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The 2021 Ageing Report

Underlying Assumptions & Projection Methodologies

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This report has been prepared as part of the mandate the Economic and Financial Affairs (ECOFIN) Council gave to the Economic Policy Committee (EPC) in 2018 to update and further deepen its common exercise of age-related expenditure projections, on the basis of a new population projection by Eurostat.

The forthcoming 2021 Ageing Report analyses the long-term projections of the budgetary impact of demographic ageing in the European Union in the period 2019–2070. It will be calculated on the basis of the macroeconomic assumptions and methodologies described in this report. The 2021 vintage will be the sixth edition of the Ageing Report and is envisaged to be presented to the ECOFIN Council in spring 2021.

In response to the mandate, the EPC mandated a working group, the Ageing Working Group (AWG) under the chairmanship of Godwin Mifsud, to take forward the work needed to discharge this remit.

This report is presented by the EPC and the European Commission (Directorate-General for Economic and Financial Affairs - DG ECFIN) after full discussion on the basis of the AWG's comprehensive work. DG ECFIN provided the necessary analysis and calculations underpinning the report. Eurostat prepared the demographic projections.

The report was prepared under the supervision of Lucio Pench (Director in DG ECFIN), Wolfgang Merz (Chair of the EPC), Godwin Mifsud (Chair of the AWG), Giuseppe Carone (Head of Unit in DG ECFIN). The main contributors were Pedro Arevalo, Santiago Calvo Ramos, Ben Deboeck, Per Eckefeldt, Nicola Gagliardi, Boriana Goranova, Fabrice Orlandi, Anda Patarau and the members of the AWG (see list of Members below). The EPC and DG ECFIN would like to thank all those concerned.

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1. 2021 AGEING REPORT: MANDATE AND GENERAL PRINCIPLES

With a view to ensuring the sustainability of public finances in the EU, the ECOFIN Council charged the Economic Policy Committee (EPC) with producing a new set of long-term budgetary projections by 2021, on the basis of new population projections to be provided by Eurostat. Safeguarding the sustainability of public finances requires that the analysis is based on reliable, comparable information on possible challenges to fiscal sustainability, including strains caused by future demographic changes, in particular population ageing.

The EPC and the Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN) subsequently developed a work programme with arrangements for the budgetary projections and the preparation of the underlying assumptions and methodologies (see Graph 1 for details).

This report sets out the macroeconomic assumptions and methodologies to be used for the age-related expenditure projections for all Member States. These will form the basis for calculating projected expenditure on pensions, healthcare, long-term care and education in the sixth *Ageing Report*, to be presented to the ECOFIN Council in spring 2021.

The long-term projections show where (in which countries), when (2019-2070) and to what extent ageing pressures will accelerate as the baby boom generation retires and life expectancy in the EU continues to increase. They are thus helpful in highlighting the immediate and future policy challenges that governments face as a result of demographic trends. The report provides a very rich set of comparable information, including alternative assumptions (sensitivity scenarios), at country level. Comparable and reliable underlying assumptions are crucial, since the projections cover a long time span (until 2070).

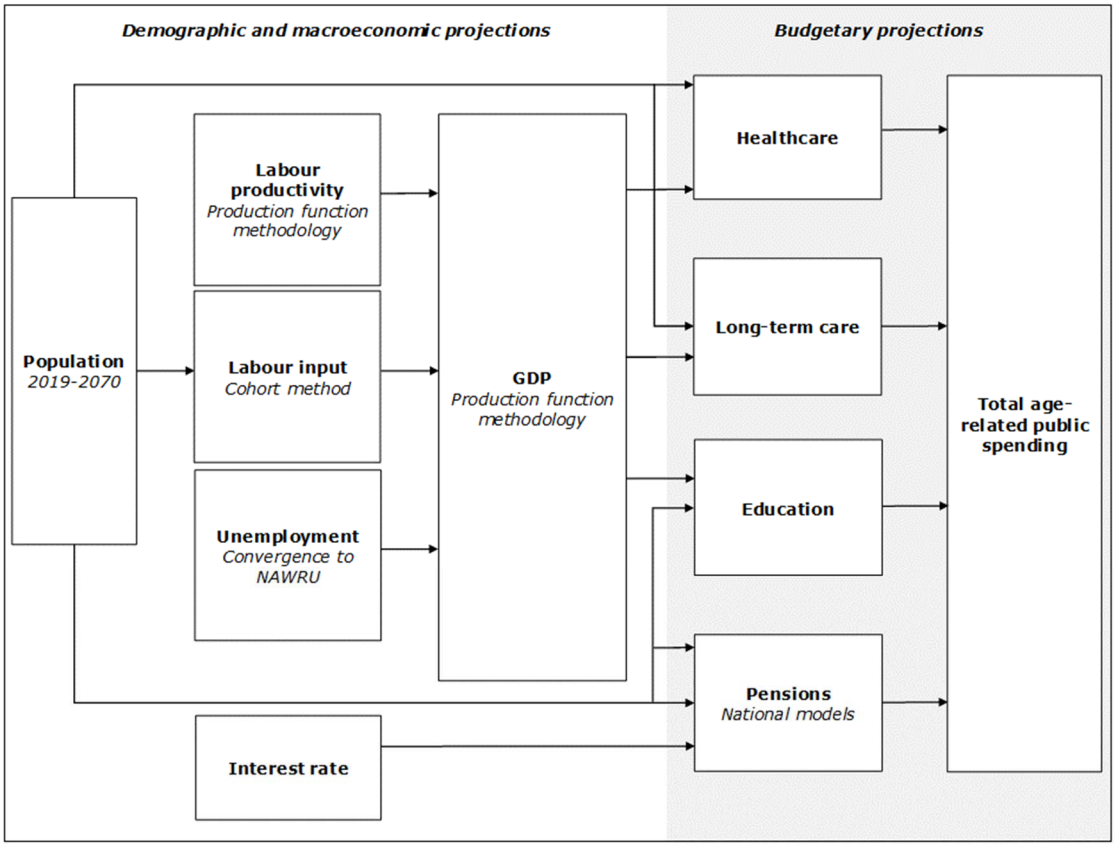
The Ageing Report projections feed into a range of policy debates and processes at EU level. In particular, they are used in the coordination of economic policies (the European Semester, multilateral budgetary surveillance and the assessment of public finance sustainability) to identify relevant policy challenges and options ([1]). In addition, the projections assist the analysis of the impact of population ageing, including on the labour market and potential economic growth.

Coverage and overview of the 2021 long-term projection exercise

The long-term projections take Eurostat's 2019-2070 population projections as a starting point. In addition, on the basis of proposals from DG ECFIN and the EPC's Ageing Working Group (EPC-AWG), the EPC agreed common assumptions and methodologies for all Member States to project a set of exogenous macroeconomic variables covering labour force (participation, employment and unemployment), labour productivity and interest rates (see Graph 1). The combined set of projections make it possible to calculate GDP figures for all Member States up to 2070.

([1]) They will also feed into the Recovery and Resilience Facility, which is rooted in the EU's aim of achieving competitive sustainability and cohesion through a new growth strategy, the European Green Deal.

Graph 1: **Overview of the 2021 projection exercise**



Source: European Commission, EPC.

On the basis of the assumptions presented in this report, budgetary projections will be made for four government expenditure items: pensions, healthcare, long-term care and education. Using national models, Member States will make projections for pensions in a peer-reviewed process overseen by the EPC-AWG. The projections will capture country-specific circumstances (e.g. different pension legislation), while ensuring consistency by using the common agreed macroeconomic assumptions. The healthcare, long-term care and education projections will be prepared by DG ECFIN in collaboration with the EPC-AWG, on the basis of a common projection model for each expenditure item. The results of all these projections provide an overall projection of age-related public expenditure (see Graph 1).

The long-term projections are not forecasts. Projecting economic developments over the next half century is a daunting analytical task, subject to considerable uncertainty. The projections are made under a 'no policy change' assumption. They do not aim to predict the future but to illustrate what the future could hold if current policies remain unchanged. As the results are strongly influenced by the underlying assumptions, a set of tests are carried out to gauge the extent of this sensitivity.

This report is structured in two parts. The first part describes the underlying assumptions (as regards population, labour force, potential GDP and other macroeconomic factors) and the sensitivity tests. The second part presents the methodologies for projecting future expenditure on pensions, healthcare, long-term care and education. A statistical annex gives an overview of the main assumptions and macroeconomic projections by country.

2. MAIN RESULTS: THE ECONOMIC IMPACT OF POPULATION AGEING

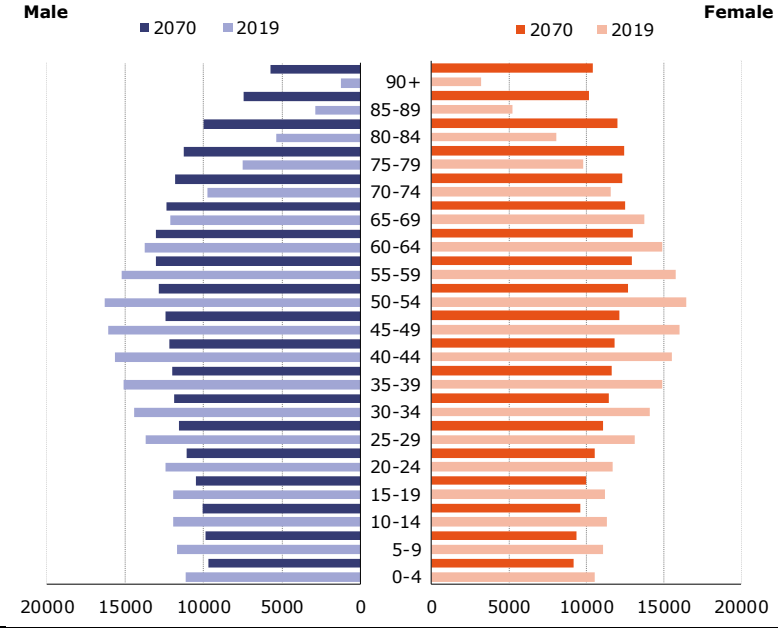
The EU population is projected to fall over the long term

The total population of the EU is projected to decline over the long term and the age structure will change significantly in the coming decades (see Graph 2). According to Eurostat, the overall population is projected to shrink by 5% between 2019 (447 million) and 2070 (424 million) (see Table 1). However, there are wide differences in national population trends, with increases in 11 Member States and falls in the others.

The old-age dependency ratio is set to continue to rise sharply over the coming decades

The EU's demographic old-age dependency ratio (i.e. the ratio between people aged 65 years and over and those aged 20-64) is projected to increase significantly in the coming decades. From about 29% in 2010, it had risen to 34% in 2019 and is projected to rise further, to 59% in 2070, i.e. a shift from less than four working-age people for every person aged 65 years and over in 2010 to below two in 2070.

Graph 2: **EU – Population by age groups and gender, 2019 and 2070 (thousands)**



Source: European Commission, EPC.

Projected changes in the size and age profile of the population are determined by assumptions regarding fertility rates, mortality rates and migration (see Table 2):

- The total **fertility** rate (TFR) is projected to rise from 1.52 in 2019 to 1.65 by 2070 for the EU as a whole, with an increase of similar magnitude projected for the euro area (see Table 2). This follows from an assumed process of convergence across Member States to the country with the highest fertility rate over the very long term.

- **Life expectancy** at birth for males is expected to increase by 7.4 years over the projection period, from 78.7 in 2019 to 86.1 in 2070 in the EU. For females, it is projected to increase by 6.1 years, from 84.2 in 2019 to 90.3 in 2070, implying continued convergence between males and females. The biggest increases, for both males and females, are projected for the Member States with the lowest life expectancies in 2019.

- For the EU as a whole, it is assumed that annual net **migration** inflows will fall gradually over the very long term; they are projected to decrease from about 1.3 million people in 2019 to about 1 million in 2070 (0.2% of the EU population) ([2]). However, there are large differences between Member States.

Labour force participation is projected to increase, in particular among older workers on account of implemented pension reforms

The labour force projections are made using a cohort simulation model, capturing the specific situation in each country and assuming no further policy changes beyond already-legislated pension reforms. They expect an increase in labour force participation rates, especially among older workers, reflecting the combined effect of the estimated impact of pension reforms and rising participation by younger women.

Total labour force participation (for the 20-64 age group) in the EU is projected to increase by about 3 pps (from more than 78% in 2019 to close to 81% in 2070) and similar developments are projected for the euro area (see Table 3).

The biggest increase in participation rates is projected for older workers (55-64 age group): almost 10 pps. As this is the result of increases of 13 pps for women and only 6 pps for men, the participation gender gap is projected to narrow substantially in the period to 2070.

However, labour supply is still set to decline

Still, given the projected shrinkage of the prime-age population (25-54 age group) in many countries, total labour supply in the EU is projected to decrease over the projection horizon, by an average of 0.3% a year, corresponding to a reduction of 16% (32 million people) in the period to 2070. Male labour supply is projected to fall by 17% (around 19 million) and female labour supply by 14% (almost 13 million). In the euro area, total labour supply is projected to fall between 2019 and 2070 by 13%, equivalent to 20 million people.

Further rises in employment rates projected, although the number of employed is declining

Employment rate projections are determined on the basis of the population projections, assumed participation and unemployment rates. Unemployment is projected to decline slightly in the EU (from 6.8% in 2019 to 5.8% in 2070), under the general assumption that the rate will converge to estimated 'NAWRUs' ([3]). Euro area unemployment is assumed to fall from 7.7% in 2019 to 6% in 2070.

The total employment rate (among people aged 20-64) in the EU is projected to increase from 73.1% in 2019 to 76.2% in 2070. In the euro area, a somewhat bigger increase is expected. Employment among women is projected to rise by 5.1 pps (from 67.2% to 72.3%), compared to 1.1 pps for men. The rate for older workers (aged 55-64) is expected to rise by almost 10 pps (from 59.1% to 68.7%), reflecting the expected impact of pension reforms in many Member States that are aimed at raising people's effective retirement age.

The EU's effective economic old-age dependency ratio (inactive persons aged 65 years and over relative to the number of employed 20-64 year-olds) is projected to rise significantly, from 45% in 2019 to 72% in 2070. This reflects how the growth in the number of older people is not offset by higher employment considering that the higher employment rate combines with a declining working-age population. In the

([2]) The immigration and emigration projections, which combine into net migration, rest on a number of technical assumptions, e.g. total non-EU immigration is assumed constant as of 2024 for the EU as a whole. For more information, see Box I.1.1 in Chapter 1.

([3]) NAWRU stands for 'non-accelerating wage rate of unemployment'. For countries with a high estimated NAWRU, it is assumed that structural unemployment will fall further to reach the EU median.

euro area, a similar deterioration is projected (from 46% to 71%). The total economic dependency ratio (total inactive population versus employment) is also projected to rise further, from 119% in 2019 to 141% in 2070, with a similar change for the euro area.

Stable potential GDP growth projected over the long term

Average annual potential GDP growth of 1.3% in 2019-2070 is projected for the EU as a whole under the baseline scenario (see Table 4). Growth will average 1.2% up to 2030, rise slightly to 1.3% in the 2030s and further to 1.4% in the 2040s, where it is expected to remain through to 2070. The projections for the euro area follow a similar (though slightly lower) trajectory, with annual growth of 1% up to 2030, 1.2% in 2031-2040 and 1.4% in 2041-2070. Overall, the average euro area growth rate in 2019-2070 is projected at 1.3%.

As labour growth turns negative in the 2020s, only labour productivity is expected to drive GDP growth over the long term

The contribution of labour input (total hours worked) to potential growth in the EU and the euro area is projected to be negative from the early 2020s onwards. Demographic developments result in a decline of the working-age population and by extension a negative contribution of labour input to potential growth for most EU Member States.

As a result, potential GDP growth projections are driven almost entirely by labour productivity. Annual growth in productivity per hour worked is projected to increase from less than 1% to 1.5% by the 2030s and to remain fairly stable at around 1.6% throughout the remaining projection period. As a result, average annual productivity growth equals 1.6% in 2019-2070. A similar trajectory is envisaged in the euro area, though with average productivity growth of only 1.4% (see Table 4).

A risk scenario takes on board the downward trend in TFP growth

The projected increase in labour productivity rests on the assumption that TFP growth in all Member States will converge to 1% by 2070 at the latest. It is assumed that those with relatively high *per capita* GDP will converge by 2045, while those with *per capita* GDP below the EU average will go through a period of economic catching-up, with higher TFP growth of up to 1.5% until 2045.

Given the downward trend in TFP growth in recent decades, it is important to assess the impact on age-related expenditure and fiscal sustainability. To this end, a 'TFP risk scenario' was run, which entailed convergence to a lower assumed TFP growth rate of 0.8% (while still allowing for catching-up by countries with below-average *per capita* GDP). In that scenario, average annual potential GDP growth in 2019-2070 is projected at 1.1% for the EU and the euro area, compared to 1.3% in the baseline scenario.

The fallout from the COVID-19 crisis presents considerable risks to the future GDP growth outlook

The COVID-19 pandemic and the containment measures it has necessitated have profoundly disrupted people's lives and the economy at large. Global demand, supply chains, labour markets, industrial output, commodity prices, foreign trade and capital flows have all been affected. Given the severity of this unprecedented worldwide shock, it was clear that the EU had entered the deepest economic recession in its history when this report was finalised. The baseline scenario in this report takes the Commission's

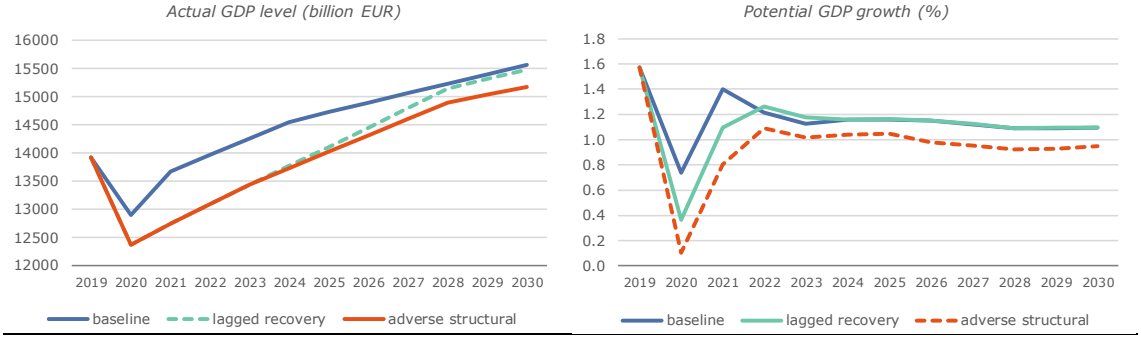
spring 2020 forecast as a starting point, reflecting the impact of the crisis and assuming recovery as per May 2020 ([4]).

Given the current uncertainty, economic growth developments may be less buoyant than those set out in the baseline scenario. For this reason, without assigning any ex-ante probability of materialisation, two additional – and more adverse scenarios – were prepared (see Graph 3 and Box I.3.1 for details):

- **The lagged recovery scenario**, which maintains the assumption of a relatively limited impact of the COVID-19 crisis on potential GDP growth (with only a slightly greater impact on potential GDP growth than in the baseline scenario) but with a much more pronounced cyclical downturn and a longer recovery phase, resulting in a wide 'U-shaped' recovery; and

- **The adverse structural scenario**: in addition to the stronger cyclical downturn in the 'lagged recovery' scenario, this scenario assumes that potential growth will be lower over the next decade, so potential output growth will be permanently lower than in the baseline. Labour productivity growth recovers to lower trend growth, through lower investment and/or total factor productivity (TFP) growth stemming from a long period of reduced business activity, with the crisis contributing to the historical downward trend. In addition, the deeper recession and slower recovery lead to lower business activity, producing a hysteresis effect and permanently higher unemployment.

Graph 3: **Baseline and COVID-19 crisis scenarios, EU27**



Source: European Commission, EPC.

However, the COVID-19 crisis is still running its course and its full medium/long-term consequences are uncertain. Continued vigilance is therefore called for if policymakers are to be able to adjust and adapt economic policies to mitigate the short-, medium- and long-term impact. The recovery path will depend on what policies are implemented. The Commission has tabled a comprehensive proposal for a durable, inclusive and sustainable recovery from the crisis with the Recovery and Resilience Facility (RRF).

Comparison with the long-term budgetary projections in the 2018 Ageing Report

In the base year 2019, the EU population counted 762 000 fewer people than anticipated in the 2015-based demographic projections. The old-age dependency ratio was 0.1 pps lower in 2019 than anticipated in the previous Ageing Report at EU/EA aggregate level. In most countries, the total labour force and total employment were larger in 2019 than anticipated in the 2018 Ageing Report. In the EU as a whole, 3.3 million more people were employed in 2019 than expected in the previous exercise, with the labour force showing 1.1 million more people as two thirds of the higher employment stems from people previously presumed unemployed. Real GDP growth was slightly higher in the EU in 2019 (at 1.5%) than

([4]) The spring 2020 forecast assumed a rebound of growth in 2021, broadly resulting in a narrow 'U-shaped' recovery scenario. Also, it incorporates the 't+10'projections according to the methodology agreed by the EPC's Output Gap Working Group, which assumes a rather small impact on potential growth (see Box I.3.1 in Chapter 3 for details).

expected in the 2018 Ageing Report (at less than 1.4%), while similar figures are found for the euro area (1.2%).

The total EU population is projected to shrink by about 15.2 million more by 2070 as compared to the 2018 Ageing Report estimate, given reductions in the younger age groups and the working-age population (see Table 1). The population in the euro area is projected to be 12.4 million lower. As a result, the new Eurostat population projections lead to a 2070 old-age dependency ratio that, for the EU as a whole, is 1.7 pps higher than the previous assumption and 2 pps higher for the euro area.

For the EU, the annual contribution from labour productivity growth during 2019-2070 is 0.1 pps higher than in the 2018 projection, while for the euro area, labour productivity growth is the same. Labour input growth (hours worked) is projected to be the same as in the 2018 Ageing Report for both the EU and the euro area.

At 1.3% on average over the period 2019-2070, potential GDP growth in both the EU and the euro area is projected to remain unchanged from the baseline projection in the 2018 Ageing Report. For the EU as a whole, annual potential GDP growth is projected to average 1.2% in 2019-2035 and 1.4% in 2036-2070, similar rates as in the 2018 Ageing Report. For the euro area, the 2021 Ageing Report projects average annual potential GDP growth of 1.1% in 2019-2035, against 1% in the 2018 Ageing Report, but the same average of 1.4% for 2036-2070.

Table 1: **Population projections, 2021 Ageing Report and 2018 Ageing Reports**

	Projection exercise 2021 Ageing Report						2021 AR - 2018 AR (2019-70)						
	Total population (million)			Old-age dependency ratio (%)			Total population (thousand)			Old-age dependency ratio (pps)			
	2019	2070	% change 2019-2070	2019	2070	pps change 2019-2070	2019	2070	2070 difference as % of 2070 population (ESSPOP2015)	2019	2070	pps change 2019-2070	
BE	11.5	11.8	3.1%	32.5	53.3	20.8	-63	-2070	-14.9%	0.0	3.5	3.5	BE
BG	7.0	5.0	-27.8%	36.0	60.8	24.8	-6	178	3.7%	-0.2	-1.0	-0.8	BG
CZ	10.7	10.2	-4.4%	33.0	53.7	20.6	31	236	2.4%	-0.3	-1.2	-0.9	CZ
DK	5.8	6.2	6.0%	34.1	53.8	19.7	-56	-673	-9.9%	0.3	-1.6	-1.8	DK
DE	83.1	81.7	-1.6%	36.1	54.6	18.5	-555	2488	3.1%	0.1	-6.7	-6.8	DE
EE	1.3	1.2	-10.2%	33.8	59.4	25.6	10	16	1.4%	-0.2	1.4	1.6	EE
IE	4.9	6.5	31.7%	24.2	53.0	28.7	105	458	7.6%	-0.8	7.0	7.8	IE
EL	10.7	8.6	-19.8%	37.9	65.2	27.3	120	925	12.1%	-0.4	-3.5	-3.1	EL
ES	47.1	47.0	-0.2%	32.1	62.5	30.5	585	-2813	-5.6%	-0.9	11.0	11.8	ES
FR	67.1	69.4	3.5%	36.5	56.9	20.4	-572	-7604	-9.9%	0.3	7.2	6.9	FR
HR	4.1	3.0	-25.5%	34.8	64.6	29.8	-34	-368	-10.8%	0.3	3.3	3.0	HR
IT	60.3	53.9	-10.7%	38.9	65.6	26.7	-406	-986	-1.8%	0.1	0.1	0.0	IT
CY	0.9	1.1	24.7%	26.2	50.7	24.6	15	80	7.8%	0.1	-14.8	-14.9	CY
LV	1.9	1.2	-38.4%	34.6	63.6	29.0	-5	-161	-12.0%	-0.3	3.6	3.9	LV
LT	2.8	1.8	-34.8%	32.9	66.0	33.1	27	101	5.9%	-0.6	7.2	7.8	LT
LU	0.6	0.8	27.0%	22.6	56.1	33.6	-2	-250	-24.1%	-0.6	2.6	3.2	LU
HU	9.8	8.9	-8.7%	32.2	57.4	25.1	-21	46	0.5%	-0.4	0.0	0.4	HU
MT	0.5	0.7	41.4%	29.7	62.4	32.7	50	186	35.8%	-4.8	0.9	5.7	MT
NL	17.3	18.0	3.7%	32.9	55.2	22.4	-14	-1561	-8.0%	-0.2	1.9	2.1	NL
AT	8.9	9.2	4.1%	30.7	55.9	25.2	-85	-922	-9.1%	0.2	-3.7	-3.9	AT
PL	38.0	30.8	-18.8%	29.0	67.8	38.8	11	-58	-0.2%	-0.3	-0.5	-0.2	PL
PT	10.3	8.5	-17.7%	37.3	67.3	30.0	57	479	6.0%	0.0	-5.6	-5.6	PT
RO	19.3	13.7	-29.4%	31.1	62.1	31.0	30	-1333	-8.9%	0.0	3.7	3.7	RO
SI	2.1	1.9	-7.3%	33.2	58.8	25.5	14	-19	-1.0%	-0.4	3.5	3.9	SI
SK	5.5	4.7	-13.6%	25.9	63.1	37.2	-1	-186	-3.8%	0.1	0.6	0.5	SK
FI	5.5	5.0	-8.9%	38.9	62.5	23.6	-30	-592	-10.5%	0.0	5.3	5.3	FI
SE	10.3	13.1	27.3%	35.2	49.8	14.6	34	-788	-5.7%	-0.3	1.8	2.1	SE
NO	5.3	6.7	25.6%	29.4	52.4	23.0	-32	-297	-4.2%	0.2	0.4	0.2	NO
EA	342.4	333.1	-2.7%	35.3	58.9	23.6	-751	-12430	-3.6%	-0.1	2.0	2.1	EA
EU27	447.2	424.0	-5.2%	34.4	59.2	24.7	-762	-15190	-3.5%	-0.1	1.7	1.8	EU27

(1) Population is defined as per 1 July, and EU/EA averages are constructed accordingly (weighted with population per 1 July).

Source: European Commission, EPC.

