EU Member States increased from 476.8 to 508.5 million. As map 4.1 illustrates, in spite of low fertility, western and southern¹⁴ EU Member States experienced marked population growth as they attracted immigrants from within and outside of the EU. In contrast, Eastern Member States experienced population decline due to a combination of very low fertility and emigration. For example, the Baltic States and Bulgaria lost between 26% and 16% of their population, intra-EU mobility being one of the drivers of this decline.

Intra-EU mobility has played an important role in population change in Member States over the past decades. In 2017, over 3% of EU citizens (16.9 million) resided in a country other than their country of citizenship (Eurostat 2018). Since 2004, migration among the current Member States increased following the accession of 13 countries, although transitional restrictions imposed by some of the older EU-15¹⁵ Member States have affected the volume and direction of flows between individual Member States. In addition, evidence shows that intra-EU mobility stabilises after an initial rise following a country's accession (de Haas 2018).

If internal migration flows to western Member States continue, some in the south and east will see significant declines in their populations.

Nonetheless, **an estimated 1.8% of the population in the eastern Member States that joined the EU in 2004 moved to the EU-15 between 2004 and 2009, rising to 4.1% in Bulgaria and Romania between 2007 and 2009** (Fic et al. 2011). EU-15 populations grew by an estimated 0.4% and 0.3% due to immigration from new Member States during the period (Fic et al. 2011).

Separate projections of both international migration to/from the EU and intra-EU mobility are necessary to assess the possible impact

of intra-EU mobility on future population changes in EU Member States. Such modelling was not normally done in previous EU population projections, the only similar projection for the EU being Bijak et al. (2007).¹⁶ Assessment of bilateral flows between the Member States is still particularly challenging due to large discrepancies in reported in- and outflows between the countries. In spite of significant efforts by Eurostat to improve data quality, there are significant variations in definitions, data-collection systems and gaps in information exchange between the national statistical offices.¹⁷ The data which were used to compute the mobility rates for the modelling of bilateral flows between the EU Member States already include the post-financial crisis years when return migration from the eastern Member States picked up. Thus, return migration is included in the overall rate although we do not model it separately. As a consequence, additional modelling is needed to arrive at integrated, harmonised bilateral flows between the Member

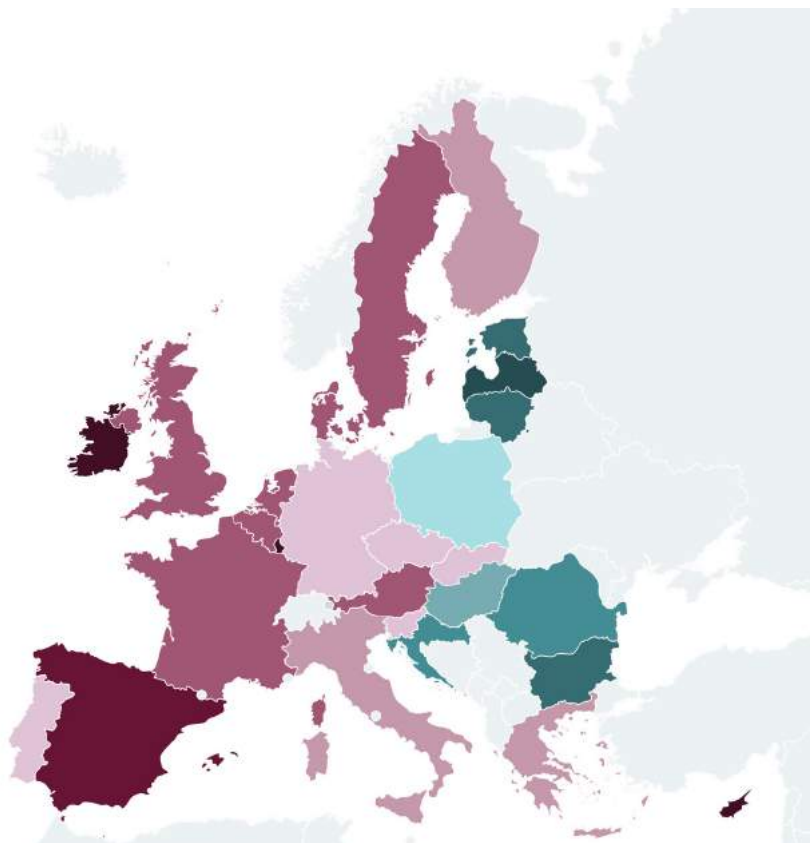
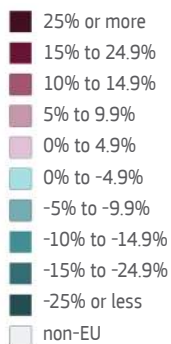
States. For the purposes of CEPAM, taking into account the large discrepancies of in-outflows, we estimated intra-EU mobility bilateral flows for the period 2009-2016 using the method developed by Raymer et al. (2013).¹⁸

The purpose of this section is to assess the impact of intra-EU mobility on the EU population. To do so, three scenarios were developed: the central scenario, the no intra-EU mobility scenario, and the double intra-EU mobility scenario.¹⁹

4.2 Intra-EU mobility scenarios

Keeping international migration into the EU constant²⁰ and varying only the magnitude of intra-EU mobility, the **central scenario** is juxtaposed against the no intra-EU mobility and double intra-EU mobility scenarios. The **no intra-EU mobility scenario** is used to illustrate the impact of intra-EU mobility on sending and receiving countries. We hypothesise that,

Population change 1991-2015



Map 4.1: Population change in EU-28 Member States between 1991 and 2015

Source: Eurostat, CEPAM - Created with mapchart.net©

in the long-term, thanks to greater convergence toward the living standards found in the most-developed Member States, greater cohesion, diminishing regional disparities and stronger EU integration, it is likely that intra-EU mobility may slow down from the south and east of the EU to the west. Therefore, by 2060, it is likely that the impact of intra-EU mobility would be smaller than that projected under the central scenario, although still larger than in the no intra-EU mobility scenario. In contrast, the **double intra-EU mobility scenario** assumes that the deepening gap between the economically stronger and weaker Member States can lead to increased intra-EU mobility.

■ 4.3 The impact of intra-EU mobility on the EU population

Intra-EU mobility has the biggest impact on the past and projected population change in the eastern Member States, where it exacerbates their population decline. The magnitude of this impact is illustrated in map 4.2 and figure 4.1, which depict relative changes in population size between 2015 and 2060 according to the different scenarios. For example, the population of Romania would shrink from 19.9 million in 2015 to 13.8 million in 2060 in the **central scenario** (losing 30% of its population). However, the loss would be much lower in the **no intra-EU mobility scenario**, which is 14% of the 2015 population (red bar in figure 4.1).

In the case of the **double intra-EU mobility scenario**, Romania could lose about 40% of its population by 2060 (orange bar in figure 4.1). Since most migrants are young adults, the direct effect of higher intra-EU emigration on the population change of a sending Member State is the loss of the mainly working-age population. The indirect effect is fewer new families because the number of the country's potential parents is smaller than would be the case with less-intense emigration.

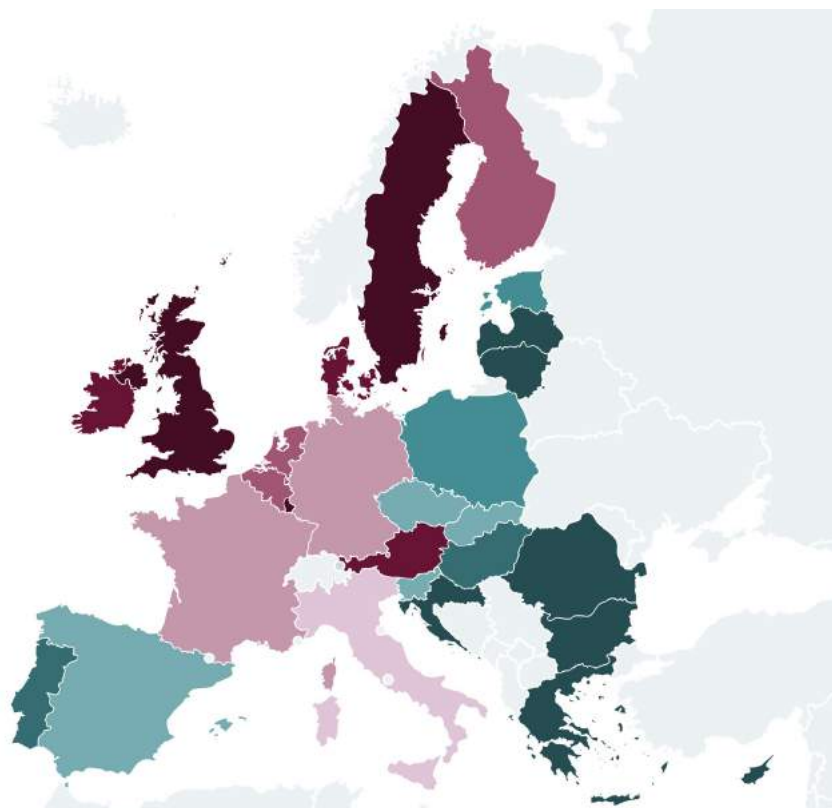
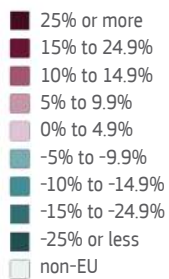
The relative adverse effect of intra-EU mobility is more pronounced in less populous countries. Despite large flows in absolute terms from, for example, Poland and Spain, figure 4.1 illustrates that the effect on their population size is actually less dramatic, although still sizeable.

Of all the Member States showing a projected declining population, Slovenia is the only one where a **no intra-EU mobility scenario** would completely prevent a population decline (see figure 4.1). On the contrary, Germany, which is a net gainer from intra-EU mobility, would face a negative population change should intra-EU mobility stop. **Due to its lower fertility rates and rapid change in age structure, Germany's population would decline without arrivals from other Member States (intra-EU mobility) even with sustained high international migration.**

Among net receiving Member States²¹, the impact of immigrants from other Member States is sizeable in Austria and the UK, although in most other Member States the changes in volume of the intra-EU flows do not make much difference to the population growth.

The outflow of people from the eastern and southern Member States contributes to an increase of population concentration in western Member States (countries depicted in red in map 4.2). In 2015, 54% of the EU's 508 million lived in western Member States. Depending on the volume of intra-EU mobility in the future, and in case of sustained increases in international migration to/from the EU, this proportion would rise to 59-61% by 2060 according to the three scenarios. In absolute terms, the population of western Member States would increase by 30 million in the **no intra-EU mobility scenario** (due to gains from international migration) and by 50 million in the **double intra-EU mobility scenario** (due to larger gains from intra-EU mobility).

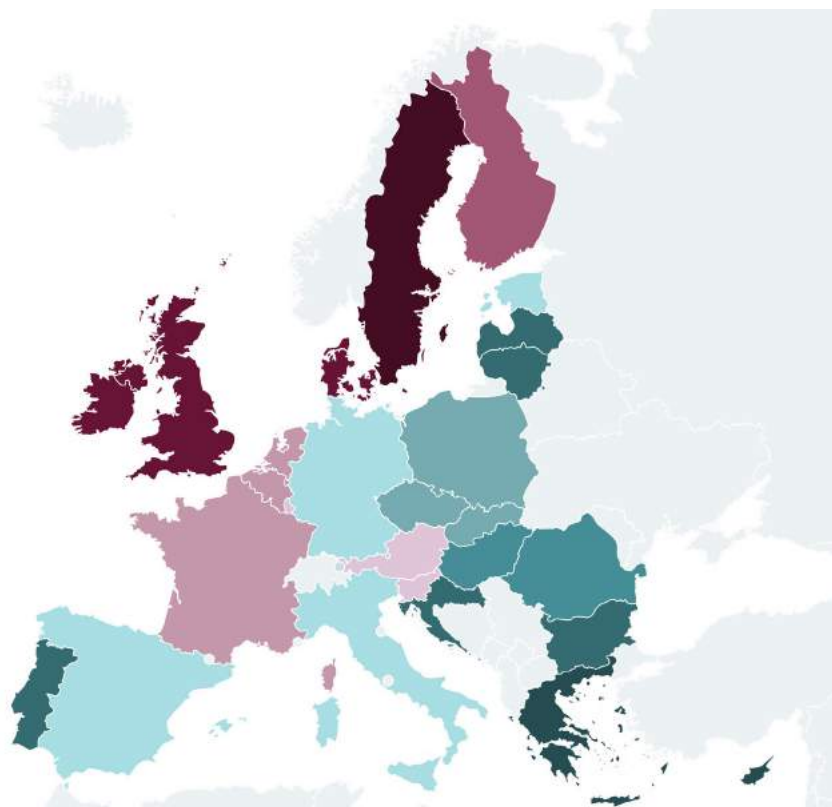
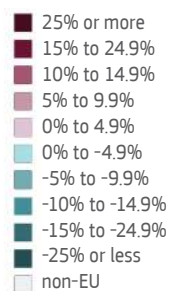
Population change 2015-2060
Central scenario



Map 4.2: Relative population change between 2015 and 2060 (projection) in EU Member States
(a) Central scenario

Source: Eurostat, CEPAM - Created with mapchart.net©

Population change 2015-2060
No intra-EU mobility scenario



Map 4.2: Relative population change between 2015 and 2060 (projection) in EU Member States
(b) No intra-EU mobility scenario

Source: Eurostat, CEPAM - Created with mapchart.net©

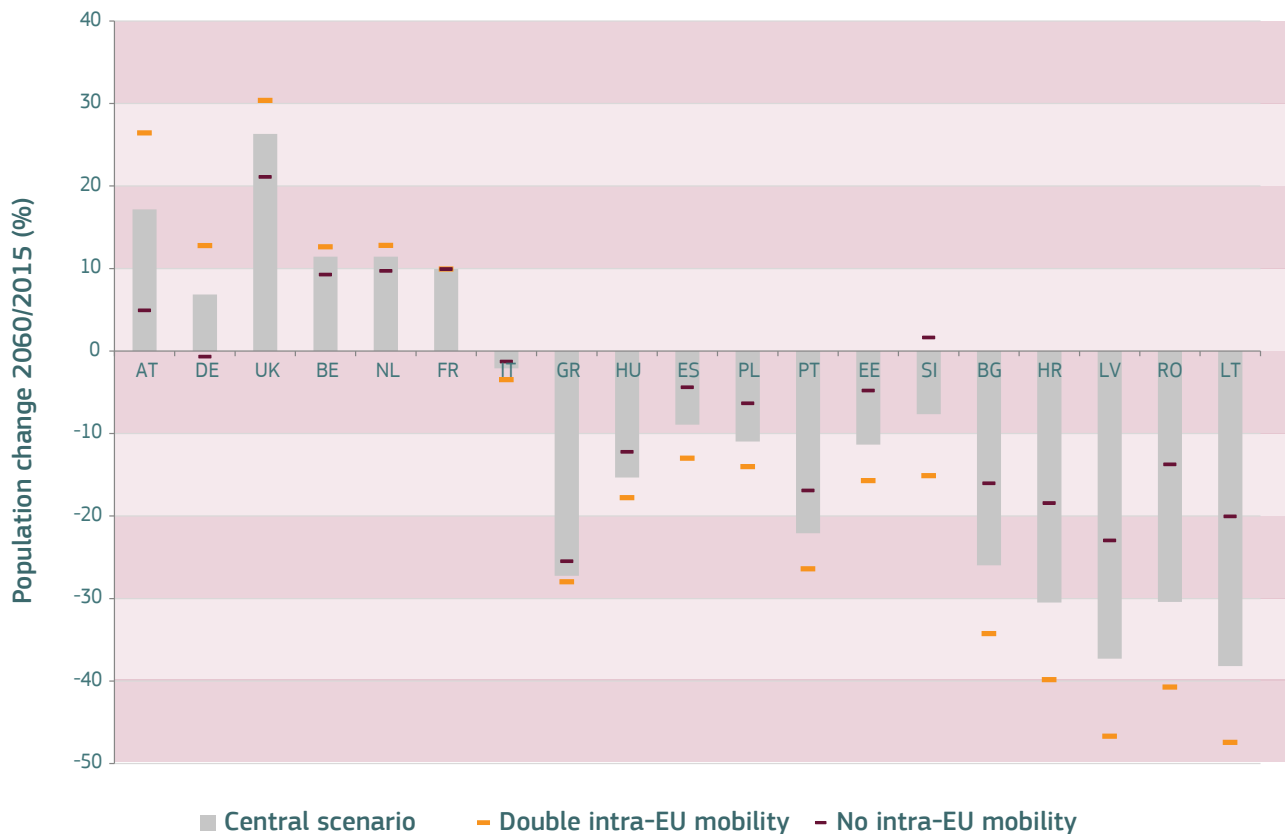


Figure 4.1: Relative population change (in %) between 2015 and 2060 (projection) in selected EU Member States, by scenario

Note: Countries are ranked by the relative importance of the impact of intra-EU mobility on their population (double intra-EU mobility scenario – no intra-EU mobility scenario) from positive to negative.

