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Research Article

Migration and demographic disparities in macro-regions of the European Union, a view to 2060

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Abstract

BACKGROUND
Migration has become one of the most salient policy areas in the European Union. In response, the European Commission established a research team with the task of investigating a range of possible demographic futures.

OBJECTIVE
This paper explores the demographic effects of migration on eastern, southern, and western EU regions, using different scenarios to see the extent population size, working-age population, education composition, and total age dependency can be influenced.

METHODS
We use a deterministic cohort-component projection model that (a) incorporates improving levels of educational attainment in the population and (b) explicit consideration of migration between EU member states (MS) and migration between EU MS and the rest of the world. Eight stylised what-if scenarios are developed around a medium assumption projection.

RESULTS
Although migration can have a large effect on total and working-age population size, the EU population will continue to age and see a rise in age dependency regardless. Despite depopulation occurring in many eastern MS, the region is and should remain in a better position than the south and on par with the west in terms of age dependency.

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CONCLUSIONS
While both the south and east provide large demographic subsidies of working-age people to the EU's west, the south is less prepared to cope with the losses due to an already older population, lower labour force participation, and lower education levels.
CONTRIBUTION
We report demographic consequences of contrasting migration scenarios for the EU-28 (now EU+UK) based on multidimensional projections by age, sex, and educational attainment.

1. Introduction

Prior to the COVID-19 outbreak, migration both from outside the European Union and between member states (MS) was among the most pressing policy priorities in the European Union, a situation almost certain to return as soon as travel and economic activity rebound in the post-pandemic recovery (European Commission 2015; European Council 2019). The EU's progressing integration had created an unparalleled open internal migration regime within the Union, while EU MS had, to varying degrees, more restrictive stances on immigration from outside the EU (Comte 2017). Against the backdrop of differences in living standards, wages, and services, the right to free movement (in its latest form amended in the Treaty of Lisbon 2007) stimulates migration between the MS. Around 3% of EU citizens (19.9 million people) resided in an EU MS other than the one of which they were citizens at the end of 2017 (EUROSTAT 2018). Considering sizeable changes to migration in the EU-28 in recent years – the influx from the Middle East and North Africa countries during 2015–2016, and then the unprecedented downturn in migration during the global pandemic in 2020 – one can ask, how would different potential migration futures impact long-term demographic change in the major EU-28 macro-regions, given their variations in age structure and migration patterns?

This contribution to the special collection of *Demographic Research* uses deterministic multidimensional population projections and a range of stylised migration scenarios to model possible demographic futures in three major EU's macro-regions: east, south, and west[4]. The countries in these three macro-regions share migration

[4] The grouping is based on the EUROVOC classification with western and northern Europe merged into a single entity due to similarity in demographic trends. West (11 MS): Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Sweden, and the United Kingdom. South (6 MS): Cyprus, Greece, Italy, Malta, Portugal, and Spain. East (11 MS): Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

histories and contemporary patterns, with economic downturns, political changes, and country-specific regulations playing important roles in shaping migration in individual member states. Western European countries changed from historical net senders to net receivers of immigrants in the 1950s, attracting immigrants predominantly from southern Europe, Turkey, former colonies, and since the 1990s, from eastern Europe (Therborn 1987; van Mol and de Valk 2016). Germany has become the single largest receiving country with a flow of 2.7 million immigrants from outside the EU in 2013–2017, which represented 26% of all immigrants entering the EU in the same period.

Southern EU MS have been major emigration countries historically and since only the 1990s has immigration into the region gained momentum (King, Lazaridis, and Tsardanidis 1999; Castles 2000). Emigration from Spain and Greece increased again during the economic crisis and its aftermath in the early 2010s, but immigration increased as well with large inflows of asylum seekers in 2015–2016. Despite recent attempts to reform the Dublin system, the EU's asylum system still puts a large burden on southern MS at the external EU borders as migrants are meant to apply for asylum in the first EU MS reached rather than in locations in western Europe.

By contrast, eastern Europe had been largely closed to migration until the fall of the Iron Curtain. Emigration intensified with the accession of eastern European countries to the EU, although some of the intra-EU migration is of temporary or circulatory nature (Black et al. 2010). An estimated 1.8% of the population in the eastern member states that joined the EU in 2004 moved to the EU-15[5] between 2004 and 2009 and as much as 4.1% of population in case of Bulgaria and Romania between 2007 and 2009 (Fic et al. 2011). Populations of the EU-15 (old member states) grew by an estimated 0.4%, 0.3% of which was due to immigration from new members during the period (ibid). The migration was driven predominantly by large differences in conditions on the labour market of EU countries (e.g., Kahanec and Zimmermann 2010). So far, eastern MS tend to be net-sending countries and attract only a small fraction of non-EU immigrants into the EU (9% during 2013–2017 (EUROSTAT 2020)).[6] Today anti-immigration views, or preferences for immigration from culturally similar countries (Brunarska et al. 2016), are stronger in eastern Europe than in the western MS (Czaika and di Lillo 2018; Gorodzeisky and Semyonov 2016).

We distinguish in the projections between migration within the EU-28, which we label intra-EU migration, and between the EU-28 and the rest of the world, which we

[5] EU-15: Member countries in the European Union prior to the accession of ten candidate countries on 1 May 2004 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom).

[6] Czech Republic stands out as an exception, and recently immigration to some eastern countries increased as well (Eurostat 2019): for example, a stock of 222,000 Ukrainians with valid residence permits in Poland (UDSC 2020, https://migracje.gov.pl/en/)

label extra-EU migration.[7] We differentiate these two types of international migration because they are regulated differently and represent their own unique policy challenges. Intra-EU migration is subject to minimum regulation as the right to free movement is guaranteed to all EU citizens, which means that member states cannot introduce their own policies and regulations limiting such migration, apart from emergency measures, such as during the COVID-19 pandemic, or transitional restrictions with the accession of new countries.[8] Migration into the EU is more strictly regulated and is the prerogative of national governments, which have specific national policies and regulations concerning the granting of residence permits to non-EU nationals. Thus, for deeper policy insight it is useful to illustrate differentiated impacts of intra-EU and extra-EU migration. Important previous work in this direction includes subnational population projections by Rees et al. (2012) that evaluated possible impacts of successful or unsuccessful social cohesion policies using four scenarios with differentiated intra- and extra-EU migration trends using migration modelling for statistical analyses (MIMOSA) estimates (Raymer, de Beer, and van der Erf 2011). Further important efforts can be seen in the work of Kupiszewski and colleagues, who projected EU-27[9] populations and labour force (Kupiszewska and Kupiszewski 2013) using estimated flows between the EU-27 countries (Raymer 2008) and populations of European Economic Area countries at the Nomenclature of Territorial Units for Statistics (NUTS) level 2 (Kupiszewski and Kupiszeska 2011) using Demographic and Migratory Flows Affecting European Regions and Cities (DEMIFER) estimates (NIDI and Partners 2010). At the time of working on the projections presented in this paper, other projection exercises that cover EU countries did not project different types of migration separately but were using average net migration (UN 2019; Cafaro and Dérer 2019; EUROSTAT 2019). EUROSTAT projects immigration and emigration flows separately and differentiates between intra-EU and extra-EU flows starting from 2019 EUROPOP projections (EUROSTAT 2020) and formulates three scenarios with a baseline, higher, and lower migration that do not combine different assumptions for different types of flows. Projections presented here cover a broader range of scenarios.

In ageing low-fertility societies, migration is a consequential driver of demographic change. It causes population growth in many net-receiving, predominantly western and southern EU countries, and exacerbates population decline in net-sending countries, particularly in the east (Figure 1). Populations of six eastern MS shrunk by 10% to 26%

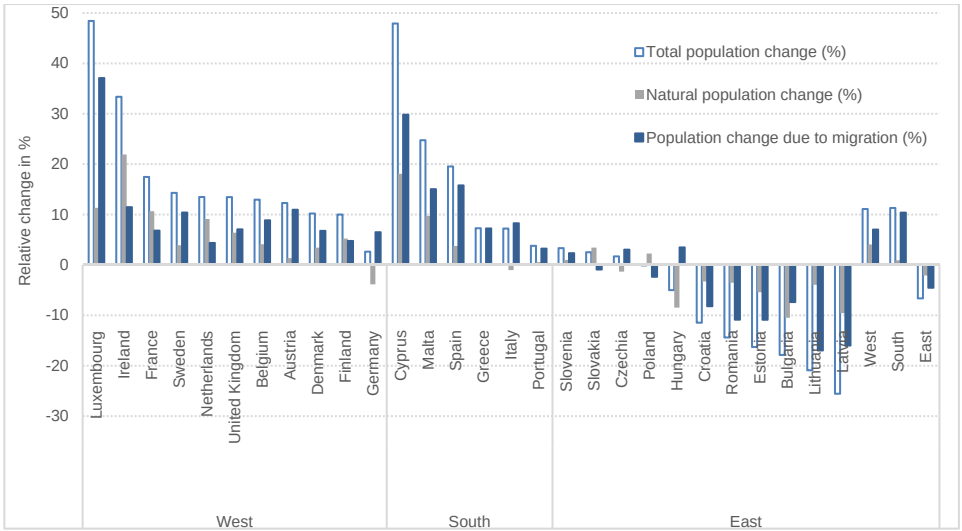
[7] To clarify our use of terms, intra-EU migration is a change of residence from one EU MS to another, that is, both origin and destination are EU-28 countries. By extra-EU migration, we refer to a change of residence from a non-EU-28 country to an EU-28 country or the other way around.