Table 2: **Population projection assumptions, 2021 Ageing Report and 2018 Ageing Reports**

	Projection exercise 2021 Ageing Report												2021 AR - 2018 AR (2019-70)											
	Fertility rate (live births/woman)			Life expectancy at birth (y)						Net migration ('000)			Fertility rate (live births/woman)			Life expectancy at birth (y)						Net migration ('000)			
				Males			Females									Males			Females						
	2019	2070	change 2019-70	2019	2070	change 2019-70	2019	2070	change 2019-70	2019	2070	cum. change 2019-70 (1)	2019	2070	change 2019-70	2019	2070	change 2019-70	2019	2070	change 2019-70	2019	2070	cum. change 2019-70 (2)	
BE	1.58	1.68	0.10	79.8	86.3	6.5	84.3	90.3	6.0	45.0	20.5	9.7%	-0.15	-0.14	0.01	0.5	0.1	-0.4	0.1	0.1	0.0	-9.2	-5.7	-7.8%	BE
BG	1.58	1.71	0.13	71.5	82.9	11.4	78.8	87.7	8.9	-3.9	10.0	2.9%	-0.03	-0.09	-0.05	-0.9	-0.4	0.5	-0.2	-0.1	0.1	7.7	8.7	4.4%	BG
CZ	1.71	1.78	0.07	76.5	84.8	8.3	82.3	89.2	6.9	44.2	18.2	9.2%	0.04	-0.04	-0.08	-0.1	-0.1	0.0	-0.2	-0.1	0.1	21.9	9.6	1.9%	CZ
DK	1.72	1.77	0.05	79.5	86.1	6.6	83.3	89.8	6.5	-1.6	11.0	9.9%	0.01	-0.04	-0.06	0.2	0.0	-0.2	-0.1	-0.2	-0.1	-36.4	1.7	-6.2%	DK
DE	1.53	1.67	0.13	79.1	86.0	6.9	83.7	89.9	6.2	277.4	214.2	14.9%	0.04	-0.01	-0.05	-0.1	-0.1	0.0	-0.3	-0.2	0.1	-107.8	70.7	1.2%	DE
EE	1.51	1.70	0.18	74.9	84.3	9.4	83.4	89.9	6.5	6.6	2.6	8.7%	-0.14	-0.12	0.02	1.3	0.4	-0.9	1.0	0.4	-0.6	4.0	2.3	4.9%	EE
IE	1.78	1.81	0.02	81.1	86.8	5.7	84.8	90.4	5.6	32.7	10.5	18.0%	-0.18	-0.16	0.02	1.1	0.4	-0.7	0.8	0.1	-0.7	21.7	-0.4	6.4%	IE
EL	1.34	1.54	0.20	79.0	86.4	7.4	84.3	90.3	6.0	13.7	26.0	8.7%	0.01	-0.11	-0.11	-0.4	-0.1	0.3	-0.1	0.0	0.1	33.6	15.0	6.5%	EL
ES	1.27	1.49	0.22	81.2	87.1	5.9	86.8	91.4	4.6	438.5	169.0	21.3%	-0.27	-0.39	-0.13	0.4	0.2	-0.2	0.6	0.2	-0.4	399.4	32.2	5.9%	ES
FR	1.85	1.84	-0.01	80.1	86.7	6.6	86.3	91.4	5.1	38.1	80.2	5.6%	-0.16	-0.14	0.01	0.1	0.1	0.0	0.3	0.3	0.0	-35.1	24.9	0.1%	FR
HR	1.43	1.59	0.16	75.3	84.3	9.0	81.6	88.8	7.2	-3.8	6.0	1.7%	-0.04	-0.06	-0.03	-0.3	-0.1	0.2	0.0	-0.1	-0.1	0.4	1.5	-3.7%	HR
IT	1.31	1.52	0.21	81.3	87.0	5.7	85.7	90.9	5.2	134.7	206.6	18.3%	-0.05	-0.14	-0.09	0.2	0.1	-0.1	0.0	0.0	0.0	-19.9	42.8	1.9%	IT
CY	1.33	1.53	0.20	80.8	86.6	5.8	85.1	90.2	5.1	7.8	2.3	18.3%	-0.01	-0.09	-0.08	-0.5	-0.4	0.1	0.2	0.0	-0.2	6.4	-1.5	-4.0%	CY
LV	1.58	1.71	0.13	70.6	82.6	12.0	80.2	88.5	8.3	-3.9	0.7	-10.1%	-0.25	-0.16	0.09	0.2	-0.1	-0.3	0.0	-0.1	-0.1	3.8	0.6	-4.2%	LV
LT	1.61	1.70	0.09	71.3	82.9	11.6	81.1	88.8	7.7	10.1	2.6	-6.0%	-0.09	-0.13	-0.04	0.7	0.1	-0.6	0.3	0.0	-0.3	34.0	2.6	7.2%	LT
LU	1.34	1.56	0.22	80.3	86.6	6.3	85.0	90.8	5.8	10.2	2.5	30.3%	-0.19	-0.13	0.06	0.4	0.2	-0.2	-0.2	-0.1	0.1	-0.3	-1.4	-24.5%	LU
HU	1.51	1.70	0.18	72.9	83.6	10.7	79.8	88.5	8.7	36.3	23.5	12.7%	-0.08	-0.10	-0.02	-0.6	-0.3	0.3	-0.4	-0.1	0.3	15.5	12.4	4.2%	HU
MT	1.14	1.47	0.33	80.5	86.8	6.3	84.5	90.6	6.1	12.8	3.8	57.4%	-0.38	-0.28	0.10	0.2	0.0	-0.2	-0.1	0.0	0.1	9.4	2.8	35.2%	MT
NL	1.58	1.68	0.10	80.7	86.6	5.9	83.6	89.9	6.3	105.4	33.2	11.0%	-0.15	-0.14	0.01	0.2	0.1	-0.1	-0.4	-0.2	0.2	37.1	8.7	-1.6%	NL
AT	1.45	1.60	0.15	79.8	86.3	6.5	84.3	90.2	5.9	44.3	25.5	16.7%	-0.04	-0.06	-0.02	0.1	0.0	-0.1	-0.1	0.0	0.1	-26.6	4.9	-5.9%	AT
PL	1.36	1.56	0.20	74.1	84.3	10.2	82.0	89.5	7.5	3.3	72.4	5.8%	-0.07	-0.15	-0.08	-0.6	-0.1	0.5	-0.2	0.0	0.2	13.0	65.1	4.5%	PL
PT	1.43	1.59	0.16	78.6	85.7	7.1	84.8	90.4	5.6	40.1	18.6	7.4%	0.16	0.00	-0.16	-0.2	-0.2	0.0	0.0	0.0	0.0	40.1	4.4	0.3%	PT
RO	1.65	1.74	0.10	71.9	83.5	11.6	79.5	88.5	9.0	-73.5	21.0	-4.4%	-0.06	-0.15	-0.09	-0.8	-0.1	0.7	-0.2	0.2	0.4	-9.2	18.4	0.2%	RO
SI	1.55	1.68	0.13	78.7	85.9	7.2	84.5	90.4	5.9	15.7	5.2	13.4%	-0.07	-0.13	-0.06	0.0	0.1	0.1	0.2	0.3	0.1	11.7	2.7	4.3%	SI
SK	1.56	1.67	0.11	74.4	84.1	9.7	81.2	89.0	7.8	3.4	7.4	5.1%	0.10	-0.16	-0.26	0.0	-0.1	-0.1	0.0	-0.1	-0.1	-2.4	4.1	0.2%	SK
FI	1.35	1.53	0.19	79.5	86.1	6.6	84.8	90.4	5.6	17.6	13.2	11.6%	-0.36	-0.27	0.09	0.6	0.2	-0.4	0.3	0.2	-0.1	1.5	6.5	1.9%	FI
SE	1.71	1.78	0.07	81.4	86.8	5.4	84.7	90.3	5.6	66.7	30.3	22.5%	-0.16	-0.25	-0.09	0.4	0.1	-0.3	0.0	0.0	0.0	-3.0	5.9	1.2%	SE
NO	1.53	1.65	0.12	81.4	86.9	5.5	84.6	90.3	5.7	25.3	23.4	24.9%	-0.21	-0.19	0.03	0.8	0.3	-0.5	-0.1	-0.1	0.0	-2.1	7.3	3.5%	NO
EA	1.51	1.65	0.13	79.9	86.5	6.6	85.0	90.6	5.6	1,249.9	844.5	13.4%	-0.09	-0.15	-0.06	0.1	0.0	-0.1	0.1	0.0	0.0	401.5	216.2	1.4%	EA
EU27	1.52	1.65	0.14	78.7	86.1	7.4	84.2	90.3	6.1	1,317.5	1,036.8	11.8%	-0.08	-0.14	-0.06	0.0	0.0	0.0	0.0	0.0	0.0	411.2	339.5	1.6%	EU27

(1) Cumulated net migration as % of total population in 2019 (EUROPOP2019)
(2) Cumulated difference as % of total population in 2019 (ESSPOP2015).

Source: European Commission, EPC.

Table 3: **Labour force projections, 2021 Ageing Report and 2018 Ageing Reports**

	Projection exercise 2021															2021 AR - 2018 AR (2019-70)														
	Employment rate (%)						Participation rate (%)						Unemployment rate (%)			Employment rate (pps)						Participation rate (pps)						Unemployment rate (pps)			
	(20-64y)			(55-64y)			(20-64y)			(55-64y)			(15-64y)			(20-64y)			(55-64y)			(20-64y)			(55-64y)			(15-64y)			
	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	2019	2070	pps change	
BE	70.6	70.9	0.3	52.4	60.8	8.5	74.5	75.7	1.1	54.6	64.0	9.4	5.4	6.4	1.0	1.6	-0.4	-2.1	2.2	-1.5	-3.8	-0.1	-1.7	-1.6	1.6	-1.8	-3.4	-2.3	-1.5	0.8	BE
BG	75.2	73.5	-1.7	64.5	64.5	0.0	78.5	77.5	-0.9	67.1	67.7	0.6	4.3	5.4	1.1	5.4	5.7	0.3	9.0	5.1	-3.9	4.5	5.0	0.5	8.3	4.4	-3.9	-1.4	-1.3	0.1	BG
CZ	80.4	78.5	-1.9	67.1	68.3	1.3	82.0	81.3	-0.7	68.4	70.7	2.3	2.1	3.7	1.6	2.5	1.9	-0.6	8.9	3.4	-5.5	1.6	1.5	-0.1	8.4	3.3	-5.1	-1.1	-0.5	0.6	CZ
DK	78.4	80.9	2.5	71.9	79.7	7.8	82.3	83.7	1.4	74.4	81.7	7.3	5.1	3.6	-1.6	-0.7	1.0	1.7	-0.4	4.8	5.2	-0.8	0.3	1.1	-0.3	4.7	5.0	-0.1	-1.0	-0.9	DK
DE	80.6	80.7	0.2	72.6	73.4	0.7	83.2	84.2	1.0	74.6	76.0	1.4	3.2	4.2	1.0	1.7	1.9	0.2	3.5	2.4	-1.1	1.3	1.5	0.2	3.1	1.9	-1.2	-0.5	-0.5	0.0	DE
EE	80.2	82.5	2.3	72.7	82.7	10.0	83.8	88.0	4.1	75.7	87.6	11.9	4.6	6.6	2.0	3.6	6.8	3.3	7.8	17.7	9.9	1.2	6.1	4.9	4.9	16.6	11.7	-2.9	-1.3	1.6	EE
IE	75.1	75.9	0.7	61.8	66.8	5.0	78.8	81.1	2.3	64.1	70.4	6.3	5.1	7.0	1.9	3.0	4.6	1.5	2.6	4.2	1.6	2.6	5.0	2.4	2.2	4.6	2.4	-0.4	0.5	0.9	IE
EL	60.9	76.5	15.6	43.7	76.4	32.7	73.8	82.2	8.4	50.4	80.8	30.4	17.6	7.0	-10.6	0.4	2.2	1.7	3.1	5.8	2.7	-0.3	1.6	1.8	2.7	5.5	2.8	-0.9	-0.9	0.0	EL
ES	68.1	76.2	8.2	53.9	73.5	19.6	79.0	81.8	2.8	61.7	78.3	16.6	14.2	7.0	-7.2	0.4	-1.4	-1.8	-2.1	-3.1	-1.0	-1.6	-2.3	-0.7	-3.5	-3.5	0.0	-2.2	-0.9	1.3	ES
FR	71.6	74.5	2.9	53.0	63.3	10.2	78.0	80.0	1.9	56.9	67.0	10.1	8.6	7.0	-1.6	0.6	-0.3	-0.8	0.3	-1.1	-1.4	0.1	-1.0	-1.1	0.5	-1.1	-1.6	-0.7	-0.9	-0.2	FR
HR	66.8	69.6	2.8	44.3	52.5	8.2	71.4	74.6	3.2	45.8	54.5	8.6	6.7	7.0	0.3	3.4	-0.3	-3.7	4.6	0.6	-4.1	0.1	-1.0	-1.1	2.7	-0.3	-3.0	-4.9	-0.9	4.0	HR
IT	63.6	69.8	6.2	54.4	73.2	18.8	70.5	74.9	4.4	57.5	75.9	18.4	10.2	7.0	-3.2	0.4	2.5	2.1	-1.1	2.7	3.8	0.0	2.0	2.0	-1.0	2.8	3.8	-0.7	-0.9	-0.2	IT
CY	75.1	80.1	5.0	61.2	75.4	14.2	80.9	85.9	4.9	65.3	80.1	14.8	7.5	7.0	-0.5	3.8	1.5	-2.4	5.7	2.7	-3.0	0.8	2.3	1.5	3.9	3.4	-0.6	-3.8	0.9	4.8	CY
LV	77.6	77.4	-0.2	67.7	64.7	-3.0	82.9	83.0	0.1	72.5	69.4	-3.1	6.6	7.0	0.4	3.9	-0.2	-4.1	8.3	-2.7	-11.1	1.9	-1.2	-3.1	7.7	-3.0	-10.7	-2.5	-0.9	1.6	LV
LT	78.3	80.4	2.2	68.7	69.1	0.4	83.6	86.4	2.8	73.8	74.5	0.7	6.5	7.0	0.5	2.9	2.1	-0.8	8.8	0.8	-8.0	2.5	1.4	-1.1	9.3	0.8	-8.6	-0.6	-0.9	-0.3	LT
LU	72.7	74.1	1.4	43.3	43.6	0.3	76.8	77.5	0.8	45.2	45.2	0.0	5.7	4.9	-0.9	1.1	2.9	1.8	0.6	2.3	1.7	1.1	2.9	1.8	0.9	2.7	1.8	0.0	-0.1	-0.2	LU
HU	75.4	81.9	6.5	56.9	81.4	24.5	77.9	85.3	7.3	58.2	83.7	25.5	3.5	4.2	0.7	1.5	2.5	1.0	6.6	3.4	-3.1	1.1	1.8	0.8	6.1	2.3	-3.8	-0.5	-0.8	-0.3	HU
MT	77.3	82.7	5.5	51.5	67.5	16.0	79.7	86.0	6.4	52.3	69.2	16.8	3.4	4.4	1.0	5.4	2.0	-3.4	8.1	-0.5	-8.6	4.7	1.0	-3.7	7.5	-0.9	-8.4	-1.2	-1.2	0.0	MT
NL	80.2	80.7	0.6	69.7	74.7	4.9	82.6	84.6	1.9	72.0	78.5	6.5	3.4	5.0	1.7	2.3	-0.3	-2.6	5.8	0.2	-5.6	1.1	0.1	-1.0	4.2	-0.2	-4.4	-1.7	0.5	2.2	NL
AT	76.8	79.5	2.7	54.6	62.1	7.5	80.3	82.9	2.6	56.5	63.9	7.4	4.6	4.3	-0.3	0.9	0.9	0.0	1.5	2.8	1.4	0.1	0.5	0.4	1.0	2.6	1.7	-1.0	-0.5	0.5	AT
PL	73.3	72.1	-1.2	49.9	53.1	3.2	75.7	75.9	0.2	51.1	55.1	4.0	3.3	5.2	1.8	1.5	1.4	-0.1	1.3	2.3	1.0	0.4	1.0	0.6	0.8	2.2	1.3	-1.5	-0.7	0.8	PL
PT	76.2	80.4	4.2	60.4	73.8	13.3	81.4	85.7	4.3	64.5	78.4	14.0	6.7	6.4	-0.2	3.4	4.6	1.2	3.8	9.4	5.7	0.8	3.6	2.7	2.0	9.1	7.1	-3.3	-1.5	1.8	PT
RO	71.0	72.7	1.7	47.9	55.7	7.8	73.7	76.0	2.2	49.0	57.2	8.2	4.0	4.8	0.7	3.1	6.1	3.0	2.5	6.5	4.0	2.4	5.4	2.9	2.4	6.5	4.1	-1.1	-1.4	-0.4	RO
SI	76.4	78.3	1.9	48.0	60.7	12.8	79.9	83.0	3.1	50.3	64.6	14.3	4.5	5.8	1.3	3.9	3.6	-0.3	3.0	2.6	-0.4	2.2	3.6	1.4	2.7	3.7	1.0	-2.3	-0.1	2.2	SI
SK	73.6	71.3	-2.3	57.7	56.4	-1.3	78.0	76.4	-1.6	60.5	59.6	-0.9	5.8	7.0	1.2	1.9	-4.3	-6.2	6.9	-14.9	-21.8	-0.1	-5.5	-5.4	5.5	-16.7	-22.2	-2.6	-0.9	1.7	SK
FI	77.1	79.7	2.6	66.8	76.0	9.2	82.2	85.0	2.8	71.5	81.4	9.9	6.9	6.9	0.0	2.4	2.5	0.1	3.9	1.2	-2.7	2.1	2.1	0.0	4.6	1.8	-2.8	-0.4	-0.7	-0.2	FI
SE	82.1	83.0	0.8	77.9	76.0	-1.9	87.3	87.1	-0.3	81.7	78.9	-2.8	7.0	5.6	-1.4	-0.2	0.7	0.9	2.6	1.5	-1.1	0.5	0.6	0.1	2.9	1.2	-1.8	1.0	-0.2	-1.2	SE
NO	79.4	78.7	-0.7	72.8	69.2	-3.6	82.1	81.2	-0.9	73.9	70.3	-3.6	3.8	3.6	-0.2	-0.4	-1.6	-1.2	1.0	-2.6	-3.6	-0.1	-1.5	-1.4	1.2	-2.5	-3.7	0.5	0.2	-0.2	NO
EA	72.6	76.3	3.7	60.0	70.2	10.2	78.4	81.0	2.5	63.7	73.7	10.0	7.7	6.0	-1.7	1.2	1.0	-0.2	1.5	0.9	-0.6	0.3	0.4	0.1	1.0	0.7	-0.3	-1.1	-0.8	0.4	EA
EU27	73.1	76.2	3.1	59.1	68.7	9.6	78.2	80.7	2.5	62.3	71.9	9.6	6.8	5.8	-1.0	1.4	1.2	-0.1	1.9	1.4	-0.5	0.5	0.7	0.2	1.5	1.2	-0.3	-1.1	-0.8	0.4	EU27

Source: European Commission, EPC.

Table 4: **Potential GDP projections, 2021 Ageing Report and 2018 Ageing Reports**

	Projection exercise 2021										2021 AR - 2018 AR (2019-70)										
		Due to growth in (pps)										Due to growth in (pps)									
	GDP growth 2019-70 (%)	***Labour prod. (GDP/ hours worked)***	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of working age population*	*Change in average hours worked*	**GDP per capita growth 2019-70 (%)**	**GDP growth 2019-70 (pps)**	***Labour prod. (GDP/ hours worked)***	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of working age population*	*Change in average hours worked*	**GDP per capita growth 2019-70 (pps)**	
	1=2+5	**2=3+4**	*3*	*4*	**5=6+7+8+9**	*6*	*7*	*8*	*9*	**10=1-6**	**1=2+5**	**2=3+4**	*3*	*4*	**5=6+7+8+9**	*6*	*7*	*8*	*9*	**10=1-6**	
BE	1.2	1.2	0.8	0.4	0.0	0.1	0.1	-0.2	0.0	1.2	-0.3	-0.1	-0.1	0.0	-0.3	-0.3	0.0	0.0	0.0	0.0	BE
BG	1.2	2.1	1.3	0.8	-0.9	-0.6	0.0	-0.3	0.0	1.9	-0.1	-0.2	-0.1	-0.1	0.2	0.1	0.1	0.0	0.0	-0.1	BG
CZ	1.6	2.0	1.3	0.7	-0.3	-0.1	0.0	-0.3	0.0	1.7	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2	CZ
DK	1.7	1.5	1.0	0.5	0.2	0.1	0.3	-0.2	0.0	1.6	0.1	0.1	0.1	0.0	0.0	-0.2	0.2	0.0	0.0	0.3	DK
DE	1.2	1.4	0.9	0.5	-0.2	0.0	0.0	-0.2	0.0	1.3	0.1	-0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	DE
EE	1.9	2.2	1.4	0.8	-0.3	-0.2	0.1	-0.2	-0.1	2.1	0.4	0.3	0.2	0.1	0.1	0.0	0.1	0.0	-0.1	0.4	EE
IE	1.8	1.5	1.1	0.5	0.3	0.6	-0.1	-0.1	0.0	1.3	-0.1	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	-0.2	IE
EL	1.2	1.5	1.0	0.4	-0.3	-0.4	0.3	-0.2	0.0	1.6	0.3	0.2	0.2	0.0	0.1	0.2	-0.1	0.0	0.0	0.1	EL
ES	1.4	1.5	1.0	0.5	0.0	0.0	0.2	-0.2	0.0	1.4	-0.1	0.1	0.1	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.1	ES
FR	1.3	1.3	0.8	0.5	0.1	0.1	0.1	-0.2	0.0	1.3	-0.2	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0	FR
HR	1.1	1.8	1.1	0.7	-0.7	-0.6	0.1	-0.2	0.0	1.7	-0.1	0.1	0.1	0.1	-0.3	-0.2	-0.1	0.0	0.0	0.1	HR
IT	1.0	1.3	0.8	0.4	-0.2	-0.2	0.2	-0.2	0.0	1.3	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	IT
CY	1.9	1.5	0.9	0.6	0.4	0.5	0.2	-0.2	0.0	1.4	0.4	0.2	0.1	0.1	0.2	0.1	0.0	0.1	0.0	0.3	CY
LV	1.2	2.3	1.4	0.9	-1.1	-0.9	0.1	-0.2	0.0	2.2	-0.7	-0.4	-0.3	-0.1	-0.3	-0.2	0.0	0.0	0.0	-0.4	LV
LT	1.2	2.2	1.3	0.9	-1.0	-0.8	0.1	-0.2	0.0	2.1	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	LT
LU	1.8	1.1	0.7	0.4	0.7	0.5	0.4	-0.2	0.0	1.3	-0.4	-0.3	-0.2	-0.1	0.0	-0.5	0.5	0.0	0.0	0.2	LU
HU	1.8	2.1	1.3	0.7	-0.3	-0.2	0.2	-0.2	0.0	2.0	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.2	HU
MT	2.2	1.8	1.2	0.6	0.4	0.7	0.1	-0.3	-0.1	1.5	0.1	-0.1	-0.1	-0.1	0.2	0.4	-0.2	0.0	-0.1	-0.3	MT
NL	1.3	1.3	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.2	-0.2	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0	NL
AT	1.3	1.4	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	0.1	0.0	0.0	0.0	AT
PL	1.5	2.3	1.5	0.9	-0.8	-0.4	-0.1	-0.3	0.0	1.9	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	PL
PT	1.2	1.7	1.1	0.6	-0.5	-0.4	0.1	-0.3	0.0	1.6	0.3	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.2	PT
RO	1.7	2.6	1.6	0.9	-0.9	-0.7	0.0	-0.2	0.0	2.4	0.0	0.1	0.0	0.1	-0.1	-0.2	0.1	0.0	0.0	0.2	RO
SI	1.6	1.9	1.3	0.6	-0.3	-0.1	0.1	-0.2	0.0	1.7	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	SI
SK	1.3	2.1	1.3	0.8	-0.7	-0.3	-0.1	-0.3	0.0	1.6	-0.5	-0.2	-0.2	0.0	-0.3	-0.1	-0.2	0.0	0.0	-0.4	SK
FI	1.2	1.5	0.9	0.5	-0.3	-0.2	0.1	-0.2	0.0	1.4	-0.1	0.1	0.1	0.0	-0.2	-0.2	0.0	0.0	0.0	0.1	FI
SE	1.8	1.4	0.9	0.5	0.4	0.5	0.1	-0.1	0.0	1.3	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	SE
NO	1.7	1.5	0.9	0.5	0.2	0.5	-0.1	-0.1	0.0	1.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	NO
EA	1.3	1.4	0.9	0.5	-0.1	0.0	0.1	-0.2	0.0	1.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	EA
EU27	1.3	1.6	1.0	0.5	-0.2	-0.1	0.1	-0.2	0.0	1.4	0.0	0.1	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	EU27

Source: European Commission, EPC.

Part I

Underlying assumptions and projection methodologies

1. POPULATION

1.1. INTRODUCTION

EUROPOP2019, the 2019-based population projections, was released by Eurostat in April 2020. It provides the demographic basis for the age-related expenditure projections in the 2021 Ageing Report for the 27 EU Member States and Norway. The fertility rates, mortality ratesand net migration projections for the period 2019-2100, as well as the underlying methodologies used can be found on the Eurostat dedicated website ([5]). National statistical institutes collaborated with Eurostat for the data collection and had the opportunity to make some methodological suggestions during the preparation of these population projections ([6]).

EUROPOP2019 applies a 'partial convergence' approach, meaning that the country-specific key demographic determinants converge in the very long term. Setting the convergence point far into the future – even beyond the endpoint of the projections – has the advantage of taking due account of recent country-specific trends at the start, while at the same time assuming that Member States' demographic drivers will converge over time. These demographic determinants are the fertility rate (impacting the number of births), the mortality rate (impacting the number of deaths) and the level of net migration (the population growth beyond the 'natural' growth due to births and deaths).

The projection methodology assumes that fertility and mortality tend to converge to that of the best performing Member States. As a result, fertility rates would rise in almost all Member States during 2019-2070, though faster in the countries that currently have the lowest rates. Similarly, life expectancy follows an upward convergent trajectory with longevity increasing relatively faster in countries with lower current levels of life expectancy.

Net migration is estimated through separate emigration and immigration flows, based on past trends, the latest empirical evidence, long-term partial convergence and intra-EU flows consistency. Moreover, when the working-age population shrinks, additional 'partially compensating' immigration is assumed.

1.2. DEVELOPMENTS AND ASSUMPTIONS FOR FERTILITY RATES

The total fertility rate (TFR) is assumed to rise in almost all Member States between 2019 and 2070, increasing from 1.52 to 1.65 on average in the EU.

1.2.1. Past trends

Total fertility rates (TFR ([7])) declined sharply in the EU Member States following the post-war 'baby boom'. From an EU average of 2.6 in 1960, the number of live births per woman declined steadily in nearly all countries, to two children on average in 1980, thus below the natural replacement rate of 2.1 (see Table I.1.1). By 1980, fertility had fallen to 1.6 or less in Denmark, Germany, Luxembourg and the Netherlands.

By the mid-1990s, fertility rates had fallen below the natural replacement rate in all Member States. In 2000, fertility rates were below 1.4 in fifteen Member States, with women in the Czech Republic, Spain and Latvia giving birth to just 1.2 children on average.

Fertility rates seemed to have reached their nadir in most Member States by the turn of the century, with a slightly upward trend in general. Total fertility rates increased in 17 of them between 2000 and 2018. However, this increase mostly reflects developments during the 2000s, when fertility rates increased in all but five Member States. Since 2010, the trend has reversed again,

([5]) The datasets can be found on http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data; Eurostat (2020), 'Methodology of the Eurostat population projections 2019-based (EUROPOP2019)', available at https://ec.europa.eu/eurostat/cache/metadata/Annexes/proj_esms_an1.pdf.

([6]) This does not preclude national statistical institutes having different population projections based on their own assumptions and methodologies.

([7]) Fertility rates are reflected by the average number of children a woman would have, should she at each bearing age have the fertility rates of the year under review. This number is obtained by summing the fertility rates by age and is called the Total Fertility Rate, or TFR.

with decreases in 16 Member States. The largest declines between 2000 and 2018 were in Cyprus, Finland, Luxembourg and Malta, with a decline in the TFR of 0.3-0.5 live births. Conversely, Bulgaria, Estonia, Slovenia, Latvia, Romania and the Czech Republic saw increases of 0.3-0.6 in their fertility rate during the same period.