Source: Eurostat and CEPAM

In contrast, only between 15-18% of EU residents would reside in the eastern Member States compared to 20% in 2015 (falling from 103 million to 82-93 million).

4.4 Conclusions

Intra-EU mobility is driven to an important extent by demand for labour and wage inequality. In spite of strong economic growth in some eastern Member States (largely driven by foreign direct investment), convergence is relatively slow. For example, Slovenia – the most advanced country in the group in terms of economic performance – had a GDP per capita (in purchasing power standards) at only 76% of the EU-15 average in 2017, although up from 67% in 2000 (Economist Intelligence Unit 2018).

Although it likely benefited the EU as whole, unusually large emigration from the eastern Member States has had negative effects

on the sending countries, contributing to lower economic growth and thus slower convergence to western EU Member States (IMF 2016). **Gaps in wages and living standards keep driving the flow of labour westwards in spite of the implementation of EU cohesion policies, leading to a loss of home-grown talent and innovation as well as having consequences for inter-generational replacement and population ageing** (Atoyán et al. 2016).

Policies targeting economic inequality between Member States resulting in greater cohesion and integration can help those countries facing population decline, a loss of working-age population and population ageing. But these policies also need to pay special attention to skills and try to reverse the education selectivity of emigration by offering interesting employment opportunities to the highly skilled and possibly facilitating return migration for some of the talent that has left.



SUMMARY

The loss of talent to comparatively higher-income countries continuously confronts some societies within the EU, and many others around the globe. This section demonstrates at the EU level, what has already been seen in certain Member States in terms of high emigration. The purpose of this demographic exercise is to illustrate the relationship between high emigration and demographic variables, rather than presenting a scenario to be viewed as a likely future for the EU as a whole. It can also help demonstrate how the currently observed pattern of net migration inflows should not be automatically assumed to continue in the long term.

If the EU stagnated and started to see its highly educated citizens leave – on the scale already observed in some Southern and Eastern Member States – it would find itself with a smaller and less-educated workforce. Such changes would coincide with a more rapidly ageing population because emigrants tend to be early-career adults.

BOX 5: SCENARIOS FEATURED IN SECTION 5

High emigration scenario: This is a scenario which, due to a number of demographic factors – population ageing, shrinking labour force, as well as the attractiveness of other developed countries and emerging economies outside of the EU – creates more emigration than immigration. To assume some empirically based migration rates for this rather hypothetical scenario, we took those observed in Spain (emigration rate of 3.9% and immigration rate of 1.2% at the peak of the financial crisis in 2008) for the entire EU, aware that this was a rather specific situation. Same fertility rates as in the central scenario.

Central scenario: This is the same as in previous sections, assuming roughly constant fertility and flows of approximately 2 000 000 immigrants from third countries into the EU every year. Medium assumptions of mortality, education levels, includes intra-EU-mobility, and uses the recent average for migration.

Zero migration scenario: In this scenario there is no migration to/from EU and no intra-EU mobility. Same fertility rate as the central scenario.

DEMOGRAPHIC CONSEQUENCES OF 'BRAIN DRAIN'

■ 5.1 The hypothetical scenario of an EU 'brain drain'

Just a century ago, Europe lost a substantial share of its population as millions went in search of a better life overseas. Between 1850 and 1913, it is estimated that more than 40 million people emigrated from Europe to the New World (Hatton and Williamson 1994). Unlike what went before, the EU has seen far more immigrants than emigrants in recent decades and migration has become a driver of population growth. Yet, not only in the newer Members States but also in some older ones – particularly Spain, Portugal and Greece – emigration has exceeded immigration as many young adults left these countries during the most recent financial crisis.

What if the whole EU started facing brain drain or a large-scale emigration of skilled workers?

To illustrate this hypothetical – but not impossible – situation, we developed a **high emigration scenario** (see descriptions of scenarios in box 5). The conditions of this scenario are that the EU cannot keep pace with economic, scientific and technological developments taking place in other parts of the developed world, particularly in East Asia and North America. Emerging economies also become attractive and create robust alternatives for potential immigrants.

The loss of talent to comparatively higher-income countries continuously confronts some societies within the EU, and many others around the globe.

As a consequence of this, immigrant flows into the EU would lessen considerably as other destinations become comparatively more attractive or advantageous. For similar reasons, many EU nationals would also decide to seek career opportunities in North America, East Asia and other more economically dynamic regions. This slow-moving, long-term shift eventually returns Europe back to its historical patterns of more people emigrating than immigrating.

5.2 Consequences of the high-emigration scenario

Steep decline in the EU population

This **high-emigration scenario** leads to a net migration outflow of 9.4 million (nearly the population of Sweden) that would gradually lessen to 7.8 million for the period 2055-2060 (greater than Bulgaria's population). Should this happen, at these levels, the EU would start to rapidly lose its population through a combination of high emigration and below replacement fertility. Therefore, as figure 5.1 demonstrates, the size of the EU population would decline by 31% from

508.5 million in 2015 to 353 million people in 2060 (figure 5.1, blue line), i.e. 155 million less than in 2015. Such a rate of population decline might seem extreme, however, this is not unseen in the EU. **Latvia and Lithuania have lost 27% and 23% of their populations, respectively, in a shorter period between 1990 and 2017, due in part to specific conditions of the post-Soviet era and the financial crisis years 2009-2012.** By comparison, in the **zero-migration scenario**, the EU population would gradually reduce by 42 million people (8% of its population size) by 2060 (zero migration scenario, figure 5.1, orange line).

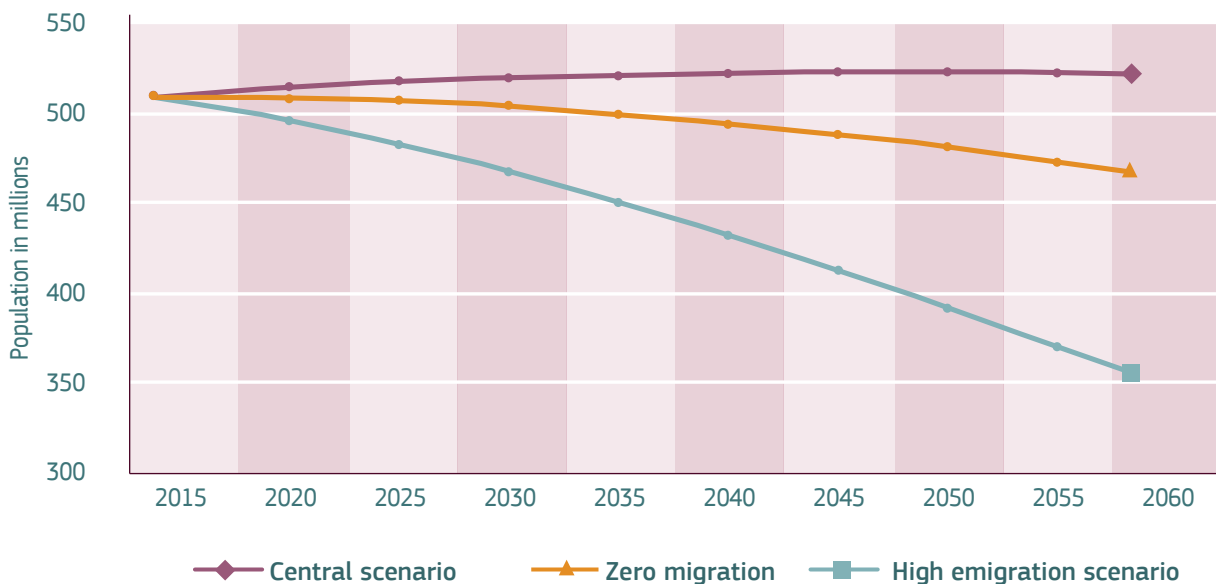


Figure 5.1: Population size of EU-28 in 2015-2060, by scenario

Source: CEPAM

Severe population ageing

The high-emigration scenario would also lead to severe population ageing. Highest immigration rates are currently observed among young adults (peaking at 20-29 years old), who are more likely to immigrate as they are looking for better work and life opportunities and have a longer time span to benefit from the expected gains of migrating. Therefore, sizeable and lasting emigration from the EU would severely deplete the size of the working-age population. **Under the high emigration scenario, the working-age population**

would shrink by half from 306 million in 2015 to 150 million in 2060 (see figure 5.2) and its share of the total population would drop from 60% in 2015 to 43%. This is five percentage points lower than in the other scenarios (48%) respectively.

Simultaneously, as older people are less likely to emigrate out of the EU, the share of the population aged 65+ would more than double from 19% in 2015 to 41% in 2060. The **zero migration** and **central scenarios** lead to different overall population size (see figure 5.1) but a very similar

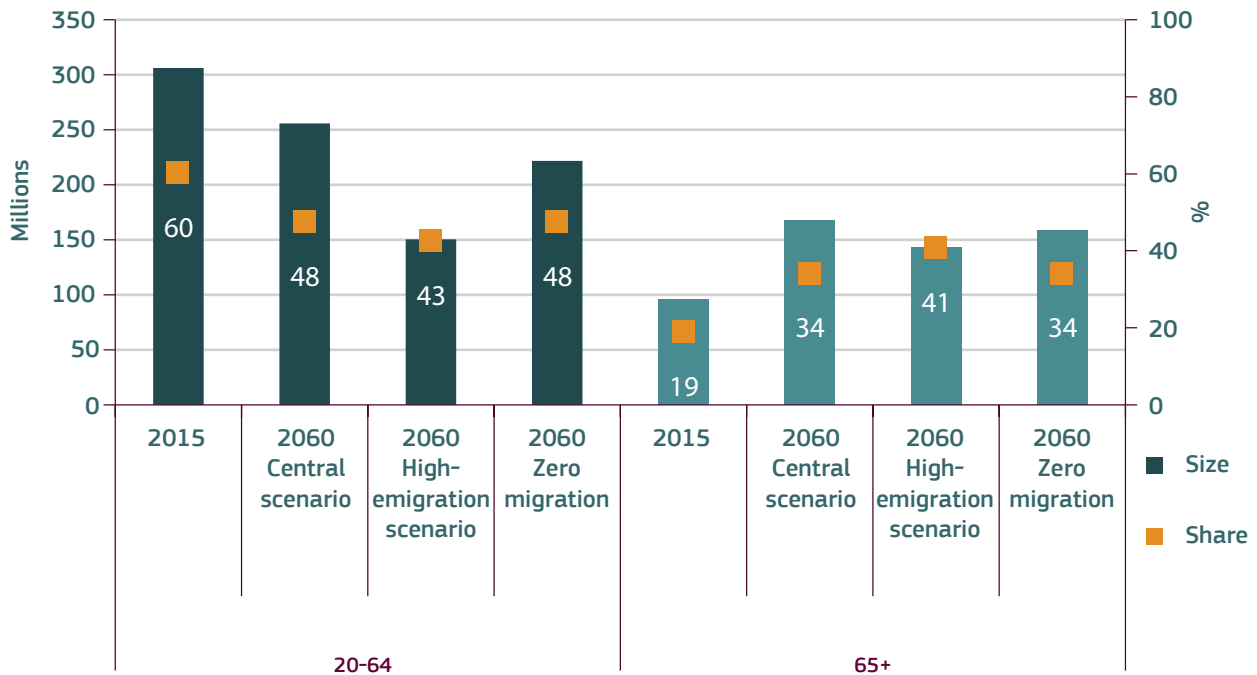


Figure 5.2: Size and share of the working-age (dark green) and 65+ population (light green) in EU-28 in 2015 and 2060, by scenario

Source: CEPAM

proportion of working age and population aged 65+ (figure 5.2). In the **central scenario**, the size of the working-age population would decrease by 17% by 2060 compared to its size in 2015, whereas in the **zero-migration scenario** the size would decrease by 27%.

Loss of the more-educated workers

As a consequence of the assumed ongoing educational expansion (as discussed in Section 2), the share of the highly educated among the working-age population increases in all scenarios because retiring less-educated workers are replaced by their more-educated and younger counterparts. Thus, figure 5.3 shows the share of post-secondary educated increases in all scenarios. In the **central scenario**, the educational composition of the working-age population is affected by international migration, leading to a higher share of low educated (5% more than in the case of the zero-migration scenario) and a lower share of highly educated (4% less than in the case of the zero-migration scenario) in 2060. This is due to the fact that, on average, immigrants

to the EU are less educated compared to the host population.

In the **high-emigration scenario**, we double the emigration rate of the highly educated compared to the rate in the central scenario. Highly educated workers thus have a much higher propensity to emigrate compared to the less-educated population. Figure 5.3 shows that this scenario would lead to only 50% of the labour force having post-secondary education in the potential workforce, 10% less than would be the case in the zero-migration scenario.

This scenario illustrates only one theoretically possible case of an EU that is in decline. An alternative pattern of migration may also be considered resulting from a loss of economic competitiveness with many highly skilled leaving Europe and, at the same time, large numbers of low-skilled migrants entering from Africa and Western Asia. This would result in less population decline and ageing, but an even stronger decline in the average skills of the European labour force.