[8] These were lifted for most new member states in 2014 and 2015, Croatia being the last and only member state subjected to the restrictions until 2020. It is also the only country that has applied the principle of reciprocity and raised restrictions to the countries that introduced them towards Croatia.

[9] EU-27: the number of member countries in the European Union prior to the accession of Croatia in 2013.

between 1990 and 2015 due to combination of large emigration and low fertility. In the context of economic downturns and high unemployment in eastern MS during their economic transition to market economies, migration was mutually economically beneficial (Kahanec and Zimmermann 2010) and economic benefits of increased migration between the MS for the EU as a whole have been well documented (see for example D'Auria, McMorrow, and Pichelmann 2008). But large emigration has severe impacts (direct and indirect) on the sending member states: acceleration of already rapid population ageing, depopulation, decrease in the size and ageing of labour force, and reduction in number of births due to lower-reproductive potential because emigrants tend to be young workers at both productive and reproductive age. Not a single southern or western EU MS recorded population decline during 1990–2015, although Italy and Germany had a negative natural balance (births minus deaths). One can expect that natural change would turn (increasingly) negative in the near future in more countries as baby boomers age and smaller cohorts of women of reproductive age bear fewer overall births even if fertility rates were to increase. Excess mortality (Goldstein and Lee 2020), birth deficits (Luppi, Arpino, and Rosina 2020), and reduction in international migration due to COVID-19 might have spurred population declines in some EU-28 countries in 2020 and 2021.

Figure 1: Contribution of migration and natural change to population growth in EU-28 countries and macro-regions, 1990–2015



Source: European Demographic datasheet 2018 (WIC 2019) and EUROSTAT, authors' calculations.

The impact of migration goes beyond population growth or decline; therefore, we investigate how varying volumes and educational composition of migration flows influence composition of the working-age population and age dependency ratios. Educational attainment serves as a good proxy for human capital – the abilities and skills of workers – because education attainment is quantifiable, widely measured, and is strongly correlated with productivity in work and life. This human capital dimension is particularly vital for dealing with the effects of population ageing and the smaller anticipated working-age population in the future because it represents potential economic productivity and the ability of a society to meet the challenges ahead. Arntz, Gregory, and Zierahn (2016) estimate 9% of jobs in 21 OECD countries are at high risk of automation, while Nedelkoska and Quintini (2018) put the number at 14% for the OECD as a whole, with an additional 32% of jobs likely to be significantly altered. Those impacts are expected to hit the south and east of Europe much harder than the west given differences in the economy and how jobs are structured (Nedelkoska and Quintini 2018). Even though there is a relatively wide range of views in the literature about the extent to which artificial intelligence will revolutionise and disrupt the labour force with jobs lost and created, it is clear that human capital and the associated adaptability will be even more critical to success in the future. Educational attainment or skills need to be included in population and migration projections of modern societies, in which human capital is a major asset and source of competitive advantage.

2. Data and methods

Population and human capital projections presented in this paper use a widely accepted model of multidimensional population dynamics, which is an extension of standard cohort-component model that accounts for additional dimensions of population heterogeneity that influence demographic components (e.g., Keyfitz and Rogers 1982; KC et al. 2010; KC and Lutz 2014; Stonawski et al. 2015). Multidimensional models use the additional attributes to influence assumptions of the components and to generate model outputs (for differences to multistate models, see Rees 2019: 42). The Centre for Expertise on Population and Migration (CEPAM)[10] model used in this paper is a deterministic population projection which stratifies and projects each EU-28 country's population by age (in five-year age groups), sex, and educational attainment (Lutz et al.

[10] The CEPAM model was developed in the Centre for Expertise on Population and Migration (CEPAM), a joint research project between the International Institute for Applied Systems Analysis (IIASA) and the Joint Research Centre (JRC) of the European Commission. CEPAM's modelling work was directed to provide scientific evidence to the European Commission's bodies and support policymakers within the Commission.

2018; Lutz et al. 2019).[11] Population projection was computed in R using MSDem package.

The starting population by age and sex in 2015 corresponds to EUROSTAT,[12] and educational compositions for the baseline year come from the Wittgenstein Centre dataset (Lutz et al. 2018). All CEPAM scenarios are developed using SSP2[13] medium scenario assumptions on future fertility, mortality, and educational attainment for the EU-28 countries, which are documented in Lutz et al. (2018), while modifying the SSP2 medium migration assumptions, which are explained in the following section.

Mid- and long-term fertility assumptions maintain the target values of overall TFR for 2030–2035 and 2050–2055, which were derived from meta-expert meetings as described in Basten, Sobotka, and Zeman (2014), and short-term values assure a smooth transition from the 2010–2015 levels (UN 2017). The total fertility is set to converge to 1.75 children per woman in 2200. In the west of Europe TFR is 1.78 at the baseline and oscillates around this level during the whole projection, while in the east and south, where initial levels are at 1.46 and 1.43 children per women, respectively, the assumptions assume an increase to 1.6 children per woman. Educational differentials were updated with additional information from the Cohort Fertility and Education database[14] (Zeman et al. 2017) for the baseline, and over time these differentials are assumed to converge to ratios (relative to TFR of lower secondary) of 1.42 for up to primary educated women, 1.35 for lower secondary, 1.14 for upper secondary, and 1 for post-secondary (Lutz et al. 2018: 19–27). Education-specific TFRs for the three regions are presented in Table 1.

Table 1: Projection assumptions for education-specific total fertility rates for the three macro-regions and selected periods

	West				East				South			
	e1-e3	e4	e5	e6	e1-e3	e4	e5	e6	e1-e3	e4	e5	e6
2015–2019	1.90	1.94	1.75	1.68	1.54	1.61	1.44	1.30	1.85	1.76	1.48	1.27
2035–2039	2.09	2.13	1.88	1.73	1.88	1.89	1.64	1.48	1.99	2.00	1.68	1.44
2055–2059	2.11	2.17	1.90	1.72	2.06	2.05	1.73	1.56	2.15	2.11	1.77	1.51

Notes: e1-e3 = primary or lower; e4 = lower secondary; e5 = upper secondary; e6 = post-secondary. Values are weighted average of country-specific assumptions. Fertility assumptions for all years and countries can be found with the supplementary materials.

[11] The model uses the following categories based on ISCED 2011 classification: lower secondary and below (no education, ISCED 1–2), upper secondary (ISCED 3), and post-secondary (ISCED 4–8).
[12] Eurostat database, table demo_pjan [last accessed 10.6.2018]
[13] The Shared Socioeconomic Pathways (SSP) scenarios describe plausible future societal changes in demographics, human development, economy, institutions, technology, and environment in the context of sustainable development; SSP2 is a middle-of-the-road scenario (O'Neill et al. 2014). KC and Lutz (2014) detail the demographic components of SSPs.
[14] See http://www.eurrep.org/database/ for more details.

Long-term mortality assumptions for the end of the century foresee improvement in life expectancy and were formulated for female life expectancy at birth using the meta-expert survey (Caselli et al. 2014). The gender gap is assumed to narrow to three years by the end of the 21st century, resulting in higher increases for male life expectancy. These long-term mortality assumptions are linearly interpolated to correspond to the new baseline levels in 2015 (UN 2017). While these assumptions had been defined before the outbreak of the COVID-19 pandemic, they seem to be still meaningful since at this stage it is still very unclear what could be the longer-term impacts of the pandemic on future life expectancy. There could both be possible positive effects due to those not affected having on average better health (also called 'harvesting') and possible new investments in the health systems as well as possible negative effects due to possible long-term health impacts of those surviving infections. It is not yet clear what will be the balance of these opposing effects.

Table 2 shows average life expectancy at birth for men and women in the three macro-regions used in the CEPAM model. Southern EU has highest life expectancy at the baseline and also at the end of the projection. Western EU catches up to these levels and has highest assumed gain of 8.6 years for both men and women between 2015–2019 and 2055–2059. The improvements are smaller for east (8.3 years for women, 7.6 for men). A fixed six-year differential is assumed for the life expectancy of those with lowest versus highest educational attainment.

Table 2: Projection assumptions for life expectancy at birth, by sex and three macro-regions for selected periods

		2015–2019	2035–2039	2055–2059	Change from 2015–2019 to 2055–2059
West	Female	84.1	88.4	92.7	8.6
	Male	79.6	82.8	88.2	8.6
East	Female	80.6	84.8	88.9	8.3
	Male	71.7	75.2	79.3	7.6
South	Female	85.4	89.6	93.9	8.5
	Male	80.5	84.7	88.9	8.4

Notes: Values were calculated as weighted average of country-specific assumptions. An expanded set of assumptions for all years and countries can be found with the supplementary materials.