Table I.1.1: **Past trends in total fertility rates (1960-2018)**

	1960	1980	2000	2018	*1960-2018*	*2000-2018*
BE	2.54	1.68	1.67	1.62	*-0.9*	*0.0*
BG	2.31	2.05	1.26	1.56	*-0.8*	*0.3*
CZ	2.09	2.08	1.15	1.71	*-0.4*	*0.6*
DK	2.57	1.55	1.77	1.73	*-0.8*	*0.0*
DE	2.37	1.56	1.38	1.57	*-0.8*	*0.2*
EE	1.98	2.02	1.36	1.67	*-0.3*	*0.3*
IE	3.78	3.21	1.89	1.75	*-2.0*	*-0.1*
EL	2.23	2.23	1.25	1.35	*-0.9*	*0.1*
ES	2.86	2.22	1.22	1.26	*-1.6*	*0.0*
FR	2.73	1.95	1.89	1.88	*-0.9*	*0.0*
HR	2.38	1.90	1.46	1.47	*-0.9*	*0.0*
IT	2.40	1.64	1.26	1.29	*-1.1*	*0.0*
CY	3.51	2.48	1.64	1.32	*-2.2*	*-0.3*
LV	1.95	1.88	1.25	1.60	*-0.3*	*0.4*
LT	2.60	1.99	1.39	1.63	*-1.0*	*0.2*
LU	2.29	1.50	1.76	1.38	*-0.9*	*-0.4*
HU	2.02	1.91	1.32	1.55	*-0.5*	*0.2*
MT	3.62	1.99	1.68	1.23	*-2.4*	*-0.5*
NL	3.12	1.60	1.72	1.59	*-1.5*	*-0.1*
AT	2.69	1.65	1.36	1.47	*-1.2*	*0.1*
PL	2.98	2.28	1.37	1.46	*-1.5*	*0.1*
PT	3.16	2.25	1.55	1.42	*-1.7*	*-0.1*
RO	2.74	2.43	1.31	1.76	*-1.0*	*0.5*
SI	2.18	2.11	1.26	1.60	*-0.6*	*0.3*
SK	3.04	2.32	1.30	1.54	*-1.5*	*0.2*
FI	2.72	1.63	1.73	1.41	*-1.3*	*-0.3*
SE	2.20	1.68	1.54	1.76	*-0.4*	*0.2*
NO	2.90	1.72	1.85	1.56	*-1.3*	*-0.3*
EA	2.72	2.00	1.50	1.50	*-1.2*	*0.0*
EU27	2.63	1.99	1.47	1.54	*-1.1*	*0.1*

(1) EU27 and EA are simple averages.
(2) DE: time series does not include the former GDR until 1991; HR: 2000 value is from 2001, 1960 and 1980 based on UN data; CY: 1980 value is from 1982; LV: 1960 based on UN data; RO: 1960 based on UN data.
Source: European Commission based on Eurostat/UN data.

In 2018, the Czech Republic, Denmark, Ireland, Romania, Sweden and France had fertility rates of at least 1.7, with a maximum of around 1.9 in France. At 1.2 children per woman, Malta had the lowest fertility rate in 2018, followed by Spain, Italy, Cyprus, Greece and Luxembourg, which all had fertility rates below 1.4. For Luxembourg and Malta, the 2018 rates are the lowest on record, as rates have continued to decline in recent years.

1.2.2. Latest Eurostat population projections

The new projections assume a country-specific trend extrapolation up to 2020. Afterwards, convergence to the long-term anchor starts gaining weight. This anchor equals 1.83 live births, which is the maximum fertility rate projected by the United Nations in 2100 for the countries covered in EUROPOP2019, namely France. Full convergence to this common anchor is assumed beyond EUROPOP2019's own 2100 horizon.

Table I.1.2: **Projection of total fertility rates (2019-2070)**

	2019	2030	2050	2070	*change 2019-2070*	*avg 2019-2070*
BE	1.58	1.59	1.64	1.68	*0.10*	*1.6*
BG	1.58	1.65	1.70	1.71	*0.13*	*1.7*
CZ	1.71	1.75	1.78	1.78	*0.07*	*1.8*
DK	1.72	1.74	1.76	1.77	*0.05*	*1.8*
DE	1.53	1.57	1.63	1.67	*0.13*	*1.6*
EE	1.51	1.59	1.68	1.70	*0.18*	*1.6*
IE	1.78	1.80	1.80	1.81	*0.02*	*1.8*
EL	1.34	1.39	1.47	1.54	*0.20*	*1.4*
ES	1.27	1.33	1.41	1.49	*0.22*	*1.4*
FR	1.85	1.84	1.84	1.84	*-0.01*	*1.8*
HR	1.43	1.48	1.54	1.59	*0.16*	*1.5*
IT	1.31	1.37	1.45	1.52	*0.21*	*1.4*
CY	1.33	1.38	1.46	1.53	*0.20*	*1.4*
LV	1.58	1.64	1.69	1.71	*0.13*	*1.7*
LT	1.61	1.63	1.67	1.70	*0.09*	*1.7*
LU	1.34	1.40	1.49	1.56	*0.22*	*1.5*
HU	1.51	1.61	1.69	1.70	*0.18*	*1.7*
MT	1.14	1.26	1.39	1.47	*0.33*	*1.3*
NL	1.58	1.60	1.64	1.68	*0.10*	*1.6*
AT	1.45	1.49	1.55	1.60	*0.15*	*1.5*
PL	1.36	1.40	1.49	1.56	*0.20*	*1.5*
PT	1.43	1.47	1.53	1.59	*0.16*	*1.5*
RO	1.65	1.66	1.72	1.74	*0.10*	*1.7*
SI	1.55	1.59	1.65	1.68	*0.13*	*1.6*
SK	1.56	1.59	1.63	1.67	*0.11*	*1.6*
FI	1.35	1.38	1.46	1.53	*0.19*	*1.4*
SE	1.71	1.75	1.78	1.78	*0.07*	*1.8*
NO	1.53	1.55	1.60	1.65	*0.12*	*1.6*
EA	1.51	1.55	1.60	1.65	*0.13*	*1.6*
EU27	1.52	1.55	1.61	1.65	*0.14*	*1.6*

(1) EU27 and EA are weighted averages.
Source: EUROPOP2019 (Eurostat).

The total fertility rate would rise from 1.52 in 2019 to 1.65 by 2070 for the EU as a whole (see Table I.1.2). The fertility rate increases in all Member States, with the exception of a stable rate in France (the frontrunner, with the highest current and prospective TFR). Considering a long-term anchor of 1.83 live births per woman implies that fertility in all Member States would remain below the natural replacement rate over the entire projection period. The difference in fertility between the

Table I.1.3: **Past trends in life expectancy at birth (1960-2018)**

	Males						Females						
	1960	1980	2000	2018	*1960-2018 (2)*	*2000-2018*	1960	1980	2000	2018	*1960-2018 (2)*	*2000-2018*	
BE	66.8	69.9	74.6	79.4	*12.6*	*4.8*	72.8	76.7	81.0	83.9	*11.1*	*2.9*	BE
BG	67.5	68.4	68.4	71.5	*4.0*	*3.1*	71.1	73.9	75.0	78.6	*7.5*	*3.6*	BG
CZ	67.8	66.9	71.6	76.2	*8.4*	*4.6*	73.5	74.0	78.5	82.0	*8.5*	*3.5*	CZ
DK	70.4	71.2	74.5	79.1	*8.7*	*4.6*	74.4	77.3	79.2	82.9	*8.5*	*3.7*	DK
DE	66.5	69.6	75.1	78.6	*12.1*	*3.5*	71.7	76.2	81.2	83.3	*11.6*	*2.1*	DE
EE	64.7	64.2	65.6	74.0	*9.3*	*8.4*	73.1	74.3	76.4	82.7	*9.6*	*6.3*	EE
IE	68.1	70.1	74.0	80.5	*12.4*	*6.5*	71.9	75.6	79.2	84.1	*12.2*	*4.9*	IE
EL	67.3	73.0	75.9	79.3	*12.0*	*3.4*	72.4	77.5	81.3	84.4	*12.0*	*3.1*	EL
ES	67.4	72.3	75.8	80.7	*13.3*	*4.9*	72.2	78.4	82.8	86.3	*14.1*	*3.5*	ES
FR	66.9	70.2	75.3	79.7	*12.8*	*4.4*	73.6	78.4	83.0	85.9	*12.3*	*2.9*	FR
HR	:	:	:	74.9	*:*	*:*	:	:	:	81.5	*:*	*:*	HR
IT	67.2	70.6	76.9	81.2	*14.0*	*4.3*	72.3	77.4	82.8	85.6	*13.3*	*2.8*	IT
CY	:	72.3	75.4	80.9	*8.6*	*5.5*	:	77.0	80.1	84.8	*7.8*	*4.7*	CY
LV	65.2	63.6	65.0	70.1	*4.9*	*5.1*	72.4	74.2	76.1	79.7	*7.3*	*3.6*	LV
LT	64.9	65.4	66.7	70.9	*6.0*	*4.2*	71.4	75.4	77.4	80.7	*9.3*	*3.3*	LT
LU	66.5	70.0	74.6	80.1	*13.6*	*5.5*	72.2	75.6	81.3	84.6	*12.4*	*3.3*	LU
HU	65.9	65.5	67.5	72.7	*6.8*	*5.2*	70.2	72.8	76.2	79.6	*9.4*	*3.4*	HU
MT	66.5	68.0	76.3	80.4	*13.9*	*4.1*	70.5	72.8	80.5	84.6	*14.1*	*4.1*	MT
NL	71.5	72.7	75.6	80.3	*8.8*	*4.7*	75.5	79.3	80.7	83.4	*7.9*	*2.7*	NL
AT	66.2	69.0	75.2	79.4	*13.2*	*4.2*	72.7	76.1	81.2	84.1	*11.4*	*2.9*	AT
PL	64.9	66.9	69.6	73.7	*8.8*	*4.1*	70.6	75.4	78.0	81.7	*11.1*	*3.7*	PL
PT	61.1	67.9	73.3	78.3	*17.2*	*5.0*	66.7	74.9	80.4	84.5	*17.8*	*4.1*	PT
RO	:	66.6	67.7	71.7	*5.1*	*4.0*	:	71.9	74.8	79.2	*7.3*	*4.4*	RO
SI	66.1	67.4	72.2	78.5	*12.4*	*6.3*	72.0	75.2	79.9	84.4	*12.4*	*4.5*	SI
SK	67.9	66.7	69.2	73.9	*6.0*	*4.7*	72.7	74.4	77.5	80.8	*8.1*	*3.3*	SK
FI	65.5	69.2	74.2	79.1	*13.6*	*4.9*	72.5	78.0	81.2	84.5	*12.0*	*3.3*	FI
SE	71.2	72.8	77.4	80.9	*9.7*	*3.5*	74.9	79.0	82.0	84.3	*9.4*	*2.3*	SE
NO	71.6	72.4	76.0	81.1	*9.5*	*5.1*	76.0	79.3	81.5	84.5	*8.5*	*3.0*	NO
EA	66.5	69.1	73.2	78.2	*11.7*	*5.0*	72.1	76.2	80.2	83.8	*11.7*	*3.6*	EA
EU27	66.8	68.9	72.6	77.3	*10.4*	*4.7*	72.2	75.8	79.5	83.0	*10.8*	*3.5*	EU27

(1) EU27 and EA are simple averages.
(2) 1980-2019 for CY and RO.
Source: European Commission based on Eurostat data.

countries with the highest and lowest rates shrinks from 0.7 live births per woman in 2019 to 0.4 in 2070, with a minimum of 1.47 in Malta versus 1.84 in France. Aside from Malta, also Spain, Italy, Cyprus, Greece, Luxembourg, Poland, Croatia and Portugal would have a fertility rate below 1.6 in 2070.

1.3. DEVELOPMENTS AND ASSUMPTIONS FOR LIFE EXPECTANCY

Eurostat demographic projections show continued increases in life expectancy both at birth and at the age of 65 for both males and females over the period 2019-2070. For the EU as a whole, life expectancy at birth would increase by 7.4 years for males and by 6.1 years for females, with the largest increases in Member States that currently have the lowest life expectancy.

1.3.1. Past trends

Life expectancy has been increasing in most developed countries for very long periods. Since 1960, there have been significant gains in life expectancy at birth in all EU Member States (see Table I.1.3). The average life expectancy at birth increased by more than ten years between 1960 and 2018 in the EU; from 66.8 years in 1960 to 77.3 years in 2018 for males, and from 72.2 years to 83 years for females.

The gap between the average female and the average male life expectancies at birth rose from 5.4 years in 1960 to 7 years in 1980 and remained at that level until 2000, with diverging

developments across Member States. Since 2000, the increase in life expectancy has been 3.5 years for females and 4.7 years for males, resulting in a narrowing of the gender longevity gap to 5.8 years in 2018.

The general trend of rising life expectancy and a smaller gender gap differs across countries. Between 1960 and 2018, females gained 12 years or more in life expectancy in Ireland, Greece, Spain, France, Italy, Luxembourg, Malta, Portugal, Slovenia and Finland. Gains however amounted to less than eight years in Bulgaria, Latvia and the Netherlands ([8]). Gains in male life expectancy over the same period exceeded 12 years in Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Malta, Austria, Portugal, Slovenia and Finland. Male longevity rose by at most eight years in Bulgaria, Latvia, Lithuania, Hungary and Slovakia.

Up to 2000, the gender gap widened compared to 1960 in Bulgaria, the Czech Republic, Estonia, Spain, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania (compared to 1980) and Slovakia, as gains in female life expectancy exceeded those for males. Looking at developments since 2000, the gender gap widened only in Bulgaria and Romania.

There is no consensus among demographers on very long-term trends, e.g. whether there is a natural biological limit to longevity, the impact of future medical breakthroughs, and the long-term effect of public health programmes and societal behaviour such as the reduction of smoking rates or a higher prevalence of obesity. Past population projections have, however, generally under-estimated the gains in life expectancy at birth as the reduction of mortality was not assumed to continue at the same pace in the long run. Therefore, previous estimates on the budgetary impact of ageing populations may have been too low in certain cases.

Most official demographic projections by international and national statistical institutes nevertheless still assume that gains in life expectancy at birth will slow down compared with historical trends. This is because mortality rates at younger ages are already very low and future gains in life expectancy would require improvements in mortality rates at older ages, which statistically have a smaller impact on life expectancy at birth.

On the other hand, the current wide range of life expectancies across EU Member States, also compared with non-EU developed countries, points to considerable scope for future gains. In 2018, life expectancy at birth for females ranged from 78.6 in Bulgaria to 86.3 years in Spain and from 70.1 in Latvia to 81.2 in Italy for males. These gaps of 7.7 and 11.1 years entail a narrowing compared to 2000, when the difference between the highest and lowest life expectancy in the EU still amounted to 8.2 years for woman and 12.4 years for men.

1.3.2. Latest Eurostat population projections

The projected changes in life expectancy at birth and at the age of 65 for males and females underlying the 2019-based population projections are shown in Table I.1.4. The projections assume that increases in life expectancy at birth are sustained during the projection period, albeit with considerable diversity across Member States ([9]).

In the EU, life expectancy at birth for males is expected to increase by 7.4 years over the projection period, from 78.7 in 2019 to 86.1 in 2070. Female life expectancy at birth would rise by 6.1 years, from 84.2 in 2019 to 90.3 in 2070, leading to a further convergence between genders. The largest increases in life expectancies at birth, for both males and females, are projected to take place in the Member States that currently have the lowest life expectancies.

In 2019, male life expectancy at birth was the lowest in Bulgaria, Estonia, Latvia, Lithuania, Hungary, Poland, Romania and Slovakia, ranging between 70 and 75 years. In these countries, male life expectancy would increase by 9-12 years by

([8]) Also CY and RO gained less than eight years (both in the case of men and women in the case of RO), but over a shorter period (1980-2018), see Table I.1.3.

([9]) Mortality patterns are assumed to partially converge from the latest observed values towards a common (sex-specific) life table (the 'ultimate' life table), which incorporates some information from previous mortality trends of selected countries. The initial mortality patterns are derived from the period-cohort age- and sex-specific deaths reported by the country for the last three years (2016-2018). See https://ec.europa.eu/eurostat/cache/metadata/Annexes/proj_esms_an1.pdf

Table I.1.4: **Projection of life expectancy at birth and at 65 (2019-2070)**

	Life expectancy at birth								*Life expectancy at 65*								
	Males				Females				Males				Females				
	2019	2050	2070	*change 2019-70*	2019	2050	2070	*change 2019-70*	2019	2050	2070	*change 2019-70*	2019	2050	2070	*change 2019-70*	
BE	79.8	83.9	86.3	*6.5*	84.3	88.2	90.3	*6.0*	18.9	21.8	23.6	*4.7*	22.2	25.1	26.8	*4.6*	BE
BG	71.5	79.0	82.9	*11.4*	78.8	84.6	87.7	*8.9*	14.2	18.8	21.4	*7.2*	18.1	22.3	24.7	*6.6*	BG
CZ	76.5	81.8	84.8	*8.3*	82.3	86.7	89.2	*6.9*	16.5	20.3	22.5	*6.0*	20.0	23.6	25.7	*5.7*	CZ
DK	79.5	83.7	86.1	*6.6*	83.3	87.5	89.8	*6.5*	18.5	21.5	23.3	*4.8*	21.1	24.4	26.3	*5.2*	DK
DE	79.1	83.5	86.0	*6.9*	83.7	87.7	89.9	*6.2*	18.4	21.5	23.4	*5.0*	21.4	24.6	26.4	*5.0*	DE
EE	74.9	80.8	84.3	*9.4*	83.4	87.5	89.9	*6.5*	16.5	20.2	22.6	*6.1*	21.5	24.6	26.5	*5.0*	EE
IE	81.1	84.6	86.8	*5.7*	84.8	88.3	90.4	*5.6*	19.6	22.1	23.8	*4.2*	22.1	24.9	26.7	*4.6*	IE
EL	79.0	83.8	86.4	*7.4*	84.3	88.1	90.3	*6.0*	18.8	22.1	23.9	*5.1*	21.8	24.9	26.7	*4.9*	EL
ES	81.2	84.9	87.1	*5.9*	86.8	89.7	91.4	*4.6*	19.9	22.5	24.1	*4.2*	23.9	26.2	27.7	*3.8*	ES
FR	80.1	84.3	86.7	*6.6*	86.3	89.6	91.4	*5.1*	20.0	22.6	24.2	*4.2*	24.1	26.5	27.9	*3.8*	FR
HR	75.3	81.1	84.3	*9.0*	81.6	86.2	88.8	*7.2*	15.8	19.7	22.1	*6.3*	19.4	23.1	25.3	*5.9*	HR
IT	81.3	84.9	87.0	*5.7*	85.7	89.0	90.9	*5.2*	19.6	22.3	23.9	*4.3*	22.9	25.6	27.2	*4.3*	IT
CY	80.8	84.5	86.6	*5.8*	85.1	88.3	90.2	*5.1*	19.2	21.9	23.5	*4.3*	22.1	24.7	26.4	*4.3*	CY
LV	70.6	78.4	82.6	*12.0*	80.2	85.6	88.5	*8.3*	14.5	19.0	21.7	*7.2*	19.4	23.3	25.5	*6.1*	LV
LT	71.3	78.8	82.9	*11.6*	81.1	86.0	88.8	*7.7*	15.0	19.3	21.9	*6.9*	20.0	23.5	25.7	*5.7*	LT
LU	80.3	84.4	86.6	*6.3*	85.0	88.7	90.8	*5.8*	19.1	22.0	23.7	*4.6*	22.5	25.4	27.1	*4.6*	LU
HU	72.9	79.8	83.6	*10.7*	79.8	85.4	88.5	*8.7*	14.8	19.3	21.9	*7.1*	18.7	23.0	25.4	*6.7*	HU
MT	80.5	84.6	86.8	*6.3*	84.5	88.4	90.6	*6.1*	19.6	22.3	23.9	*4.3*	22.4	25.3	27.0	*4.6*	MT
NL	80.7	84.4	86.6	*5.9*	83.6	87.6	89.9	*6.3*	19.0	21.8	23.5	*4.5*	21.4	24.5	26.3	*4.9*	NL
AT	79.8	83.9	86.3	*6.5*	84.3	88.1	90.2	*5.9*	18.8	21.8	23.6	*4.8*	21.8	24.8	26.6	*4.8*	AT
PL	74.1	80.7	84.3	*10.2*	82.0	86.9	89.5	*7.5*	16.1	20.2	22.6	*6.5*	20.5	24.2	26.2	*5.7*	PL
PT	78.6	83.2	85.7	*7.1*	84.8	88.3	90.4	*5.6*	18.4	21.4	23.2	*4.8*	22.2	25.0	26.7	*4.5*	PT
RO	71.9	79.5	83.5	*11.6*	79.5	85.3	88.5	*9.0*	14.9	19.5	22.1	*7.2*	18.6	22.9	25.4	*6.8*	RO
SI	78.7	83.3	85.9	*7.2*	84.5	88.2	90.4	*5.9*	18.1	21.3	23.2	*5.1*	22.0	25.0	26.8	*4.8*	SI
SK	74.4	80.6	84.1	*9.7*	81.2	86.2	89.0	*7.8*	15.6	19.7	22.1	*6.5*	19.6	23.4	25.7	*6.1*	SK
FI	79.5	83.7	86.1	*6.6*	84.8	88.4	90.4	*5.6*	18.9	21.7	23.5	*4.6*	22.3	25.1	26.8	*4.5*	FI
SE	81.4	84.8	86.8	*5.4*	84.7	88.2	90.3	*5.6*	19.7	22.2	23.7	*4.0*	22.0	24.8	26.6	*4.6*	SE
NO	81.4	84.8	86.9	*5.5*	84.6	88.2	90.3	*5.7*	19.7	22.2	23.8	*4.1*	21.9	24.8	26.6	*4.7*	NO
EA	79.9	84.1	86.5	*6.6*	85.0	88.6	90.6	*5.6*	19.1	22.0	23.7	*4.6*	22.6	25.4	27.1	*4.5*	EA
EU27	78.7	83.5	86.1	*7.4*	84.2	88.2	90.3	*6.1*	18.4	21.6	23.5	*5.1*	22.0	25.0	26.8	*4.8*	EU27

(1) EU27 and EA are weighted averages.
Source: EUROPOP2019 (Eurostat).

2070. For females, gains in life expectancy of 8-9 years are expected in Bulgaria, Latvia, Hungary and Romania, with life expectancy of around 80 years in 2019. As a result of this catching-up, the difference between the countries with the highest and the lowest life expectancy narrows from 10.8 and 8 years in 2019 for men and women, respectively, to 4.5 and 3.7 years in 2070.

When looking at the remaining life expectancy at the age of 65, average increases of 5.1 and 4.8 years are expected respectively for males and females in the EU over the projection period, implying a more modest narrowing of the gender gap than for the life expectancy at birth.

By 2070, male life expectancy at 65 is expected to increase by around seven years in Bulgaria, Latvia, Lithuania, Hungary and Romania. In these countries, remaining life expectancy at the age of 65 was 15 years or less in 2019, compared with an EU average of more than 18 years. Gains of between six and seven years are projected for females aged 65 in Bulgaria, Latvia, Hungary, Romania and Slovakia. In 2019, life expectancy at 65 was less than 20 years in these countries, compared to 22 years on average in the EU.

1.4. DEVELOPMENTS AND ASSUMPTIONS FOR NET MIGRATION

Because of high historical volatility over time and between countries, assumptions on migration are methodologically the most difficult when preparing demographic projections. On the basis of the latest projections, annual net migration inflows into the EU are expected to decrease from about 1.3 million people in 2019 (0.3% of the population) to around 1 million people (0.2%) during most of the projection period.

1.4.1. Past trends and driving forces

Graph I.1.1 shows the net migration flows to the EU and the euro area during the last six decades. From 1960 through the mid-1980s, net migration was mostly positive with annual net inflows averaging around 118 000, though certain years saw large net outflows. Since 1985, annual net

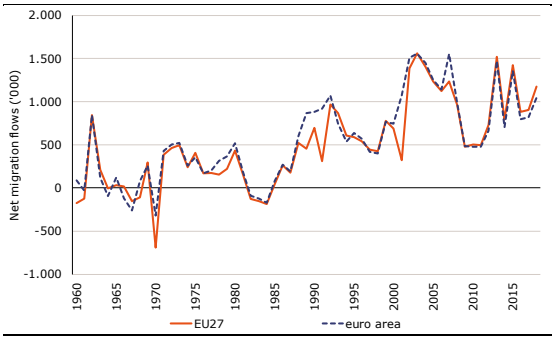
Table I.1.5: **Average annual net migration flows (including statistical adjustment; 1960-2018)**

	1960-1979 (%1960 pop)		1980-1999 (%1980 pop)		2000-2018 (%2000 pop)		total 1960-2018 (%1960 pop)		highest value in 2009-2018 (year)	
BE	11.857	(0.1)	7.705	(0.1)	45.182	(0.4)	1.249.688	(13.7)	86.413	(2010)
BG	-7.717	(-0.1)	-25.036	(-0.3)	-22.353	(-0.3)	-1.079.771	(-13.7)	-1.108	(2013)
CZ	-9.108	(-0.1)	42	(0)	20.806	(0.2)	213.977	(2.2)	38.629	(2018)
DK	2.567	(0.1)	8.433	(0.2)	17.570	(0.3)	553.816	(12.1)	41.886	(2015)
DE	142.347	(0.2)	275.275	(0.4)	277.538	(0.3)	13.625.651	(18.7)	1.165.772	(2015)
EE	7.603	(0.6)	-3.965	(-0.3)	-1.750	(-0.1)	39.497	(3.3)	7.071	(2018)
IE	-3.821	(-0.1)	-6.238	(-0.2)	22.568	(0.6)	227.596	(8)	43.835	(2018)
EL	-11.493	(-0.1)	41.774	(0.4)	5.290	(0)	706.147	(8.5)	17.290	(2018)
ES	-30.654	(-0.1)	55.646	(0.1)	285.307	(0.7)	5.920.662	(19.4)	332.939	(2018)
FR	136.844	(0.3)	36.617	(0.1)	79.137	(0.1)	4.972.821	(10.9)	98.939	(2013)
HR	-1.140	(0)	-9.615	(-0.2)	-3.769	(-0.1)	-286.717	(-6.9)	888	(2009)
IT	-45.135	(-0.1)	8.372	(0)	240.927	(0.4)	3.842.365	(7.7)	1.183.877	(2013)
CY	-3.703	(-0.6)	3.794	(0.7)	6.148	(0.9)	122.326	(21.4)	18.142	(2011)
LV	12.376	(0.6)	-4.541	(-0.2)	-14.859	(-0.6)	-125.631	(-5.9)	-4.905	(2018)
LT	4.847	(0.2)	-5.446	(-0.2)	-26.562	(-0.8)	-516.650	(-18.6)	-3.292	(2018)
LU	2.067	(0.7)	2.623	(0.7)	7.421	(1.7)	234.816	(74.8)	11.159	(2015)
HU	-191	(0)	-699	(0)	14.271	(0.1)	253.357	(2.5)	32.165	(2018)
MT	-3.606	(-1.1)	1.014	(0.3)	4.650	(1.2)	36.484	(11.2)	17.102	(2018)
NL	18.990	(0.2)	28.458	(0.2)	31.007	(0.2)	1.538.079	(13.4)	85.917	(2018)
AT	6.745	(0.1)	18.383	(0.2)	43.034	(0.5)	1.320.212	(18.7)	114.237	(2015)
PL	-35.689	(-0.1)	-23.546	(-0.1)	-9.738	(0)	-1.369.729	(-4.6)	22.147	(2018)
PT	-51.042	(-0.6)	1.734	(0)	8.268	(0.1)	-829.068	(-9.4)	15.408	(2009)
RO	-11.167	(-0.1)	-40.519	(-0.2)	-112.411	(-0.5)	-3.169.517	(-17.2)	-13.887	(2013)
SI	3.282	(0.2)	953	(0.1)	4.849	(0.2)	176.834	(11.2)	14.928	(2018)
SK	969	(0)	-3.670	(-0.1)	-258	(0)	-58.929	(-1.4)	3.955	(2018)
FI	-9.030	(-0.2)	4.922	(0.1)	11.891	(0.2)	143.776	(3.2)	17.934	(2013)
SE	14.869	(0.2)	17.848	(0.2)	55.905	(0.6)	1.716.529	(22.9)	117.693	(2016)
NO	1.767	(0)	7.689	(0.2)	28.041	(0.6)	721.893	(20.2)	47.142	(2012)
EA	189.627	(0.1)	463.410	(0.2)	1.029.787	(0.3)	32.626.676	(12.4)	1.473.824	(2013)
EU27	142.050	(0)	390.317	(0.1)	990.067	(0.2)	29.458.622	(8.3)	1.518.409	(2013)

(1) CY: 1961-1979 average.
Source: European Commission based on Eurostat data.

migration into the EU has been consistently positive. Despite high volatility, it rose significantly: annual net entries averaged 622 000 people in 1990-1999 and around 1.1 million in 2000-2008. Following a slowdown to around 500 000 people in 2009-2011 in the wake of the global economic crisis, net migration started to rise again, peaking at more than 1.5 million in 2013, because of record inflows in Italy due to the statistical adjustment linked to the post-2011 census corrections (+966 000). In 2015, several Member States countries saw large inflows because of instability in North Africa and the Middle East, and in 2018, net inflows surpassed 1 million people.