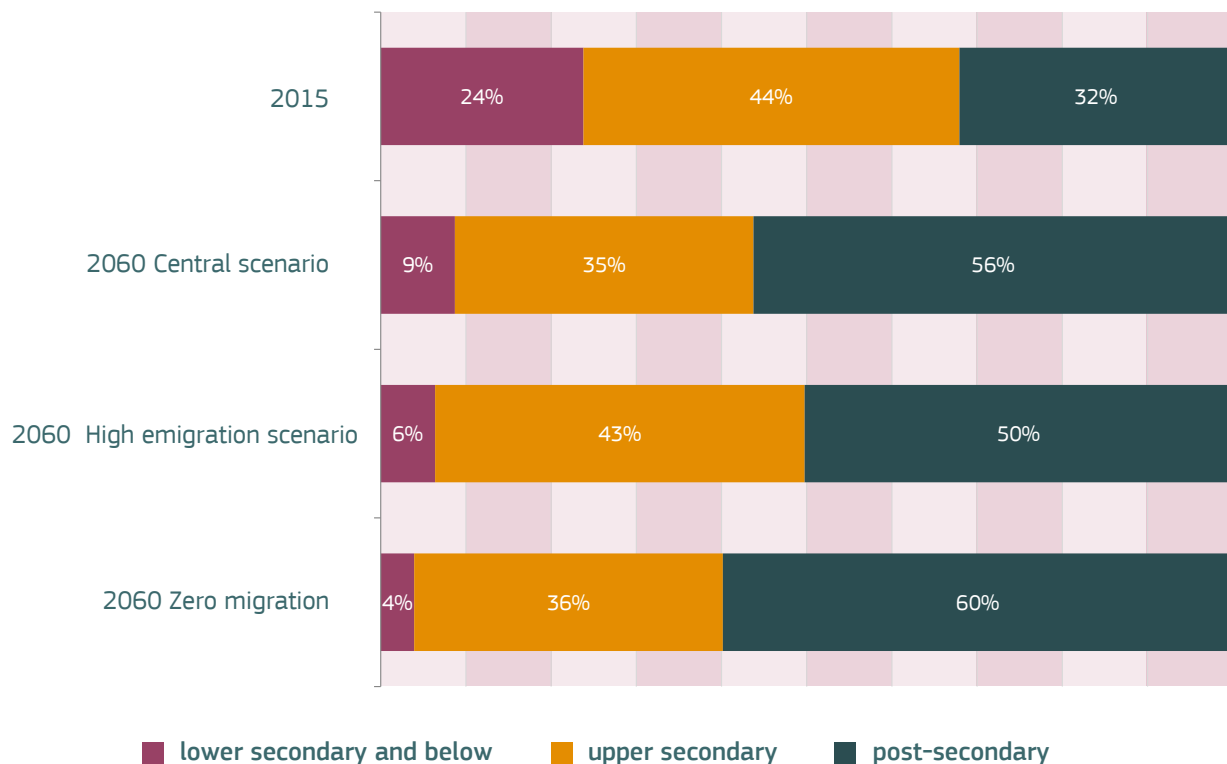


Figure 5.3: Working-age population of EU-28 by educational attainment in 2015 and in 2060, by scenario

Source: CEPAM

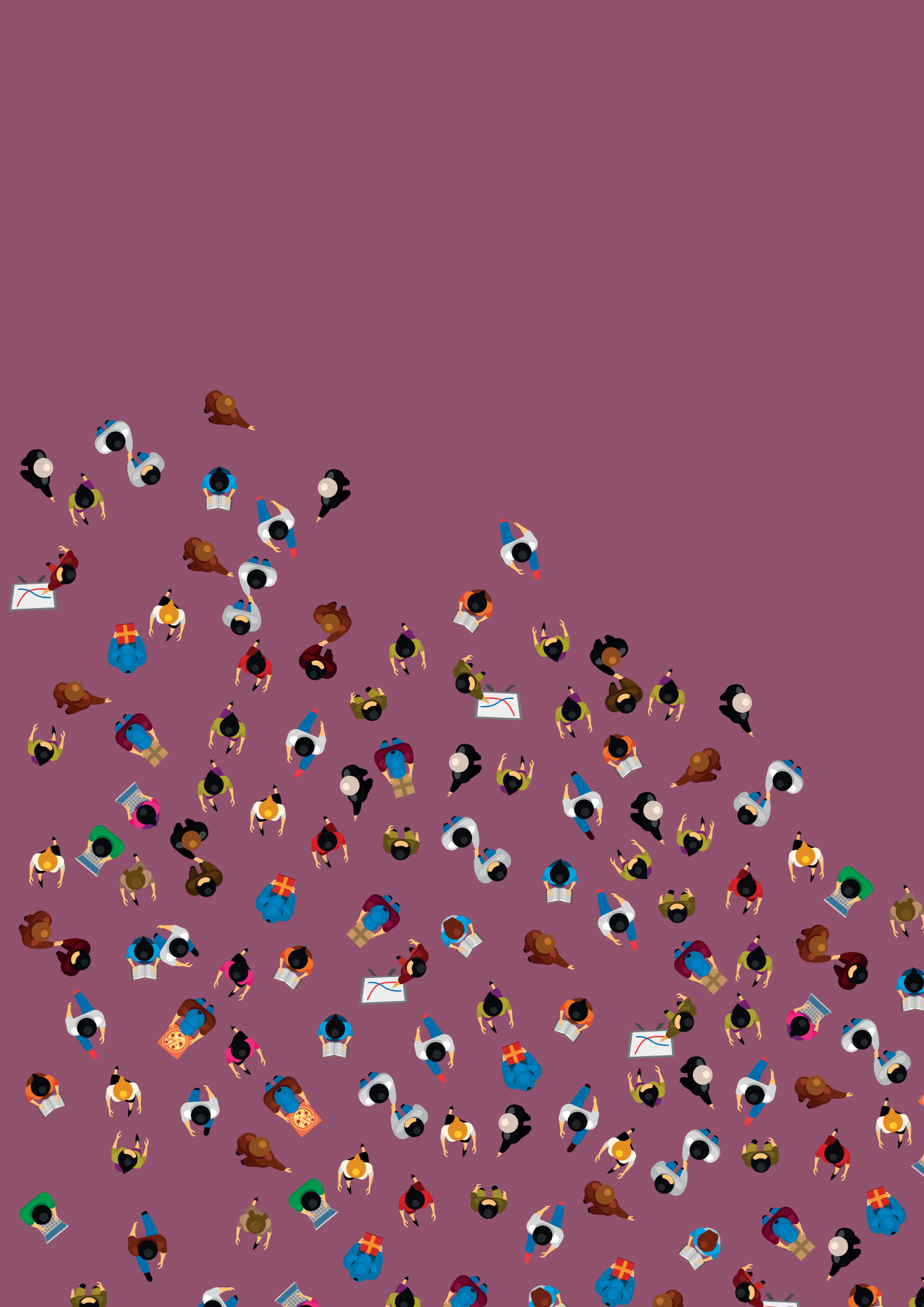
5.3 Conclusions

To sum up, this high-emigration scenario can help illustrate at the EU level what some individual countries (certain southern and eastern EU Member States) have already experienced. The stagnant EU that is hypothesised in the **high-emigration** scenario would generate a rapidly decreasing and ageing population which would be less educated compared to the population projected under the **central scenario**.

Such a scenario illustrates the detrimental effects that the high emigration of highly skilled workers can impose on a society. The lessons to be drawn about the loss of talent are also applicable to other regions of the world, in particular to developing countries which are often left with shortages in critical professions due to the prospect of higher pay from abroad.

Within the EU, large emigration of talent can have a strong impact on the Member States and depress economic growth, necessitating compensation by increasing the productivity of the smaller workforce and tailoring education to be responsive to local job-market needs.





PART B: DEMOGRAPHIC TRENDS AND MIGRATION IN AFRICA AND WESTERN ASIA

In the same way that EU policies have global implications, the future of the EU will be influenced not just by internal dynamics but by developments around the world. To address this, the report now assesses the demographic outlook for regions of particular relevance to the EU due to factors of proximity or migration. A clearer demographic picture of regions outside the EU helps provide greater context and actionable solutions for policymakers in fields as different as development cooperation and diplomacy, natural resource management and migration policy, among others.

The scenarios detailed in 'Part B' bring to light just how seriously diverging socio-economic development pathways can alter the course of world population growth. Specifically, the scenarios identify education as a key element in accelerating development.

Pressure coming from continuous population growth jeopardises the welfare and sustainability of many developing countries. This pressure interacts with other factors, such as conflict, instability and climate change, making it harder for people to maintain the ability and desire to build upon opportunities at home. These considerations and the resulting migration decisions have important implications for a third country's accumulation of human capital and resilience.





SUMMARY

Many regions of the world have progressed towards late stages of the demographic transition with both low rates of mortality and fertility, notably East Asia, North America and Europe. World population may even eventually peak and start to reduce slightly during the second half of the century, depending on how fast fertility levels in Africa drop to moderate levels.

This section underscores the urgent need for expanding education in Africa. Education expansion must keep pace with pressure coming from rapid population growth, as it holds the key to accelerating the demographic transition and bringing development successes within reach.

Achieving such goals depends on access to education for girls and young women in particular, as education and family planning are closely intertwined. Education broadens horizons and helps fertility enter the realm of conscious choice for women and men. Evidence from educational sub-populations within countries indicate that higher living standards and decisions for moderate fertility levels accompany higher education and the associated wider range of life choices.

BOX 6: SCENARIOS FEATURED IN SECTION 6

The **Shared Socioeconomic Pathways (SSPs)** are global development scenarios for the rest of the century that are widely used by the global environmental change research community. Instead of developing our own global scenarios, CEPAM decided to directly refer to the narratives and assumptions of a subset of these scenarios.

SSP1 (rapid social development): A sustainable and human well-being-focused path with an accelerated demographic transition and relatively low world population, as envisaged by the UN's Sustainable Development Goals. Scenario assumes high education, low mortality, low fertility, and uses the long-term average of migration.

SSP2 (middle-of-the-road): Virtually identical to the CEPAM medium scenario. Trends continue and development of low-income countries is uneven. Scenario assumes medium fertility, mortality, education, and uses the long-term average of migration.

SSP3 (stalled social development): A world separated into regions broadly characterised by rapidly growing populations. Scenario assumes low education, high mortality, high fertility, and uses the long-term average of migration.

WORLD POPULATION GROWTH TRAJECTORIES

■ 6.1 The projected population growth of Africa

The projections based on three scenarios – **Shared Socioeconomic Pathways (SSP)1, SSP2 and SSP3** (explained in box 6) – are illustrated in figure 6.1, bringing to light the potential for large population growth in Africa. According to **SSP1**, the world population could be around 8.9 billion by 2060 and Africa as a whole could reach 2 billion, whereas under **SSP3**, global population could rise to 11 billion and Africa's share could increase to 3.1 billion (figure 6.1a). It is clear, therefore, that whichever scenario is projected, Africa's population is expected to increase more than that of the rest of the world. Africa is the EU's neighbour and although it is currently acknowledged that most migration in Africa takes place intra-regionally (MEDAM, 2018), it cannot be discounted that immigration flows from Africa to Europe are likely to continue (European Commission 2018b), and due to a number of factors (rapid growth in youth population, increased education, increased wealth, climate change, conflict), more people might want and be able to come to the EU. It is therefore important to consider the projected population growth of Africa as it could be a source of possible future migration flows into the EU.

The education of girls in Africa – whether rapidly expanded or stalled – will be decisive in determining the future of world population growth.

These **differences in population growth can be explained by those populations which are at various stages of the universal process of demographic transition**. In this process, deaths (in particular child mortality) initially start to decline while births remain at high levels because high fertility norms tend to be embedded in most cultures. Hence, for a period, the combination of high-birth and low-death rates result in rapid population growth. It is only when birth rates also fall that population growth diminishes. African countries have entered this transition about

a century later than Europe and several decades later than Eastern Asia, which is why population growth is still very high in Africa and already low

in Europe. Thus, the future of population growth in Africa will largely depend on the speed of fertility decline which is closely associated with female

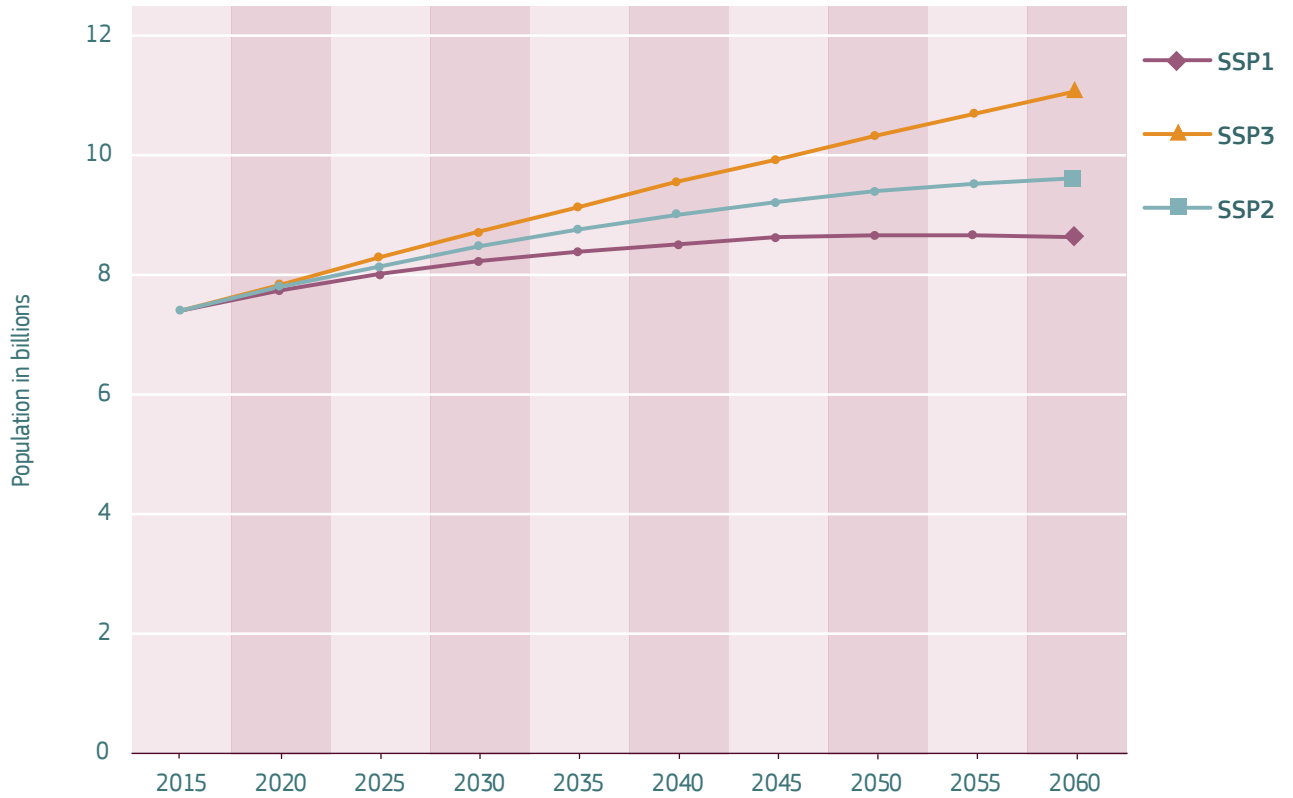


Figure 6.1a: Population projections for 2015-2060
(a) Projected world population (2015-2060)