Future changes in educational attainment follow the Global Education Trend scenario (Barakat and Durham 2014). Multidimensional projections do not require transition rates and instead use modelled future shares of educational attainment at ages 15 to 19, 20 to 24, and 25 to 29 conditional on the presumed final attainment level reached

at ages 30 to 34.[15] These presumed final attainment levels at ages 30 to 34 in 2015, 2035, and 2055 are presented in Table 3 for the three macro-regions.

Table 3: Projection assumptions for education attainment at ages 30 to 34 by sex for the three macro-regions for selected periods

	Education	East	West	South		Education	East	West	South
2015 Female	e1-e3	1%	3%	4%	2015 Male	e1-e3	2%	3%	7%
	e4	8%	11%	18%		e4	10%	12%	25%
	e5	45%	36%	35%		e5	57%	41%	36%
	e6	46%	50%	43%		e6	31%	44%	32%
2035 Female	e1-e3	0%	1%	0%	2035 Male	e1-e3	1%	1%	1%
	e4	2%	4%	7%		e4	4%	6%	12%
	e5	42%	32%	36%		e5	56%	38%	44%
	e6	56%	63%	57%		e6	39%	55%	43%
2055 Female	e1-e3	0%	0%	0%	2055 Male	e1-e3	0%	0%	0%
	e4	1%	2%	1%		e4	2%	3%	4%
	e5	32%	23%	29%		e5	53%	33%	44%
	e6	67%	75%	70%		e6	45%	64%	52%

3. CEPAM migration scenarios

In order to understand how populations of countries and macro-regions would develop under different migration situations, we develop multiple what-if scenarios that combine different volumes of intra-EU and extra-EU migration with different educational compositions. The scenarios do not aim at forecasting migration and should not be understood as predictions but rather represent stylised migration situations that can also be viewed from the perspective of diverging policy options and thus allow policymakers to assess the long-term demographic outcomes of these contrasting migration futures. The scenarios presented in this paper replace the migration assumptions of the SSP2 scenario presented in Lutz et al. (2018), which use the long-term average of immigration and emigration rates derived from the global flows (Abel 2017).

Different approaches were employed to set assumptions for intra- and extra-EU migration. For the latter, the starting point was broad scenario narratives which describe in qualitative terms possible future volume and composition of migration flows in various socioeconomic and political circumstances. These broadly different futures can be benchmarked against a scenario of recent trends continued (which we model as the Medium scenario, described later in this section).

[15] For the reasoning of this solution to modelling of educational distributions rather than transition rates, see Goujon et al. 2016: 322.

The conceptual foundation for the development of migration scenario narratives was a survey prepared by the CEPAM team, which asked experts inside the European Commission (EC) and its agencies about possible future migration trajectories in the EU. The survey included a structured questionnaire in which experts evaluated different aspects of migration trends, drivers, and policies. The experts also answered an open question at the end of the survey, which prompted them to formulate one or several migration futures they would find useful to explore through demographic projections. The themes that emerged could be organised into several broad narratives that envisage future intra- and extra-EU migration trajectories within the context of economic stability and continuing integration inside the EU versus economic instability and more restrictive and selective policies regulating immigration into the EU. Although some respondents developed situations for intra-EU migration, most focused on the aspects concerning immigration from outside the EU, which is not surprising given that asylum migration had been a major focus of the EC in 2018. The survey was followed up with a workshop involving migration experts from the EC and scientific community that was held in April 2018. Invited experts were prompted to discuss in moderated groups and further develop the scenarios. This input was consolidated by a smaller expert group, which included the CEPAM team at the Joint Research Centre (JRC) and International Institute for Applied Systems Analysis (IIASA). The main themes raised by the experts were organised within the context of existing examples of policy responses and actions in migration management seen in other countries around the world. This process produced a set of four scenario narratives of extra-EU migration presented below.[16]

3.1 Scenario narrative 1: Low volume – High education (Lv-He) of immigration

Responding to historical changes as Europe becomes a continent increasingly defined by immigration, EU member states adopt more selective migration policies to both emphasise skills and substantially reduce overall volume. Immigrants are admitted primarily based on their potential for economic contributions, using a point system targeting highly specialised and needed skills. This highly selective system promotes short-term permits, restricts long-term migration towards the EU, and reduces the inflows to a fraction of what the EU has seen in the recent past. Economic integration is facilitated by their high skills profile and being screened by language and other criteria. Member states maintain integrity of the system by enforcing existing requirements for legal employment status and penalising businesses for unlawful hiring practices. Coming to terms with the reality of an ageing workforce, member states address associated

[16] An additional high-emigration scenario that emerged from the discussions is not analysed in this paper but is included in Lutz et al. (2019)

challenges by making investments in automation and mechanisation as in East Asia. The new policy focus intends to use emerging technologies to improve production efficiency and reduce the dependence of various sectors (agriculture, heavy industry) on repetitive, low-skilled, and automation-candidate labour.

3.2 Scenario narrative 2: Low volume – Low education (Lv-Le) of immigration

A major renewal of the education system benefits EU member states by successfully linking university and technical programmes with economic needs. With such developments and investments in automation, member states do not try supplementing their workforce by recruiting large numbers of workers from around the world. The primary focus of immigration policy shifts to providing for refugees and filling remaining low-skilled jobs. A new immigration system is implemented with an emphasis on work permits of a temporary and seasonal nature. Such changes to labour migration promote circular migration, resulting in much lower immigration into the EU than in the recent past. Member states also adhere to the new asylum policies to affirm they help designated groups at designated levels. Accordingly, asylum seekers are accepted as refugees in acute cases and for limited amounts of time. Despite some difficulty in economically integrating refugees, the general orderly management and low volume does not overload relevant support resources. At the same time, the spots for low-skilled migrants and temporary workers are calibrated to match with unfilled jobs, facilitating their relatively easy entry into the European workforce. The system depends on regular diagnoses of the economy, efficient administration of set migration levels, and ensuring employers of migrants and temporary workers fulfil legal work requirements as protection against fraud.

3.3 Scenario narrative 3: High volume – High education (Hv-He) of immigration

EU member states begin recruiting increasing numbers of high-skilled workers from countries around the world to address economic concerns. The introduction of a new high-volume, high-skilled immigration system brings approximately double immigrants into the European Union. Maintaining its selective nature, the system relies on strict enforcement of work permits and borders as the EU becomes an increasingly prominent immigration destination. Most of the new migrants originate from middle-income countries with relatively strong education systems, but the immigration system also attracts highly educated elites from low-income countries. Sending countries in turn struggle with the losses of their most talented and educated citizens as the appetite for

skilled workers in the EU continues. Integration into the economic system comes without significant barriers, since the admission of migrants is a function of scoring highly on measures of education, skills, language ability and work experience. A large proportion of the migrants pursue opportunities in the urban economic hubs of western and northern Europe, given the greater demand for high-skilled workers as well as their own personal preferences and existing migrant networks.

3.4 Scenario narrative 4: High volume – Low education (Hv-Le) of immigration

In the face of persistent conflict, instability, and poverty in the Middle East and Africa, and increasing costs and tensions from securing the external borders, EU member states decide to expand their intake of low-skilled labour and adopt more generous asylum policies (in terms of the determinations of safe countries, allocation of resources, and acceptance rates). Many member states aim for the highest migration-granting rates of recent years, focused less on skill-selection or border enforcement. Intensifying push factors create conditions for a constant supply of migrants 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 migrants, encouraging a sustained and self-reinforcing exodus. Overall migrant flows to the EU as a whole double and are characterised by greater proportions of low-skilled workers, as well as refugees and family reunification cases. Economic integration becomes an important topic in public discourse as record numbers of migrants are given permission to live and work in Europe. Most arriving migrants tend to have a lower skills profile in comparison to the European 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 the migrants choose to live in western, northern, and a few southern European member states.

These four narratives – focused on migration between the EU and the rest of the world – are complemented by the Zero Extra-EU Migration (ZEM) scenario. It serves the purpose of a counterfactual against which the demographic effects of the other migration situations can be understood as an example of an extremely strict 'closed EU borders' situation. In the ZEM scenario the intra-EU migration trends continue as in the recent past because the demand for labour and economic attractiveness of the more affluent, yet ageing, EU MS would not cease.

In the Medium scenario, intra-EU and extra-EU trends continue as in the recent past. It serves as a benchmark for evaluating the impact of alternative intra-EU flows projected in the Zero Intra-EU Migration (ZIM) scenario and the Double Intra-EU migration scenario.

The last scenario used in the analysis explores what would happen if the EU sealed its borders (ZEM) and if investments into family-friendly policies resulted in increased fertility closer to desired fertility in the EU starting in 2020. ZEM+25% fertility scenario allows us to contrast the effect of immigration on long-term demographic outcomes against the effect of sustained higher fertility in the EU. Such comparisons explore the two commonly proposed paradigms for addressing potential population declines and population ageing: increased migration versus increased fertility. We label this scenario ZEM+25% fertility as we assume 25% higher fertility rates compared to the levels from the Medium scenario, resulting in overall EU TFR slightly above the replacement level by 2060.[17]

Table 4 shows an overview of migration assumptions in all scenarios. Fertility assumptions presented in Table 1 are the same in all scenarios except ZEM +25% fertility, which uses rates boosted by a factor of 1.25.