Graph I.1.1: **Net migration flows (including statistical adjustment; 1960-2018)**



Source: European Commission based on Eurostat data.

Net migration flows per country ([10]) between 1960 and 2018 are shown in Table I.1.5, in absolute terms and relative to the population size. Over this period, Germany, Spain, France, Italy and Sweden recorded the largest total net inflows in absolute terms. When relating migration flows to the 1960 population, the largest overall inflows were in Luxembourg (+75%), Sweden (+23%), Cyprus (+21%), Norway (+20%), Spain (+19%), Austria (+19%) and Germany (+19%). At the opposite end are Romania, Poland, Bulgaria, Portugal and Lithuania, which saw the largest outflows in absolute terms. Relative to population size, net outflows were the largest in Lithuania (-19%), Romania (-17%), Bulgaria (-14%) and Portugal (-9%). Between 2000 and 2018, net migration was negative on average in Lithuania (with annual outflows representing 0.8% of the 2000 population), Latvia (-0.6%), Romania (-0.5%), Bulgaria (-0.3%), Estonia (-0.1%) and Croatia (-0.1%), with very small outflows in Slovakia and Poland. In the latter two countries, as well as in Estonia, net migration has been positive and rising for several years.

Following the 2009 crisis, net migration turned temporarily negative in several countries. This was the case in, for example, Ireland, Greece, Spain, Cyprus and Portugal. For France, net migration has been negative since 2015. For eleven Member States, net migration in 2018 was the highest since 2009.

1.4.2. Latest Eurostat population projections

Table I.1.6 presents the net migration flows in the EUROPOP2019 projections. The methodology underlying the net migration projections is summarised in Box I.1.1.

Table I.1.6: **Projection of net migration flows (2019-2070)**

	Net migration ('000)				*Net migration (% of population)*				
	2019	2030	2050	2070	2019	2030	2050	2070	2019-70 (%2019)[1]
BE	45	20	20	21	0.4	0.2	0.2	0.2	9.7
BG	-4	1	6	10	-0.1	0.0	0.1	0.2	2.9
CZ	44	16	17	18	0.4	0.2	0.2	0.2	9.2
DK	-2	12	11	11	0.0	0.2	0.2	0.2	9.9
DE	277	248	227	214	0.3	0.3	0.3	0.3	14.9
EE	7	2	2	3	0.5	0.1	0.2	0.2	8.7
IE	33	19	14	10	0.7	0.3	0.2	0.2	18.0
EL	14	12	21	26	0.1	0.1	0.2	0.3	8.7
ES	439	185	179	169	0.9	0.4	0.4	0.4	21.3
FR	38	68	75	80	0.1	0.1	0.1	0.1	5.6
HR	-4	-1	3	6	-0.1	0.0	0.1	0.2	1.7
IT	135	224	214	207	0.2	0.4	0.4	0.4	18.3
CY	8	3	3	2	0.9	0.4	0.3	0.2	18.3
LV	-4	-7	-2	1	-0.2	-0.4	-0.2	0.1	-10.1
LT	10	-10	-2	3	0.4	-0.4	-0.1	0.1	-6.0
LU	10	4	3	3	1.6	0.6	0.4	0.3	30.3
HU	36	24	23	24	0.4	0.2	0.3	0.3	12.7
MT	13	6	5	4	2.6	1.0	0.7	0.5	57.4
NL	105	33	33	33	0.6	0.2	0.2	0.2	11.0
AT	44	31	27	25	0.5	0.3	0.3	0.3	16.7
PL	3	25	48	72	0.0	0.1	0.1	0.2	5.8
PT	40	10	14	19	0.4	0.1	0.2	0.2	7.4
RO	-74	-40	-2	21	-0.4	-0.2	0.0	0.2	-4.4
SI	16	5	5	5	0.8	0.2	0.2	0.3	13.4
SK	3	5	5	7	0.1	0.1	0.1	0.2	5.1
FI	18	11	12	13	0.3	0.2	0.2	0.3	11.6
SE	67	52	40	30	0.6	0.5	0.3	0.2	22.5
NO	25	27	25	23	0.5	0.5	0.4	0.3	24.9
EA	1250	871	856	844	0.4	0.3	0.2	0.3	13.4
EU27	1318	960	1001	1037	0.3	0.2	0.2	0.2	11.8

(1) Cumulative net migration as % of 2019 population.
Source: EUROPOP2019 (Eurostat).

For the EU as a whole, annual net inflows are expected to decrease from about 1.3 million people in 2019 (0.3% of the EU population) to around 1 million as of the mid 2020s (0.2% of the EU population). Total net migration in the period up to 2070 would amount to 52.6 million people, equivalent to almost 12% of the 2019 population. Net migration would broadly converge to a level of about 0.2% of population across Member States.

The countries with the highest cumulative net migration as a share of population are expected to be Malta, Luxembourg, Norway, Sweden and Spain, with cumulative inflows of at least 20% of the 2019 population over the projection period. While net migration is assumed to turn positive in all countries during the projection period, cumulative net migration in 2019-2070 would nevertheless be negative for Latvia, Lithuania and Romania, the only countries with net migration outflows after 2035.

([10]) Due to difficulties in producing good statistics on migration flows for all Member States, net migration is measured as the difference between the total population stocks on 31 December and 1 January for a given calendar year, minus the natural increase (the difference between births and deaths). The population stocks that Member States transmit to Eurostat represents the number of person with usual residence in the country for at least 12 months (or legal or registered persons), including refugees and, in some cases, asylum seekers who are resident in the country for at least 12 months. This method is different from the approach of subtracting recorded emigration flows from immigration flows, which not only incorporates errors due to the difficulty of registering migration flows, but also includes all possible errors and adjustments in other demographic variables.

Box I.1.1: Methodology for the migration assumptions in the EUROPOP2019 projections

The models used by Eurostat to produce immigration and emigration projections, which combine into net migration, take account of past migration trends, the most recent data, underlying demographic factors as well as assumptions about future developments in migration flows. The models are built around a nowcast component, a trend extrapolation and a long-term convergence module. In the case of the immigration model, also a working-age population feedback mechanism is applied ([1]).

The nowcast components determine the emigration and immigration figures for base year 2019. They are based on the latest empirical evidence as provided by the national statistical institutes. For the EUROPOP2019 exercise, finalised in April 2020, all countries transmitted nowcast data for emigration and immigration for 2019, with the exceptions of Belgium, Estonia, Greece, France, Romania and Portugal (though Portugal provided the immigration nowcast). For these countries, 2019 figures were produced using the models' other components.

Emigration assumptions

Emigration values for 2020-2023 are obtained by linear interpolation between the nowcast emigration value for the base year (2019) and the midterm year (2024), when emigration is assumed to return to its 2000-2018 average. The latter is 'winsorized' by replacing the maximum and minimum values by the second highest and second lowest values, respectively, in order to correct for extreme values that might bias the average.

Next, the midterm value is linearly interpolated with the ultimate emigration distribution derived from the aggregation of all emigration events in the EU. To this end, the country profiles converge towards a common probabilities profile, progressively removing national peculiarities.

Immigration assumptions

The immigration assumptions are the sum of three components. First, the immigration from other EU Member States, which is generated from the corresponding sex- and age-specific emigration probabilities. This way, labour migration and post-retirement migration flows can be distinguished.

Second, there is the non-EU immigration before applying the working-age feedback mechanism (see below). These assumptions are derived from the latest observed data. As non-EU immigration is available only for 2013-2018, values for earlier years are estimated by applying the average share of non-EU immigration in the total inflow in 2013-2018 to past total immigration. Adding the immigration nowcast provides an immigration time series covering 20 years, i.e. 2000-2019.

Given the high volatility and general unpredictability of immigration, the assumptions for non-EU migration are based on the average value of the available time series. To confine the profound impact in some countries of the 2015 refugee crisis and the economic crisis, the immigration time series are winsorised. Immigration for the first projection years is computed by linear interpolation between the nowcast for 2019 and 2024, when the average of the winsorised 2000-2019 time series is assumed to be reached.

The 2024 immigration figure is then converted in immigration per capita and starts converging towards a common value, namely total non-EU immigration per capita for the EU as a whole in 2024. This means that, making abstraction of the working-age feedback mechanism discussed below, the inflow into the EU is kept constant as of 2024. This inflow is nevertheless redistributed across countries in function of a partial convergence towards equal attractiveness between countries for non-EU immigrants.

Third, there is the potential additional non-EU immigration generated by the working-age feedback mechanism. For all years in which the size of the population aged between 15 and 64 is projected to shrink, a 'feedback' correction factor is triggered, assuming an additional non-EU immigration flow in the same year. This extra immigration is assumed to be 10% of the decline in the working-age population, distributed by age and sex in accordance with the country-specific immigration pattern for the applicable year.

([1]) This box is based on Eurostat (2020), 'Methodology of the Eurostat population projections 2019-based (EUROPOP2019)'.

(Continued on the next page)

Box (continued)

Methodological changes

The methodology to determine net migration projections is fundamentally different from that of the population projections underlying the 2018 Ageing Report. Whereas these directly projected net migration([2]), EUROPOP2019 provides separate flows for emigration and immigration as migration data has improved. The new migration model ensures consistency for intra-EU flows and takes better into account sex differentials. It works on immigration levels and emigration probabilities.

([2]) See 2018 Ageing Report – Underlying Assumptions & Projection Methodologies, Box I.1.1.

1.5. OVERALL RESULTS OF THE 2019-BASED POPULATION PROJECTIONS

The EU population is projected to decline from 447 million people in 2019 to 424 million in 2070. During this period, Member States' population will age dramatically given the dynamics in fertility, life expectancy and migration. The median age would rise by five years over the next decades.

Table I.1.7 presents an overview of the population projections for the period 2019-2070 ([11]). These provide the basis for the age-related expenditure projections in the 2021 Ageing Report.

According to the baseline demographic projections, the EU population would reach a peak during the next decade. It would rise from about 447 million people in 2019 to a little over 449 million people in 2026. Thereafter, the population would start to shrink, falling back to 424 million in 2070. This is a decline by 5% compared to the base year level, most of which would take place in the second half of the projection period. The overall downward trend comprises rather heterogeneous developments at the country level.

For 11 Member States and Norway the total population would increase between 2019 and 2070, while 16 Member States would see the number of inhabitants shrink. Compared to the base year, the sharpest declines are expected in Latvia, Lithuania, Romania, Bulgaria and Croatia, with a fall of between 26% and 38%. Declines by around 20% are projected in Greece, Poland and Portugal. In these countries, the population is expected to dwindle steadily throughout the projection period.

Table I.1.7: **Total population projections (2019-2070)**

	Total population (annual average - millions)			*% change*		
	2019	2045	2070	2019-2045	2045-2070	2019-2070
BE	11.5	11.9	11.8	4%	-1%	3%
BG	7.0	5.8	5.0	-17%	-13%	-28%
CZ	10.7	10.6	10.2	-1%	-3%	-4%
DK	5.8	6.1	6.2	5%	1%	6%
DE	83.1	83.0	81.7	0%	-2%	-2%
EE	1.3	1.3	1.2	-4%	-6%	-10%
IE	4.9	6.1	6.5	23%	7%	32%
EL	10.7	9.7	8.6	-9%	-11%	-20%
ES	47.1	49.5	47.0	5%	-5%	0%
FR	67.1	70.0	69.4	4%	-1%	3%
HR	4.1	3.5	3.0	-14%	-13%	-26%
IT	60.3	58.8	53.9	-3%	-8%	-11%
CY	0.9	1.0	1.1	17%	6%	25%
LV	1.9	1.5	1.2	-24%	-19%	-38%
LT	2.8	2.2	1.8	-20%	-18%	-35%
LU	0.6	0.8	0.8	22%	4%	27%
HU	9.8	9.3	8.9	-4%	-5%	-9%
MT	0.5	0.7	0.7	31%	8%	41%
NL	17.3	18.2	18.0	5%	-1%	4%
AT	8.9	9.3	9.2	5%	-1%	4%
PL	38.0	34.8	30.8	-8%	-12%	-19%
PT	10.3	9.6	8.5	-7%	-12%	-18%
RO	19.3	16.0	13.7	-17%	-14%	-29%
SI	2.1	2.1	1.9	-1%	-6%	-7%
SK	5.5	5.2	4.7	-4%	-10%	-14%
FI	5.5	5.4	5.0	-3%	-6%	-9%
SE	10.3	12.0	13.1	17%	9%	27%
NO	5.3	6.2	6.7	17%	8%	26%
EA	342	346	333	1%	-4%	-3%
EU27	447	444	424	-1%	-5%	-5%

Source: EUROPOP2019 (Eurostat).

Among the countries with rising population between 2019 and 2070, Cyprus, Luxembourg, Sweden, Ireland and Malta would see their inhabitants increase by between 25% and 41%, mainly in the first part of the projection period. In the cases of Belgium, Spain, France, the

([11]) The population projections published by Eurostat refer to the population on 1 January of each year. The projections in this table (and used throughout this report) for year t are calculated as the average of the Eurostat projections on 1 January for year t and those for year t+1, as done in previous projection exercises.

Netherlands and Austria, the initial population increase would be mitigated in the second half of the projection horizon.

In 2019, Germany (83.1 million people) was the Member State with the largest population, followed by France (67.1 million), Italy (60.3 million), Spain (47.1 million) and Poland (38 million). In 2070, this order would remain the same despite the depopulation in Germany, Italy and Poland, and population growth in France.

In all Member States, the share in the overall population of the age cohorts above 65 years is expected to rise by 2070 (see Table I.1.8), from 20% in 2019 to 30% in 2070 for the EU. Increases range from six pps in Sweden to 16 pps in Poland, where people aged 65 or more would represent 34% of the population in 2070. Shares in Greece, Croatia, Italy, Latvia and Poland would be similar, with one in three persons being at least 65 years old at the end of the projection period.

Table I.1.8: **Composition of the population by age group**

	2019				*2070*			
	(0-19)	(20-64)	(65+)	(80+)	(0-19)	(20-64)	(65+)	(80+)
BE	22%	59%	19%	6%	20%	52%	28%	12%
BG	19%	60%	21%	5%	18%	51%	31%	14%
CZ	20%	60%	20%	4%	20%	52%	28%	13%
DK	22%	58%	20%	5%	21%	52%	28%	11%
DE	18%	60%	22%	7%	20%	52%	28%	12%
EE	21%	59%	20%	6%	18%	51%	30%	14%
IE	27%	59%	14%	3%	21%	52%	27%	12%
EL	19%	58%	22%	7%	17%	50%	33%	15%
ES	20%	61%	20%	6%	17%	51%	32%	15%
FR	24%	56%	20%	6%	21%	50%	29%	13%
HR	19%	60%	21%	5%	17%	51%	33%	14%
IT	18%	59%	23%	7%	16%	51%	33%	15%
CY	22%	62%	16%	4%	19%	53%	27%	11%
LV	21%	59%	20%	6%	18%	50%	32%	15%
LT	20%	60%	20%	6%	17%	50%	33%	14%
LU	21%	64%	14%	4%	17%	53%	30%	12%
HU	20%	61%	20%	4%	19%	52%	30%	12%
MT	18%	63%	19%	4%	16%	52%	32%	13%
NL	22%	59%	19%	5%	20%	52%	29%	11%
AT	19%	62%	19%	5%	18%	52%	29%	12%
PL	20%	62%	18%	4%	16%	50%	34%	16%
PT	19%	59%	22%	6%	18%	49%	33%	15%
RO	21%	60%	19%	5%	18%	51%	32%	14%
SI	20%	60%	20%	5%	18%	52%	30%	14%
SK	21%	63%	16%	3%	18%	50%	32%	15%
FI	21%	57%	22%	6%	17%	51%	32%	13%
SE	23%	57%	20%	5%	21%	53%	26%	11%
NO	23%	59%	17%	4%	19%	53%	28%	11%
EA	20%	59%	21%	6%	19%	51%	30%	13%
EU27	20%	59%	20%	6%	18%	51%	30%	13%

Source: European Commission based on EUROPOP2019 (Eurostat).

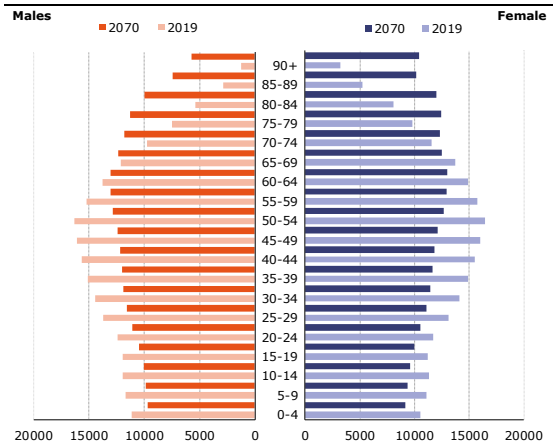
The population share of the age cohorts above 80 would more than double in all Member States between 2019 and 2070, with the exception of Germany. For the EU as a whole, their share would rise from 6% in 2019 to 13% in 2070. The projected increase is the highest in Poland, and Slovakia.

The population share of the age group 0-19 would shrink in all Member States during the projection horizon, aside from Germany where it would increase slightly. The share in the EU population of this youngest group would decrease from 20% in 2019 to 18% in 2070. The dwindling – also in absolute numbers for most countries – of the 0-19 age group is the sharpest in Ireland and Finland.

Finally, the population at working age (20-64 year olds), would shrink in all Member States relative to the overall population. Whereas in 2019, people at working age represented 59% of the EU population, this share would fall to 51% in 2070. The decrease exceeds 10 pps in Lithuania, Luxembourg, Malta, Poland and Slovakia.

The drivers of these trends are manifold. First, the increasing share of the population in the higher age cohorts is due to the combination of the numerous cohorts born in the 1950s and 1960s and continuing gains in life expectancy. Second, the size of the groups aged 25-59 (the bulk of the working-age population, see Graph I.1.2) shrinks significantly between 2019 and 2070 due to fertility rates below the natural replacement rate and shrinking cohorts of women in childbearing ages. Finally, net migration flows would not suffice to offset the trends towards an ageing population.

Graph I.1.2: **EU population by age group and gender ('000)**



Source: European Commission based on EUROPOP2019 (Eurostat).

The strong upward shift in the age distribution over the next decades is shown in Graph I.1.2. While in 2019, the largest cohort for both males and females was that of people aged 50-54, in 2070 the 55-59 and 60-64 age brackets would be the largest cohorts. Overall, the median age will rise from 43.7 year in 2019 to 48.8 year in 2070, most of which occurs by around 2040. For men it goes from 42.2 to 47.3, for women from 45.2 to 50.3.

Because of the demographic shift from younger to older age groups, demographic dependency ratios are expected to increase significantly in all countries (see Table I.1.9).

The old-age dependency ratio (OADR), i.e. people aged at least 65 relative to those aged 20-64) expresses the presumed number of pensioners in terms of the theoretical number of contributors. It provides a gauge of how demographic ageing alters the beneficiary-contributor balance. The OADR is projected to increase from 34% in 2019 to 59% in 2070 for the EU as a whole. This increase would predominantly take place during the first half of the projection period. The change in the OADR means that the EU would move from having, for every person aged over 65 years, nearly three (2.9) people at working-age to less than two (1.7).

The Member States with the highest projected increase in the OADR are Portugal, Spain, Romania, Malta, Lithuania, Luxembourg, Slovakia and Poland, with increases of at least 30 pps. In 2070, the OADR would surpass 65% in Greece, Italy, Lithuania, Portugal and Poland: for every two retirees, there would be only three potential contributors. In Sweden, Cyprus, Ireland, Belgium, the Czech Republic, Denmark and Germany, the OADR would stay below 55% in 2070.

Similarly, the very old-age dependency ratio (people aged 80 or above relative to those aged 20-64) is projected to rise considerably, from 10% to 25.7% on average in the EU. The same countries come to the fore as for the standard old-age dependency ratio.

Finally, the total dependency ratio (people younger

Table I.1.9: **Dependency ratios (%, 2019-2070)**

	Old-age dependency ratio (65+/20-64)				*Very old-age dependency ratio (80+/20-64)*				*Total dependency ratio ((0-19 & 65+)/20-64)*				
	2019	2045	2070	2019-2070 (pps change)	2019	2045	2070	2019-2070 (pps change)	2019	2045	2070	2019-2070 (pps change)	
BE	32.5	47.7	53.3	20.8	9.7	17.8	22.2	12.5	70.8	84.8	90.5	19.8	BE
BG	36.0	55.8	60.8	24.8	8.1	16.9	27.5	19.4	67.7	89.8	96.7	29.0	BG
CZ	33.0	51.3	53.7	20.6	6.8	15.5	24.1	17.3	67.1	88.1	92.1	25.0	CZ
DK	34.1	48.2	53.8	19.7	8.0	17.2	21.1	13.2	72.7	88.3	94.0	21.3	DK
DE	36.1	52.2	54.6	18.5	11.1	20.3	22.9	11.8	66.9	87.1	92.1	25.2	DE
EE	33.8	49.5	59.4	25.6	9.7	17.5	27.0	17.3	69.5	83.3	94.9	25.4	EE
IE	24.2	42.2	53.0	28.7	5.8	13.3	22.2	16.4	70.0	82.6	92.6	22.7	IE
EL	37.9	64.0	65.2	27.3	12.2	22.7	30.3	18.0	71.1	96.3	98.7	27.6	EL
ES	32.1	61.2	62.5	30.5	10.0	21.1	28.5	18.5	64.4	93.1	95.3	30.9	ES
FR	36.5	53.1	56.9	20.4	11.1	20.8	25.0	13.9	79.8	95.1	98.1	18.3	FR
HR	34.8	53.7	64.6	29.8	9.0	18.7	26.7	17.7	67.1	85.0	97.5	30.4	HR
IT	38.9	65.4	65.6	26.7	12.3	23.7	28.5	16.2	69.2	95.8	96.8	27.6	IT
CY	26.2	36.7	50.7	24.6	6.0	13.4	19.6	13.7	61.0	71.4	86.9	26.0	CY
LV	34.6	57.4	63.6	29.0	9.7	20.6	29.9	20.2	69.5	92.0	100.2	30.7	LV
LT	32.9	58.9	66.0	33.1	9.7	21.5	28.7	19.0	66.0	91.5	100.8	34.8	LT
LU	22.6	41.6	56.1	33.6	6.2	13.4	23.3	17.1	55.9	72.9	89.2	33.4	LU
HU	32.2	49.6	57.4	25.1	7.3	14.4	23.5	16.2	64.4	84.1	93.6	29.2	HU
MT	29.7	39.3	62.4	32.7	6.8	13.7	25.4	18.7	58.5	65.7	92.3	33.9	MT
NL	32.9	49.3	55.2	22.4	7.9	18.5	21.7	13.8	69.9	87.0	93.2	23.2	NL
AT	30.7	49.5	55.9	25.2	8.4	18.1	23.3	14.9	62.1	82.8	91.1	29.0	AT
PL	29.0	49.5	67.8	38.8	7.1	17.2	31.4	24.3	61.5	78.6	99.5	38.0	PL
PT	37.3	65.9	67.3	30.0	11.0	23.4	30.0	19.0	69.4	100.7	103.3	33.9	PT
RO	31.1	55.6	62.1	31.0	7.8	15.9	28.2	20.4	66.0	89.6	97.1	31.1	RO
SI	33.2	55.9	58.8	25.5	8.9	19.8	26.7	17.8	65.7	88.9	93.2	27.5	SI
SK	25.9	49.9	63.1	37.2	5.3	15.5	29.1	23.8	58.5	82.8	99.1	40.6	SK
FI	38.9	49.9	62.5	23.6	9.8	19.8	26.1	16.2	76.4	81.7	94.7	18.3	FI
SE	35.2	41.8	49.8	14.6	9.1	14.8	20.1	11.0	76.2	81.3	89.4	13.2	SE
NO	29.4	42.6	52.4	23.0	7.2	14.7	20.6	13.4	69.0	78.8	88.6	19.6	NO
EA	35.3	55.8	58.9	23.6	10.6	20.7	25.5	14.9	69.7	91.1	95.2	25.5	EA
EU27	34.4	54.6	59.2	24.7	9.9	19.7	25.7	15.8	68.8	89.4	95.3	26.5	EU27

Source: European Commission based on EUROPOP2019 (Eurostat).

Table I.1.10: **Geographical distribution of world population (1960-2070, % of total world population)**

	1960	1980	2000	2020	2045	2070	(pps change) 1960-2020	(pps change) 2020-2070
Africa	9.3%	10.7%	13.2%	17.2%	24.1%	31.6%	7.9	14.4
Asia	56.2%	59.4%	60.9%	59.5%	55.4%	49.8%	3.4	-9.8
China	21.8%	22.4%	21.0%	18.5%	15.1%	12.0%	-3.3	-6.4
Japan	3.1%	2.6%	2.1%	1.6%	1.2%	0.9%	-1.5	-0.8
India	14.8%	15.7%	17.2%	17.7%	17.1%	15.6%	2.9	-2.1
Europe	19.9%	15.6%	11.8%	9.6%	7.6%	6.4%	-10.4	-3.2
EU27	11.7%	9.1%	6.9%	5.7%	4.5%	3.7%	-6.0	-2.0
EA	8.7%	6.8%	5.2%	4.4%	3.5%	2.9%	-4.3	-1.5
Russian Federation	3.9%	3.1%	2.4%	1.9%	1.4%	1.2%	-2.1	-0.6
Latin America and the Caribbean	7.3%	8.1%	8.5%	8.4%	8.0%	7.3%	1.1	-1.1
Northern America	6.7%	5.7%	5.1%	4.7%	4.4%	4.3%	-2.0	-0.4
US	6.2%	5.1%	4.6%	4.2%	3.9%	3.9%	-1.9	-0.4

Source: UN World Population Prospects 2019.

than 20 or older than 64 relative to the population aged 20-64) is projected to rise from 69% in 2019 to 95% in 2070 for the EU as a whole. This measure relates the theoretical inactive population – people that have not yet entered or have already left the labour market – to the theoretical contributory base. Again, broadly the same countries record the largest changes for the total dependency ratio as for the more narrow definitions.

In 2070, it is expected that the number of young and old people will have surpassed the number of people at working age in Latvia, Lithuania and Portugal, with a total dependency ratio of more than 100%. In contrast, the ratio would stay below 90% in Cyprus, Norway, Luxembourg and Sweden. This compares to a maximum value of 80% in 2019.

1.6. DEMOGRAPHIC AGEING IN A GLOBAL CONTEXT

The EU's share of the world population is forecast to shrink from 5.7% in 2020 to 3.7% by 2070. The projected increase in dependency ratios is comparatively high for the EU, in particular given the current demographic balance compared to 'younger' continents.

The UN population statistics and projections provide a global perspective of demographic trends ([12]). The combined share of EU Member States in the world population halved since 1960, when the EU represented almost 12% of the world population (see Table I.1.10). While the EU population grew by 25% over the past six decades, demographic growth was faster outside of Europe, with the global population increasing by more than 150% over the same period. The shares of China, Japan, Russia and the US in the global population also declined compared to 1960, in contrast with the rising shares in India, Latin America and, particularly, Africa.

Given that fast population growth is expected to continue, the African continent's share in the world population would increase further, to about 32% in 2070. While staying the most populous continent, Asia's share would decline over the next five decades to around 50%. This fall is driven by China, India and Japan – in particular China, whose share would decrease by a third in 2020-2070 –, with a broadly stable share of about 22% for the other Asian countries.

By 2070, the EU's share in the global population is expected to reach 3.7%, shrinking by 2 pps relative to the current situation ([13]). This is comparable to the projected share of the US, whose share would remain broadly stable.

Looking at the age structure in the UN projections, the EU currently has already a comparatively high OADR (see Table I.1.11). At 35%, it is below the Japanese ratio of 52% but considerably above that in other large countries, with a higher increase in

([12]) The United Nations Population Division updates its global population projections every two years. The latest projections are the UN World Population Prospects 2019.