Source: CEPAM

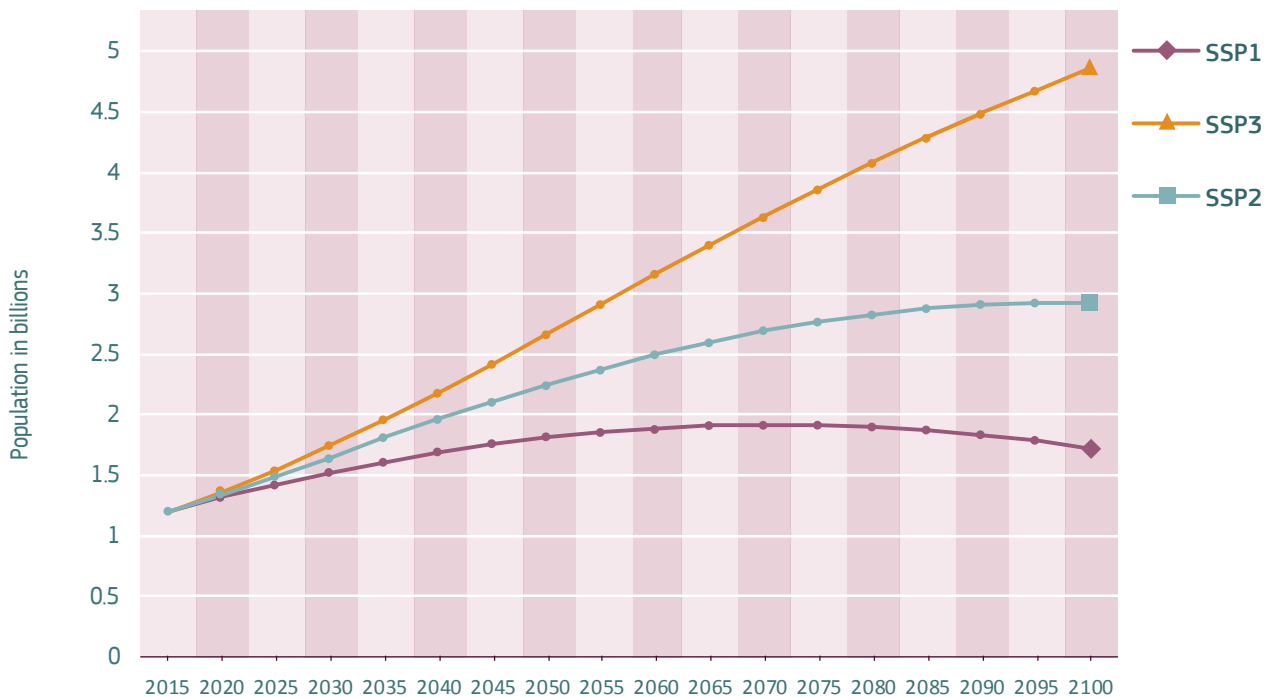


Figure 6.1b: Population projections for 2015-2100
(b) Projected population of Africa (2015-2100)

Source: CEPAM



Figure 6.1c: Population projections for 2015-2060
Projected population growth by region (2015-2060)
Source: CEPAM

education and contraceptive use. Therefore, this section will look at how raising education levels in Africa, especially among girls, will affect birth rates and consequently population growth.

6.2 How female education leads to lower fertility rates

The series of Demographic and Health Surveys (DHS) provide high-quality data on fertility for most developing countries derived from large numbers of individual interviews that also collect key background characteristics for women. **Of all the socio-economic variables measured, female education shows the strongest and most consistent relationship with fertility.** Figure 6.2 shows the differentials in fertility for six categories of educational attainment, collected from 58 developing countries with multiple surveys from some countries. The dotted lines show the curves traced through the data for each education level

and display an almost perfect ordering with uneducated women having the highest fertility rates and women with post-secondary education having the lowest.

There are also good reasons to believe that the effect of education on fertility is in fact causal because first, it brings fertility within the calculus of conscious choice (as suggested by A. Coale 1975); secondly, more-educated women tend to want fewer children; and thirdly, better-educated women are more empowered to access contraception and actually have fewer children despite possible resistance from husbands or family.²²

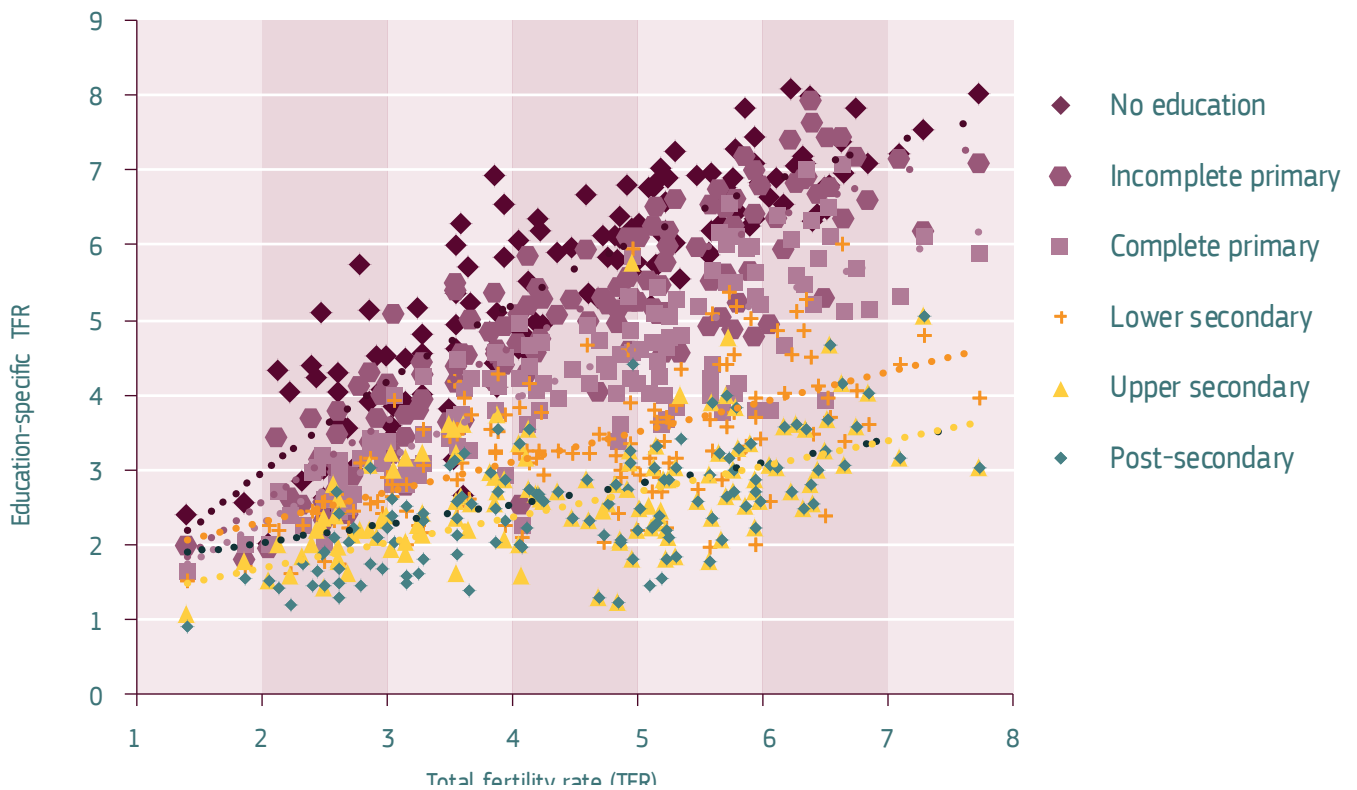


Figure 6.2: Total fertility rates (TFR) for six different levels of female education

for multiple DHS surveys from 58 developing countries (most recent survey data for each country, with the x-axis giving the average fertility level and the coloured dots indicating education-specific levels in that country)

Source: CEPAM

6.3 How the expansion of girls' education determines the future population growth in Africa

Until the 1970s, fertility in sub-Saharan Africa remained very high with an average TFR of around seven births per woman (Bongaarts and Casterline 2013), and differences between regions and countries were relatively modest. Over the past quarter century, however, significant fertility declines have occurred, particularly in Eastern and Southern Africa, while fertility remains at pre-demographic transition levels in some countries in Western and Central Africa.

As a result, differences among African countries have grown large over time. In 2015, the TFR in the African region ranged from 6.8 births per woman in Niger to 1.5 in Mauritius.²³ Except for a few countries in Southern Africa, current fertility rates in sub-Saharan Africa are among

the highest in the world, making it much harder to reach development goals.

African countries are latecomers in the process of demographic transition compared to Asia or Latin America²⁴, and some could remain trapped in low-education and high-fertility rates longer than others. As argued by Bongaarts and Casterline (2013), high fertility levels in Africa are also a consequence of parents having higher desired family size and thus having less motivation to adopt birth control.²⁵ In this context, there is a controversial discussion about African exceptionalism²⁶ to be explained by cultural factors which also manifests itself via objections from husbands or other family members about contraception and concerns about the moral and social acceptability of family planning. Whatever the specific cultural embeddedness of reproductive decisions, as mentioned above, the empowerment of women through education can

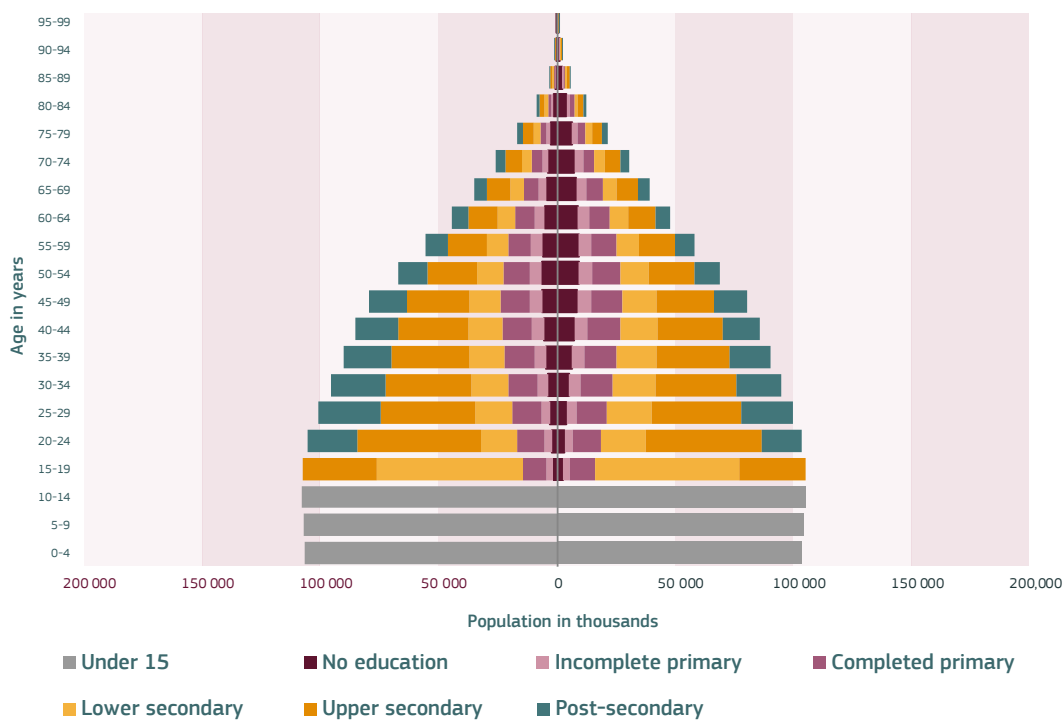
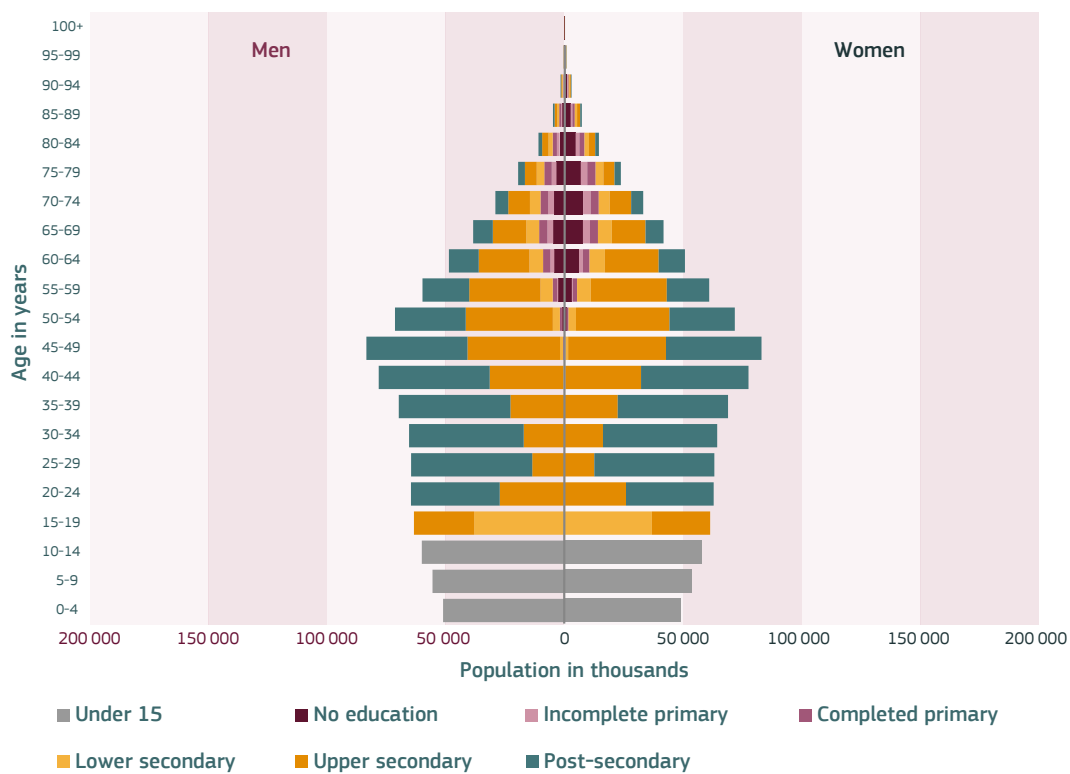


“ For development to succeed, the expansion of education must keep pace with rapid population growth ”

strongly contribute to overcoming such resistance and enable them to effectively pursue their own interests, which tends to result in lower fertility.

To see the effect educational attainment can have on fertility rates, we will now look at the scenarios. Figure 6.1 shows that if there was little further progress in education, the associated higher fertility rates in African countries would generate a world population size 15%²⁷ larger (for the **SSP3 scenario**) than under the **SSP2 scenario**, whilst the rapid expansion of education associated with a more rapid fertility decline (SSP1) would generate a population 10%²⁸ lower than that in the SSP2 scenario. Although differences in population projections reflect assumptions about all demographic components, these differences in future of population growth are to a large extent due to different future education trajectories.

The population pyramids (in figure 6.3) display the distribution by age, sex and level of education of the African population in 2060, under the **rapid development scenario (SSP1)**, the **medium (SSP2)** and the **stalled development scenario (SSP3)**, illustrating the potential impact of investments in social development, in particular female education, on future population dynamics.²⁹ As shown by the SSP3 population pyramid, Africa is in danger of becoming less educated over time if education expansion cannot keep pace with population growth.