Table 4: Matrix with migration assumptions for intra-EU migration and extra-EU migration

Scenario	Immigration volume from outside EU-28	Education of immigrants from outside EU-28	Intra-EU migration volume
Medium scenario	Medium	Medium	Medium
Lv-He	Low	High	Medium
Hv-He	High	High	Medium
Hv-Le	High	High	Medium
Lv-Le	Low	Low	Medium
Zero Intra-EU Migration	Medium	Medium	Zero
Double Intra-EU Migration	Medium	Medium	Double
Zero Extra-EU Migration (ZEM)	Zero	Zero	Medium
ZEM+25% fertility	Zero	Zero	Medium

4. Translation of migration narratives into projection scenarios

4.1 Assumptions for extra-EU migration

The four storylines of extra-EU migration presented above were translated into numeric assumptions on volume and educational composition of the immigration flows following an associative process of identifying the closest possible empirical example of an existing

[17] Country-specific levels differ due to initial levels and Medium scenario assumptions reflecting country-specific trends. Projected TFRs in 2060 range between 1.88 in Romania to 2.48 in Finland.

migration system or migration policies that resemble the real-world situation and experiences of developed countries.

Numerical foundation of scenario 1 Low volume – High education (Lv-He) can be found in Japan in terms of volume and in the Canadian system in terms of educational selectivity. Japan has been selected as an example of an industrialised country with very restrictive immigration. We apply an average immigration rate of 0.235% per year derived from the 2010–2014 average[18] applied to the EU-28 (approximately 1.2 million every five years, which would mean immigration flows reduced to about 10% of the volume EU experienced during 2015–2019, according to EUROSTAT), and educational composition of immigrants arriving to Canada between 2011 and 2016. According to the Canadian 2016 census, 73% of immigrants in the age groups 25 to 44 had post-secondary education (seen in Table 5),[19] reflecting the established human capital point system of migration set up to attract young immigrants with high levels of education.

Table 5: Educational compositions of immigrants from outside the EU used in the projection scenarios

	e1–e4	e5	e6
Medium	39%	27%	34%
High	7%	20%	73%
Low	53%	35%	12%

In scenario 2 Low volume – Low education (Lv-Le) we use immigration rate as in Japan (scenario 1) and combine it with the educational composition of immigrants in Italy (taking recent stock of persons born outside the EU in the EU-LFS 2011–2016) seen in Table 5, an EU country that had the highest share of low-educated immigrants (52%) among the EU countries with available data.

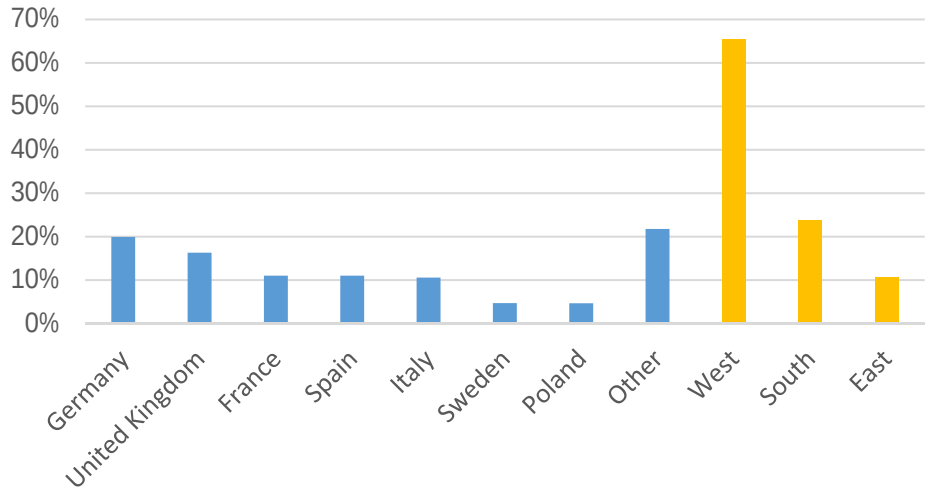
Scenario 3 High volume – High education (Hv-He) is based on the Canadian migration system applied to the EU. In terms of flows, such a situation would correspond to double volume of immigration into the EU compared to quinquennial equivalent of the EU's 2013–2016 inflows (Medium scenario). The educational composition of immigrants in this scenario takes from Canada (2011–2016).

Scenario 4 High volume – Low education (Hv-Le) covers a future of intensive immigration, predominantly made up of immigrants with low education. It uses again the low-educational composition of immigrants as in Italy (2011–2016) and combines it with double migration into the EU compared to quinquennial equivalent of 2013–2016 immigration flows.

[18] Taking inflows of foreign population to Japan in 2010–2014 as reported in International Migration Database (OECD) divided by total population of Japan in those years (OECD 2021).
[19] Canadian Census – Data tables: 2016 Census, immigration and ethnocultural diversity.

The assumption of medium migration volume for extra-EU immigration (used in the Medium, Zero Intra-EU, and Double Intra-EU migration scenarios) was derived as a quinquennial equivalent of 2013–2016 immigration flows of persons born outside the EU as reported by EUROSTAT.[20] This corresponds to 10 million for the whole EU-28 (extremely high flows for Germany 2015, Austria 2015, and Greece 2016 were replaced with average values for other years in order to correct for extremely high inflows that resulted from the refugee crisis). Figure 2 illustrates the distribution of this flow across the receiving countries. The same country distribution is used for the low and high immigration volume assumptions. Immigration flows by age were derived by applying the Rogers–Castro schedule (Rogers and Castro 1981).

Figure 2: Distribution of the modelled extra-EU immigrant flows across major receiving countries and macro-regions at each projection step 2015–2055



The assumptions for medium educational composition of extra-EU immigrants (used in Medium, Zero Intra-EU, and Double Intra-EU migration scenarios) was derived from the available 2011 census data. We use country-specific educational compositions of the stock of persons born outside the EU who arrived between 2000 and 2011. This country-specific educational composition is applied to the flow of immigrants at each projection step.

[20] Table migr_imm3ctb.

Emigration from the EU to the rest of the world is modelled in the same manner in all scenarios using country-specific emigration rates by age and sex derived from the EUROSTAT data for years 2013–2016, taking the average number of emigrants by sex multiplied by the proportion of emigrants leaving the EU,[21] divided by average population aged 20 to 34 during the same period. These rates were applied to the baseline, and this expected number of emigrants was then redistributed using the Rogers–Castro schedule (Rogers and Castro 1981). Age-specific rates were calculated using these expected numbers of emigrants by age to the baseline population by age and sex. An average emigration rate is applied to all education levels due to lack of empirical data, at all projection steps.

Table 6 summarises the resulting extra-EU immigration and emigration flows for the three macro-regions and all scenarios and selected periods.

Table 6: Projected extra-EU migration flows (in thousands) towards and from the macro-regions, by scenario and for selected periods

			Hv-He	Lv-He	Hv-Le	Lv-Le	Medium	Zero Intra-EU	Double Intra-EU
East	2015–2019	emigrants	638	638	638	638	638	638	638
		immigrants	2,159	130	2,159	130	1,079	1,079	1,079
	2035–2040	emigrants	528	449	528	449	486	516	461
		immigrants	2,159	130	2,159	130	1,079	1,079	1,079
	2055–2059	emigrants	496	353	494	353	420	462	392
		immigrants	2,159	130	2,159	130	1,079	1,079	1,079
South	2015–2019	emigrants	1,721	1,721	1,721	1,721	1,721	1,721	1,721
		immigrants	4,763	286	4,763	286	2,380	2,380	2,380
	2035–2039	emigrants	1,576	1,212	1,574	1,211	1,381	1,422	1,343
		immigrants	4,763	286	4,763	286	2,380	2,380	2,380
	2055–2059	emigrants	1,525	887	1,516	887	1,183	1,233	1,138
		immigrants	4,763	286	4,763	286	2,380	2,380	2,380
West	2015–2019	emigrants	3,771	3,771	3,771	3,771	3,771	3,771	3,771
		immigrants	13,079	785	13,079	785	6,535	6,535	6,535
	2035–2039	emigrants	4,280	3,281	4,265	3,280	3,744	3,653	3,823
		immigrants	13,079	785	13,079	785	6,535	6,535	6,535
	2055–2059	emigrants	4,769	2,949	4,712	2,946	3,784	3,658	3,879
		immigrants	13,079	785	13,079	785	6,535	6,535	6,535

Note: Country-specific values are provided in the supplementary materials.

[21] Tables migr_emi2 for emigrants by sex and migr_emi3nxt to estimate the share of emigrants leaving the EU which were not available by sex for all countries.