([13]) The UN projections and Eurostat's EUROPOP2019 projections differ notably. The former expect the EU27 population to peak in 2021 before falling to 392 million people in 2070, i.e. 32 million below the Eurostat baseline (see Table I.1.8). The UN figures show a larger decline (or a smaller increase) for a majority of Member States.

Table I.1.11: **Global demographic dependency ratios (19, 1960-2070, (%)**

	Old-age dependency ratio (65+/20-64)						*Very old-age dependency ratio (80+/20-64)*					
	1960	2000	2020	2070	(pps change) 1960-2020	2020-2070	1960	2000	2020	2070	(pps change) 1960-2020	2020-2070
World	10.1	12.8	16.3	34.3	6.2	18.0	1.2	2.2	3.3	11.1	2.1	7.9
Africa	7.0	7.8	7.7	14.8	0.6	7.2	0.6	0.8	1.0	2.7	0.4	1.7
Asia	7.6	10.6	14.8	41.1	7.2	26.3	0.7	1.5	2.6	13.5	1.9	10.9
China	7.6	11.3	18.5	58.2	10.9	39.7	0.4	1.6	2.9	24.0	2.5	21.2
Japan	10.4	27.3	52.0	81.9	41.6	30.0	1.3	5.9	16.4	42.2	15.1	25.7
India	6.4	8.6	11.3	35.5	4.9	24.2	0.7	1.0	1.7	8.7	1.0	7.1
Europe	15.3	24.3	32.0	55.6	16.7	23.6	2.2	4.9	8.9	24.2	6.6	15.4
EU27	16.7	25.7	35.2	62.5	18.5	27.3	2.4	5.4	10.2	28.0	7.8	17.7
EA	17.8	26.7	36.0	63.7	18.2	27.7	2.7	5.9	11.0	28.6	8.3	17.6
Russian Federation	10.5	20.4	25.3	40.1	14.8	14.8	1.5	3.3	6.3	17.2	4.9	10.9
Latin America and the Caribbean	8.1	10.9	15.2	48.0	7.1	32.7	0.9	1.9	3.2	16.9	2.3	13.7
North America	17.1	20.9	28.5	48.7	11.5	20.2	2.6	5.4	6.8	18.9	4.2	12.0
US	17.3	20.9	28.4	48.3	11.1	19.9	2.7	5.5	6.8	18.7	4.1	11.9
Oceania	14.3	17.4	22.6	36.7	8.3	14.1	2.1	3.8	5.4	13.6	3.2	8.2

Source: UN World Population Prospects 2019.

recent decades. Ratios and projected changes for the EU are comparable to those based on the Eurostat projections (see Table I.1.9).

Globally, the UN demographic projections expect the OADR to rise by 18 pps, from 16% in 2020 to 34% in 2070. The EU ratio would increase by 27 pps, reaching 63% in 2070. All continents are expected to see an increase and in some cases, e.g. Asia and Latin America, the projected change in the balance between potential retirees and potential contributors is similar to what is anticipated for the EU. However, given that the current situation is generally more favourable in other regions, it can be concluded that European Member States will on average undergo a more radical ageing process than the rest of the world, notable exceptions such as Japan and China aside. Developments for the very old-age dependency ratio lead to the same conclusion.

Global ageing shows in expected changes of median ages. In 2020, the median age in the EU was 43 years, up from 30 years in 1960. This compares to 39 years in Northern America, 32 years in Asia and 31 years in Latin America. By 2070, half of the EU population would be above 49 years according to the UN projections, compared to 46 years in Latin America, 44 years in Northern America and 43 years in Asia.

1.7. COMPARISON WITH THE DEMOGRAPHIC SCENARIO UNDERLYING THE 2018 AGEING REPORT PROJECTIONS

In 2070, the EU would count 15.2 million people less than assumed in the 2018 Ageing Report. This is due to lower projections for people aged less than 65 years, with the upward revision in net migration insufficient to offset the downward revision in the average fertility rate. As a result, the new demographic projections entail a larger increase in the old-age dependency ratio between 2019 and 2070.

This section compares the latest Eurostat demographic projections, EUROPOP2019, with those underlying the 2018 Ageing Report, ESSPOP2015.

In the base year 2019, the EU population counted 762 000 fewer people than anticipated in the 2015-based demographic projections (see Table I.1.12). This difference was mainly due to France, Germany and Italy, reflecting how net migration in 2016-2018 was smaller than expected under ESSPOP2015.

In 2070, the total EU population would be some 15.2 million people smaller (-3%) than previously projected. Among the sixteen Member States with a downward revision, the latter corresponds to at least 10% of the previous 2070 population projection for Luxembourg, Belgium, Latvia, Croatia, Finland, Denmark and France. Upward revisions are fewer in number and generally

Table I.1.12: **Population – difference between EUROPOP2019 and ESSPOP2015 ('000)**

	Total population			Population 0-19			Population 20-64			Population 65+			
	2019	2070	*Difference in 2070 (%)* [1]	2019	2070	*Difference in 2070 (%)* [1]	2019	2070	*Difference in 2070 (%)* [1]	2019	2070	*Difference in 2070 (%)* [1]	
BE	-63	-2.070	*-15%*	-27	-646	*-22%*	-26	-1.097	*-15%*	-10	-328	*-9%*	BE
BG	-6	178	*4%*	0	-4	*0%*	2	128	*5%*	-7	54	*4%*	BG
CZ	31	236	*2%*	8	43	*2%*	30	165	*3%*	-8	28	*1%*	CZ
DK	-56	-673	*-10%*	-9	-134	*-9%*	-43	-315	*-9%*	-5	-224	*-12%*	DK
DE	-555	2.488	*3%*	240	1.102	*7%*	-634	2.619	*7%*	-161	-1.233	*-5%*	DE
EE	10	16	*1%*	1	-16	*-7%*	8	15	*3%*	1	17	*5%*	EE
IE	105	458	*8%*	-48	-52	*-4%*	140	187	*6%*	13	323	*22%*	IE
EL	120	925	*12%*	59	168	*13%*	63	539	*14%*	-2	218	*8%*	EL
ES	585	-2.813	*-6%*	21	-2.981	*-27%*	614	-1.631	*-6%*	-50	1.799	*14%*	ES
FR	-572	-7.604	*-10%*	-334	-3.113	*-18%*	-256	-4.694	*-12%*	18	203	*1%*	FR
HR	-34	-368	*-11%*	-16	-100	*-16%*	-18	-198	*-11%*	0	-71	*-7%*	HR
IT	-406	-986	*-2%*	-93	-777	*-8%*	-254	-146	*-1%*	-59	-62	*0%*	IT
CY	15	80	*8%*	11	57	*37%*	2	66	*13%*	1	-44	*-13%*	CY
LV	-5	-161	*-12%*	-3	-67	*-24%*	1	-72	*-11%*	-3	-22	*-5%*	LV
LT	27	101	*6%*	2	-31	*-9%*	26	42	*5%*	-1	90	*18%*	LT
LU	-2	-250	*-24%*	-2	-69	*-33%*	1	-125	*-23%*	-2	-56	*-19%*	LU
HU	-21	46	*1%*	-4	-114	*-6%*	4	101	*2%*	-21	59	*2%*	HU
MT	50	186	*36%*	4	8	*8%*	45	109	*42%*	0	70	*44%*	MT
NL	-14	-1.561	*-8%*	-14	-556	*-14%*	18	-770	*-8%*	-18	-235	*-4%*	NL
AT	-85	-922	*-9%*	3	-190	*-10%*	-76	-347	*-7%*	-12	-385	*-12%*	AT
PL	11	-58	*0%*	73	-620	*-11%*	2	377	*3%*	-63	185	*2%*	PL
PT	57	479	*6%*	50	225	*18%*	7	281	*7%*	0	-28	*-1%*	PT
RO	30	-1.333	*-9%*	80	-687	*-22%*	-37	-569	*-8%*	-13	-78	*-2%*	RO
SI	14	-19	*-1%*	1	-47	*-12%*	14	-4	*0%*	0	33	*6%*	SI
SK	-1	-186	*-4%*	15	-84	*-9%*	-14	-71	*-3%*	-1	-31	*-2%*	SK
FI	-30	-592	*-11%*	-23	-284	*-25%*	-6	-284	*-10%*	-1	-24	*-1%*	FI
SE	34	-788	*-6%*	10	-467	*-15%*	32	-302	*-4%*	-7	-20	*-1%*	SE
NO	-32	-297	*-4%*	-10	-182	*-12%*	-23	-86	*-2%*	1	-29	*-2%*	NO
EA	-751	-12.430	*-4%*	-137	-7.352	*-11%*	-327	-5.383	*-3%*	-287	305	*0%*	EA
EU27	-762	-15.190	*-3%*	5	-9.433	*-11%*	-355	-5.995	*-3%*	-411	238	*0%*	EU27

(1) Difference in 2070 as percentage of ESSPOP2015 projection for 2070.
Source: European Commission based on EUROPOP2019 and ESSPOP2015 (Eurostat).

smaller, with the exceptions of Malta (+36%) and Greece (+12%).

Developments for broad age groups (0-19, 20-64 and above 65), show that the average revision is driven by the 0-19 and 20-64 age brackets, which in 2070 would on average be 11% and 3% smaller, respectively, than projected in ESSPOP2015.

- The 2070 projection for people below 20 was revised down by at least 20% of the previous number in the cases of Luxembourg, Spain, Finland, Latvia, Romania and Belgium. Upward revisions for this age group are limited to six Member States, led by Cyprus and Portugal.

- For the working-age population (20-64 year-olds), downward revisions surpass 20% of the previous projection only for Luxembourg (-23%). Malta has by far the largest upward revision for this age bracket (+42%), with most other revisions below 10%.

- Downward revisions for the population cohort above 65 year are mostly small, surpassing 10% only for Denmark, Austria, Cyprus and Luxembourg. Conversely, upward revisions exceed 10% of the previous projection for Spain, Lithuania, Ireland and, notably, Malta.

These changes result in a higher projected increase in the old-age dependency ratio for 18 Member States and Norway (see Table I.1.13). For the EU as a whole, the OADR would increase by an additional two pps as compared to the 2018 Ageing Report's demographic projections. The largest upward revisions are for Spain (+12 pps), Ireland and Lithuania (+8 pps), France (+7 pps), Malta (+6 pps) and Finland (+5 pps). Projections for Cyprus (-15 pps), Germany (-7 pps) and Portugal (-6 pps) show smaller increases in the OADR than assumed in the 2018 Ageing Report.

Table I.1.13: **Old-age dependency ratio – difference between EUROPOP2019 and ESSPOP2015 (percentage points)**

	2019	2045	2070	2019-2070
BE	0.0	2.9	3.5	3.5
BG	-0.2	-2.7	-1.0	-0.8
CZ	-0.3	-1.8	-1.2	-0.9
DK	0.3	3.9	-1.6	-1.8
DE	0.1	-2.2	-6.7	-6.8
EE	-0.2	-0.2	1.4	1.6
IE	-0.8	-4.1	7.0	7.8
EL	-0.4	-8.0	-3.5	-3.1
ES	-0.9	-6.1	11.0	11.8
FR	0.3	2.8	7.2	6.9
HR	0.3	2.1	3.3	3.0
IT	0.1	-1.2	0.1	0.0
CY	0.1	-3.6	-14.8	-14.9
LV	-0.3	-2.8	3.6	3.9
LT	-0.6	-5.7	7.2	7.8
LU	-0.6	2.8	2.6	3.2
HU	-0.4	-2.2	0.0	0.4
MT	-4.8	-8.0	0.9	5.7
NL	-0.2	1.7	1.9	2.1
AT	0.2	2.3	-3.7	-3.9
PL	-0.3	-2.6	-0.5	-0.2
PT	0.0	-1.8	-5.6	-5.6
RO	0.0	-0.8	3.7	3.7
SI	-0.4	-1.7	3.5	3.9
SK	0.1	0.1	0.6	0.5
FI	0.0	1.4	5.3	5.3
SE	-0.3	0.6	1.8	2.1
NO	0.2	0.5	0.4	0.2
EA	-0.1	-0.9	2.0	2.1
EU27	-0.1	-0.9	1.7	1.8

(1) Old-age dependency ratio: persons aged 65 and over in relation to persons aged 20-64.
Source: European Commission based on EUROPOP2019 and ESSPOP2015 (Eurostat).

The broad differences in the population projections described above can be related to changes in the assumptions regarding fertility, life expectancy and net migration.

Fertility

Fertility rates are lower than those assumed in the previous demographic projections, by 0.1 on average (see Table I.1.14). This is caused by the combined effect of the fertility rate in 2019 being in most countries lower than what was assumed in the previous demographic projections and the lower anchor point for long-term convergence.

The sole exceptions to the decrease in the average number of live births in 2019-2070 are Portugal, with a 0.1 increase, and Germany, with a marginally higher fertility rate. Downward revisions are the largest for Spain (-0.4 live births per woman), Malta and Finland (-0.3), Norway, Sweden, Latvia, Ireland and France (-0.2). For these countries, the fertility rate in 2019 was on average 0.2 lower than what was assumed in the previous demographic projections, thus lowering the starting point.

Table I.1.14: **Fertility and net migration – differences between EUROPOP2019 and ESSPOP2015**

	Fertility rate			Net migration ('000)			
	2019	2070	avg 2019-2070	2019	2070	sum 2019-2070	sum 2019-2070(1)
BE	-0.2	-0.1	-0.1	-9	-6	-903	-6.5%
BG	0.0	-0.1	-0.1	8	9	310	6.4%
CZ	0.0	0.0	0.0	22	10	207	2.1%
DK	0.0	0.0	0.0	-36	2	-369	-5.4%
DE	0.0	0.0	0.0	-108	71	957	1.2%
EE	-0.1	-0.1	-0.1	4	2	65	5.5%
IE	-0.2	-0.2	-0.2	22	0	327	5.4%
EL	0.0	-0.1	0.0	34	15	699	9.1%
ES	-0.3	-0.4	-0.4	399	32	2.884	5.8%
FR	-0.2	-0.1	-0.2	-35	25	12	0.0%
HR	0.0	-0.1	0.0	0	1	-154	-4.5%
IT	0.0	-0.1	-0.1	-20	43	1.070	2.0%
CY	0.0	-0.1	0.0	6	-1	-32	-3.1%
LV	-0.2	-0.2	-0.2	4	1	-81	-6.0%
LT	-0.1	-0.1	-0.1	34	3	199	11.6%
LU	-0.2	-0.1	-0.1	0	-1	-153	-14.7%
HU	-0.1	-0.1	-0.1	15	12	413	4.7%
MT	-0.4	-0.3	-0.3	9	3	187	36.0%
NL	-0.1	-0.1	-0.1	37	9	-288	-1.5%
AT	0.0	-0.1	0.0	-27	5	-545	-5.4%
PL	-0.1	-0.2	-0.1	13	65	1.697	5.5%
PT	0.2	0.0	0.1	40	4	39	0.5%
RO	-0.1	-0.1	-0.1	-9	18	42	0.3%
SI	-0.1	-0.1	-0.1	12	3	90	4.6%
SK	0.1	-0.2	-0.1	-2	4	9	0.2%
FI	-0.4	-0.3	-0.3	2	6	100	1.8%
SE	-0.2	-0.2	-0.2	-3	6	128	0.9%
NO	-0.2	-0.2	-0.2	-2	7	183	2.6%
EA	-0.1	-0.1	-0.1	402	216	4.637	1.3%
EU27	-0.1	-0.1	-0.1	411	339	6.911	1.6%

(1) Difference in total net migration (2019-2070) as percentage of ESSPOP2015 population projection for 2070.
Source: European Commission based on EUROPOP2019 and ESSPOP2015 (Eurostat).

Net migration

In 2019, net migration flows were generally slightly higher than the numbers projected under ESSPOP2015 (see Table I.1.14). The higher net migration for the EU as a whole (411 000 persons) – mostly accounted for by Spain – corresponded to 0.1% of the EU population. The difference was larger than 0.5% of the 2019 population in the cases of Slovenia, Cyprus, Spain, Lithuania and Malta with higher net migration representing up to 2% of the overall population. Among the countries for which net migration in 2019 was lower than previously expected, the difference surpasses 0.5% of the population only in the case of Denmark (-0.6%).

Over the entire projection period 2019-2070, cumulative net migration is expected to count

about seven million more people as compared to the ESSPOP2015 projections. This corresponds to 1.6% of the previous population projection for 2070. For most countries, the new migration projections entail an upward revision. This revision exceeds 5% of the former 2070 population size in the cases of Ireland, Estonia, Poland, Spain, Bulgaria (+5-7%), Greece (+9%), Lithuania (+12%) and Malta (+36%). At the opposite end, downward revisions in the total net migration during 2019-2070 correspond to at least 5% of the old 2070 population figure for Denmark, Austria, Latvia, Belgium (minus 5-7%) and Luxembourg (-15%).

Life expectancy

For the EU as a whole, life expectancy at birth in 2019 remained unchanged between the two projections for males and females (see Table I.1.15). The expected average increase in male and female longevity was also confirmed.

Considering that Eurostat projections assume upward convergence, lower/higher values than in the previous round of projections for the base year in a country, implies respectively higher/lower increases in life expectancy by 2070 than in the previous round.

When looking at the projections for males, upward revisions for 2019 exceed one year for Estonia and Ireland, and ranges between 0.5 and one year for Belgium, Finland, Lithuania and Norway. Downward revisions of between 0.5 and one year are found for Hungary, Poland, Romania and Bulgaria. This results in smaller differences for life expectancy compared to the previous projections in 2070 than in 2019.

For females, the biggest upward revisions in 2019, of between 0.5 and one year, are for Estonia, Ireland and Spain. Downward revisions for the base year are generally small, with a maximum of 0.4 years for Hungary and the Netherlands. As to the overall gain in life expectancy at birth in the period up to 2070, revisions range from -0.7 years for Ireland to +0.4 years for Romania.

Table I.1.15: **Life expectancy at birth – difference between EUROPOP2019 and ESSPOP2015 (years)**

	Males			Females		
	2019	2070	change 2019-2070	2019	2070	change 2019-2070
BE	0.5	0.1	-0.4	0.1	0.1	0.0
BG	-0.9	-0.4	0.5	-0.2	-0.1	0.1
CZ	-0.1	-0.1	0.0	-0.2	-0.1	0.1
DK	0.2	0.0	-0.2	-0.1	-0.2	-0.1
DE	-0.1	-0.1	0.0	-0.3	-0.2	0.1
EE	1.3	0.4	-0.9	1.0	0.4	-0.6
IE	1.1	0.4	-0.7	0.8	0.1	-0.7
EL	-0.4	-0.1	0.3	-0.1	0.0	0.1
ES	0.4	0.2	-0.2	0.6	0.2	-0.4
FR	0.1	0.1	0.0	0.3	0.3	0.0
HR	-0.3	-0.1	0.2	0.0	-0.1	-0.1
IT	0.2	0.1	-0.1	0.0	0.0	0.0
CY	-0.5	-0.4	0.1	0.2	0.0	-0.2
LV	0.2	-0.1	-0.3	0.0	-0.1	-0.1
LT	0.7	0.1	-0.6	0.3	0.0	-0.3
LU	0.4	0.2	-0.2	-0.2	-0.1	0.1
HU	-0.6	-0.3	0.3	-0.4	-0.1	0.3
MT	0.2	0.0	-0.2	-0.1	0.0	0.1
NL	0.2	0.1	-0.1	-0.4	-0.2	0.2
AT	0.1	0.0	-0.1	-0.1	0.0	0.1
PL	-0.6	-0.1	0.5	-0.2	0.0	0.2
PT	-0.2	-0.2	0.0	0.0	0.0	0.0
RO	-0.8	-0.1	0.7	-0.2	0.2	0.4
SI	0.0	0.1	0.1	0.2	0.3	0.1
SK	0.0	-0.1	-0.1	0.0	-0.1	-0.1
FI	0.6	0.2	-0.4	0.3	0.2	-0.1
SE	0.4	0.1	-0.3	0.0	0.0	0.0
NO	0.8	0.3	-0.5	-0.1	-0.1	0.0
EA	0.1	0.0	-0.1	0.1	0.0	0.0
EU27	0.0	0.0	0.0	0.0	0.0	0.0

Source: European Commission based on EUROPOP2019 and ESSPOP2015 (Eurostat).

2. LABOUR FORCE PROJECTIONS

The total participation rate in the EU is projected to rise from 78% in 2019 to 81% in 2070, mostly as a result of higher labour force participation of older workers. Over the same period, the total employment rate is projected to increase from 73% to 76%. This change is driven largely by increases in the employment of older people (+10 pps) and women (+6 pps). The total labour supply in the EU is projected to fall by 16% during the period in question, as higher labour force participation can only partly offset the expected reduction in the working-age population.

2.1. INTRODUCTION

The macroeconomic implications of the demographic trends described in the previous chapter will depend in large part on the future growth of the labour force and on how long people remain part of it. Working longer can provide more resources to finance the higher social security and healthcare costs associated with population ageing. This would also enable the propor¬tion of total resources allocated to supporting the older population to be reduced. More resources would thereby be freed up to provide education and training for the young and the unemployed.

How long people work will depend, among other factors, on the incentive emanating from public and private pension programmes. It is therefore important to take into account the future effects of any pension reforms adopted. Other aspects that may affect the labour supply are trends in health and disability and the implementation of active labour market policies that may increase the demand for older workers and the flexibility of work at older ages.

This chapter starts with a comparison of recent trends in labour forces, followed by an overview of the estimated effects of legislated pension reforms. Thereafter, the participation rate and employment rate projections are discussed ([14]). An analysis of the economic dependency ratio and a comparison with the 2018 Ageing Report conclude the chapter. The boxes and annexes focus on the underlying assumptions and on methodological aspects of the projections.

2.2. PAST TRENDS AND MAIN DRIVERS OF LABOUR MARKET DEVELOPMENTS

Labour force composition has undergone profound changes in recent decades. While younger cohorts tend to enter the labour market later, women and older people have steadily increased their labour market participation. There are four broad dynamics driving these changes, namely:

- Social factors, such as longer schooling or a change in the role women play in households;
- Demographic factors, including the decline of fertility rates and delays in childbearing;
- Institutional factors, in particular changes in the early and statutory retirement ages;
- Economic factors, such as substitution and income effects of labour taxation (particularly relevant for second earners), a higher prevalence of part-time employment and the shift towards a service-based economy.

The labour market participation of people of working age (20-64) rose from 72% in 2000 to 78% in 2019 for the EU as a whole (see Table I.2.1). Aside from Romania, all Member States saw an increase. In the cases of Bulgaria, Hungary and Malta, the overall participation rate has risen by more than 10 pps since the start of the century.

Although labour forces show large cross-country variabilities, some common features stand out and need to be catered for in any projection exercise. They can be summarised as follows:

- At 92% in the EU and more than 90% in nearly all countries, the participation rates of prime-age male workers (aged 25-54), are the highest of all groups.
- The participation rates of men aged between 55 and 64 years have risen considerably since 2000, mostly as a result of pension reforms

([14]) To project participation rates by gender and single age, the cohort simulation model (CSM) developed by the European Commission (DG ECFIN) is used. Labour force projections are based on a 'no-policy-change' assumption (see Box I.2.1).

Table I.2.1: **Historical participation rates: total**

	20-64			20-24			25-54			55-64			
	2000	2010	2019	2000	2010	2019	2000	2010	2019	2000	2010	2019	
BE	70.8	73.5	74.4	60.7	55.2	49.0	82.8	86.3	84.8	25.9	39.2	54.3	BE
BG	67.1	71.9	78.3	48.5	51.3	42.4	81.6	82.9	85.8	25.1	49.3	66.9	BG
CZ	77.4	75.7	81.9	69.3	51.5	52.3	88.5	87.8	89.1	38.1	49.7	68.0	CZ
DK	81.4	80.6	82.2	79.1	75.2	72.4	87.9	88.4	86.5	56.9	58.9	73.8	DK
DE	74.6	80.6	83.2	71.1	69.9	71.0	85.4	87.3	88.0	42.9	62.6	74.7	DE
EE	77.6	80.2	83.8	64.7	60.8	72.3	88.0	88.3	87.8	47.3	64.3	75.5	EE
IE	73.0	76.2	78.7	73.6	78.1	71.9	78.4	80.7	83.5	46.3	55.1	64.1	IE
EL	69.6	73.0	74.0	63.1	51.4	42.1	78.3	83.2	85.4	40.9	45.2	49.8	EL
ES	69.8	77.8	78.9	60.9	64.6	55.0	78.0	85.7	87.0	40.8	50.7	61.6	ES
FR	74.9	75.8	78.0	59.3	61.6	62.2	86.4	88.7	87.4	31.7	42.2	56.9	FR
HR	67.6	69.9	71.3	63.1	56.5	52.3	80.2	80.8	83.6	24.5	41.8	45.5	HR
IT	63.6	66.3	70.5	55.8	46.8	44.4	74.2	76.9	78.1	28.6	37.9	57.4	IT
CY	75.6	80.0	81.4	72.6	69.4	63.7	81.6	86.9	88.3	51.2	59.1	65.3	CY
LV	73.7	79.6	82.6	64.8	65.0	63.8	85.5	88.6	88.3	39.0	56.9	72.1	LV
LT	78.6	78.2	83.5	64.6	52.3	61.6	89.3	88.4	90.3	45.6	56.5	73.4	LT
LU	69.0	73.8	76.8	56.3	40.8	52.4	79.8	85.7	88.5	27.6	40.6	45.0	LU
HU	65.0	67.4	77.9	57.6	44.7	53.6	77.3	80.9	87.0	22.6	36.5	58.0	HU
MT	60.5	64.0	79.6	79.5	73.8	77.3	64.2	72.9	87.7	29.5	33.3	52.4	MT
NL	76.0	79.7	82.6	80.6	77.1	75.7	83.6	87.8	87.4	38.6	55.3	72.0	NL
AT	74.1	77.5	80.3	71.7	73.4	73.9	85.3	87.1	89.0	31.4	42.2	56.4	AT
PL	72.9	71.1	75.4	63.7	57.9	61.0	82.7	84.1	85.3	32.1	36.7	50.7	PL
PT	76.4	79.1	81.4	63.7	59.1	58.2	84.6	88.7	90.3	53.2	54.3	64.4	PT
RO	75.9	69.7	73.6	60.9	47.2	47.9	84.4	81.9	84.1	52.5	42.1	48.9	RO
SI	73.4	75.8	79.9	59.4	57.7	58.6	87.7	90.0	92.4	23.7	36.5	50.9	SI
SK	76.5	75.2	77.8	70.1	52.7	50.2	88.3	86.9	86.5	24.6	45.1	59.8	SK
FI	79.6	79.0	82.2	77.7	69.7	70.8	88.1	87.5	87.7	45.5	60.2	71.5	FI
SE	80.7	84.5	87.3	61.3	72.0	71.5	86.8	89.8	91.3	68.4	74.8	81.5	SE
NO	82.9	82.1	82.2	74.6	72.3	70.8	87.7	87.3	86.3	66.2	69.6	74.0	NO
EA	72.0	75.8	78.4	64.1	62.3	60.6	82.2	85.2	85.8	37.3	49.3	63.6	EA
EU27	72.4	75.0	78.2	63.5	60.5	59.9	82.6	85.0	85.9	37.9	48.1	62.3	EU27

2000 figures for Croatia show 2002 values; EU27 figures for 2000 do not include Croatia.
Source: Eurostat, LFS.

raising the early and statutory retirement ages. For women aged 55-64 there has also been a strong increase, though from a lower starting point, given the general convergence in retirement conditions to those for men;

- Female overall participation rates have steadily increased in recent decades, largely reflecting societal trends;

- The participation rates of young people (aged 20-24) have declined, mostly because more are now spending longer in education, as average educational attainment has risen;

- Given these trends, the main drivers of changes in the total labour market participation rate will be changes in the labour force attachment of prime-age women, older workers (especially men) and, to a lesser extent, young people.