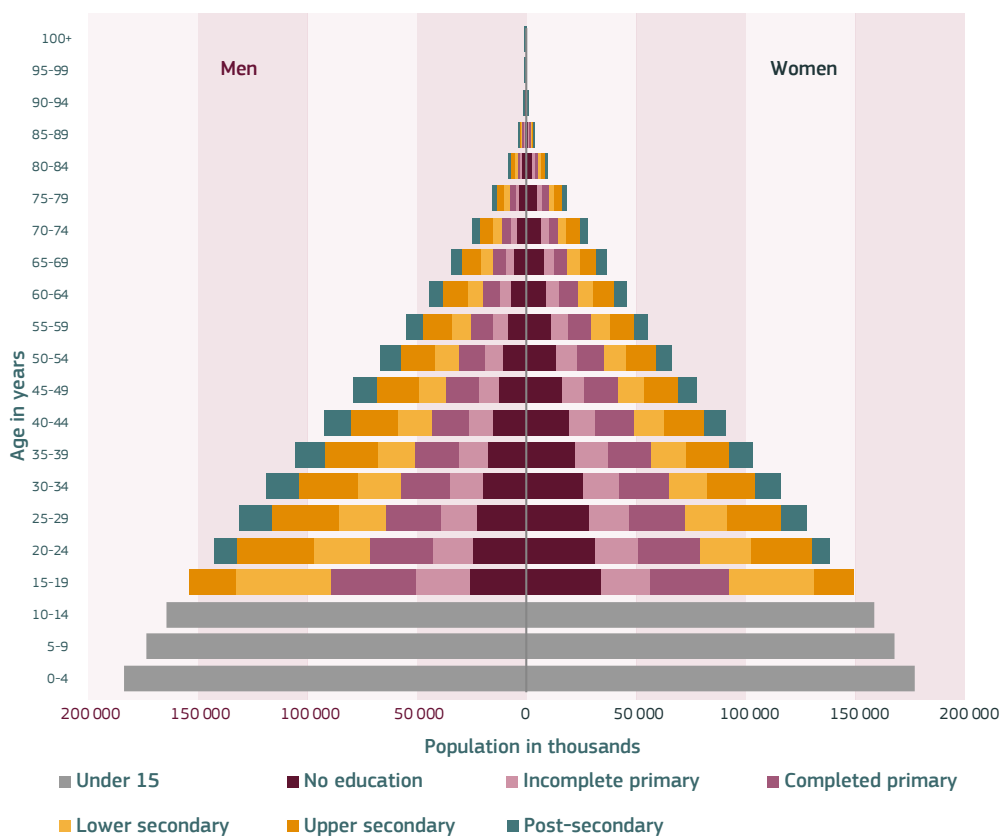


Figure 6.3: Scenario SSP3 - Stalled Development Scenario - Age and education pyramids for Africa in 2060, according to three contrasting scenarios; the colours indicate the level of educational attainment

Source: CEPAM

6.4 Conclusions

This section looked at Africa's future population growth under three global development scenarios following the SSP narratives. It discussed how female education can help reduce fertility rates and illustrated how alternative education and social development scenarios affect population growth as well as the make-up of a population's future age and educational attainment. While population policies tend to be a controversial topic, a clear policy focus on female education is much less controversial.

In terms of the consequences of population growth, there can be little doubt that rapid population growth makes it much more difficult to expand

essential services such as education and health, which in turn are essential for social and economic development. Improvements in reproductive health and female education also work together synergistically in reducing the desired family size and making it easier to access effective contraception, resulting in lower fertility.

Looking at the scenarios, it becomes apparent that a policy focus on education has the double effect of simultaneously reducing fertility and increasing skills and thus economic productivity. This could create a virtuous circle of women's empowerment, better health, lower fertility and economic growth, putting human capital investment at the centre of global development strategies.



SUMMARY

Africa's population will increase by a factor of two to three, or possibly even more over the coming decades in the event of stalled socio-economic development. In addition, population growth in Western Asia will also be significant. For example, the population of Afghanistan is likely to triple and that of Pakistan to almost double. Such massive projected population increases raise questions about future job opportunities, economic growth, as well as the peace and stability necessary to facilitate such opportunities. Furthermore, the already unavoidable climate change is likely to further complicate these challenges.

The insecurity and conflict arising from worsening economic and environmental conditions act as key push factors for potential migrants. These factors are associated with a perceived lack of opportunity to thrive in one's own country, reflected in youth unemployment and a lack of suitable jobs. Pursuing policies that enhance local employment opportunities and foster stability and security are critical to building opportunities in the countries of origin.

REASONS FOR MIGRATION IN AFRICA AND WESTERN ASIA

■ 7.1 Conflict and instability as push-factors

This section looks at the factors confronting Africa and Western Asia, which are critical in creating possible push factors for outmigration: conflict, unemployment and instability. Such political and economic factors are much more volatile and harder to forecast than the demographic and human capital trends discussed in the previous section which are backed by greater inertia and predictability. Thus, this section focuses on recent developments and current socio-economic conditions in Africa and Western Asia that may give rise to future migration. It is beyond the scope of CEPAM's research to be able to make projections on alternative unemployment rates, conflict scenarios or other political developments over the coming decades that may cause future migration flows to the EU¹. Climate change, however, is another more slowly evolving and more predictable change, which will be explicitly discussed in Section 8. Here we will only consider it as a possible trigger of conflict.

Conflicts can cause multiple negative consequences for human well-being, which can be important reasons for people deciding to leave their home country. These consequences range from possible premature death and injury to psychological trauma, destruction of housing and loss of

Insecurity, conflict and population growth interplay to degrade life prospects, pushing migrants away from building a future locally.

livelihoods. There is abundant evidence that such experiences or fear of such experiences can be a major push factor for outmigration.

In parts of Western Asia and Africa recent escalation in conflicts, terrorist attacks and increasing forms of organised violence have forced people to move both within their countries and abroad in search of security and peace. The intensity of the conflict and the location of the fighting can explain an essential part of the variation in flows of asylum applications and refugees, both inside and outside the EU.

Results suggest that people flee terror and war, as well as violence and insecurity emerging from non-conflict-affected areas and areas perpetrated by different criminal groups (Conte and Migali 2018).

Figure 7.1 presents a recent estimate of global flows of asylum seekers by world regions for the five-year periods 2006-2010 and 2011-2015 (Abel 2018). The arrows indicate the direction of flows, while the thickness of the arrows shows the volume of flows. Indeed, this comprehensive estimate of global bilateral flows confirms the view that Western Asia and Africa have been the most important regions of origin for refugees while Western Europe is the most important destination region. Interestingly, the pattern changes somewhat between the two periods: **in 2011-2015, refugee movements from Eastern to Southern Africa dominate the picture and are much larger than the combined flows from all African regions to Western Europe.** The regional definitions used in this analysis do not directly allow for identifying the flows into the EU, which mainly comprise Western and Northern Europe (only receiving

countries of refugees), as well as parts of Eastern and Southern Europe (both receiving and sending countries).

This recent study (Abel et al. 2018) conducted in the context of CEPAM also tried to link conflict-induced migration to several triggering factors, including spells of drought caused by climate change. Climate contributed to the outbreak of conflicts in Western Asia from 2010-2012, where political uprising occurred in countries including Tunisia, Libya and Yemen, and Syria. In Syria, particularly, long-running droughts and water shortages caused by climate change resulted in repeated crop failures, with rural families eventually moving to urban areas. This in turn led to overcrowding, unemployment and political unrest, and then civil war. Similar patterns were also found in sub-Saharan Africa during the same period. However, it is hard to draw generalisations from this trend because the findings of this study suggest that the impact of climate on conflict and consequently on asylum-seeking flows is limited to specific time periods and contexts.

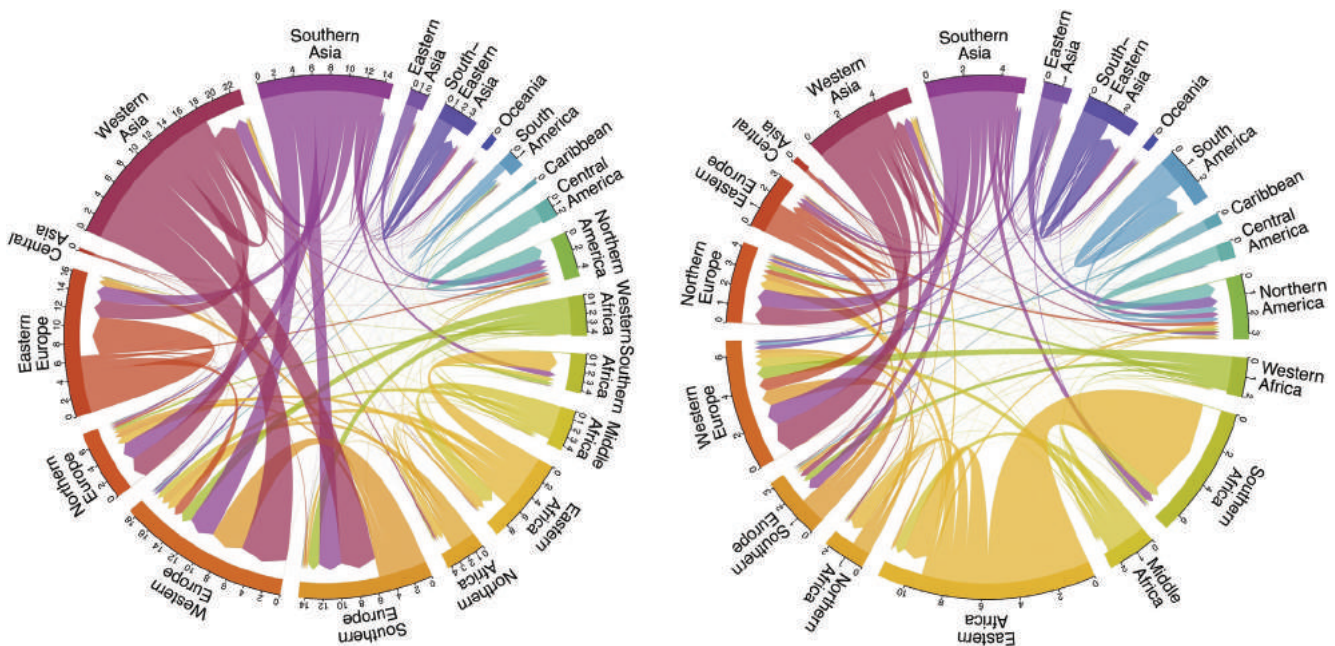


Figure 7.1: Asylum seeking flows by world region, 2006-2010 (left) and 2011-2015 (right)

Source: Abel 2018

7.2 Youth unemployment as a driver of outmigration

Sub-Saharan Africa (SSA) is currently the youngest region in the world and has the largest potential increase in domestic labour supply. Under the SSP2 scenario (Lutz et al. 2018), in SSA, the share of the working-age population is projected to increase over the coming decades in all subregions, with the percentage change ranging from 4.7% in Southern Africa to 31% in Central Africa between 2015 and 2060. Educational attainment in SSA is also expected to increase over time in all subregions, although it would still remain lower than educational attainment in the rest of the world. For the North Africa sub-region, by 2060, 77% of the population would have a post-secondary or higher education and those with no formal education would be less than 5%. For the Middle East, 64% of the population would have a post-secondary education or higher, against 6% with no formal education (Lutz et al. 2018).

In recent years, most countries in the SSA region have experienced high and sustained economic growth, although starting from a very low level. Six of the ten fastest-growing economies in the world are from this region (Samans and Zahidi 2017) and, according to the World Bank's latest estimates, GDP growth is expected to strengthen to 3.1% in 2018 and 3.5% in 2019 (World Bank 2018a).

When studying the relationship between economic growth and outmigration, however, it is important to note that it is not linear. Under extremely poor conditions, people cannot afford to move to another country. Although South Sudan is currently one of the poorest countries with the most insecure living conditions, hardly any migrants from South Sudan make it to Europe. They simply cannot afford the cost of travel which may include excessive fees for traffickers.

More generally, there is a well-established pattern whereby, in the early phases of development and economic growth, outmigration rates tend

to increase as some people get the means and a desire to actually leave the country. As development continues, however, outmigration rates typically fall again, unless conflict and huge unemployment bring additional hardship. It thus seems to be less the objective difference in wages between countries of origin and destination that drives migration, rather the perceived opportunities for a better future in one's own country. If these opportunities for the future look very bleak, it can be a reason to leave; if they obviously look better than the current conditions and people see a brighter future for themselves and their families, they may choose to stay.

Despite the good news about economic growth in many SSA countries, the labour market is generally characterised as being largely informal³¹. Work

“When deciding whether to migrate, the objective differences in wages between countries *are less influential than the outlook on opportunities at home*”

remains widespread in the informal sector, as major supply-and-demand challenges hamper the creation of formal jobs. On the labour supply side, inadequate supply of human capital³² is perceived as a major obstacle to business expansion by 51% of firms in SSA, surveyed by the World Bank Enterprise Survey (World Bank 2018b).

While employment in the formal sector has increased in recent decades (especially in small enterprises), this increase has not kept pace with the population growth, leading to a growing mismatch between supply and demand. The growing number of young people entering the labour force every year, combined with the limited transformation of most economies into high-productivity and non-agricultural jobs, could also consolidate the informal sector as the main source of jobs for young people, especially the least skilled and least educated, in the near future.

Figure 7.2 shows the recent trend in youth unemployment for selected countries and regions

in Africa and Western Asia. Actually, North Africa has among the highest youth unemployment in the world with over 30% in Tunisia and Egypt in 2017. With continued population growth, the serious challenge of massive youth unemployment could further increase in the future. Figure 7.2 also shows that for the youth unemployment rate SSA seems to fare better than North Africa and Western Asia. However, this is also linked to the way unemployment data are collected and estimated. Low unemployment rates in SSA can mask high poverty, and countries with higher levels of economic development also tend to register higher unemployment rates, as observed in South Africa for example.

Unemployment also relates to the size of different age groups in relation to others. There is a huge body of literature on the so-called 'youth bulge'³³ in Africa and Western Asia which refers to social and political risks resulting from large numbers of young adults with high aspirations, but low economic opportunities and little possibility for

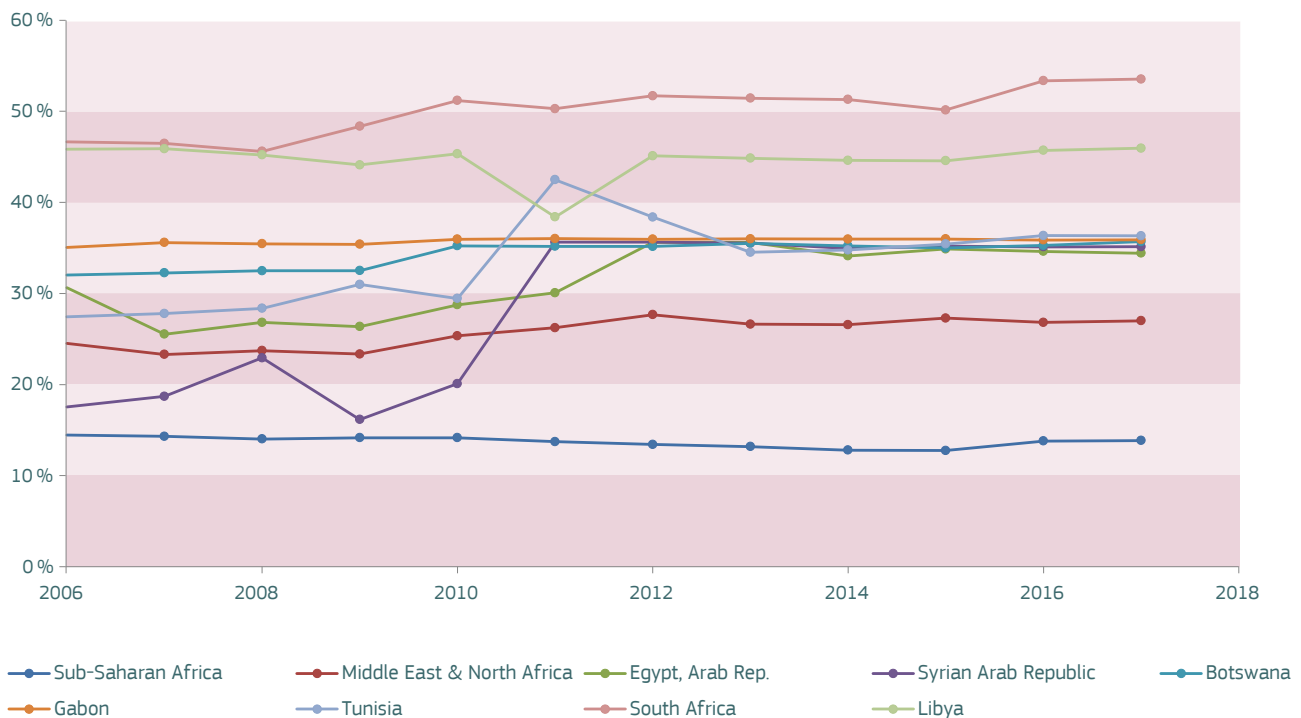


Figure 7.2: Youth unemployment (% of total labour force aged 15-24)

Source: World Bank 2018

Data from database: World Development Indicators

political participation. There seems to be some evidence that an increasing proportion of idle and unemployed young people in the developing world serves as a catalyst for internal conflict which in turn can also be a push factor for migration (Cincotta 2011).