4.2 Intra-EU migration assumptions

For intra-EU migration we use a set of three basic, non-narrative (naïve) scenarios: Medium, Zero, and Double Intra-EU migration. The Medium scenario is based on recent trends of migration flows between the EU countries (2008–2016). These were estimated by applying the methodology for estimating and harmonising the migration flows between countries of the European Union developed in the Integrated Modelling of European Migration (IMEM) project (Raymer et al. 2013) on the EUROSTAT data by country of birth, age, and sex. The Bayesian methodology employed for this estimation was previously used to estimate the flows from 2002 to 2008 taking into account the various data collection systems, their accuracy, and the undercount or overcount of migration flows. IMEM calculations for 2002–2008 were extended to the period 2009–2016.[22]

More recent data capture the situation after the 2007–2009 economic crisis and for the new EU countries reflect the situation after the transitional restriction period on migration, at least for the later years of the period (with the exception of Croatia). We employ the exact same methodology, but update certain auxiliary data, for example the population size, gross national income, migrant stock, and trade flows between countries. The estimation was done in two steps: First, a measurement error model was used to estimate parameters of the data collection systems, and then a regression model estimated the flows after adjusting for the measurement error and harmonising the two reported flows. Using these numbers, we calculated destination-, age-, and sex-specific emigration rates for each EU member state. We assume average in and out rates for all educational levels. The rates in the Medium scenario are kept constant for the entire projection period. In the Zero Intra-EU Migration scenario, we assume no migration between countries, and in the Double Intra-EU Migration scenario the emigration rates are doubled and held constant during the whole projection period. With respect to the possible impacts of the COVID-19 pandemic on future migration trends it is too early to draw any conclusions. While during the period of the lockdown in 2020 there seems to be evidence that sizeable numbers of migrants returned to their home countries, it is still very uncertain what this implies for longer-term migration trends. In any case, the very wide range of alternative migration assumptions seems to cover very different possible future impacts of the pandemic on migration patterns.

[22] We would like to acknowledge Erofili Grapsa for preparing these estimates.

5. Demographic outcomes of alternative migration scenarios

5.1 Population size

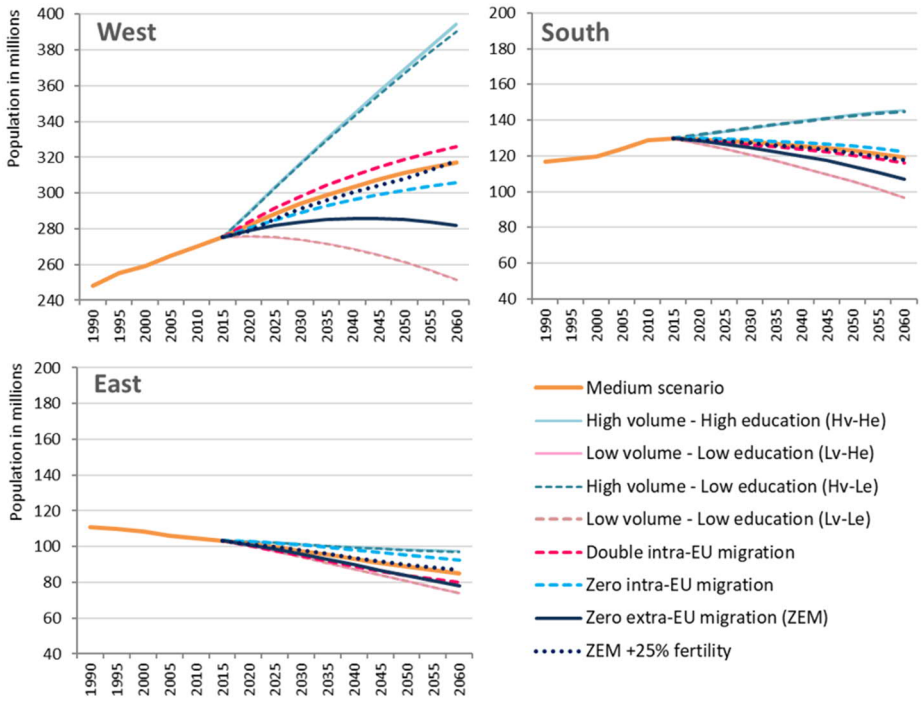
The EU-28 population has been steadily increasing from 475 million in 1990 to 508 million in 2018, with migration driving the 0.24% average annual increase. Population growth would continue under the assumptions of six out of the nine presented scenarios in this paper. The Medium scenario leads to a slightly increasing EU population to 521 million in 2060 (+2.5%). Doubled immigration of non-EU country nationals (Hv-He and Hv-Le scenarios) compared to the recent past trends would lead to rapid growth, a 25% higher EU population by 2060 (635 million) compared to 2015. In the case of Zero Extra-EU Migration (ZEM), the EU total population could expect about 8% decline to 466 million in 2060, back to the EU's population size in the 1980s. However, in the absence of extra-EU migration combined with a 25% increase in TFR to slightly above the replacement level, a 2.8% higher population of 522 million can be expected, very similar level to the Medium scenario.

These overall values conceal distinct demographic regimes and sharply contrasting demographic prospects between the west, south, and east EU macro-regions, as illustrated by Figure 3. The divide between west and south/east (presented in Figure 1) is a legacy of the diverging past demographic trends and their momentum. In the western MS below replacement, moderately low fertility combined with net migration gains overtake the potential natural decrease, driving population growth. This population growth is projected to continue in most western countries (Appendix Figure A-1) in all but the low-migration (Lv-Le and Lv-He) scenarios. The Medium scenario results in continued population growth with a projected population of 317 million by 2060, 15% larger compared to 2015 when it stood at 275 million. In the same period, the population of southern and eastern MS is projected to drop to 88% of its 2015 size (233 million in 2015 to 204 million in 2060).

A regime of sustained low fertility but sizeable immigration that reduces, and in some cases overtakes, population decreases due to negative natural change, is typical for contemporary southern Europe (Italy, Spain, see Appendix Figure A-1). Overall, population size in the southern EU most likely peaked between 2010 and 2015, following increased growth due to intensified immigration from outside the EU between 2000 and 2010, in particular to Spain and Italy. Only if immigration from outside the EU intensified again to similarly high levels in future (Hv-He and Hv-Le scenarios) would the south of Europe further grow its population. Both increased fertility (+25%) in the absence of extra-EU migration and doubled intra-EU migration would lead to smaller total population sizes in the southern EU MS.

Continuing population decreases seem certain in the eastern MS where only the degree differs across scenarios, ranging from 6% between 2015–2060 in high immigration scenarios (Hv-He and Hv-Le) to 24% in the theoretical Double Intra-EU Migration scenario. The past population declines emerged with the change of demographic regime in these countries after the fall of the Iron Curtain, when fertility fell and since then remained (with the exception of the Baltic states) at low levels, combined with sizeable emigration and low immigration. For instance, Latvia, Lithuania, and Bulgaria had lost between 26% to 16% of their 1991 population by 2017. Should intra-EU migration trends continue as in the recent past, the countries would lose a sizeable share of their 2015 population by 2060 (see Appendix Figure A-1).

Figure 3: Past and projected population in EU-28 macro-regions by scenario, 1990–2060



Sources: 1990–2015 EUROSTAT, 2020–2060 authors' calculations.

The volume of international migration clearly matters more for the projected population size than the educational composition of immigrants. In the population projections, lower-educated people are assumed to have somewhat higher fertility but also higher mortality. Therefore, adding more people with low education through migration will add to the number of births but also to the number of deaths. Evidently the second effect (more deaths) slightly outweighs the first effect for the given time horizon, and the net result is a slightly lower population size for the Hv-Le scenario as compared to the Hv-He.

In a situation of strictly limited extra-EU migration, we assume that intra-EU migration would continue due to pull factors in the economically more advanced MS, leading to the projected population declines in the south and east (ZEM scenario). Low-migration scenarios (Lv-Le and Lv-He) result in the sharpest population declines in all EU macro-regions because emigration according to our assumptions surpasses immigration.

This leads to questioning what would happen if intra-EU migration reduced to near zero, for example, with fast economic convergence among EU countries, represented by the Zero Intra-EU Migration scenario. This assumption reduces population decreases in eastern MS from 18% in the Medium scenario to 10% by 2060 (compared to the 2015 population). The effect is smaller in southern Europe, with 8% versus 6% loss by 2060 in the two scenarios. As expected, intra-EU migration further expands the western MS population size – doubled intra-EU migration rates would result in 3% higher population in 2060 compared to the Medium scenario. Whereas, stopped intra-EU migration (but persisting extra-EU migration) would reduce the projected 2060 population in the western MS by 4%.

Policies supporting families and stimulating higher fertility are often juxtaposed to increased immigration as contrasting policy paths for mitigating adverse effects of population decline or ageing. Figure 3 shows that if TFR increased by 25% (ZEM+25% fertility scenario) in the absence of extra-EU migration (but with continued intra-EU migration), the resulting population size in all macro-regions would remain very similar to the Medium scenario. Thus, successfully boosting fertility by 25% to above replacement level in the west and to about two children per woman in the south and east leads to sustained population growth in the west and relative stability in the south and east even in absence of extra-EU migration.