Table I.2.2: **Historical participation rates: men**

	20-64			20-24			25-54			55-64			
	2000	2010	2019	2000	2010	2019	2000	2010	2019	2000	2010	2019	
BE	80.1	79.8	78.9	65.5	59.5	51.8	92.1	92.2	89.3	36.3	47.6	59.8	BE
BG	73.4	76.8	83.0	58.3	58.2	48.1	84.4	86.1	90.0	39.9	56.6	72.0	BG
CZ	86.2	84.9	89.2	77.3	60.0	59.3	95.0	95.5	95.9	54.5	62.5	76.2	CZ
DK	85.7	84.5	85.7	84.4	77.0	73.8	91.5	91.8	90.1	64.5	65.1	78.4	DK
DE	82.9	86.8	87.7	74.6	72.5	73.6	93.7	93.2	92.7	52.5	70.8	79.5	DE
EE	83.3	83.8	87.4	75.8	67.2	77.3	91.6	91.8	92.5	54.4	64.3	73.3	EE
IE	86.2	83.9	85.5	79.2	81.0	74.6	92.0	88.9	90.6	64.6	64.3	72.5	IE
EL	85.1	84.4	82.9	69.3	56.3	43.5	94.5	94.2	93.2	57.7	60.2	63.8	EL
ES	84.4	85.4	84.2	65.2	67.4	58.3	93.2	92.4	91.7	60.3	63.7	69.2	ES
FR	81.9	80.7	82.0	63.2	65.9	66.5	94.3	94.2	91.9	35.5	45.0	59.4	FR
HR	75.2	75.8	76.5	69.5	63.8	59.9	86.9	84.1	86.9	34.2	54.4	54.2	HR
IT	78.6	78.4	80.6	61.9	54.1	50.2	90.4	89.4	88.5	42.2	49.5	68.6	IT
CY	89.2	87.2	87.1	78.2	68.8	61.0	95.3	93.4	93.4	69.5	74.3	76.7	CY
LV	80.5	82.5	85.4	74.7	68.7	67.9	88.5	91.0	91.2	53.8	58.5	73.0	LV
LT	82.8	80.6	85.0	70.0	57.4	64.5	90.4	89.0	91.4	59.0	62.6	74.6	LT
LU	82.2	82.1	81.6	61.5	42.6	57.5	94.2	94.8	92.8	38.6	48.8	51.2	LU
HU	73.6	74.0	85.9	66.0	49.5	61.1	84.3	87.3	93.4	34.3	42.2	70.6	HU
MT	85.8	83.2	89.3	81.7	77.9	78.0	93.5	94.5	96.8	52.9	52.3	67.6	MT
NL	85.8	85.9	87.4	82.5	77.6	76.1	93.8	93.3	91.5	50.8	66.2	81.0	NL
AT	83.2	83.0	84.9	75.3	76.5	76.4	93.6	91.9	92.4	44.5	51.4	65.6	AT
PL	79.4	78.6	83.2	68.3	65.3	67.5	88.4	89.6	91.5	41.1	48.9	62.6	PL
PT	84.8	83.8	84.8	70.0	61.4	61.0	92.4	92.7	92.7	64.6	62.0	70.9	PT
RO	82.6	79.1	83.7	67.2	54.7	57.2	91.0	90.9	93.1	58.4	52.3	61.6	RO
SI	78.0	79.9	83.0	63.4	63.3	63.6	90.7	91.7	94.4	33.5	47.5	55.7	SI
SK	84.7	83.4	84.4	78.0	62.3	62.8	94.0	92.9	93.2	41.0	59.7	62.8	SK
FI	82.6	81.4	84.1	82.2	72.4	73.5	91.1	90.5	90.3	46.4	60.1	70.5	FI
SE	83.1	88.0	89.8	64.8	75.3	74.0	88.6	92.9	93.7	72.1	79.3	84.1	SE
NO	87.4	85.2	85.1	78.8	74.6	72.4	91.7	90.1	88.9	72.7	73.5	78.4	NO
EA	82.3	83.1	84.1	68.7	66.2	64.2	92.9	92.4	91.4	48.5	58.1	70.1	EA
EU27	81.9	82.3	84.2	68.6	65.1	64.1	92.0	91.8	91.6	48.8	57.2	69.6	EU27

2000 figures for Croatia show 2002 values; EU27 figures for 2000 do not include Croatia.
Source: Eurostat, LFS.

Table I.2.3: **Historical participation rates: women**

	20-64			20-24			25-54			55-64			
	2000	2010	2019	2000	2010	2019	2000	2010	2019	2000	2010	2019	
BE	61.3	67.1	69.8	55.8	51.0	46.2	73.2	80.4	80.3	15.8	30.9	48.9	BE
BG	61.0	67.0	73.5	38.5	43.9	36.3	78.9	79.6	81.4	12.5	42.9	62.2	BG
CZ	68.8	66.4	74.4	61.5	42.5	44.9	81.9	79.8	81.8	23.3	38.0	60.1	CZ
DK	77.1	76.7	78.5	74.2	73.3	70.9	84.3	85.0	82.8	48.2	52.8	69.3	DK
DE	66.2	74.5	78.7	67.8	67.3	68.2	77.0	81.3	83.3	33.4	54.6	70.0	DE
EE	72.3	76.8	80.2	52.8	54.3	67.3	84.5	84.8	82.8	41.9	64.3	77.4	EE
IE	59.9	68.5	72.1	67.9	75.3	69.2	64.9	72.6	76.7	27.7	45.7	55.9	IE
EL	54.6	61.8	65.3	57.1	46.6	40.7	62.2	72.4	77.6	25.9	31.1	37.3	EL
ES	55.2	70.1	73.7	56.6	61.8	51.5	62.7	78.8	82.3	22.5	38.4	54.4	ES
FR	68.1	71.0	74.1	55.7	57.3	58.0	78.6	83.4	83.1	28.2	39.5	54.6	FR
HR	60.4	64.1	66.1	56.5	49.0	44.4	73.7	77.4	80.2	16.0	30.2	37.5	HR
IT	48.9	54.6	60.5	49.9	39.2	38.2	57.9	64.5	67.8	15.9	26.9	47.0	IT
CY	62.8	73.4	76.1	68.0	70.1	66.1	68.6	81.0	83.5	33.6	44.3	54.2	CY
LV	67.6	77.0	80.0	54.7	61.2	59.4	82.7	86.3	85.5	28.0	55.7	71.4	LV
LT	74.7	76.0	82.1	59.1	47.0	58.5	88.3	87.8	89.2	35.4	51.7	72.5	LT
LU	55.5	65.3	71.9	51.0	39.0	47.1	64.9	76.4	84.0	16.8	32.0	38.4	LU
HU	56.7	61.0	70.0	49.0	39.6	45.7	70.5	74.6	80.6	13.2	31.7	47.2	HU
MT	35.1	44.3	69.0	77.1	69.5	76.6	34.5	50.6	77.5	8.6	14.6	36.7	MT
NL	66.0	73.5	77.8	78.7	76.5	75.3	73.0	82.2	83.3	26.4	44.4	63.1	NL
AT	65.1	71.9	75.6	68.1	70.5	71.4	76.8	82.4	85.7	18.9	33.6	47.4	AT
PL	66.7	63.6	67.7	59.2	50.1	54.2	77.1	78.6	79.0	24.4	25.9	40.0	PL
PT	68.4	74.7	78.3	57.4	56.9	55.2	77.1	84.9	88.0	43.1	47.4	58.8	PT
RO	69.4	60.2	63.3	54.9	39.1	38.3	77.9	72.7	74.6	47.5	33.1	37.3	RO
SI	68.8	71.5	76.7	55.1	50.8	52.7	84.7	88.1	90.4	14.8	25.5	46.0	SI
SK	68.5	67.0	71.0	62.3	42.8	37.0	82.5	80.9	79.6	11.1	32.3	56.9	SK
FI	76.6	76.6	80.2	73.3	66.9	68.0	85.1	84.4	84.9	44.6	60.3	72.4	FI
SE	78.3	81.0	84.8	57.7	68.5	68.8	84.9	86.6	88.7	64.6	70.2	78.9	SE
NO	78.3	79.0	79.1	70.4	70.0	69.1	83.5	84.3	83.5	59.7	65.5	69.5	NO
EA	61.7	68.6	72.8	59.5	58.3	56.9	71.4	78.1	80.2	26.6	41.1	57.5	EA
EU27	63.1	67.8	72.2	58.6	55.7	55.5	73.1	78.1	80.2	27.8	39.6	55.4	EU27

2000 figures for Croatia show 2002 values; EU27 figures for 2000 do not include Croatia.
Source: Eurostat, LFS.

Box I.2.1: Main features of the Cohort Simulation Model (CSM) and assumptions for the 2021 projections

The cohort simulation model (CSM) as developed by the European Commission (DG ECFIN) ([1]) is used to project participation rates by gender and single age, as was the case in the 2006, 2009, 2012, 2015 and 2018 long-term projection exercises. This methodology is based on the calculation of the average probability of labour force entry and exit observed over the last ten years ([2]). The average entry and exit rates are then used to project future participation rates as older generations are progressively replaced by younger ones.

For those Member States having legislated pension reforms, average exit rates for the age group 51-74 are adjusted to account for the reform impact, based on a best-reasoned judgment. Otherwise, both average entry and exit rates are kept constant throughout the projection period, reflecting a no-policy-change assumption ([3]).

The rationale for using the CSM is to reflect the substantial changes in labour market behaviour in recent decades across different cohorts and gender groups. This methodology is particularly suited to take into account the significant rise in female labour force participation in recent decades, as younger women, with a much stronger attachment to the labour force, gradually replace older women with relatively low participation rates. Simultaneously, the cohort methodology also caters for a – relatively small – decline in the participation rate of men in recent generations in a majority of countries, opposite to the trend observed for women.

The 2021 projection is made using the latest Eurostat demographic projections (see Chapter 1), prepared independently by Eurostat in collaboration with National Statistical Institutes. Population projections are the major driving force of labour force projections.

The following assumptions were made:

- The base year for labour market projections is 2019, 2020 is the first year of projections and the projection horizon ends in 2070;
- Average entry/exit rate are calculated, as a ten-year average (2010-2019), using participation rates by single age (15-74) and sex from the harmonised EU Labour Force Survey of Member States (as compiled by Eurostat);
- Labour market participation rates are calculated, by single age and sex, using average labour force entry/exit rates for 2010-2019;
- A corrective mechanism for young cohorts (15-29) is applied, in order to avoid that any increase in education enrolment rates (and the corresponding decline in participation rates) feeds into future declines of participation rates for prime-age workers. This assumption implies that participation rates at each single year of age between age 15 and 19 remain constant at the last observed level, i.e. 2019. Participation rates between ages 20 and 29 are allowed to increase if this is the outcome of the cohort simulation model. Otherwise, the rates are kept constant at the level observed in 2019;

([1]) The methodology was initially developed at the OECD, see Burniaux, Duval & Jaumotte (2003).
([2]) A more detailed description of the methodology can be found in Carone (2005).
([3]) For a given set of exogenous macroeconomic assumptions and using partial equilibrium methodologies, a no-policy-change assumption projects future outcomes at unchanged current policies. It should not be interpreted as a forecast, because no assumptions are made regarding (entry/exit) probability distributions, but rather as an 'unbiased' estimate.

(Continued on the next page)

Box (continued)

- Pension reforms were modelled through their estimated impact on the labour market exit rates of older workers (aged 51-74) ([4]). This is largely a judgemental approach, using the probabilistic nature of the CSM. Specifically, the historical average exit rates of older workers, calculated separately for both genders, are adjusted to account for the expected effects of enacted pension reforms. The estimation of the adjustment takes into account country-specific information about the relationship between retirement behaviour and the parameters of the pension system, as well as cross-country evidence of the impact of changes in the implicit tax rate on retirement decisions. This framework for analysis is able to incorporate a broad typology of measures, inter alia, increases in the statutory or early retirement age, the convergence of fower female statutory retirement ages to that of men, the linking of the statutory retirement age to changes in life expectancy, and changes in (price) incentives affecting the retirement decision. Moreover, policy changes can be incorporated as one-off measures or be phased in progressively within a specified period.

Steps to project the labour force/supply

First, participation rates by single age and gender are projected up to 2070 using the CSM. Aggregate values for participation rates are a weighted average of participation rates by single age and gender using population shares as weights. For example, the average participation rate *PR* for age groups $\underline{a}$ (lower age) to $\overline{a}$ (upper age) in period *t* is calculated as:

$$PR\left(\underline{a},\overline{a},t\right)=\sum_{a=\underline{a}}^{\overline{a}}\sum_{g=m,f}PR_{a,g}^{t}*p_{a,g}^{t}$$

where $p_{a,g}^{t}=\frac{pop_{a,g}^{t}}{\sum_{a=\underline{a}}^{\overline{a}}\sum_{g=m,f}pop_{a,g}^{t}}$

where a is the age index, g is the gender index, $PR_{a,g}^{t}$ is the participation rate for single age a and gender g in period t, pop is the population; and p is the structure of the population.

Second, the labour force ($LF_{a,g}^{t}$) or labour supply (for each single age and gender combination) is calculated by multiplying the age/gender labour force participation rate by the corresponding population projection:

$$LF_{a,g}^{t}=PR_{a,g}^{t}*pop_{a,g}^{t}$$

The total labour supply for age groups $\underline{a}$ (lower age) to $\overline{a}$ (upper age) in period t is calculated as:

$$LF\left(\underline{a},\overline{a},t\right)=\sum_{a=\underline{a}}^{\overline{a}}\sum_{g=m,f}LF_{a,g}^{t}=\sum_{a=\underline{a}}^{\overline{a}}\sum_{g=m,f}PR_{a,g}^{t}*pop_{a,g}^{t}$$

Age aggregates commonly used are the groupings 15-64, 20-64, 25-54, 55-64, 20-71 and 20-74.

Additional assumption on labour input

In addition, the production function methodology is used to project GDP growth (see Chapter 3), using total hours worked as the labour input variable. The split between full- and part-time work

([4]) A more detailed description of the methodology can be found in Carone (2005).

(Continued on the next page)

Box (continued)

(for the age groupings 15-24, 25-54, 55-64 and 65-74), as well as the corresponding weekly hours worked, is fixed at the average values for the last available year (2019) for the entire projection period.

Although part-time vs. full-time rates and the corresponding average weekly hours of work are frozen per age group over the projection period, total hours worked change due to compositional effects that mostly reflect the projected increase in female labour force participation, given the higher incidence of part-time work among women.

2.3. LEGISLATED PENSION REFORMS IN EU MEMBER STATES

Over the past decade, many Member States have adopted gradual and substantial pension reforms. However, reversals of reforms introduced previously have been made in several recent cases.

As discussed in Carone et al. (2016), the intensity of pension reforms was particularly high in 2000-2015 ([15]). Especially in the slipstream of the 2008-2009 financial crisis and the subsequent euro area crisis, many Member States reformed their pension systems. Box I.2.2 provides an overview of those reforms that have an impact on effective retirement ages in the 27 Member States and Norway and which are thus incorporated in the Cohort Simulation Model when projecting future participation rates (see Box I.2.1).

While in some cases reforms were systemic – for example a shift from a defined benefit public scheme to a point system – in most cases parametric changes were implemented. Two broad types can be distinguished: tightening the eligibility requirements for pension benefits and making pension benefits less generous by adapting the pension formula and indexation rules. Some countries also increased the contributions for current workers in order to strengthen the internal balance of their pension systems.

In more recent years, the reform drive has generally abated and several Member States have even reversed already legislated reforms. This was for example the case in Poland ([16]), the Czech Republic ([17]), Croatia and Slovakia ([18]). In other cases, the impact of legislated reforms was suspended or postponed (e.g. the application of the 'index for pension revaluation' and the sustainability factor in Spain) or new, temporary possibilities to retire early were created, which was the case in Italy.

The most frequent reform over the past decades is the decision to raise the statutory and early retirement ages. It is probably the measure with the largest direct impact on the retirement decision and on the labour supply and therefore needs to be accounted for when projecting participation rates. Indeed, nearly all Member States have increased their early and statutory retirement ages or have legislation in place to do so in the coming years. Some countries have opted for the introduction of an automatic link between retirement ages and changes in life expectancy to make their pension system more robust against the effect of continuous demographic ageing (see Table I.2.4). The adoption of an automatic balancing mechanism within the pension system or a sustainability factor also adjust certain parameters in function of longevity gains but they do at most have an indirect impact on the labour supply.

([15]) For an extensive review of the pension reforms legislated in the last decades see Carone, G., Eckefeldt, P., Giamboni, L., Laine, V. and S. Pamies-Sumner (2016). 'Pension reforms in the EU since the early 2000s: Achievements and challenges ahead', European Economy, Discussion paper No 42.

([16]) The 2016 reform lowered the statutory retirement age to 60 for women and to 65 for men, restoring the situation from before the 2012 reform, which increased the statutory retirement age to 67 years for both men (by 2020) and women (by 2040).

([17]) The 2011 reform linked the retirement age to changes in life expectancy. The 2017 reform reintroduced a ceiling at 65 years, undoing the automatic link.

([18]) See Box I.2.2 for the recent changes concerning Croatia and Slovakia.

Table I.2.4: **Automatic adjustment mechanisms**

Country	Automatic balancing mechanism	Sustainability factor (benefit link to life expectancy)(5)	Retirement age linked to life expectancy	Legislated
IT		X	X	1995 & 2010
LV		X		1996
SE	X	X		1998 & 2001
PL		X		1999
FR(1)		X		2003
DE	X			2004
FI		X	X	2005 & 2015
PT(2)		X	X	2007 & 2013
EL(3)			X	2010
DK(4)			X	2011
ES	X	X		2011 & 2013
NL(2)			X	2012
CY			X	2012
LT	X			2016
EE			X	2018

(1) Pension benefits evolve in line with life expectancy through the 'proratisation' coefficient; it has been legislated until 2035.
(2) Only two thirds of the increase in life expectancy is reflected in the retirement age.
(3) An automatic balancing mechanism is applied in the auxiliary pension system.
(4) Subject to Parliamentary decision.
(5) In NDC systems, the benefit is linked to changes in life expectancy through the annuity factor.
Source: European Commission, EPC.

Box I.2.2: Pension reforms legislated in Member States incorporated in the labour force projections

This box lists recent pension reforms legislated by the Member States that have a direct impact on labour market participation rates and that are thus relevant for the participation rates as projected with the CSM model for the baseline scenario. For a more exhaustive overview of Member States' pension systems, see Annexes 5 and 6. This box describes the situation per 30 September 2020.

Belgium

The 2015 pension reform raised the minimum early retirement age to 63 years as of 2018 and the minimum required career length to 42 years as of 2019. Exceptions are still possible for people aged 60/61 with a career of at least 44/43 years. The reform also raised the statutory retirement age in the three main public old-age pension schemes (wage earners, self-employed and civil servants), from 65 for both men and women to 66 in 2025 and to 67 in 2030. A career of 45 years remains required to obtain a full pension.

The system of unemployment with company allowance was also modified: the minimum age was raised from 60 to 62 in 2015 (for restructuring companies it went from 55 in 2015 to 60 in 2021). Moreover, since 2015, new beneficiaries of the scheme need to remain available to the labour market and are thus included in the labour force. The pension bonus for people working beyond the age of 60 (while meeting the early retirement requirements) was abolished as of 2015.

Bulgaria

With the entering into force of the 2015 pension reform, the statutory retirement age for both men and women is being gradually increased and equalised to 65 years by 2037 (2029 for men). After 2037, the statutory retirement age is supposed to increase in line with gains in life expectancy, though no clear rule has been legislated so that such mechanism is not included in the projections.

The required career length for workers in normal work conditions to qualify for retirement is rising by two months annually, until it reaches 40 years for men and 37 years for women in 2027 (from 38 years for men and 35 years for women in 2015).

The retirement age in case of insufficient insurance years is gradually increased to 67 years, while the minimum required length of service remains unchanged at 15 years of actual service (i.e. excluding periods of military service, maternity leave and unemployment).

A possibility for granting a reduced early retirement pension is introduced for persons who are within 12 months from the statutory retirement age, with a lifetime reduction in the pension benefit of 0.4% for each month of anticipation.

The retirement age for workers in strenuous and hazardous work conditions is gradually increased to 55 years for the former group and to 60 years for the latter category.

In 2016, the minimum retirement age was set at 52 years and 10 months for workers in the defence and security sector, with a minimum career length of 27 years. The minimum retirement age is being increased by two months annually, until it reaches 55 years.

Czech Republic

To be entitled to an old-age pension, one has to either reach an insurance period of at least 35 years and a retirement age specified by law, or at least 20 years of insurance with an age five years above the statutory retirement age. Non-contributory periods are also included in the insurance period.

Statutory retirement ages are determined in function of a person's birth year and, in the case of women, the number of children raised. In June 2017, a reform was legislated to cap the increase in the statutory retirement age at 65, reversing the 2011 reform that entailed increases in line with gains in life expectancy.

Early retirement is possible prior to the statutory retirement age under the condition that the applicable statutory retirement age is at least 63 years. The moment as of which early retirement is possible, is gradually increasing to five years prior to the statutory retirement age, under the conditions that the latter is lower than 63 years and people are at least 60 years old.

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Box (continued)

Denmark

The 2011 "Retirement Reform" brought forward the discretionary increase in the retirement ages agreed in the 2006 "Welfare Reform". The retirement age for the voluntary early retirement pension (VERP) rose from 60 to 62 years in 2014-2017, while the public old-age pension is rising from 65 to 67 years in 2019-2022. Furthermore, the VERP period is reduced from five to three years in 2018-2023. The minimum contribution period to VERP rose from 25 to 30 years. Private pension wealth also lowers the VERP amount to a higher degree than before the reform, making the VERP scheme less favourable to people with large private pension wealth.

As of 2015, retirement ages are indexed to the life expectancy for a 60-year-old, with updates every 5 years and a maximum jump by one year. Changes have to be confirmed by Parliament 15 years before they take effect (12 years for changes in the VERP age), so that the first increase will apply in 2030 (2027 for the VERP).

Germany

As a result of the 2007 reform, the statutory retirement age is gradually increasing, reaching an age of 67 by 2029, with annual steps of one or two months depending on the year of birth.

In July 2014, a pension reform was legislated that aimed at improving pension benefits and early retirement conditions for certain groups:

- 'Rente mit 63': the possibility of early retirement without pension reduction two years ahead of the statutory retirement age in case of a contributory period of 45 years (including periods of unemployment). As of 2016, the age will rise by 2 months a year until it reaches 65;

- Continuation of labour agreement after reaching statutory retirement age: employers and employees can continue the employment relationship for a certain period after the statutory pensionable age has been reached. The agreement to postpone retirement must be reached before the pensionable age.

Estonia

The retirement age for men and women was equalised in 2016 at 63y, rising to 65 by 2026. The 2018 reform introduces a link to changes in the 5-year average life expectancy at the age of 65 as of 2027, with a maximum annual increase of three months. The change in the retirement age will be known two years in advance.

The old bonus/malus system (-0.4%/+0.9% per month) will be replaced by an actuarially neutral system as of 2021. Early retirement (previously three year prior to the statutory retirement age) will be possible 1-2-3-4-5 year before reaching the statutory retirement age, depending on the contribution period (20-25-30-35-40 years respectively).

Ireland

The State Pension Transition payment was abolished in 2014. In the social security pension system the earliest retirement age rose to 66 in 2014, rising to 67 in 2021 and to 68 in 2028.

Greece

In November 2012, Parliament approved a pension law, increasing the statutory retirement age from 65 to 67 to receive a full pension. The full contributory career rose to 40 years and the early retirement age from 60 to 62. In addition, as of 2021, retirement ages are linked to changes in life expectancy, with updates every three years. In August 2015, an additional reform reduced pathways to early retirement.

Spain

The 2013 pension reform entails a gradual increase in the statutory retirement age from 65 in 2013 to 67 in 2027. The contributory career for a full pension will be gradually increased from 35 to 37 years. Workers with contributory careers of more than 38.5 years are allowed to retire at 65 with a full pension.

Early retirement for involuntary retirees (collective dismissals) require a minimum retirement age of 63 years in 2027 (increasing progressively from 61 in 2013) and a minimum contributory period of 33 years (unchanged).

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Box (continued)

Early retirement for voluntary retirees requires a minimum age of 65 in 2027 (increasing progressively from 63 in 2013), a minimum contributory period of 35 years (unchanged) and the computed benefit must be greater than the minimum pension.

In case a worker with a 40-year career decides voluntarily to retire at the earliest possible age (63 years), the penalty to the pension at retirement is 15%, 7.5% for each of the two years remaining to reach the statutory retirement age. For involuntary retirement, the earliest retirement age is 61 years and the annual penalty 7%, so that the corresponding penalty is 28% when retiring at 61.

Access to early partial retirement is restricted. For longer careers (beyond 36.5 years), the minimum age is increasing progressively to 63 years, up from 61 in 2013. For careers of 33-36.5 years the minimum age being raised progressively from 61 to 65 years. For careers shorter than 33 years, partial retirement is not possible; only 30 years were required before the reform.

France

The 2010 reform (Law 2010-1330) led to the following changes:

- The standard pension age is gradually increasing, for all pension schemes, from 60 to 62 years of age. Simultaneously, the full rate pensionable age will rise from 65 to 67. These two rises imply a 4 months increase in age limits every year from generation 1951 to generation 1955 (e.g., people born in 1956 will be able to claim pension at 62 in 2018 and a full rate pension at 67 in 2023);
- The early retirement age for long contributory careers is also increasing by 2 years;
- Closing down of early retirement pathways in the public sector: for parents with a career of 15 years and three children; provisions in the 'Cessation Progressive d'Activité' programme;
- Some categories/groups will still be granted a full rate pension at 65 years of age;
- People suffering from a professional disease or an accident that results in a permanent incapacity of at least 10% can continue to retire at 60 with a full rate pension.

In 2013, a public pension reform was adopted that gradually increases the required number of contribution years for a full retirement benefit. The number of required contribution years for a full benefit will rise gradually from 41.5 to 43 years in 2020-2035.

In 2015, an agreement was reached on the complementary schemes Agirc and Arrco. The agreement introduces a system of incentives to postpone retirement:

- For individuals who retire less than one calendar year after the age at which they are entitled to a full basic pension, the Agirc and Arrco benefits are reduced by a solidarity coefficient of 10% for three years or until they reach the age of 67;
- Individuals who retire between one and two years after that age receive their full pension, with no solidarity coefficient;
- For each additional year that the individual delays retirement, the benefit is increased for one year by 10% (with a maximum of 30%).

Croatia

In December 2018, the Croatian Parliament adopted a pension reform package, which came into force in 2019. The reforms included an accelerated increase of the statutory retirement age to 67 and higher penalties/bonus for early/deferred retirement.

In 2019, Parliament adopted amendments to the pension law, including capping the early/statutory retirement age at 60/65 years as of 2030, decreasing penalisation for early retirement and reversing the acceleration of the equalisation of retirement ages between men and women. These changes, which entered into force as of January 2020, reversed features of the 2018 reform as well as the earlier 2014 reform, which introduced the gradual increase in the early/statutory retirement age to 62/67 years by 2038.

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Box (continued)

Italy

Given the fact that the Italian Statistical Institute (ISTAT) estimates no gains in life expectancy were made in the past two years, in the period 2021-2022, the automatic update of the statutory retirement age (SRA) and all pension requirements will be nil. In 2021-2022, the statutory retirement age will therefore remain at 67 years for men and women. Starting from 2023, the automatic indexation mechanism linking eligibility requirements to changes in life expectancy at 65 – as applied in 2013-2018 – is projected to increase all age and contributory requirements by a maximum of 3 months every 2 years.

Adjustments to life expectancy for the early retirement scheme based only on a minimum contribution requirement regardless of age, are frozen until 2026 (Decree Law 4/2019, as converted into Law 26/2019). As of 2027, there is an increase of three months every two years. As a result, early retirement remains possible until 2026 with a contribution period of 42 years and 10 months for men and 41 years and 10 months for women, irrespective of their age (plus 3 months for all as a shifting retirement window is also foreseen). Precocious workers can retire with 41 years of contributions until 2026 (plus 3 months for all). Thereafter there is an increase of three months every two years. Those enrolled in the pension system after 1995 (i.e. those fully covered by the NDC scheme) may retire at the statutory retirement age as long as they have at least 20 years of contributions and a monthly pension of at least 1.5 times the old-age allowance. They can retire retire up to a maximum of three years before the statutory retirement age, as long as they have 20 years of contributions and a monthly pension of at least 2.8 times the old-age allowance.

Decree Law 4/2019 (converted into Law 26/2019) introduced a temporary early retirement channel. This 'Quota 100' scheme allows early retirement with 62 years of age and 38 years of contribution during 2019-2021. A shifting retirement window of 3 months for private sector workers and 6 months for public sector workers is also established. For women, 'Opzione Donna' was extended to 2019, allowing retirement at 58 (59 for self-employed) with 35 years of contribution. It has to be considered though that the law foresees a 12 months shifting retirement window for female employees, whereas for female self-employed such shifting retirement window is extended to 18 months.