■ 7.3 Conclusions

Conflict, instability and a perceived lack of future opportunities in the country of origin have been shown to be key push factors when it comes to the decision to leave a country either as a refugee or as an economic migrant. But these economic and political factors are very volatile and almost impossible to forecast with any meaningful probability. In contrast, much more inert demographic processes, including human capital formation, can be anticipated with a longer time horizon. This also applies to climate change which has been identified as a possible trigger of conflict and forced migration under certain conditions. For these reasons, we have tried to focus on some of the slowly changing factors that can be identified as underlying drivers of possible future push factors.

What policy priorities can be drawn from this an analysis? The European Commission has recently adopted measures in an effort to boost economic growth and human capital. The 'new Africa-Europe Alliance for Sustainable Investment and

Jobs' aims to increase investment in Africa, create jobs and invest in education and skills, at both the continental and national levels, to strengthen employability and respond to labour market needs. The 'European Union Emergency Trust Fund for stability and addressing root causes of irregular migration and displaced persons in Africa (EUTF for Africa)' aims to promote stability and contribute to better management of migration.

Policy priorities in this area should also focus on understanding the obstacles to the development of young people's skills, expanding school enrolment, while ensuring the quality and relevance of higher education to specific local labour market needs. Job creation in the formal sector will be crucial to absorb the growing number of young people entering the workforce each year. Policies that stimulate economic growth and utilise local talent are necessary for development. Efforts in the field of education and the labour market should be combined with the promotion of an environment that allows for an effective and productive use of knowledge in the economy. Political instability, corruption, violence and conflict are strong factors limiting economic growth and productivity. For policymakers, promoting the prevention and reduction of conflict and violence, addressing human rights violations, and enforcing the rule of law will be key actions to reduce migratory pressure.



SUMMARY

The potential of global climate change and natural disasters as future drivers of migration has attracted significant media attention. To capture the latest scientific understanding of whether climate change will result in mass-migration events, we conducted a comprehensive literature review. In the previous section, we identified climate change as one of the possible triggers of conflict which, in turn, would induce migration. Here we study the relationship between climate change and migration more broadly.

While evidence of direct climate-related migration is inconclusive, climate change can influence migration by affecting drivers of migration such as political and economic conditions. When climate-change-related migration does occur, we find that it tends to be mostly intra-regional. For example, intra-regional migration within Africa makes up by far the largest share of international migration globally.

EVIDENCE FOR CLIMATE-RELATED MIGRATION

8.1 The relationship between environmental change and migration

The view that climate change would result in mass migration across borders has been referred to as an ‘alarmist’ approach, based on a simple assumption that all affected populations in environmental risk areas would eventually move out (Gemenne 2011). Whilst empirical studies on climate change and disaster and migration have become increasingly prolific, especially since 2010 (Borderon et al. 2018; Piguet, Kaenzig and Guélat 2018), thanks to the availability of environmental and migration data and tools (Fussell, Hunter and Gray 2014), the evidence on the relationship between environmental change and migration is inconclusive.

Indeed, a body of research on the issue shows that on the one hand, climate variability or climatic shocks can drive migration (with migration normally being employed as a coping strategy), whilst on the other hand, such variability and shocks can suppress migration due to the lack of resources to facilitate it. A review of the effect of climate variability and migration based on 20 macro-level studies shows that there is no conclusive evidence on the direction and magnitude of the influence of environmental change on migration, which can range from a limited and rather indirect role (de

Climate-related migration primarily involves a short-distance move within a country or region, rather than over long distances.

Haas 2011) to significant impacts (Marchiori and Schumacher 2011; Missirian and Schlenker 2017).

This lack of consensus is partly due to the complexity of migration processes and their interactions with different drivers. It is likely that climate change indirectly influences migration by inducing changes in other drivers of migration, such as a reduction in crop yields (Cai et al. 2016), changes in GDP per capita (Cattaneo and Peri 2016; Coniglio and Pesce 2015) and being a trigger of conflict (Abel et al. 2019). Indeed, a systematic review of 53 studies on environmental change

“ It is likely that *climate change indirectly affects migration* by influencing other migration drivers ”



and migration focusing on Africa by Borderon et al. (2018) reports that there is no evidence showing that environmental change is the sole driver of migration.

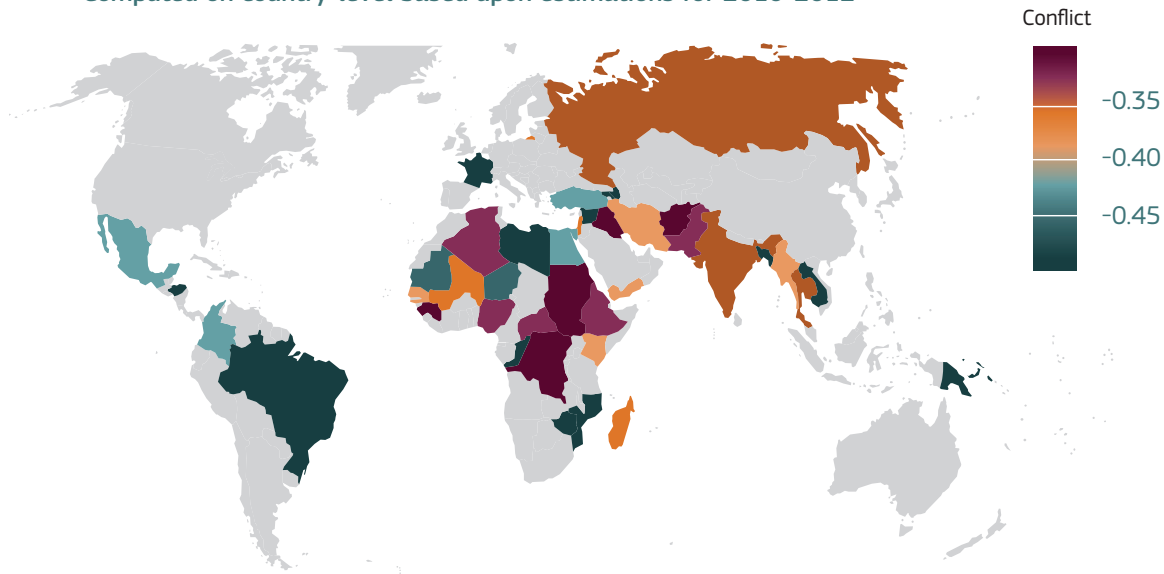
Some experts claim that climate change, crop failure and food security are responsible for the recent migrant caravans moving towards the United States from Central American countries, including Guatemala, Honduras and El Salvador (Milman, Holden and Agren 2018). Likewise, the Syrian crisis and massive refugee flows from Syria in the past couple of years have been highlighted as a consequence of conflict driven by growing water scarcity, frequent droughts and poor water governance (Gleick 2014; Kelley et al. 2015).

The indirect impact of climate change on migration is captured in a recent study by Abel et al. (2019)

which shows that droughts increase the flow of asylum seekers, as a consequence of droughts increasing the risk of conflict. Figure 8.1 presents how changes in the Standardised Precipitation-Evapotranspiration Index (SPEI)³⁴ results in different conflict intensity. The positive value of SPEI indicates wet conditions where the negative values indicates drought.

Here we find that a one (within-country) standard deviation decrease in the SPEI leads on average to an increase of approximately 0.03 in the probability of asylum-seeking flows from the country experiencing a change in this climatic factor. Such a link between changes in drought severity and asylum-seeking flows is mediated by the increase in the likelihood of conflict caused by the change in the climatic variable, which can be very large in some world regions, as shown in figure 8.1.

Total marginal effect of SPEI on conflict
Computed on country-level based upon estimations for 2010-2012



The average value of the SPEI is 0, and the standard deviation is 1. The SPEI is a standardised variable, and it can therefore be compared with other SPEI values over time and space. The lower SPEI-index values are associated with more severe droughts.

Map 8.1: Marginal effects of SPEI on conflict for the 2010-2012 period

Source: Abel et al. 2019

Taking into account the findings from extensive studies mentioned above, establishing a clear relationship between climate change and migration is not simple – rather, the indirect impacts of climate change on decisions to migrate need more careful research. Whilst the media and public concern often focuses on the impacts of climate change on international migration, the research suggests the opposite. Climate-related migration is likely to involve a short-distance move within a country rather than a long-distance move across borders (Borderon et al. 2018; Rigaud et al. 2018; Sterly, Sakdapolrak and Ober 2016).

8.2. Conclusions

This section has shown that caution must be expressed in matters regarding climate-related migration since current research cannot yet establish a clear, causal link between climate change and migration. However, research suggests that when there is climate-related migration, it tends to be over a short distance. If climate change becomes more severe or human mobility increases further, these patterns, including the indirect effects of migration, could change in the future.

REPORT SUMMARY AND CONCLUSIONS

While exploring a spectrum of demographic scenarios for the future of the EU and the wider world, CEPAM found evidence that dispels some popular and important misconceptions about migration and the nature of demographic change.

The different migration scenarios considered in this report reveal that when considering how migration can impact the labour force dependency ratio, economic integration is more influential than either education selection or migration volume. While a high volume of migration does increase the overall working-age population, it also increases the overall non-working population, having limited ability to impact the dependency ratio in the long term.

Thinking of the EU, it is all but certain that population ageing will continue. This ageing, a product of longer life spans, is a sign of success in health and living standards. Insights gained from the demographic scenarios show that for the challenges of population ageing the most effective strategy is to increase labour-force participation of everyone, particularly women. Both higher fertility and more migration, in a variety of scenarios, are shown to have minimal impact by comparison. As significant real-world costs – such as funding, time and effort – are on the line, this is one example of how essential it is that the origins of policy are based on evidence.

Faced with the expected demographic ageing as well as a transforming labour market, the future populations of EU Member States will have to become more adaptable. Fortunately, the average educational attainment is continuing to rise. Such investments in education and human capital will

be the best defence against uncertainty. For the EU, it is also important to recognise that internal mobility encouraged by economic disparities has the potential to disproportionately influence the emigration of skilled people and even the overall population sizes of certain Member States, primarily in Eastern and Southern Europe.

In a similar sense, different socio-economic development trajectories will have a huge impact on the world. This is particularly true for Africa and Western Asia where the difference between stalled and rapid development will impact the lives of billions. If education among girls in Africa becomes widespread, for example, the continent could access a virtuous, reinforcing cycle of lower mortality, lower fertility and higher socio-economic development. However, a situation of stalled education expansion and development produces the opposite, leading to a world of rapid population growth, instability and increased conflict. Such conflict and instability are important reasons for outmigration. Furthermore, climate change can encourage intra-regional migration and may be an indirect factor for other drivers of migration. Linking education with local job market opportunities and ensuring an ability to thrive in one's own country are critical in lessening push factors and the pressure for migration.

Above all else, this report aims to inject a scientifically faithful understanding of demography into policy initiatives. By taking these key findings to heart, relevant policy initiatives for the future will be better positioned to forge sustainable solutions to the demographic challenges of our times.

THE WAY FORWARD FOR DEMOGRAPHIC ANALYSIS

Reliable data and state-of-the-art analysis are key prerequisites for evidence-based policymaking, especially in the field of migration, where myths and ideologies often compete with evidence-based reasoning. While reliable data exist for other demographic components, there is still plenty of room for improvement to the state of migration flow data in the EU and third countries, which is an opinion echoed by researchers and policymakers alike.³⁵ There is also a need for more EU-level capability for comprehensive demographic analysis (by age, education and labour-force status) of likely future population trends in and around Europe, with a specific focus on Africa and Western Asia.

Benefits of the multidimensional demographic approach

In terms of analytical tools applied, the study of migration and its longer-term implications calls for more comprehensive multi-dimensional demographic micro- and macro-simulations, which go beyond conventional models defined in terms of age and sex structures only. This can be done by explicitly incorporating population heterogeneity due to level of education, place of residence, labour force participation, country of birth, duration of stay in country and others. The CEPAM study tried to move the frontier of research into this direction.

There are many advantages of a multidimensional demographic approach, which complements conventional analysis by age and sex with a stratification, for example, by level of education and labour-force participation. In the Commission's Ageing Report (European Commission 2018a), for instance, a set of alternative scenarios are analysed in terms of their effects on population structure by age and sex, and matched with economic assumptions on future labour-force participation and employment plus additional exogenous productivity assumptions. Building on this important step, an integrated model would be able to move further and fill in key gaps, generating the supply of labour comprehensively by age, gender and level of skills in a multidimensional form. The key advantage to using this approach lies in its ability to make projections on education and labour-force participation as well as age and sex, and incorporating their interdependencies. Fertility and mortality systematically vary according to education, and so does labour-force participation.

Human capital scenarios are also interesting in their own right since progress in education, as projected in the scenarios in this report, is a key component of human development and socio-economic progress more generally. Research has shown that economic growth is fastest when

better-educated younger people enter the labour force (Lutz, Crespo Cuaresma and Sanderson 2008), and this multidimensional demographic approach is able to project the future educational attainment of both younger populations and that of older-age groups, which is very significant for their health and disability.

Towards consistent data on migration flows in the EU and beyond

To document the dynamics of internal EU migration, Member States are obliged to provide harmonised migration flow statistics to Eurostat (Regulation (EC) No 862/2007). Despite these efforts, obtaining the necessary data on intra-EU mobility remains a challenge. This is due in part to the complexities in capturing the phenomenon when EU citizens have the right to free movement, and in part to the limited number of variables mandated in the regulation. Beyond those variables, Member States provide data to Eurostat only on a voluntary basis, which results in discrepancies³⁶ and missing data for certain countries and years. Furthermore, important characteristics of immigrants, such as their level of education, are frequently unavailable for all EU countries.

Beyond the EU, similar limitations exist. Many countries do not produce or publish migration-related data: for example, only 45 of the 193 UN member states report statistics on migration flows (IOM and McKinsey & Company 2018); data is spread incoherently across various locations and sources both at national and international levels; and the inconsistency in definitions, sources and measurements all contribute to making it difficult to compare data. For instance, of the 45 countries that report migration-flow data, only 24 use the same definition as to what constitutes a migrant (IOM and McKinsey & Company 2018). For CEPAM, we relied on the estimates of global bilateral migration flows provided by Abel (2018). However, due to the many assumptions and uncertainties involved, such statistical estimations are no substitute for actual empirical data.