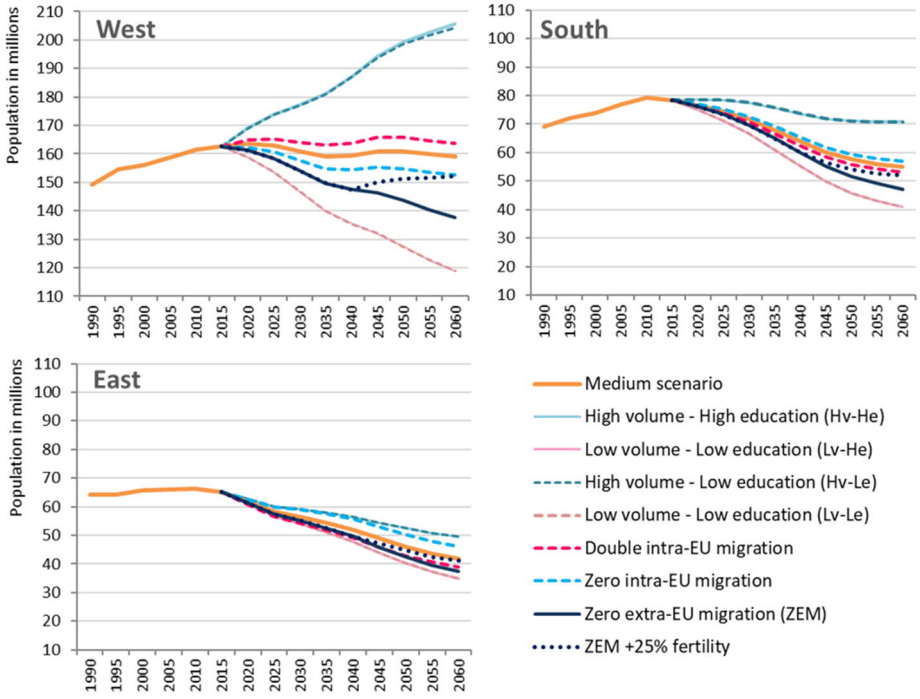
5.2 Did working-age population peak in the EU?

Mildly increased fertility boosts total population size; however, it would not prevent drops in the total working-age population (age 20 to 64) in any macro-region over the time horizon considered (Figure 4). Again, we see diverging past and projected trends in the size of the potential labour force between the regions. While working-age population most likely peaked in southern and eastern MS around the year 2010, it may not be the case in the western EU where the Medium scenario projects a rather stable working-age population, peaking between 2020–2025 at 164 million and oscillating around 160 million through 2060. In the southern EU, the Medium scenario results in 30% smaller working-age population by 2060 compared to 2015. In the eastern MS, partially due to the migration to western MS, the drop would be even more pronounced with a 36% smaller working-age population in 2060 compared to 2015.

In the west, Zero Extra-EU Migration (ZEM) would result in a smaller working-age population,[23] 138 million by 2060. This is the equivalent to 30 million fewer workers during the projection period than if both intra-EU and extra-EU migration continued as in recent past (Medium scenario). The 25% rise in fertility from 2020 onwards would result in lesser decline than in the ZEM scenario, but the benefits of increased fertility on the working-age population are most visible in the long run. In the 25% higher fertility scenario, the working-age population would drop to a minimum of 147 million in 2040 and would subsequently increase to 152 million by 2060. As expected, Doubled Intra-EU Migration would benefit western MS but adds in the long run only fewer than 5 million potential workers by 2060 to the region compared to the number projected with current levels of intra-EU migration.

[23] Working-age population (20 to 64) shrinks in ZIM scenario in all EU countries with the exception of Luxembourg (see Appendix Table A-2).

Figure 4: Past and projected working-age population (20 to 64) in EU macro-regions and by scenario, 1990–2060



Sources: 1990–2015 EUROSTAT, 2020–2060 authors' calculations.

Zero Extra-EU Migration (ZEM) has a less significant impact on working-age population in eastern MS (10% smaller in 2060 compared to Medium scenario) than in southern and western (14% smaller than in the Medium scenario). Country-specific results show that the impact of ZEM is smaller in eastern member states with fewer non-EU immigrants compared to southern member states (mainly Italy and Spain, see Appendix Figure A-2). In countries with net migration losses to outside the EU (such as Greece), ZEM scenario results in smaller decline and larger working-age population compared to the Medium scenario.

For eastern MS, the Double Intra-EU Migration scenario decreases the projected working-age population in 2060 by 7% compared to the Medium scenario and the Zero Intra-EU Migration scenario returns a nearly 10% larger working-age population in 2060 compared to the projected value in the Medium scenario. The impact of Zero Intra-EU

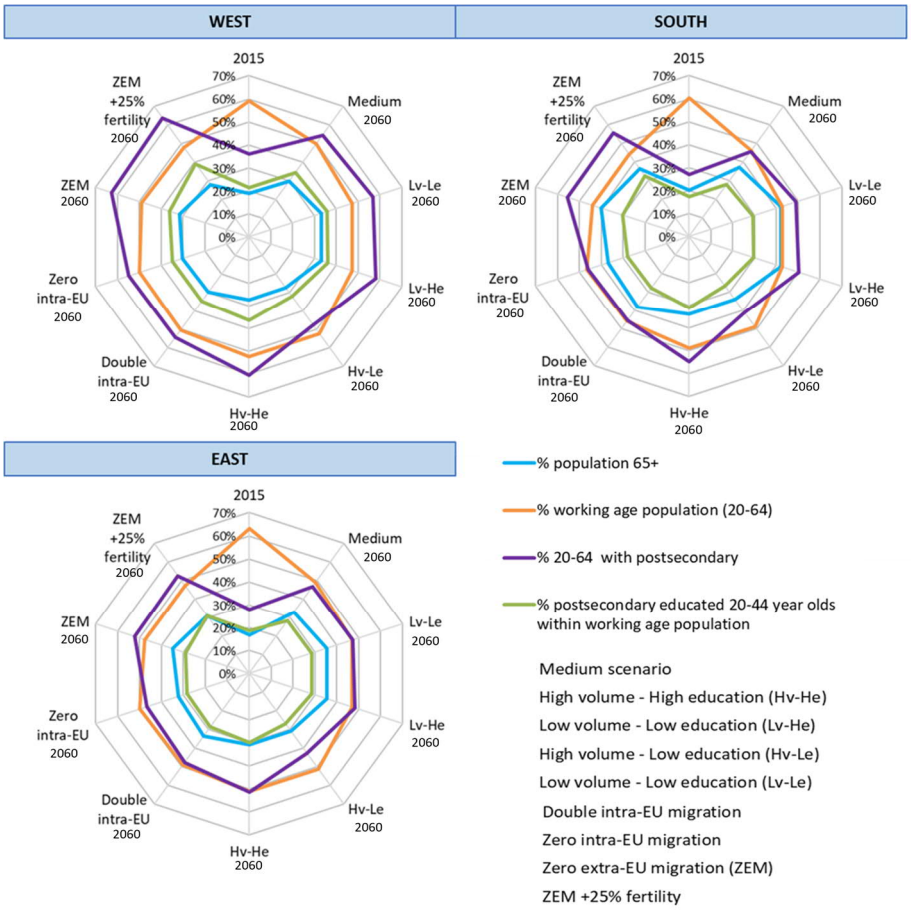
Migration is less pronounced in the southern EU, with a 4% reduction in 2060, while there is a 4% larger potential workforce in the Double Intra-EU Migration scenario compared to the Medium. Naturally, both high migration variants (Hv-He and Hv-Le) show the largest working-age population size.

5.3 Smaller but better-educated working-age population

While projected population dynamics will result in a smaller potential workforce (Figure 4), increases in educational attainment can potentially offset some of the feared adverse effects of smaller working-age population. Educational attainment is positively associated with labour force participation and productivity (Marois, Bélanger, and Lutz 2020; Loichinger and Fürnkranz-Prskawetz 2017; Loichinger 2015; Stonawski 2009). Continued educational expansion and cohort replacement will result in a better-educated working-age population in the EU in 2060. Figure 5 shows selected indicators of population and working-age population composition for the three EU macro-regions in all scenarios. The southern EU may find itself in the least favourable situation due to the highest share of population 65 and over and reciprocally the least favourable composition of the working-age population. In 2015, 36% of the working-age population in the west had post-secondary education[24] compared to south (27%) and east (28%). This difference is projected to persist under current trends with the Medium scenario projecting 55% of the working-age population in western MS, 47% in eastern MS, and 46% in southern MS holding a post-secondary degree by 2060.

[24] Completed university (bachelor, master, or higher) or non-university degree. Post-secondary category covers ISCED 2011 levels 4 to 8.

Figure 5: Population composition in macro-regions in 2015 and projected 2060 by scenario



Sources: 1990–2015 EUROSTAT, 2020–2060 authors' calculations.

Western MS, under the Medium scenario, and in fact in most other scenarios, find themselves in a more advantageous situation when the stable working-age population is coupled with a highly educated population composition and slower pace of ageing than in other macro-regions. The share of young (20 to 44 years) and highly educated working-age population within the overall working-age population may best capture the simultaneous trends of ageing of the workforce and educational expansion. The share of

the highly educated young working-age population within the overall population ages 20 to 64 has been increasing and is projected to increase further: in the west to 35% in 2060 according to Medium scenario, up from 22% in 2015 and 16% in 1990.[25] In the east and south an increase to 28% is projected, coming from lower levels. Only 17% of the working-age population in southern Europe was young and had post-secondary education in 2015 (a mere 9% in 1990), compared to 19% in eastern MS in 2015. What education composition would be most advantageous is difficult to foresee as future labour demands depend on a large number of factors and often contradicting tendencies. However, a highly educated workforce is potentially more adaptable to the upcoming changes in nature of work due to upcoming technological progress related to robotisation and advances in artificial intelligence (e.g., Craglia et al. 2018).