Cyprus

The 2012 pension reform introduced a link between the statutory retirement age and changes in life expectancy, following the increase to 65 years by 2016. The mechanism applies since 2018, with updates every five years.

Latvia

As a result of the 2012 pension reform, the retirement age increases by three months every year, until reaching 65 years and a minimum contributory period of 20 years in 2025. The early retirement age – with an insurance record of at least 30 years – is two years less than the statutory one, thus rising to 63 years by 2025. The early retirement benefit is 50% of the normal benefit. The full pension is restored upon reaching the statutory retirement age.

Lithuania

In 2011, a law was passed that lifts the statutory retirement age to 65 years by 2026, with annual increases of 4 and 2 months for women and men respectively.

In 2018, the 2016 pension reform entered into force, increasing the eligibility requirements for the full general pension component from 30 years to 35 years by 2027.

Early retirement is possible five years prior the statutory retirement age on the condition of meeting the eligibility requirements for full general pension. The pension benefit is reduced by 0.4% for each month of anticipation.

Hungary

The 2009 reform entails a gradual increase in the statutory retirement age between 2014 and 2022, when it reaches 65 years for both men and women.

Subsequent reforms eliminated all early retirement possibilities, except for women with 40 eligibility

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Box (continued)

years (including years in employment, paid maternity leave, childcare fee or child homecare allowance).

Malta

The 2006 reform entailed a gradual increase in the statutory retirement age to 65 years by 2027. For people born before 1956, the pension age is 62 years; for people born in 1956-1958, it is 63 years; for people born in 1959-1961, the pension age is 64 years. In addition, the contributory period in increased from 30 years to 35/40 years, depending on the cohort.

The 2016 reform introduced the following incentives:

- The number of contribution years required for a full retirement benefit was increased from 35 to 41 years. Stricter rules on the ability to exit the labour force prematurely were introduced by capping the number of credited contributions for persons born as of 1969.

People eligible for retirement at the age of 61 are awarded a progressive bonus for each year that they continue working up to the age of 65. Those who continue working beyond the retirement age can do so without forfeiting their pension while in employment.

The Netherlands

The 2012 reform involved a gradual increase in the statutory retirement age to 67 in 2023 and the adoption of a full link of the retirement age to gains in life expectancy thereafter. The duration of social security arrangements for people below the retirement age (disability pensions, survivors' pensions, unemployment schemes and social assistance) will be extended in line with the increase in the statutory retirement age.

The Law of 2 July 2019 modified the speed at which the statutory retirement age will rise to 67. The latter will be reached in 2024. Thereafter, as will be covered by separate legislation, it will be linked to $2/3^{th}$ of the rise in the remaining life expectancy at 65, instead of the full link envisaged under the 2012 reform.

Austria

The statutory retirement age is 65 years for men and all civil servants (also females) and 60 years for women. As of 2024, the female retirement age will increase by six months every year, reaching 65 years in 2033.

In 2014, reform measures came into effect that tightened access to early retirement and modified invalidity pension schemes.

- While the early retirement scheme 'Korridor-pension' can still be accessed by men at the age of 62 years, it requires 40 insurance years since 2017, when the penalty for early retirement was increased from 4.2% to 5.1% per year for people born as of 1955.

- The early old-age pension scheme for long-term contributors 'Hacklerregelung' was tightened by increasing the minimum retirement age to 62 for men born as of 1954 and to 57 for women born as of 1959, rising to 62.

- For the heavy worker 'Schwerarbeitspension', the early retirement age is 60 (for women this gets relevant only by 2024), with a minimum of 45 insurance years (at least 10 years of hard labour in the last 20 years before retirement).

- For the early old-age pension for long-term contributors in combination with heavy worker regulation ('Hackler-Schwerarbeit'), the minimum retirement age is 55 years for women (born in 1959-1963) and 60 years for men (born in 1954-1958). Required insurance years are 40 for women and 45 for men.

In 2014, comprehensive new regulations for invalidity and occupational disability pensions came into effect. The temporary invalidity pension was replaced by medical and job-related rehabilitation and was completely abolished for people born after 1963. These people will receive special unemployment benefits ('Rehabilitations-geld') instead. Therefore, the temporary invalidity pension is phased out.

Portugal

In 2007, Portugal introduced a 'sustainability factor' linking initial benefits to average life

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expectancy at retirement. Individuals have the possibility to postpone retirement beyond the legal retirement age as a way to compensate benefit reductions due to the sustainability factor.

Since 2015, the statutory retirement age varies to two-thirds of the change in life expectancy at the age of 65. The statutory retirement age is reduced by four months for each contributory year above 40 years, with a minimum retirement age of 65 years. In 2019, the minimum retirement age for certain specific schemes (special pensions) was indexed to life expectancy at the age of 65.

In 2007, early retirement was possible for people with at least 30 contribution years at the age of 55; between 2012 and 2015 it was suspended for the Social Security Scheme; in 2016 it was re-introduced, allowing people with at least 40 contribution years to apply for an old-age early pension as of the age of 60. Initially, under this scheme, the pension benefit was reduced by 0.5% for each month of anticipation to the statutory retirement age and multiplied by the sustainability factor. As the penalties were quite severe, it only was in force between January and March 2016. Since then, people aged 60 years or more or that have a career of at least 40 years can apply for an early pension.

Since October 2017, the government implemented a set of reforms related to early retirement. Contributors with very long careers could apply to a pension benefit without application of the sustainability factor and penalty. The first phase concerned workers aged 60 or more with a contribution record of at least 48 years and people who started working at an early age (14 or younger) an have a record of at least 46 years. The second phase took place in October 2018, extending access to early retirement without penalties to workers aged 60 or more with a contribution record of at least 46 years who started working at the age of 16 or younger. In 2019, the sustainability factor was eliminated for contributors with a career of 40 years at the age of 60 and for difficult conditions jobs.

Romania

The statutory female retirement age is being increases to 63 in 2030 (already 65y for men). For active military police corps and special civil servants within the national defence, public order and national security systems, the standard retirement age is increasing gradually, reaching 60 years in 2030.

Slovenia

The 2012 pension reform included the following elements with an impact on exit behaviour:

- a gradual increase in the statutory retirement age to 65, as of 2016 for men and as of 2020 for women;
- higher penalties for early retirement, as well as bonuses for prolonging working lives;
- the lengthening of the definition of a full career.

Changes in the pension system adopted at the end of 2019 included the following relevant elements:

- higher incentives for people who continue working after they reach the required retirement conditions. For men: gradual increase in the total accrual rate from 57.25% in 2019 (previous pension law) to 63.5% in 2025. For women: following the previous law the total accrual rate would decrease from 63.5% in 2019 to 60.25% in 2023 and onwards. With the new pension law it remains at 63.5% in 2020 and onwards;
- a favourable valuation of 3% per year has been set for a maximum of 3 additional years of insurance for individuals who have already met the conditions for old-age retirement (60 years of age and 40 years of pensionable service without purchased periods);
- people who continue working after they reach the required retirement age are entitled to receive 40% of pension for the first three years and 20% from the fourth year onwards (20% according to the previous pension law).

Slovakia

The 2019 reform introduced two main changes to the universal pension system. First, the retirement age will continue to increase, but only to 64 years. For women with children, the maximum retirement age is further decreased by six months for each of

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the first three children. If the mother is unable to benefit from such early retirement possibility, the right is transferred to the father. Second, the automatic adjustment of retirement ages to changes in life expectancy was abolished. Pensioners are allowed to retire two years before reaching the statutory retirement age. In that case, their old-age pension is reduced by approximately 6.5% per year or 12.5% per two years. On the other hand, benefits are increased by 6% for every working year above the retirement age.

Sweden

As a first step of a more substantial pension reform, the earliest age to draw an old-age pension was increased from 61 years to 62 years in 2020 for both women and men. In 2019, only 11 000 people drew an old-age pension at the age of 61, of whom more than 50% continued to work, so the positive effect on the labour supply is small.

From 1 September 2021, old-age pensioners with a monthly pension income between 9 000 and 17 000 SEK (ca. 850 – 1 610 EUR) will receive a monthly pension supplement of at most 600 SEK (ca. 570 EUR). The supplement is taxed and will be financed via the central government budget.

Finland

The 2017 reform of the earnings-related pension system, increases the retirement age for most workers and amends the early and partial retirement options.

- In 2018, the lowest old-age retirement age started to rise by three months for each age cohort, to reach 65 years in 2027. The upper age limit of the old-age pension is rising to 69 for those born in 1958–1961 and to 70 for those born after 1961;

- The lowest old-age retirement age will be linked to life expectancy as of 2030 so that the time spent working in relation to the time spent in retirement remains at the 2025 level. The annual increase of the retirement age is limited to two months.

2.4. THE IMPACT OF PENSION REFORMS ON THE PARTICIPATION RATE OF OLDER WORKERS

By changing eligibility criteria and retirement incentives, reforms will affect the behaviour of older workers in the coming decades. Effective labour market exit ages for men and women are projected to increase by 0.9 and 1.3 years respectively on average in the EU by 2070.

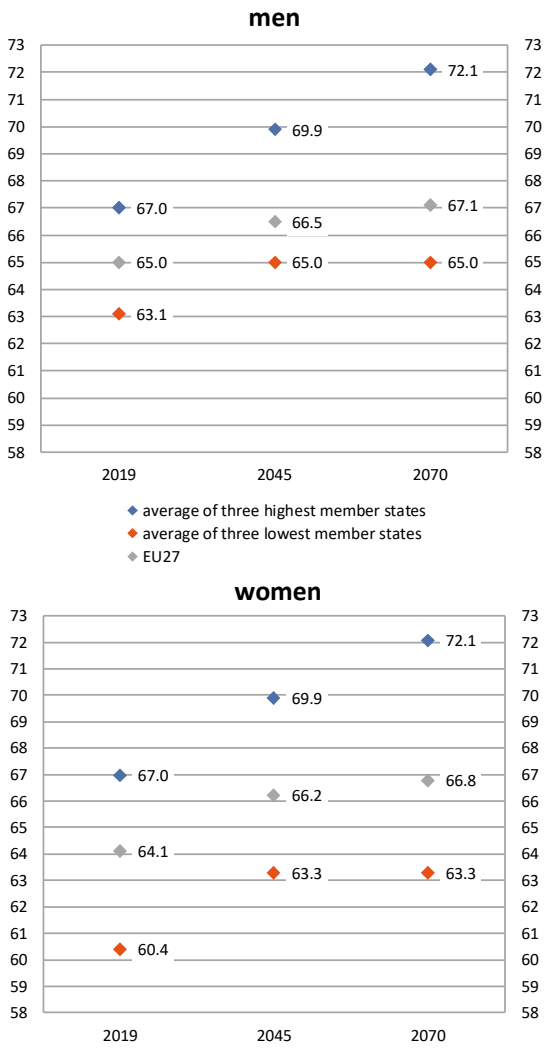
As already underlined in the previous section, Member States have legislated a considerable number of reforms to change the qualifying conditions for retirement. The age group 55-64 is the most affected by measures aimed at postponing retirement. Table I.2.1 showed how the participation rates for this age bracket increased from 38% in 2000 to 64% in 2019.

In many Member States, legislated measures envisage additional increases in retirement ages. As a result, the average statutory retirement age for men/women rises from 65/60.4 years today to around 67/63 years in 2070 (see Graph I.2.1). These changes in legal retirement ages will affect people's retirement decisions, together with changes in qualifying conditions (i.e. minimum contributory periods) or disincentives to retire (i.e. penalties for early retirement and bonuses for postponing retirement). The impact of these factors on future exit behaviour is included in the projected participation rates.

Graph I.2.3 shows the estimated impact of pension reforms on participation rates in the age group 55-64 by 2070. In most of the 24 Member States with relevant legislated pension reforms, the latter are projected to have a sizeable impact on the labour market participation of older workers. For the countries concerned, the reforms alone lift the participation rate of people aged 55-64 by about 9 pps for men and by 10 pps for women on average by 2070. Also when considering the age group 65-74, adopted reforms are estimated to push up participation rates by 2070; by 9 pps for men and by 8 pps for women (see Graph I.2.4).

It should be recalled that total participation rates (20-64) are mainly driven by changes in the participation rate of prime-age workers (25-54), as this group accounts for about 60% of the total labour force. Therefore, the significant projected increases in older workers' labour market participation only partly reflect in the overall participation rates, as discussed in the next section.

Graph I.2.1: **Legislated changes in the statutory retirement age**



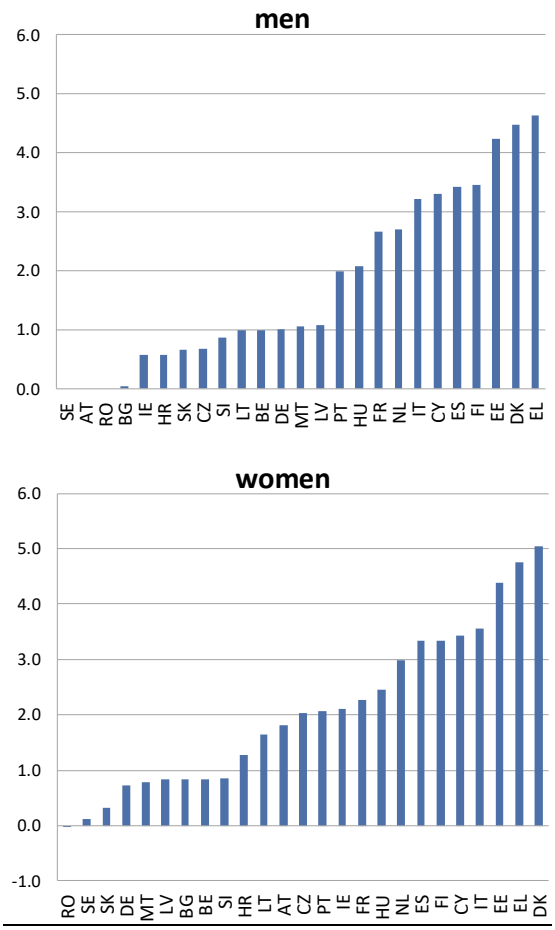
For a comprehensive overview, see Table II.A5.2 in Annex 5.
Source: European Commission, EPC.

Based on the participation rates of older age brackets, average male and female exit ages from the labour market can be calculated. Changes in these exit ages between 2019 and 2070 are shown in Graph I.2.2, providing a summary measure of the long-term impact of enacted pension reforms.

The projections show an average increase of around two years in the effective retirement age for

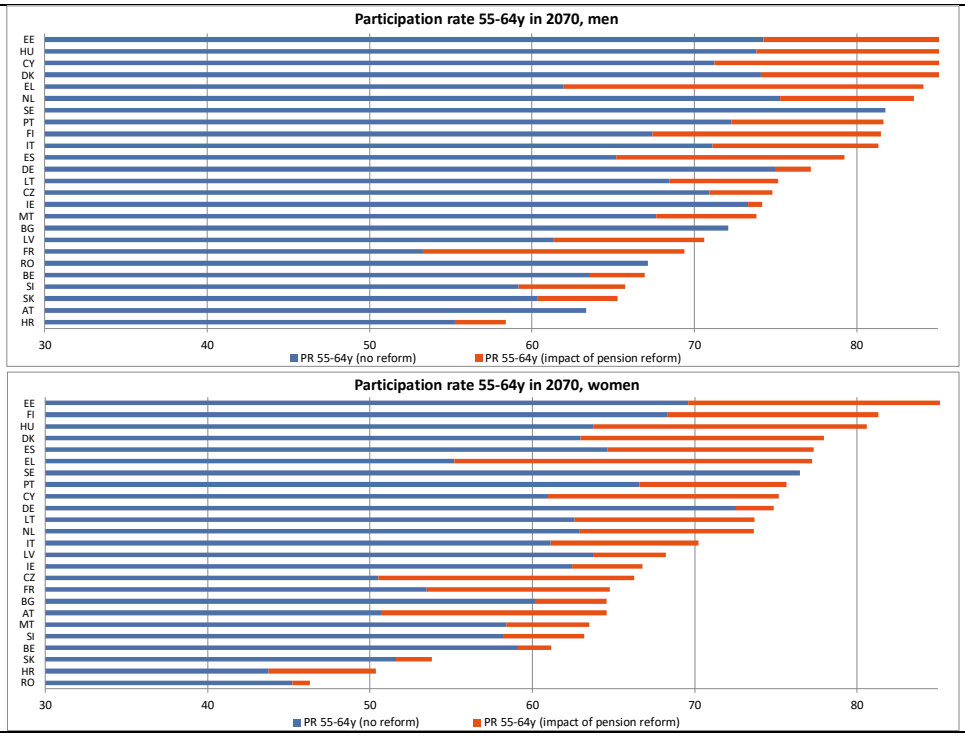
both men and women. For some countries, e.g. Austria and Ireland, the increase for women is higher than that for men because of a progressive convergence of the retirement age for women to that of men. Countries that introduced an automatic link between retirement ages and gains in life expectancy show the highest increases; in the cases of Greece, Denmark and Estonia, exit ages rise by between 4 and 5 years for both men and women. The other countries with a full link – Finland, Cyprus and Italy – have increases of between 3 and 3.5 years. The Netherlands and Portugal, which apply a partial link, show increases of around 3 and 2 years respectively.

Graph I.2.2: **Impact of pension reforms on the average exit age from the labour force**



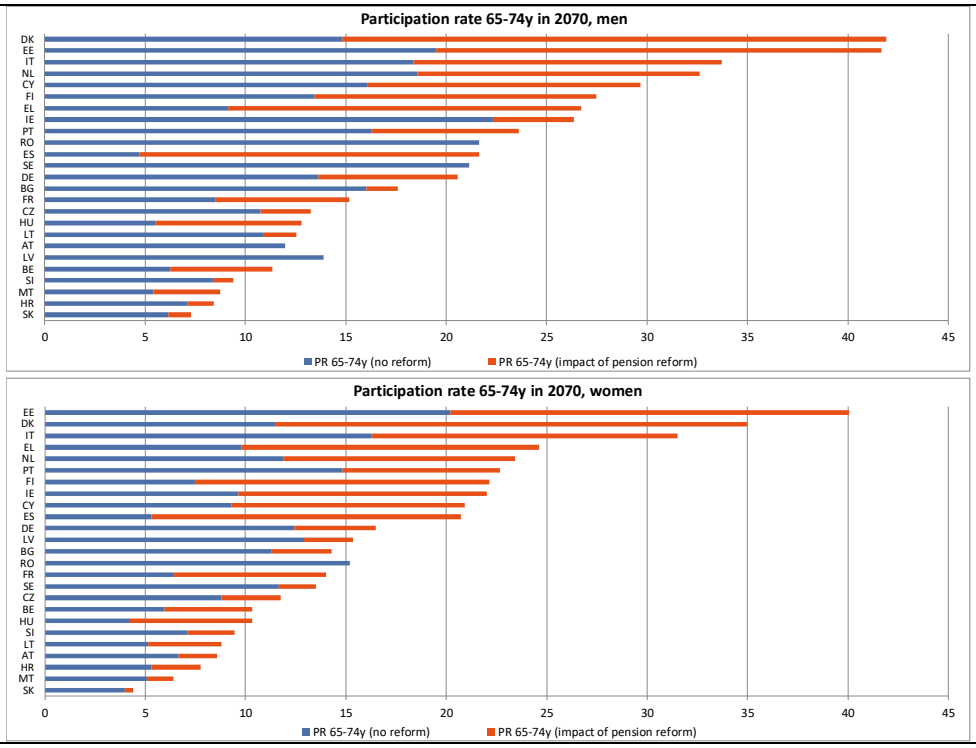
Based on the age group 51-74. LU, PL and NO are not shown as there are no legislated pension measures affecting retirement behaviour in 2019-2070.
Source: European Commission, EPC.

Graph I.2.3: **Impact of pension reforms on the participation rate of the age group 55-64**



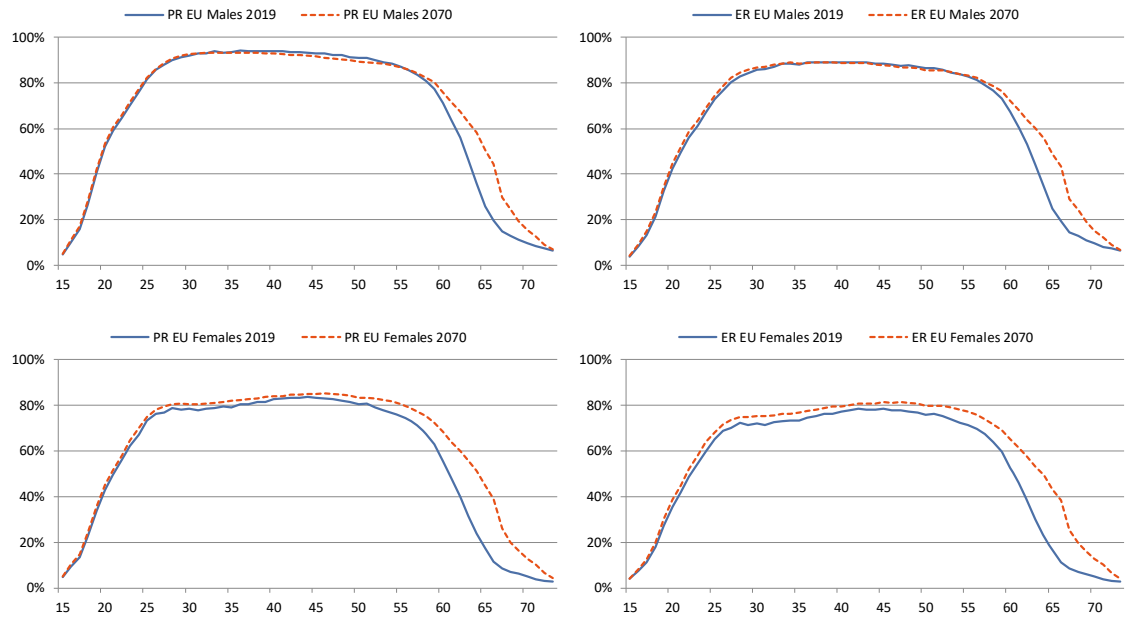
LU, PL, and NO are not shown as there are no legislated pension measures affecting retirement behaviour in 2019-2070.
Source: European Commission, EPC.

Graph I.2.4: **Impact of pension reforms on the participation rate of the age group 65-74**



LU, PL and NO are not shown as there are no legislated pension measures affecting retirement behaviour in 2019-2070.
Source: European Commission, EPC.

Graph I.2.5: **Age profiles of participation (PR) and employment rates (ER) by gender for the EU27 (2019 and 2070)**



Source: European Commission, EPC.

2.5. RESULTS OF THE PARTICIPATION RATE AND LABOUR SUPPLY PROJECTIONS

Social and institutional factors such as a higher attachment to the labour market of younger women and pension reforms lead to higher participation rates. These partly offset the impact of the projected decrease in the working-age population on the labour supply.

2.5.1. Projection of participation rates

The total participation rate in the EU is projected to increase by 2.5 pps, with female labour market participation anticipated to rise by 4.4 pps and generally the largest increases among older age groups.

As discussed in Chapter 1, the population at working age is projected to decline substantially in the coming decades as large cohorts of retiring people are replaced by smaller cohorts of younger workers. Other things being equal and given the age profile of participation rates, the increasing share of older workers in the labour force puts downward pressure on the total participation rate.

The projections nevertheless reveal a rightward shift in the age profile of both male and female participation rates, particularly visible at 60+ ages (see Graph I.2.5). For female participation, there is in addition a general upward shift. These broad trends reflect the combined effect of pension reforms and the rising attachment of younger generations of women to the labour market.

Tables I.2.6, I.2.7 and I.2.8 provide an overview of the main projected developments for the participation rates, broken down by broad age groups and gender. In the EU, the overall labour participation by the population at working age (20-64y) would increase by 2.5 pps between 2019 and 2070: from 78.2% in 2019 to 80.7% in 2070. This increase is predominantly the result of rising female participation; an increase of 4.4 pps compared to 0.5 pps for men. With 77% of the female working-age population expected to be active in the labour market in 2070, female participation would nevertheless remain 8 pps below male participation.

Only in Bulgaria, the Czech Republic, Slovakia, Sweden and Norway, the overall participation rate is expected to decrease, with the largest fall of 1.6 pps in Slovakia. The largest projected increases in labour market participation range between 4 and 8 pps in Greece, Hungary, Malta, Cyprus, Italy, Estonia and Portugal. The difference between the

countries with the highest and lowest rates would narrow somewhat, from 17 pps in 2019 to 13 pps in 2070.

When comparing projections for male and female participation for the 20-64 age group, nearly all Member States show a higher increase for women. Only Bulgaria and Slovakia are expected to see female labour market participation fall from current levels. Among men, more countries would show a decline in participation. In spite of this convergence, female participation would nevertheless remain lower than that of men in all Member States throughout the projection period.

Participation among the youngest age bracket (20-24y) is expected to rise in all Member States, by 1.7 pps on average. Only for Bulgaria and Poland, a very limited decrease in female and male participation, respectively, would take place. Differences between countries as well as differences between genders remain substantial for this age group.

For the prime-age group (25-54y), a further increase from the current levels is generally expected, with a maximum rise of 5.4 pps in Malta and decreases of up to 1.5 pps in Belgium, Denmark, Slovakia, France and Spain. In 2070, only Italy would have a participation rate below 80% and eleven Member States would have a participation rate of at least 90% among people aged 25-54.

The picture for males in the 25-54 age bracket is generally one of broad stabilisation, with projected changes limited to ±2 pps with the exception of Lithuania (+4.1 pps). In contrast, female participation is anticipated to rises for all countries aside from small decreases in Belgium, Denmark, Slovakia and Bulgaria. In the other countries, prime-aged women's participation would increase by about 3 pps on average, with the largest increases in Malta, Luxembourg and Greece.

Participation among the group of older workers (55-64y) is expected to increase substantially for most countries. The EU average rises by 10 pps between 2019 and 2070: from 62% to 72%. Projected increases exceed 15 pps in Greece, Hungary, Italy, Malta and Spain. In 2070, only Luxembourg, Croatia, Poland, Romania and Slovakia would still have participation rates below 60% for this age group. With higher increases for female (+13 pps) than for male older workers (+6 pps), the gender gap is projected to narrow substantially.

As Graph I.2.5 showed, the increase in labour market participation extends beyond the age of 65. Indeed, when considering the 65-74 age group, there is a similar upward trend in participation between 2019 and 2070 (see Table I.2.5). The average participation rate doubles over the projection period, to 20% in 2070, with large differences between Member States. The largest increases occur for countries with a link to life expectancy (e.g. Denmark, Italy, Greece, the Netherlands, Estonia, Finland and Cyprus) and countries that currently have comparatively low participation rates (e.g. Spain, Austria and France). Also for this age group, increases in labour participation are generally higher among women than what is projected for men.

Table I.2.5: **Participation rate projections – 65-74y, total**

	2019	2070	change
BE	4.3	10.8	6.5
BG	11.0	15.9	4.9
CZ	10.9	12.5	1.6
DK	14.6	38.4	23.9
DE	13.9	18.5	4.6
EE	28.1	40.9	12.7
IE	16.7	24.1	7.4
EL	8.0	25.7	17.7
ES	4.5	21.2	16.7
FR	5.5	14.6	9.0
HR	5.0	8.1	3.1
IT	9.1	32.6	23.5
CY	13.8	24.9	11.1
LV	20.7	13.6	-7.1
LT	17.5	10.7	-6.7
LU	2.9	3.9	1.0
HU	7.1	11.5	4.5
MT	8.7	7.7	-1.0
NL	14.4	27.9	13.5
AT	7.1	17.9	10.9
PL	8.5	12.6	4.1
PT	16.1	21.6	5.5
RO	13.4	17.9	4.5
SI	4.6	9.4	4.8
SK	7.0	5.8	-1.2
FI	11.5	24.8	13.3
SE	17.8	17.4	-0.4
NO	19.0	18.2	-0.8
EA	9.5	21.1	11.7
EU27	9.8	20.0	10.2

Source: European Commission, EPC.