To address some of the limitations of the current EU data, the European Commission is already working on new statistical regulations. According to the Eurostat's European Statistics Code of Practice, official statistics should be characterised by quality standards, concerning definitions, classifications, data-collection methodologies, etc. Such harmonisation of data collection should take place at an early stage. However, the harmonisation process at the EU level is implemented at later stages, which means that data-collection methods and definitions differ. New EU regulations, or amendments to existing regulations, will improve the quantity and quality of the data collected by Member States and provided to the European Commission (Eurostat). The improvements will take the form of, for example, finer disaggregation levels in some of the variables, a new and richer combination of variables in tables, or the more frequent transmission of some of the tables to Eurostat.

The European Commission is also working on a new regulation on population statistics which will combine existing annual demographic and migration statistics with new annual statistics covering some census-type socio-economic information. This effort will enable a better understanding of the EU population's demographic and social developments. Another development that is gradually improving the quality of migration and population statistics is the exploitation of existing administrative data, i.e. data collected by government departments for various other administrative procedures. An example of such data is population registers. Meeting the data-collection requirements of the new regulations mentioned above, for instance, relies on a greater use of administrative data. These plans must materialise if there is to be sustainable, reliable demographic analysis in the EU. Moreover, limitations on the data available globally will also need to be addressed.

Strengthening capabilities for demographic research

Many existing networks of national institutes or researchers within the EU deal with demographic questions. The European Commission engages in such issues through its employment, migration, scientific and research agendas^{37,38,39} as well as through its statistical office, Eurostat.⁴⁰ Population Europe⁴¹ is an active network of national researchers and demography institutes across the EU. The focus of such networks is largely on the European population rather than on Europe's neighbourhood. Research on Western Asia and Africa in particular is still dominated by institutions based in the US or the United Nations. Despite the geographical proximity of Africa and Western Asia, Eurostat's mandate is currently limited to studying population trends within the EU.

Since there appears to be a gap in comprehensive demographic analysis and the resulting knowledge of the European neighbourhood, there is room for more work at the EU level to bring together existing knowledge and to expand into the study

of populations outside Europe. Strengthening the EU's own research capacity on the massive demographic changes happening in its immediate neighbourhood would enable more anticipatory analysis. Producing multidimensional population scenarios in the context of sustainable development, with a focus on Africa and Western Asia as well as Eastern Europe, would also be relevant for longer-term policy planning in the EU.

It is therefore essential to maintain and strengthen comprehensive demographic research on future population dynamics in the EU and beyond in a multidimensional way. Such efforts will form the basis for how we look at the current historically significant demographic change, which is one of this century's megatrends.

GLOSSARY

Age structure: the distribution of the population by age.

Demographic transition: The transition from high-fertility and mortality rates to low ones; during transition, the population grows, while at the end of the transition, the population is stable or even declining and the age structure is older.

Educational attainment: This is the highest level of formal education an individual has completed. In this report, it is organised into six categories based on the International Standard Classification of Education (ISCED) 2011 classification: no education; incomplete primary; primary; lower secondary; upper secondary; and post-secondary. For EU Member States, the last category is further subdivided into short post-secondary, bachelor's and master's or higher.

Educational composition: This refers to the distribution of population by levels of education.

Human capital: The knowledge, skills, competencies and attributes individuals have that facilitate the creation of personal, social and economic well-being. Educational attainment is used as a proxy for human capital in this report.

Intra-EU mobility: This concerns the action of people (EU nationals or legally resident third-country nationals) undertaking their right to free movement by moving from one EU Member State to another.

Labour-force dependency ratio (LFDR): The ratio between people not in the labour force and in the labour force.

Labour-force participation rate (LFPR): The proportion of a country's working-age population which engages actively in the labour market, either by working or looking for work.

Old-age dependency ratio: The ratio between the population aged 65 years old and over (65+) and the working-age population (20-64 years old).

Population ageing: The age structure of a population getting older is typically measured in terms of the increasing median age or the growing proportion of those aged 65+ in the population.

Replacement level: The level of fertility at which, in the absence of migration and with a stable age structure and no changes in mortality, the population exactly replaces itself, i.e. neither grows nor declines. In low-mortality populations, this corresponds to about TFR 2.05.

Total age dependency ratio: This is the ratio between the number of dependants (children age 0-19 and those aged 65+) and the working-age population (20-64 years old). It indicates how many dependants the working-age population has to support.

Total fertility rate (TFR): This refers to the average number of children born to a woman by the time she reached the end of her child-bearing years, if she were to pass through all her child-bearing years conforming to the age-specific fertility rates of a given year.

Working-age population: The population typically defined as those aged 20 to 64, which is often considered as the potential labour force.

ENDNOTES

- 1 For more information:
https://ec.europa.eu/knowledge4policy/projects-activities/cepam-centre-expertise-population-migration_en
- 2 The Shared Socioeconomic Pathways (SSPs) are global development scenarios for the rest of the century that are widely used by the global environmental change research community. Rather than developing new global scenarios, CEPAM refers to the narratives and assumptions of a subset of these scenarios (see Section 6).
- 3 See in particular Migali, Natale, Tintori, et al. (2018). For more information:
https://ec.europa.eu/knowledge4policy/migration-demography_en
- 4 Total fertility rate (TFR) in the EU-28 has oscillated over the last 20 years between 1.45 and 1.6 children per woman. In most Member States, the TFR has increased in the past years mainly due to motherhood being postponed to a later age. This trend is expected to prevail in the medium-term, with slightly increasing fertility. Thereafter, we assume a stable TFR for the projection horizon.
- 5 This increase is comparable to that in Eurostat's 2015-based population projections, which expects an EU population of around 524 million people in 2060.
- 6 Replacement level in the EU is around 2.05 children per woman. In 2015, only France (1.96) had a TFR close to this level.
- 7 Section 3 discusses the impact of the volume of immigration and the level of immigrants' integration into the labour force on the size of the EU's labour force.
- 8 The discussion on Eastern Member States losing their labour force to more affluent Western Member States is in Section 5.
- 9 These scenarios are based on different qualitative narratives and all use medium assumptions on fertility, mortality, education, and EU-mobility – see pages 32-35.
- 10 Post-secondary is defined as higher than completed upper-secondary education, i.e. having a higher diploma or university degree (bachelor, master's or higher).
- 11 <https://www.canada.ca/en/immigration-refugees-citizenship/news/notices/supplementary-immigration-levels-2019.html>, consulted 24-01-2019.
- 12 http://www.cic.gc.ca/opendata-donneesouvertes/data/Facts_and_Figures_2016_PR_EN.pdf, consulted 20-11-2018
- 13 Combining the TFWP and the IMP programmes: http://www.cic.gc.ca/opendata-donneesouvertes/data/Facts_and_Figures_2016_TR_EN.pdf, consulted 24-01-2019
- 14 For simplicity, we refer to the following broad regional country groupings: Southern: Greece, Italy, Portugal, Spain, Cyprus and Malta. Western: Austria, Belgium, Denmark, Germany, Finland, France, Ireland, Luxembourg, the Netherlands, Sweden and the UK. Eastern: Bulgaria, Czechia, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
- 15 EU-15 refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
- 16 Neither Eurostat population projections nor our previous exercise (Lutz et al. 2018) differentiate between the two types of migration flows.
- 17 See 'The way forward for demographic analysis' section for the discussion on data gaps in demography.
- 18 The estimation of bilateral flows among EU Member States is still a work in progress. According to the method, after estimating the bilateral flows matrix, country-specific calibration factors are calculated from a preliminary simulation for the period 2013-2016 in order to get the same number of entrances by country as that estimated by Eurostat for the same period. These calibration factors are kept constant for the rest of the projection.

- 19 Note that the scenarios do not take into account possible changes in origin-destination flows triggered by Brexit or the possible future accession of the Western Balkans into the EU.
- 20 International migration is modelled using the constant immigration flow of 2 million to the EU annually and constant emigration rates from EU Member States to third countries. The emigration rates are country-specific and held constant at the level observed in 2013-2016. The computation is based on Eurostat data. Fertility, mortality and educational progression assumptions are the same in all three scenarios presented in this section.
- 21 Austria, Germany, the UK, Belgium, the Netherlands and France.
- 22 An extensive discussion of these causal mechanisms is provided by Lutz and Skirbekk (2014).
- 23 Other countries (i.e. Mali with 5.6 children and Sudan with 4 children) are in the middle. Additional details are available from Appendix 2 in Lutz et al. (2018).
- 24 According to Caldwell (1992), there is a persistence of reproductive behaviours among African women: fertility is slightly lower at intermediate ages and slightly higher among younger and older women (differences in age patterns are related to differences in the age at the first birth and inter-birth intervals).
- 25 A reduction in desired family size can result from the rising costs of children and their declining economic value (e.g. for labour and old-age support).
- 26 The definition was adopted by Caldwell and Caldwell (1987) to identify the distinct African demographic transitions.
- 27 The percentage is calculated by considering the world population provided by the medium scenario in 2060 (9.7 billion) and the estimation provided by the stalled development scenario (11 billion).
- 28 The percentage is calculated according to the world population provided by the medium scenario in 2060 (9.7 billion) and the estimation provided by the rapid development scenario (8.9 billion).
- 29 This obviously implies that projection results should not be interpreted as predictions, but merely as outcomes from a 'what if?' exercise.
- 30 Section 3 discusses the impact of immigration from third countries to the EU, with its impact on the size of the EU's future labour force, its educational composition and on the LFDR. However, it does not make particular reference as to which third countries the migrants are coming from, nor does it provide figures on the number of migrants entering the EU.
- 31 The informal sector or economy is that part of the economy that is neither taxed nor controlled by any form of government. Activities of the informal economy are not included in a country's gross national product or gross domestic product.
- 32 According to Lutz et al. (2018), general access to school will remain a major challenge for a significant part of the SSA population, and more than 13% of the Zambian population, or 16% of Congolese will not be able to progress beyond primary school by 2020.
- 33 The youth bulge is a common phenomenon in many developing countries, in particular in the least-developed countries. It is often due to a stage of development whereby a country achieves success in reducing infant mortality but mothers still have a high fertility rate. The result is that a large share of the population comprises children and young adults – today's children are tomorrow's young adults.
- 34 SPEI is a measure of droughts which accounts for the effect of both precipitation (e.g. rainfall) and potential evapotranspiration. Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces, and by transpiration from plants.
- 35 The limits of migration data are discussed in the following reports by IOM and McKinsey & Company (2018), Willekens et al. (2016), as well as Santamaria and Vespe (2018) as part of the European Commission's Knowledge Centre for Migration and Demography initiative on improving the gaps and challenges of migration data.
- 36 An example illustrating discrepancies in reporting is that of Lithuania and UK. In 2011, Lithuania reported 26 395 people migrating to UK while, in the same year, the UK reported 16 360 migrants from Lithuania.

- **37** The European Commission's Directorate-General for Employment, Social Affairs and Inclusion organised a number of initiatives around the demographic future of Europe – for instance, launching a European Observatory for Demography, Social Situation and Family.
- **38** The European Migration Network is an EU network of migration and asylum experts, coordinated by the European Commission's Directorate-General for Migration and Home Affairs.
- **39** The Joint Research Centre's Knowledge Centre on Migration and Demography and the CEPAM, as well as many Horizon 2020 and European Research Council projects, directly and indirectly deal with topics related to migration and demographic trends in Europe and around the world.
- **40** Eurostat plays a central role in coordinating and harmonising the demographic data collection by EU Member States. However, its mandate in this field is limited as it does not allow for analyses with respect to possible sending countries of migrants or multidimensional population projections in Europe.
- **41** This is a consortium of currently 32 demographic research centres in Europe, including all the leading national population research institutes as well as academic research units: <https://www.population-europe.eu/>

REFERENCES

- Abel, Guy, 2018. 'Estimates of Global Bilateral Migration Flows by Gender between 1960 and 2015'. *International Migration Review*, August, 1-44: <https://doi.org/10.1111/imre.12327>
- Abel, G. J., Brottrager, M., Crespo Cuaresma, J., & Muttarak, R. 2019. 'Climate, conflict and forced migration.' *Global Environmental Change*, 54: 239–249: doi:10.1016/j.gloenvcha.2018.12.003
- Atoyán, Ruben et al., 2016. 'Emigration and Its Economic Impact on Eastern Europe'. IMF Staff Discussion Note 16/07: https://www.imf.org/~media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/sdn/2016/_sdn1607.ashx
- Bijak, J., Kupiszewska, D., Kupiszewski, M., Saczuk, K. and Kicing, A. 2007. 'Population and labour force projections for 27 European countries, 2002–052: impact of international migration on population ageing; Projections de population et de population active pour 27 pays européens 2002–052: impact de la migration internationale sur le vieillissement de la population. *European Journal of Population*, 23(1):1-31.
- Bongaarts, John and John Casterline, 2013. 'Fertility Transition: Is Sub-Saharan Africa Different?' *Population and Development Review* 38: 153-168: <https://doi.org/10.1111/j.1728-4457.2013.00557.x>
- Borderon, Marion, Patrick Sakdapolrak, Raya Muttarak, Endale Kebede, Raffaella Pagogna and Eva Sporer, 2018. 'A Systematic Review of Empirical Evidence on Migration Influenced by Environmental Change in Africa'. IIASA Working Paper WP-18-003. Laxenburg, Austria: International Institute for Applied Systems Analysis (IIASA): <http://pure.iiasa.ac.at/id/eprint/15382/1/WP-18-003.pdf>
- Cai, Ruohong, Shuaizhang Feng, Michael Oppenheimer and Mariola Pytlikova, 2016. 'Climate Variability and International Migration: The Importance of the Agricultural Linkage'. *Journal of Environmental Economics and Management* 79 (September): 135-51: <https://doi.org/10.1016/j.jeem.2016.06.005>
- Caldwell, John C. and Pat Caldwell, 1987. 'The Cultural Context of High Fertility in Sub-Saharan Africa'. *Population and Development Review* 13 (3): 409-37: <http://dx.doi.org/10.2307/1973133>
- Caldwell, John C., I. O. Orubuloye and Pat Caldwell, 1992. 'Fertility Decline in Africa: A New Type of Transition?' *Population and Development Review* 18 (2): 211-42: <https://doi.org/10.2307/1973678>
- Cattaneo, Cristina and Giovanni Peri, 2016. 'The Migration Response to Increasing Temperatures'. *Journal of Development Economics* 122 (Supplement C): 127-46: <https://doi.org/10.1016/j.jdeveco.2016.05.004>
- Cedefop, 2016. 'Future skill needs in Europe: critical labour force trends'. Luxembourg: Publications Office of the European Union. Cedefop research paper; No 59: <http://dx.doi.org/10.2801/56396>
- Cincotta, Richard P., 2011. 'Half a Chance: Youth Bulges and Transitions to Liberal Democracy'. ECSP Report 13, 2008/2009. Washington, DC: Wilson Center: https://www.wilsoncenter.org/sites/default/files/ECSPReport13_Cincotta.pdf
- Coniglio, Nicola D., and Giovanni Pesce, 2015. 'Climate Variability and International Migration: An Empirical Analysis'. *Environment and Development Economics* 20 (Special Issue 04): 434-468: <https://doi.org/10.1017/S1355770X14000722>
- Conte, Alessandra and Silvia Migali, 2018. 'The Role of Conflict and Organized Violence in International Forced Migration'. Manuscript submitted for publication.
- de Haas, Hein, 2011. 'Mediterranean Migration Futures: Patterns, Drivers and Scenarios'. *Global Environmental Change, Migration and Global Environmental Change – Review of Drivers of Migration*, 21, Supplement 1 (December): S59-69: <https://doi.org/10.1016/j.gloenvcha.2011.09.003>
- de Haas, Hein, 2018. 'European Migrations: Dynamics, Drivers and the Role of Policies'. EUR 29060 EN. Luxembourg: Publications Office of the European Union: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109783/kjna29060enn.pdf>