Selective migration policies can alter the size and, to a smaller extent, the relative share and educational composition of the working-age population by stimulating migration of either low-skilled or high-skilled workers. The impact of immigration sizes and compositions is the most pronounced in southern MS. A doubling of international migration, but with higher selectivity of immigrants (Hv-He), such as in Canada (72% of highly educated among 25- to 44-year-olds) would add 16 million to the working-age population compared to the Medium scenario, and the share of highly educated 20- to 44-year-olds within the potential workforce would be 31% in 2060, only 3 percentage points (pp) higher than in the Medium scenario. High immigration flows with a low-educational profile (53% holding less than completed upper secondary education and only 12% post-secondary educated, as flows in Italy in the recent decades, Hv-Le) would result in similarly large working-age population, with 41% of post-secondary educated in 2060 – 5pp less than in Medium scenario. In this scenario the share of highly educated 20- to 44-year-olds would be the lowest of all the scenarios – only 26%. The impact on the highly educated population is the same, but at a lesser magnitude in the eastern EU compared to the west, as can be seen from Figure 5. Which of these situations would be more adaptable and advantageous in the future depends on the future labour market demands and structure of economies in individual MS.

Considering only the age selectivity of intra-EU migration, whether it doubled or ended, would make at most 1pp of difference to the educational composition of the working-age population in any macro-region by 2060. However, recent data find evidence for increased emigration rates of highly educated (D'Aiglepierre et al. 2019). This particularly holds for emigrants from the eastern EU and southern EU MS, with the exception of Spain (ibid). In the case of selective emigration, not modelled in these results, one would see more pronounced effects of intra-EU migration on educational composition of the potential workforce.

[25] 1990 values are taken from the Wittgenstein Centre Human Capital Data Explorer Version 2.0(beta), available at http://www.wittgensteincentre.org/dataexplorer.

Increased or stopped intra-EU migration does not alter the projected share of population 65 and over in the predominantly receiving western countries. In the predominantly sending eastern and southern countries the Zero Intra-EU Migration scenario would reduce the projected share of ages 65 and over from 36% to 35% in 2060 – a rather small effect. Increased fertility could reduce the share to 34% (ZEM+25% fertility) and increase extra-EU migration to 33% (Hv-He, Hv-Le), all indicating that the momentum of population ageing is essentially unchangeable. Despite pronounced variations in the scenarios explored, there is no meaningful prospect of changing the course of ageing. Country-specific results are shown in Appendix Figure A-3.

The most favourable educational composition and the highest share of highly educated 20- to 44-year-olds within the workforce results from the no international migration scenario (ZEM) and its variant with 25% higher fertility (ZEM+25% fertility). This is true in the long run with the fertility effect starting to influence the working-age population beginning in 2040, when the children start entering working age. In the western EU, ZEM+25% fertility increases the share of highly educated 20- to 44-year-olds within the working-age population to 39% by 2060 as compared to 35% in Medium scenario (i.e., adds 4pp). In the southern EU this variant adds 4pp and in the eastern EU 3pp.

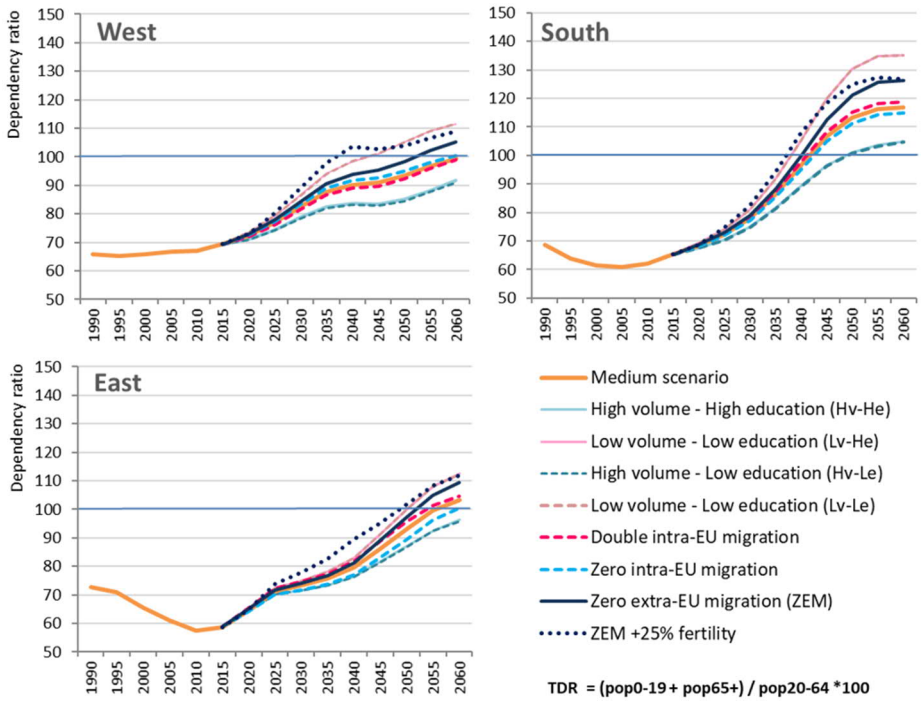
5.4 Population ageing and age dependency

Currently, the eastern EU has a younger population composition than the rest of the EU. In 2015 the share of the working-age population was highest in the east (63%), compared to the south (60%) and west (59%), while the opposite was the case for the share of population aged 65 and over (17% versus 20% versus 19%) (Figure 5). Population ageing will progress in all EU macro-regions but at different speeds, with eastern MS ageing fastest, surpassing the western MS in terms of population aged 65 and over by 2060. Under the Medium scenario, the eastern EU's share of population aged 65 and over nearly doubles to 33% by 2060. In southern Europe the pace of ageing will be slightly slower (85% increase in population 65 and over by 2060), but the projected share of 37% is still higher than in the east (33%) or west (30%). All scenarios show that population ageing is unavoidable and the share of population 65 and over is bound to increase in all macro-regions. High immigration, or increased fertility in the absence of extra-EU migration, can reduce this significant expected increase by at most 3pp.

Although sustained higher fertility decreases the share of population 65 and over, it leads to a higher overall total age dependency ratio (TADR) than the Medium scenario by 2060 (Figure 6) and increases the size and share of the working-age population only the long run (Figures 4 and 5). This is a particularly valid finding for southern MS, which

will face higher age dependency than western or eastern MS. For southern MS, the TADRs exceed 100 in all scenarios after the year 2050, including two scenarios with doubled extra-EU migration (Hv-He and Hv-Le). In the west, TADR exceeds 100 dependents per 100 working-age population only in the Zero Extra-EU Migration (ZEM) scenario and in the low-migration scenarios (Lv-Le and Lv-He) because of a negative net migration balance when keeping current emigration rates constant. Past data show that only in the coming decade will eastern and southern European countries see higher TADRs than in 1990. As expected, a scenario of zero intra-EU migration worsens TADR in the west but improves TADR in the east all else equal, and the inverse is true for a scenario of double intra-EU migration.

Figure 6: Past and projected total age dependency ratios by EU-28 macro-regions, 1990–2060



Sources: 1990–2015 EUROSTAT, 2020–2060 authors' calculations.

The results point to the fact that neither increased fertility nor increased migration are viable means to slow down population ageing and age dependency. Policy options that would aim at accommodating rather than at affecting demographic trends can focus on improving economic activity and productivity (Rees at al. 2012; Loichinger and Prskawetz 2017; Marois, Bélanger, and Lutz 2020). We showed that the future working-age population will have higher human capital, and it is important to emphasise that the same holds for 65 and over population. According to the Medium scenario, 45% of population 65 and over will be highly educated in 2060 in the western EU (19% in 2015), 39% in the east (16% in 2015), and 35% in the south (9% in 2015). Higher educational attainment is associated with better health (Raghupathi and Raghupathi 2020), a foundation for extending working lives among the future 65 and over population. This can be encouraged by policies that set floating retirement ages and promote gradual transition to retirement and the sustainability of social systems including pensions. Cohort replacement may also play an important role in halting the deterioration in the balance between workers and non-workers, as younger cohorts of women tend to have higher labour force activity rates.

6. Conclusions

The EU's macro-regions (west, south, and east) will have distinct demographic futures in the decades ahead. While the west is positioned for continued population growth and stabilised total working-age population, it nevertheless will not escape population ageing and rises in age dependency as in the south and east of Europe. The projections covered in this paper explore the extent to which future migration scenarios (both of internal EU migration and inflows from outside the EU) can or cannot influence various demographic indicators in the EU.