- European Commission, 2018a. 'The 2018 Ageing Report'. Luxembourg: Publications Office of the European Union. doi:10.2765/615631. Available at: https://ec.europa.eu/info/publications/economy-finance/2018-ageing-report-economic-and-budgetary-projections-eu-member-states-2016-2070_en
- European Commission, Joint Research Centre, 2018b. 'Many More to Come? Migration from and within Africa'. JRC 110703. Luxembourg: Publications Office of the European Union. doi:10.2760/1702, JRC 110703. Available at: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/many-more-come-migration-and-within-africa>
- Eurostat, 2018. 'Migration and Migrant Population Statistics. Statistics Explained': <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1275.pdf>
- Fic, Tatiana, Dawn Holland, Paweł Paluchowski, Ana Rincon-Aznar and Lucy Stokes, 2011. 'Labour Mobility within the EU - The Impact of Enlargement and Transitional Arrangements'. NIESR Discussion Paper, 379. London: National Institute of Economic and Social Research: http://www.niesr.ac.uk/sites/default/files/publications/050811_152043.pdf
- Fussell, Elizabeth, Lori M. Hunter and Clark L. Gray, 2014. 'Measuring the Environmental Dimensions of Human Migration: The Demographer's Toolkit'. *Global Environmental Change: Human and Policy Dimensions* 28 (September): 182-91: <https://doi.org/10.1016/j.gloenvcha.2014.07.001>
- Gemenne, François, 2011. 'Why the Numbers Don't Add up: A Review of Estimates and Predictions of People Displaced by Environmental Changes'. *Global Environmental Change, Migration and Global Environmental Change – Review of Drivers of Migration*, 21, Supplement 1 (December): S41-49: <https://doi.org/10.1016/j.gloenvcha.2011.09.005>
- Gleick, Peter H., 2014. 'Water, Drought, Climate Change, and Conflict in Syria'. *Weather, Climate, and Society* 6 (3): 331-40: <https://doi.org/10.1175/WCAS-D-13-00059.1>
- Hatton, Timothy J. and Jeffrey G. Williamson, 1994. 'What Drove the Mass Migrations from Europe in the Late-19th-Century'. *Population and Development Review* 20 (3): 533-59.
- IOM and McKinsey & Company, 2018. 'More than Numbers: How Migration Data Can Deliver Real-Life Benefits for Migrants and Governments'. International Organization for Migration (IOM) and McKinsey & Company: https://publications.iom.int/system/files/pdf/more_than_numbers.pdf
- Kelley, Colin P., Shahrzad Mohtadi, Mark A. Cane, Richard Seager and Yochanan Kushnir, 2015. 'Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought'. *Proceedings of the National Academy of Sciences* 112 (11): 3241-46: <https://doi.org/10.1073/pnas.1421533112>
- Lutz, Wolfgang and Scherbov, S., 2007. 'The Contribution of Migration to Europe's Demographic Future: Projections for the EU-25 to 2050'. IIASA Interim Report. IIASA, Laxenburg, Austria: IR-07-024.
- Lutz, Wolfgang, Jesús Crespo Cuaresma and Warren C. Sanderson, 2008. 'The Demography of Educational Attainment and Economic Growth'. *Science* 319 (5866): 1047-48: <https://doi.org/10.1126/science.1151753>
- Lutz, Wolfgang and Vegard Skirbekk, 2014. 'How Education Drives Demography and Knowledge Informs Projections'. *In World Population and Human Capital in the 21st Century*, edited by Wolfgang Lutz, William P. Butz and Samir K.C., 14-38. Oxford: Oxford University Press: <http://ukcatalogue.oup.com/product/9780198703167.do>
- Lutz, Wolfgang, Anne Valia Goujon, Samir K.C., Marcin Stonawski and Nikolaos Stilianakis, 2018. 'Demographic and Human Capital Scenarios for the 21st Century: 2018 Assessment for 201 Countries'. Luxembourg: Publications Office of the European Union: <https://doi.org/10.2760/41776>
- Marchiori, Luca and Ingmar Schumacher, 2011. 'When Nature Rebels: International Migration, Climate Change, and Inequality'. *Journal of Population Economics* 24 (2): 569-600: <https://doi.org/10.1007/s00148-009-0274-3>
- MEDAM (Mercator Dialogue on Asylum and Migration), 2018. '2018 MEDAM Assessment Report on Asylum and Migration Policies in Europe', Kiel: IfW: https://www.medam-migration.eu/wp-content/uploads/2018/08/MEDAM-assessment-report_2018.pdf
- Migali, S., Natale, F., Tintori, G. et al., 2018. 'International Migration Drivers'. EUR 29333 EN. : Luxembourg: Publications Office of the European Union. doi:10.2760/63833, JRC112622. Available at: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/international-migration-drivers>

- Milman, Oliver, Emily Holden and David Agren, 2018. 'The Unseen Driver behind the Migrant Caravan: Climate Change'. *The Guardian*, 30 October 2018, sec. World news: <https://www.theguardian.com/world/2018/oct/30/migrant-caravan-causes-climate-change-central-america>
- Missirian, Anouch and Wolfram Schlenker, 2017. 'Asylum Applications Respond to Temperature Fluctuations'. *Science* 358 (6370): 1610-14: <https://doi.org/10.1126/science.aao0432>
- Piguet, Etienne, Raoul Kaenzig and Jérémie Guélat, 2018. 'The Uneven Geography of Research on 'Environmental Migration''. *Population and Environment* 39 (4): 357-83: <https://doi.org/10.1007/s11111-018-0296-4>
- Raymer, James, Arkadiusz Wiśniowski, Jonathan J. Forster, Peter W. F. Smith and Jakub Bijak, 2013. 'Integrated Modeling of European Migration'. *Journal of the American Statistical Association* 108 (503): 801-19: <https://doi.org/10.1080/01621459.2013.789435>
- Rigaud, Kanta Kumari, Alexander M. De Sherbinin, Bryan Jones, Jonas Bergmann, Viviane Clement, Kayly Ober, Jacob Schewe, Susana Beatriz Adamo, Brent McCusker and Silke Heuser, 2018. 'Groundswell: Preparing for Internal Climate Migration': https://academiccommons.columbia.edu/download/fedora_content/download/ac:mgqnk98shj/content/WBG_ClimateChange_Final.pdf
- Samans, Richard and Saadia Zahidi, 2017. 'The Future of Jobs and Skills in Africa: Preparing the Region for the Fourth Industrial Revolution'. Executive Briefing. Geneva, Switzerland: World Economic Forum: http://www3.weforum.org/docs/WEF_EGW_FOJ_MENA.pdf
- Sanderson, Warren C. and Sergei Scherbov, 2005. 'Average Remaining Lifetimes Can Increase as Human Populations Age'. *Nature* 435 (7043): 811-13: <https://doi.org/10.1038/nature03593>
- Sanderson, Warren C. and Sergei Scherbov, 2007. 'A New Perspective on Population Aging'. *Demographic Research* 16 (January): 27-58: <https://doi.org/10.4054/DemRes.2007.16.2>
- Sanderson, Warren C. and Sergei Scherbov, 2010. 'Remeasuring Aging'. *Science* 329 (5997): 1287-88: <https://doi.org/10.1126/science.1193647>
- Sanderson, Warren C. and Sergei Scherbov, 2013. 'The Characteristics Approach to the Measurement of Population Aging'. *Population and Development Review* 39 (4): 673-685: <https://doi.org/10.1111/j.1728-4457.2013.00633.x>
- Santamaria Serena, Carlos and Michele Vespe, 2018. 'Towards an EU Policy on Migration Data: Improvements to the EU Migration Data Landscape'. JRC Science for Policy Report. Luxembourg: Publications Office of the European Union: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC112864/kcmd_eu_policy_migration_data_2018_final.pdf
- Spielvogel, G. and M. Meghnagi, 2018. 'Assessing the role of migration in European labour force growth by 2030'. OECD. Social, Employment and Migration Working Papers, No. 204, OECD Publishing, Paris: <http://dx.doi.org/10.1787/6953a8ba-en>
- Sterly, Harald, Patrick Sakdapolrak and Kayly Ober, 2016. 'Migration for Human Security? The Contribution of Translocality to Social Resilience'. *Georgetown Journal of Asian Affairs* 3 (October): 57-66.
- The Economist Intelligence Unit, 2018. 'Convergence with Developed Europe Is Slowing', 2018: <http://country.eiu.com/article.aspx?articleid=1636606147&Country=Serbia&topic=Economy&subtopic=Forecast&subsubtopic=Economic+growth#>
- Willekens, Frans, Douglas Massey, James Raymer and Cris Ceauchemin, 2016. 'International migration under the microscope: Fragmented research and limited data must be addressed'. *Science* 352 (6288): 897-99: <https://doi.org/10.1126/science.aaf6545>
- World Bank, 2018a. 'Global Economic Prospects, June 2018: The Turning of the Tide?' Washington, DC: World Bank: <https://doi.org/10.1596/978-1-4648-1257-6>
- World Bank, 2018b. Enterprise Surveys: What Business Experience. World Bank Group: <https://datacatalog.worldbank.org/dataset/enterprise-surveys>
- World Bank, 2018c. World Development Indicators. World Bank Group: <https://datacatalog.worldbank.org/dataset/world-development-indicators>.

LIST OF BOXES AND FIGURES

Box 1: Scenarios featured in section 1	18
Box 2: Scenarios featured in section 2, based on CEPAM's SSP development pathways	24
Box 3: Add-on scenarios to the Migration Narratives (on page: 32-34)	36
Box 4: Scenarios featured in section 4	44
Box 5: Scenarios featured in section 5	50
Box 6: Scenarios featured in section 6 - the Shared Socioeconomic Pathways (SSPs)	58
Figure 1.1: Population size of EU-28 in 2015-2060, by scenario	20
Figure 1.2: Working-age population (20-64) of EU-28 in 2015-2060, by scenario	21
Figure 2.1: EU labour force by education level, the constant participation scenario, 2015-60	26
Figure 2.2: The three scenarios influencing the EU's total labour force size, 2015-2060	27
Figure 2.3: EU labour-force dependency ratio, by scenario, 2015-2060	29
Figure 3.1: The migration scenarios, contrasting volumes of migrants with their level of human capital	38
Figure 3.2: Labour-force participation rate* in the EU by migration status, age at arrival and duration of stay, 2010-2015	39
Figure 4.1: Relative population change (in %) between 2015 and 2060 (projection) in selected EU Member states by scenario	49
Figure 5.1: Population size of EU-28 in 2015-2060, by scenario	52
Figure 5.2: Size and share of the working-age (in dark green) and 65+ population (in light green) in EU-28 in 2015 and 2060, by scenario	53
Figure 5.3: Working-age population of EU-28 by educational attainment in 2015 and in 2060, by scenario	54
Figure 6.1: Population projections for 2015-2060	60
Figure 6.2: Total fertility rates (TFR) for six different levels of female education for multiple DHS surveys from 58 developing countries	62
Figure 6.3: Age and education pyramids for Africa in 2060, according to three contrasting scenarios; the colours indicate the level of educational attainment.	64
Figure 7.1: Asylum seeking flows by world region, 2006-10 and 2011-15	68
Figure 7.2: Youth unemployment (% of total labour force ages 15-24)	70

LIST OF TABLES AND MAPS

Table 1.1: Share of population at age 65 and above and the total age-dependency ratio in 2015, 2040 and 2060 in the EU-28, by scenario	22
Map 2.1: Changes in the size of the labour force 2015-2060 under the constant participation and Swedish scenarios	28
Map 2.2: Labour-force dependency ratio, constant participation scenario, 2060	30
Table 3.1: Projected labour force size (in millions) of the EU in 2060	40
Table 3.2: Projected proportion of the labour-force with post-secondary education in the EU in 2060	41
Table 3.3: Projected EU labour force dependency ratio in 2060	42
Map 4.1: Population change in EU-28 Member States between 1991 and 2015 (in %)	46
Map 4.2: Relative population change between 2015 and 2060 (projection) in EU Member States	48
Map 8.1: Marginal effects of SPEI on conflict for the 2010-2012 period	75

ACKNOWLEDGEMENTS

The authors of this report comprise the Centre of Expertise on Population and Migration group, which includes both JRC and IIASA scientists:

Wolfgang Lutz, Gemma Amran, Alain Bélanger, Alessandra Conte, Nicholas Gailey, Daniela Ghio, Erofli Grapsa, Kathrine Jensen, Elke Loichinger, Guillaume Marois, Raya Muttarak, Michaela Potančoková, Patrick Sabourin and Marcin Stonawski.

Projection scenarios and narratives presented in this report were developed in a process of consultation with the relevant services of the European Commission. We are grateful to representatives of the Commission's Directorates-General and agencies who contributed to the survey and to those involved in discussions at the workshop 'Demographic Scenarios for the EU: Investigating the role of migration', held in Brussels on 18-19 April 2018. In addition, we thank the Knowledge Centre for Migration and Demography for their important insight and collaboration, as well as all JRC and IIASA colleagues who contributed to the review and discussion of this report and its production.

We are also very appreciative of the reviewers for their valuable comments and suggestions, in particular:

- Laurent Aujean, Policy Officer, Legal Migration and Integration, Directorate-General for Migration and Home Affairs
- Olivier Bontout, Deputy Head of Unit, Social Investment Strategy, Directorate-General for Employment, Social Affairs and Inclusion
- Ben Deboeck, Economic Analyst, Age-related public expenditure, Directorate-General for Economic and Financial Affairs
- Per Eckefeldt, Head of Sector, Age-related public expenditure, Directorate-General for Economic and Financial Affairs
- Giampaolo Lanzieri, Senior Expert at the Statistical Office of the European Union Eurostat, Population Unit
- Marco Montanari, Policy Officer, Schools and Multilingualism, Directorate-General for Education, Youth, Sport and Culture
- Rainer Münz, Adviser on Migration and Demography to the European Political Strategy Centre
- Adrienn Nyírcsák, Policy Officer - Education and Migration, Directorate-General for Education, Youth, Sport and Culture
- Frederik Schutyser, Policy Coordinator, Migration, Border Management and Security, Secretariat-General
- Serban Scriciu, Policy Officer, Social Investment Strategy, Directorate-General for Employment, Social Affairs and Inclusion
- Stefano Signore, Head of Unit, Employment, Social Inclusion, Migration, Directorate-General for Cooperation and Development
- Alessandro Sola, Intelligence Analyst, Migration, Directorate-General for Migration and Home Affairs.

GETTING IN TOUCH WITH THE EU

IN PERSON

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

ON THE PHONE OR BY EMAIL

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: **00 800 6 7 8 9 10 11** (certain operators may charge for these calls),
- at the following standard number: **+32 22999696**, or
- by electronic mail via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

ONLINE

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU PUBLICATIONS

You can download or order free and priced EU publications from EU Bookshop at: <https://publications.europa.eu/en/publications>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

EU LAW AND RELATED DOCUMENTS

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: <http://eur-lex.europa.eu>

OPEN DATA FROM THE EU

The EU Open Data Portal (<http://data.europa.eu/euodp/en>) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