Contrasting scenarios for extra-EU migration, inspired by some of the existing approaches to migration management in terms of the size and human capital of immigrants, lead to substantial differences in total population size for the EU as a whole in only a few decades. Taking a high-volume approach, doubling the inflows of recent years to be among the world's highest rates, would result in about 630 million people living in the EU by 2060, adding over 100 million more than today. By contrast, with a low-volume approach roughly based on Japan, the EU would return to its population levels of the 1980s over the next 30 years. When considering relative measures of population heterogeneity such as age structure, however, the influence of migration is far more modest. Irrespective of which migration scenario, the results presented above illustrate that declines in potential labour force and population ageing are clearly unavoidable in all macro-regions. Importantly, the focus of interventions should not be

to change largely unmovable age compositions or to boost the total labour force size as such policies would have short-term effects and would not significantly alter the pace of population ageing in the long run. Successful adaptations to the challenges of an ageing society depend on policies that foster and encourage labour participation and productivity (Rees et al. 2012; Lutz et al. 2019; Marois, Bélanger, and Lutz 2020).

The south of the EU stands out as the region with the greatest challenges ahead due to notably high age dependency compared to both the east and west. Prospects of the south adapting to ageing are further complicated by its comparatively low average education levels, although younger cohorts are much more educated than their country averages. The EU as a whole is expected to be better educated in the decades ahead, a positive indicator for overall productivity and adaptability amid population ageing, but different demographic scenarios can exacerbate regional disparities.

In spite of the examples of depopulation occurring in some eastern MS, the region is and should remain younger than the south, and only on par with the west in terms of age dependency by about 2050. In the presented scenarios, the pace of ageing in eastern MS will be quicker, and the share of their population 65 and over would exceed the projected values for the western EU in the Medium scenario for the decades after 2040. Doubled intra-EU migration would increase the share by 1pp, with the east and west on par slightly earlier, by 2040. Considering solely the age selectivity of EU migration, whether doubled or ended, would make at most 1pp of difference to the educational composition of the working-age population in any macro-region by 2060. Evidence indicates, however, that intra-EU migration also disproportionately select for high education and therefore is likely to redistribute human capital from the south and east to a greater extent than is modelled in this paper due to lack of migration data by level of education.

The response of many eastern European countries to reductions in size and older population structures is to introduce family-friendly policies in the hope that this would help to increase fertility, an approach which if successful is most relevant for combating age dependency in the long term. However, in a situation of continued high-volume migration towards the western MS, such investments in family support as well as investments in human capital more broadly will still in effect 'demographically subsidise' the MS that have not borne the related cost in education, family support, and other social services. In the spirit of EU cohesion policy, MS can work to moderate the consequential pull factors in the more advanced MS by closing educational gaps and meeting domestic demand for critical professions. Similarly, the push factors can be better addressed in the sending MS by continuing to improve wages, structuring education to better coordinate with local economic opportunities, and strengthening governance and public services. Besides generally improving quality of life, these reforms would help the sending MS to

attract human and financial capital from their diasporas, stimulate return migration, and further decouple the necessity to uproot from achieving satisfying lives.

Within the EU, both the east and south deal with consistent losses of their relatively young, educated citizens to western MS. Pull factors in the advanced EU economies are unlikely to cease with pressure for workers from the EU's less developed members. Currently none of the eastern MS have reached income levels of the western MS.[26] Moreover, the International Monetary Fund (Batog et al. 2019) estimates that the pace of economic convergence may slow down by 2050. If EU migration continues at the recent level, more economically affluent MS could be significantly benefiting from transfers of younger workers at the expense of the worsening demographic situation in the sending – predominantly eastern and southern EU countries. Such developments can contribute to increased vulnerability and lower capacity of the sending MS to deal with the challenges of population ageing and decreasing potential labour force. According to the IMF, in the absence of rapid population ageing, eastern countries could reach 74% of western income levels by 2050 instead of the estimated 60% under current conditions (Batog et al. 2019). Conversely, for the western countries, positive demographic consequences from continued EU migration at the intensity of the recent past would benefit the age and educational composition of their working-age populations.

7. Acknowledgements

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[26] IMF estimates that per capita income in eastern Europe (including non-EU countries) would increase from current 52% of western level to 60% in 2060, with most economically advanced eastern MS (Estonia, Slovenia) nearing 95% of the western levels, but the economically weaker and rapidly ageing Romania and Bulgaria could remain below 60% of the western average (Batog et al. 2019).

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Appendix: Country-specific results from selected scenarios

Figure A-1: Relative change in projected population size 2060/2015 by scenario (1 indicates population in 2015 = population in 2060)

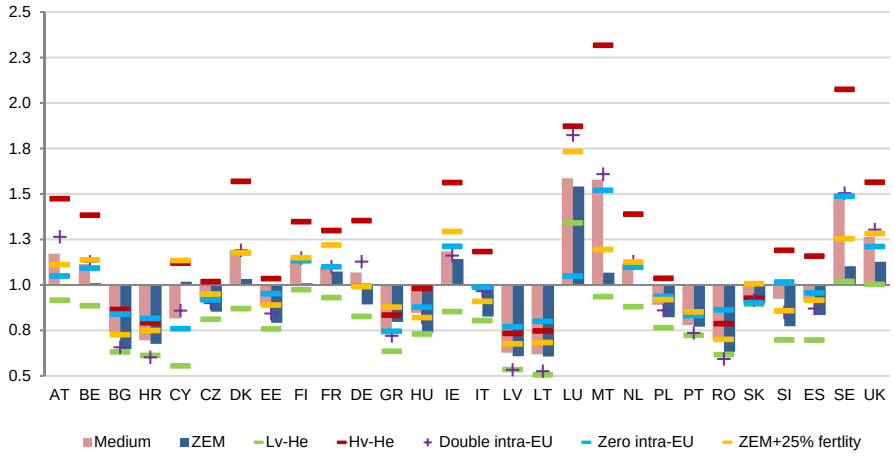


Figure A-2: Relative change in projected working-age population (20 to 64) 2060/2015 by scenario (1 indicates population in 2015 = population in 2060)

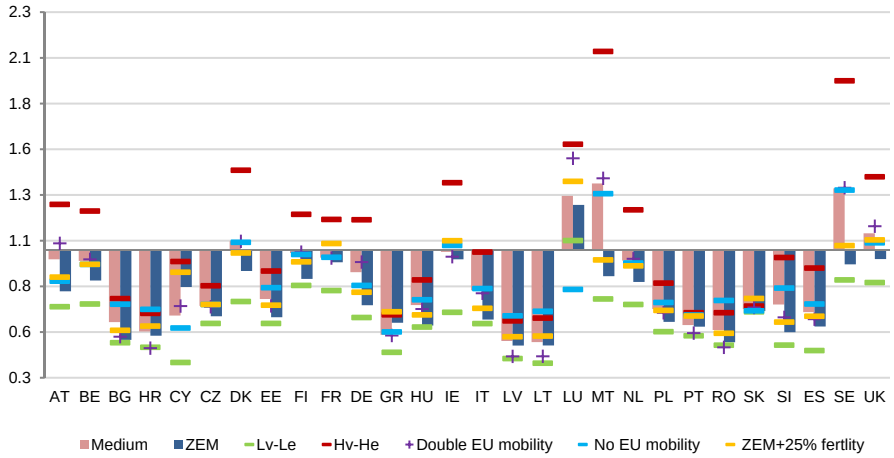
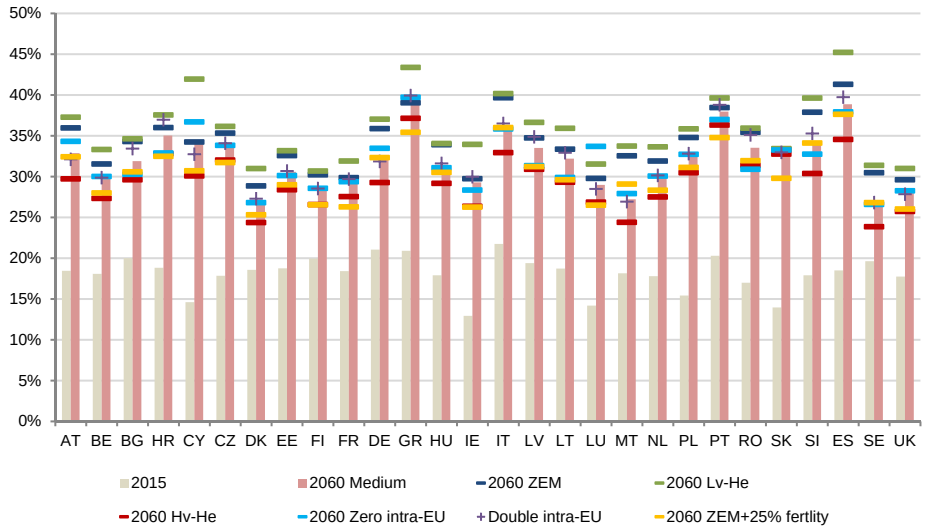


Figure A-3: Share of population age 65 and over in 2015 (green bar) and projected in 2060 in Medium scenario (pink bar) and selected other scenarios



Source: Lutz et al. 2019