Table I.2.6: **Participation rate projections by age group – total**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	74.5	75.7	49.7	52.8	84.8	83.3	54.6	64.0	1.1	3.0	-1.5	9.4	BE
BG	78.5	77.5	44.2	44.4	85.8	86.4	67.1	67.7	-0.9	0.2	0.6	0.6	BG
CZ	82.0	81.3	52.5	53.5	89.1	89.4	68.4	70.7	-0.7	0.9	0.4	2.3	CZ
DK	82.3	83.7	72.3	74.7	86.5	85.7	74.4	81.7	1.4	2.4	-0.7	7.3	DK
DE	83.2	84.2	71.1	71.3	88.0	88.8	74.6	76.0	1.0	0.2	0.8	1.4	DE
EE	83.8	88.0	72.3	74.3	87.8	90.2	75.7	87.6	4.1	2.0	2.4	11.9	EE
IE	78.8	81.1	72.3	72.9	83.5	86.1	64.1	70.4	2.3	0.6	2.6	6.3	IE
EL	73.8	82.2	42.4	45.8	85.4	88.2	50.4	80.8	8.4	3.5	2.8	30.4	EL
ES	79.0	81.8	55.5	56.2	87.0	86.9	61.7	78.3	2.8	0.7	-0.1	16.6	ES
FR	78.0	80.0	62.6	63.6	87.4	87.2	56.9	67.0	1.9	1.0	-0.3	10.1	FR
HR	71.4	74.6	52.4	55.5	83.6	85.0	45.8	54.5	3.2	3.1	1.4	8.6	HR
IT	70.5	74.9	44.7	45.4	78.2	78.5	57.5	75.9	4.4	0.6	0.3	18.4	IT
CY	80.9	85.9	62.5	66.9	88.3	90.5	65.3	80.1	4.9	4.4	2.2	14.8	CY
LV	82.9	83.0	66.2	69.9	88.4	90.1	72.5	69.4	0.1	3.8	1.7	-3.1	LV
LT	83.6	86.4	63.1	65.7	90.1	93.8	73.8	74.5	2.8	2.6	3.7	0.7	LT
LU	76.8	77.5	51.9	54.5	88.5	92.2	45.2	45.2	0.8	2.6	3.7	0.0	LU
HU	77.9	85.3	54.4	57.4	87.1	90.0	58.2	83.7	7.3	3.0	2.9	25.5	HU
MT	79.7	86.0	77.7	79.2	87.5	93.0	52.3	69.2	6.4	1.5	5.4	16.8	MT
NL	82.6	84.6	75.7	78.5	87.4	87.5	72.0	78.5	1.9	2.8	0.1	6.5	NL
AT	80.3	82.2	74.0	75.0	89.0	90.3	56.5	61.7	1.9	1.0	1.3	5.1	AT
PL	75.7	75.9	61.3	61.6	85.3	86.1	51.1	55.1	0.2	0.3	0.8	4.0	PL
PT	81.4	85.4	58.3	58.8	90.3	92.4	64.5	77.0	4.0	0.5	2.1	12.6	PT
RO	73.7	76.0	48.4	49.9	84.1	86.8	49.0	57.2	2.2	1.6	2.7	8.2	RO
SI	79.9	83.0	59.3	59.5	92.4	93.5	50.3	64.6	3.1	0.3	1.1	14.3	SI
SK	78.0	76.4	50.4	52.3	86.6	86.2	60.5	59.6	-1.6	1.9	-0.4	-0.9	SK
FI	82.2	85.0	70.7	74.6	87.6	87.8	71.5	81.4	2.8	3.9	0.2	9.9	FI
SE	87.3	87.1	71.5	75.2	91.2	91.7	81.7	78.9	-0.3	3.6	0.5	-2.8	SE
NO	82.1	81.2	70.7	72.3	86.3	86.3	73.9	70.3	-0.9	1.6	0.0	-3.6	NO
EA	78.4	81.0	61.0	62.4	85.8	86.4	63.7	73.7	2.5	1.5	0.6	10.0	EA
EU27	78.2	80.7	60.3	62.0	85.9	86.7	62.3	71.9	2.5	1.7	0.8	9.6	EU27

Source: European Commission, EPC.

Table I.2.7: **Participation rate projections by age group – men**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	79.1	79.3	52.5	54.5	89.3	87.6	60.1	66.9	0.3	2.0	-1.7	6.8	BE
BG	83.2	82.3	49.9	50.5	90.1	91.5	72.2	70.7	-0.9	0.6	1.5	-1.4	BG
CZ	89.3	87.4	59.8	60.2	95.9	96.1	76.5	74.8	-1.9	0.5	0.1	-1.7	CZ
DK	85.8	87.5	73.9	76.5	90.1	89.9	78.7	85.3	1.7	2.7	-0.2	6.6	DK
DE	87.6	86.8	73.6	73.6	92.6	92.1	79.4	77.2	-0.8	0.0	-0.5	-2.2	DE
EE	87.4	91.1	76.6	79.1	92.5	93.9	73.6	88.7	3.8	2.5	1.4	15.1	EE
IE	85.5	86.3	74.9	75.5	90.6	92.3	72.5	74.2	0.8	0.6	1.8	1.6	IE
EL	82.5	85.5	43.8	49.1	93.3	91.4	64.5	84.1	3.0	5.3	-1.9	19.7	EL
ES	84.2	84.8	58.8	59.7	91.7	90.6	69.1	79.3	0.6	0.9	-1.1	10.1	ES
FR	82.1	82.7	67.0	67.6	91.9	89.8	59.3	69.4	0.6	0.6	-2.0	10.1	FR
HR	76.6	78.3	59.9	63.4	86.8	88.1	54.8	58.4	1.7	3.5	1.3	3.6	HR
IT	80.6	81.9	50.4	51.1	88.5	86.4	68.7	81.3	1.3	0.7	-2.1	12.6	IT
CY	86.5	89.8	60.8	67.3	93.3	94.5	77.0	85.8	3.3	6.5	1.2	8.8	CY
LV	85.6	84.7	70.6	73.8	91.3	91.6	73.0	70.6	-0.9	3.2	0.3	-2.3	LV
LT	85.2	87.9	65.8	69.0	91.3	95.4	75.1	75.2	2.7	3.2	4.1	0.1	LT
LU	81.5	78.4	56.9	58.0	92.9	92.6	51.6	46.7	-3.1	1.1	-0.3	-4.9	LU
HU	85.9	90.1	61.8	64.5	93.4	95.2	70.7	86.6	4.2	2.7	1.7	15.9	HU
MT	89.4	89.6	78.0	80.7	96.7	96.4	67.8	73.8	0.2	2.6	-0.3	6.0	MT
NL	87.4	87.3	76.1	78.7	91.5	89.9	81.0	83.5	-0.1	2.6	-1.6	2.6	NL
AT	84.9	84.9	76.2	78.3	92.4	92.7	65.9	65.0	0.0	2.0	0.4	-0.9	AT
PL	83.5	82.9	68.0	67.8	91.6	91.6	63.0	66.1	-0.6	-0.3	0.0	3.0	PL
PT	84.9	87.0	61.2	61.6	92.7	92.9	71.0	81.4	2.2	0.4	0.2	10.4	PT
RO	83.9	85.1	57.7	58.8	93.0	95.4	61.9	67.1	1.2	1.1	2.4	5.2	RO
SI	83.0	84.8	64.4	64.7	94.3	95.0	54.9	65.7	1.8	0.3	0.7	10.8	SI
SK	84.6	83.9	62.9	63.7	93.2	93.6	63.5	65.3	-0.8	0.9	0.4	1.7	SK
FI	84.2	86.6	73.3	76.5	90.3	90.0	70.8	81.5	2.4	3.2	-0.3	10.7	FI
SE	89.8	88.9	74.1	76.3	93.7	93.3	84.3	81.8	-0.9	2.2	-0.3	-2.5	SE
NO	85.0	82.9	72.2	73.7	89.0	87.4	78.3	73.9	-2.1	1.5	-1.6	-4.5	NO
EA	84.1	84.5	64.5	65.8	91.4	90.3	70.2	76.3	0.4	1.3	-1.1	6.1	EA
EU27	84.2	84.7	64.5	65.9	91.6	90.9	69.7	75.5	0.5	1.4	-0.7	5.8	EU27

Source: European Commission, EPC.

Table I.2.8: **Participation rate projections by age group – women**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	70.0	71.9	46.9	51.0	80.3	78.9	49.2	61.2	2.0	4.1	-1.4	12.0	BE
BG	73.7	72.6	38.0	37.9	81.4	81.0	62.4	64.6	-1.1	-0.1	-0.4	2.2	BG
CZ	74.5	74.9	44.9	46.3	81.8	82.4	60.5	66.3	0.4	1.4	0.5	5.7	CZ
DK	78.7	79.8	70.7	72.8	82.8	81.5	70.2	78.0	1.1	2.0	-1.3	7.8	DK
DE	78.6	81.4	68.3	68.8	83.3	85.5	70.0	74.9	2.8	0.5	2.3	4.9	DE
EE	80.3	84.6	67.8	69.2	82.7	86.3	77.6	86.5	4.3	1.4	3.5	8.9	EE
IE	72.1	75.9	69.6	70.2	76.7	80.1	55.9	66.8	3.8	0.6	3.3	10.9	IE
EL	65.4	78.7	40.8	42.3	77.8	84.8	38.0	77.3	13.3	1.5	7.0	39.2	EL
ES	73.8	78.9	52.1	52.5	82.3	83.2	54.5	77.3	5.1	0.5	0.9	22.8	ES
FR	74.1	77.3	58.1	59.6	83.1	84.6	54.6	64.8	3.1	1.5	1.4	10.2	FR
HR	66.1	70.6	44.4	47.1	80.3	81.8	37.6	50.4	4.5	2.7	1.5	12.8	HR
IT	60.5	67.3	38.5	39.1	67.8	69.9	47.0	70.2	6.8	0.6	2.1	23.3	IT
CY	75.7	82.2	64.0	66.5	83.5	86.7	53.9	75.2	6.6	2.5	3.3	21.3	CY
LV	80.4	81.2	61.4	65.8	85.5	88.6	72.2	68.2	0.9	4.4	3.1	-3.9	LV
LT	82.1	84.7	60.1	62.0	89.0	92.1	72.7	73.7	2.6	2.0	3.1	1.0	LT
LU	71.8	76.6	46.5	50.7	84.0	91.8	38.4	43.6	4.8	4.2	7.9	5.2	LU
HU	70.0	80.1	46.4	49.8	80.5	84.5	47.4	80.6	10.1	3.4	4.0	33.2	HU
MT	68.8	81.8	77.3	77.6	77.1	88.9	36.4	63.5	13.0	0.3	11.8	27.1	MT
NL	77.8	81.8	75.3	78.4	83.3	85.1	63.1	73.6	4.0	3.1	1.8	10.5	NL
AT	75.6	79.4	71.6	71.6	85.7	87.9	47.4	58.3	3.8	0.0	2.2	10.9	AT
PL	68.0	68.5	54.3	55.2	79.0	80.4	40.3	44.0	0.6	0.9	1.4	3.7	PL
PT	78.3	83.9	55.3	55.9	88.0	91.9	58.7	73.3	5.7	0.6	3.9	14.6	PT
RO	63.3	65.8	38.5	40.3	74.6	77.0	37.2	46.3	2.5	1.8	2.4	9.0	RO
SI	76.6	81.0	53.5	53.9	90.4	91.8	45.6	63.2	4.4	0.4	1.4	17.6	SI
SK	71.3	68.6	37.4	40.3	79.6	78.3	57.7	53.8	-2.7	2.9	-1.3	-3.9	SK
FI	80.1	83.2	67.9	72.6	84.8	85.5	72.1	81.3	3.1	4.7	0.7	9.2	FI
SE	84.8	85.1	68.7	74.0	88.7	90.0	79.1	75.9	0.4	5.2	1.3	-3.3	SE
NO	79.1	79.4	69.1	70.8	83.5	85.2	69.4	66.5	0.3	1.7	1.7	-2.9	NO
EA	72.8	77.4	57.2	58.9	80.3	82.5	57.5	71.1	4.6	1.7	2.2	13.6	EA
EU27	72.2	76.6	55.8	58.0	80.2	82.4	55.4	68.4	4.4	2.2	2.2	12.9	EU27

Source: European Commission, EPC.

2.5.2. Projection of labour supply

The size of the EU labour supply is expected to decrease by 16% over the projection horizon, with the largest decline of labour supply of males.

Total labour supply in the EU is expected to decrease substantially over the projection horizon. ([19]) By 2070, the labour force would shrink by almost 16% as compared to 2019, with an average annual decrease of 0.3% (see Table I.2.9). This entails a total loss in the number of workers in the EU of 32.1 million people; 18.6 million fewer male workers (-17%) and 13.5 million fewer female workers (-14%).

Graph I.2.6 highlights the substantial differences in labour supply projections across Member States, ranging from an increase of 26% in Malta to a decrease of 48% in Latvia (2019-70). The labour force would be larger in 2070 than in 2019 for only six countries. In the cases of Poland, Croatia, Romania, Bulgaria, Lithuania and Latvia, it would shrink by a third or more. Such steep declines in the labour force reverberate in the potential growth estimates, discussed in Chapter 3.

The general decline in the labour supply expected in the first half of the projection period (2019-2045) is expected to continue thereafter (2045-2070), though at a slower pace in most cases (see Graph I.2.6). The countries with the sharpest fall in the labour supply in 2019-2045 also show the steepest declines in 2045-2070, both for males and females.

([19]) Labour supply projections by single age and gender are obtained by multiplying the participation rates with the demographic projections.

Table I.2.9: **Labour supply projections - total**

	Total labour force (20-64y, '000 persons)		Change (2070/2019)	Avg annual growth rate (2019-2070)	Impact on potential output growth(1)
	2019	2070			
BE	5.011	4.699	-6.2%	-0.1%	0.1%
BG	3.264	1.984	-39.2%	-1.0%	-0.4%
CZ	5.239	4.320	-17.5%	-0.4%	0.0%
DK	2.768	2.655	-4.1%	-0.1%	0.2%
DE	41.389	35.800	-13.5%	-0.3%	0.0%
EE	657	538	-18.0%	-0.4%	0.0%
IE	2.287	2.735	19.6%	0.4%	0.4%
EL	4.622	3.552	-23.1%	-0.5%	-0.1%
ES	22.639	19.705	-13.0%	-0.3%	0.0%
FR	29.127	28.024	-3.8%	-0.1%	0.2%
HR	1.737	1.143	-34.2%	-0.8%	-0.3%
IT	25.139	20.490	-18.5%	-0.4%	0.0%
CY	443	505	13.9%	0.3%	0.4%
LV	936	489	-47.8%	-1.3%	-0.6%
LT	1.407	783	-44.3%	-1.1%	-0.5%
LU	305	323	5.7%	0.1%	0.3%
HU	4.634	3.928	-15.2%	-0.3%	0.0%
MT	251	316	25.7%	0.5%	0.5%
NL	8.435	7.875	-6.6%	-0.1%	0.1%
AT	4.399	3.978	-9.6%	-0.2%	0.1%
PL	17.798	11.719	-34.2%	-0.8%	-0.3%
PT	4.942	3.555	-28.1%	-0.6%	-0.2%
RO	8.594	5.264	-38.8%	-1.0%	-0.4%
SI	1.007	832	-17.4%	-0.4%	0.0%
SK	2.683	1.809	-32.6%	-0.8%	-0.3%
FI	2.572	2.196	-14.6%	-0.3%	0.0%
SE	5.094	6.015	18.1%	0.3%	0.4%
NO	2.599	2.893	11.3%	0.2%	0.4%
EA	158.252	138.202	-12.7%	-0.3%	0.0%
EU27	207.378	175.231	-15.5%	-0.3%	0.0%

(1) Impact of labour force growth differential relative to the EU average.
Source: European Commission, EPC.

2.5.3. Breaking down changes in participation rates and labour force

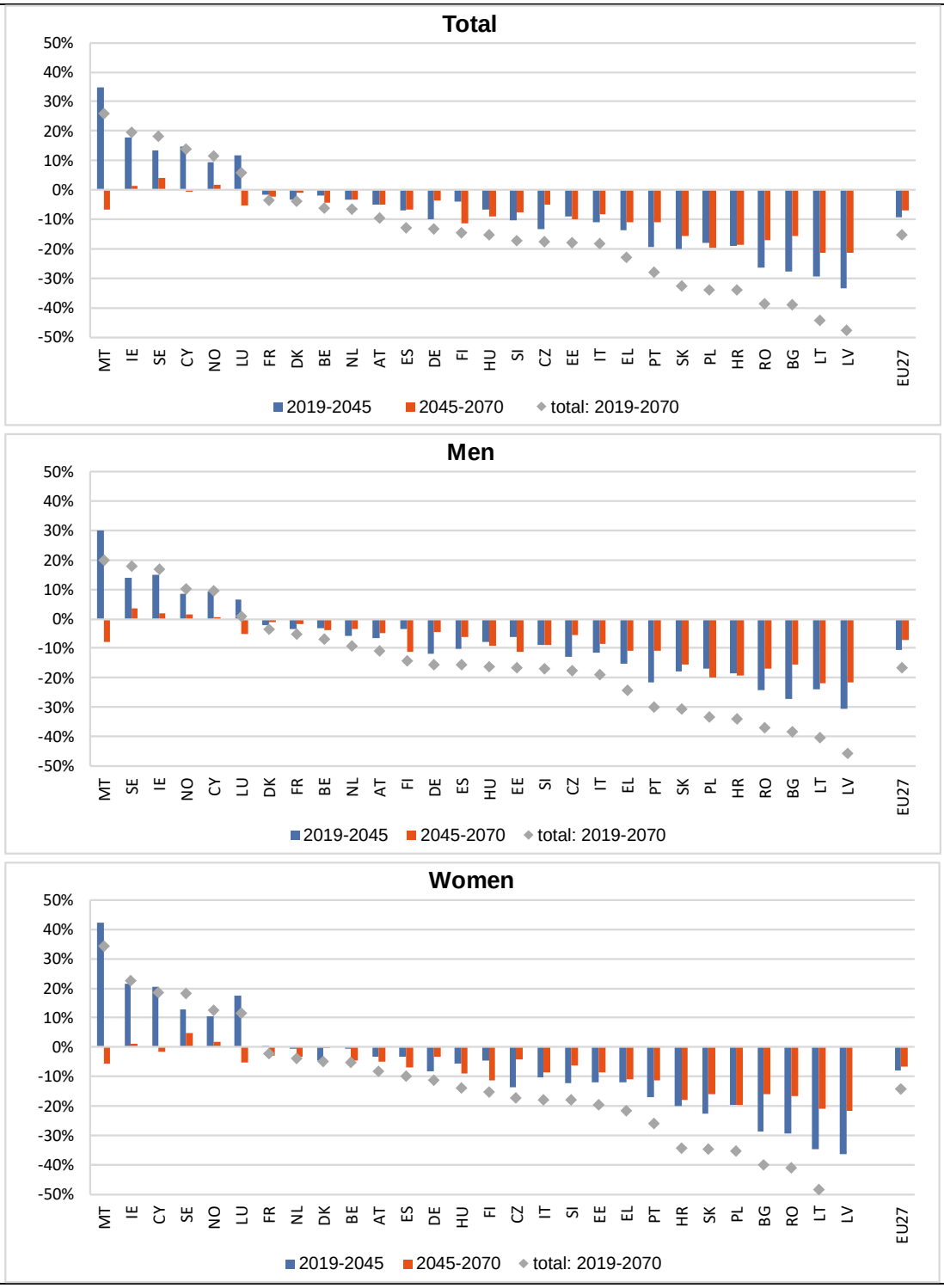
Table I.2.10 applies a shift-share analysis to changes in the total participation rate over the period 2019-2070 along age and gender dimensions. The overall participation rate is algebraically broken down in a participation rate effect, a demographic effect and a residual interaction effect ([20]).

The participation rate effect, capturing changes in participation rates of specific age and gender groups, is positive for most Member States. This basically reflects the trend rise in the participation rates of women and older workers, with a small decrease in participation among prime-aged people for several countries.

The demographic effect, capturing changes in the structure of the working-age population, is negative in nearly all many Member States, as a result of shrinking cohorts of prime-aged people and women in general. Women are thus associated with both positive participation and negative demographic effects. The former reflects the upward transmission of younger cohorts' partitcipation rates, as embedded in the CSM. The latter reflects the ageing of the population, with a stronger impact on women, mostly because they leave the labour force on average earlier than men. For some countries, the interaction effect between both dimensions is also important (e.g. EL, ES, HU and MT).

([20]) This breakdown is based on the rule for approximating the difference of a product: $y_1x_1 - y_0x_0 = x_0\Delta y + y_0\Delta x + \Delta y\Delta y$. For more details, see Carone (2005).

Graph I.2.6: **Change in the labour force (20-64y; %)**



Countries are ranked in descending order of total change over the period 2019-2070.
Source: European Commission, EPC.

Table I.2.10: **Contribution to the overall change in participation rates, 2019-2070 (in pps)**

	Participation rates in 2070	Change in participation rates 2019-2070 (pps)	Contribution of group-specific changes in participation rates												Demographic effect						Interaction effect	
			Total				*Men*				*Women*											
			Total working-age (20-64)	Young (20-24)	Prime-age (25-54)	Older (55-64)	Total working-age (20-64)	Young (20-24)	Prime-age (25-54)	Older (55-64)	Total working-age (20-64)	Young (20-24)	Prime-age (25-54)	Older (55-64)	Total working-age (20-64)	Young (20-24)	Prime-age (25-54)	Older (55-64)	Men	Women		
BE	75.7	***1.1***	***1.4***	0.3	-1.0	2.1	0.3	0.1	-0.6	0.8	1.1	0.2	-0.5	1.4	***-0.4***	0.2	-1.0	0.5	0.1	-0.1	***0.1***	BE
BG	77.5	***-0.9***	***0.5***	0.0	0.4	0.1	0.4	0.0	0.5	-0.2	0.1	0.0	-0.1	0.3	***-1.5***	1.1	-4.0	1.4	0.5	-0.5	***0.0***	BG
CZ	81.3	***-0.7***	***0.8***	0.1	0.3	0.5	-0.1	0.0	0.0	-0.2	0.8	0.1	0.2	0.6	***-1.6***	1.4	-4.8	1.8	0.5	-0.4	***0.1***	CZ
DK	83.7	***1.4***	***1.3***	0.3	-0.5	1.6	0.8	0.2	-0.1	0.7	0.5	0.1	-0.4	0.8	***0.0***	-0.6	0.0	0.6	0.2	-0.2	***0.0***	DK
DE	84.2	***1.0***	***0.9***	0.0	0.5	0.3	-0.4	0.0	-0.2	-0.3	1.4	0.0	0.7	0.6	***0.1***	0.8	1.0	-1.7	-0.2	0.1	***0.0***	DE
EE	88.0	***4.1***	***4.5***	0.2	1.7	2.6	2.1	0.1	0.5	1.5	2.3	0.1	1.2	1.1	***-0.6***	1.2	-3.9	2.1	1.0	-0.9	***0.2***	EE
IE	81.1	***2.3***	***3.1***	0.1	1.8	1.2	0.8	0.0	0.6	0.2	2.3	0.0	1.2	1.0	***-0.9***	0.1	-4.0	3.1	-0.1	0.1	***0.2***	IE
EL	82.2	***8.4***	***9.0***	0.3	1.9	6.8	1.7	0.2	-0.7	2.1	7.1	0.1	2.4	4.6	***-1.3***	0.4	-3.0	1.3	2.4	-1.9	***0.7***	EL
ES	81.8	***2.8***	***3.6***	0.1	-0.1	3.6	0.7	0.0	-0.4	1.1	2.9	0.0	0.3	2.5	***-1.3***	0.8	-4.3	2.2	-0.1	0.1	***0.6***	ES
FR	80.0	***1.9***	***2.2***	0.1	-0.2	2.3	0.4	0.0	-0.7	1.1	1.8	0.1	0.5	1.2	***-0.4***	0.3	-1.2	0.5	0.1	-0.1	***0.1***	FR
HR	74.6	***3.2***	***3.3***	0.3	1.0	2.1	1.0	0.2	0.4	0.4	2.2	0.1	0.5	1.6	***-0.2***	-0.3	-0.4	0.5	1.0	-0.8	***0.1***	HR
IT	74.9	***4.4***	***4.6***	0.1	0.2	4.3	0.7	0.0	-0.7	1.4	3.6	0.0	0.7	2.8	***-0.7***	0.2	-2.3	1.4	1.6	-1.2	***0.4***	IT
CY	85.9	***4.9***	***4.8***	0.5	1.5	2.8	1.6	0.4	0.4	0.8	3.3	0.2	1.2	2.0	***-0.2***	-0.9	-0.8	1.6	-0.7	0.6	***0.3***	CY
LV	83.0	***0.1***	***0.7***	0.3	1.2	-0.7	0.0	0.1	0.1	-0.3	0.7	0.2	1.0	-0.5	***-0.7***	1.7	-2.8	0.5	2.3	-2.2	***0.0***	LV
LT	86.4	***2.8***	***2.8***	0.2	2.4	0.2	1.5	0.2	1.4	0.0	1.3	0.1	1.0	0.1	***-0.1***	0.2	-0.2	0.0	3.0	-2.9	***0.0***	LT
LU	77.5	***0.8***	***2.9***	0.3	2.7	0.0	-0.5	0.1	-0.1	-0.5	3.4	0.2	2.8	0.5	***-1.9***	-0.3	-3.9	2.2	0.1	-0.1	***-0.2***	LU
HU	85.3	***7.3***	***7.7***	0.3	2.0	5.4	2.3	0.1	0.6	1.6	5.3	0.2	1.4	3.7	***-0.9***	0.3	-2.7	1.5	1.3	-1.0	***0.6***	HU
MT	86.0	***6.4***	***7.3***	0.2	3.8	3.3	0.6	0.1	-0.1	0.6	6.5	0.0	3.9	2.6	***-1.5***	-1.2	-2.7	2.4	1.2	-1.0	***0.6***	MT
NL	84.6	***1.9***	***1.9***	0.3	0.1	1.5	-0.1	0.1	-0.5	0.3	2.0	0.2	0.6	1.2	***0.1***	-0.3	0.6	-0.2	-0.1	0.1	***0.0***	NL
AT	82.9	***2.6***	***2.8***	0.1	1.0	1.7	0.0	0.1	0.2	-0.3	2.8	0.0	0.8	2.0	***-0.2***	0.3	-0.8	0.3	0.4	-0.4	***0.0***	AT
PL	75.9	***0.2***	***1.5***	0.0	0.6	0.9	0.3	0.0	0.0	0.3	0.9	0.0	0.5	0.4	***-1.4***	0.2	-3.7	2.0	1.0	-0.8	***0.1***	PL
PT	85.7	***4.3***	***4.7***	0.0	1.4	3.2	1.2	0.0	0.1	1.2	3.5	0.0	1.4	2.1	***-0.5***	0.4	-1.5	0.6	-0.2	0.2	***0.1***	PT
RO	76.0	***2.2***	***3.8***	0.1	1.9	1.7	1.4	0.0	0.9	0.5	1.9	0.1	0.8	1.0	***-1.7***	0.5	-4.1	1.9	1.9	-1.4	***0.2***	RO
SI	83.0	***3.1***	***4.1***	0.0	0.7	3.3	1.5	0.0	0.2	1.3	2.5	0.0	0.5	2.1	***-1.1***	1.1	-2.9	0.7	1.0	-0.9	***0.2***	SI
SK	76.4	***-1.6***	***-0.3***	0.2	-0.3	-0.2	0.4	0.0	0.1	0.2	-0.8	0.1	-0.4	-0.4	***-1.3***	0.7	-3.9	1.9	0.7	-0.6	***0.0***	SK
FI	85.0	***2.8***	***2.9***	0.4	0.1	2.3	1.3	0.2	-0.1	1.2	1.5	0.2	0.2	1.1	***-0.3***	-0.7	-1.6	2.0	0.5	-0.4	***0.2***	FI
SE	87.1	***-0.3***	***0.1***	0.4	0.3	-0.6	-0.3	0.1	-0.1	-0.3	0.4	0.3	0.5	-0.3	***-0.3***	0.4	-2.7	1.9	0.3	-0.3	***-0.1***	SE
NO	81.2	***-0.9***	***-0.5***	0.2	0.0	-0.7	-0.9	0.1	-0.6	-0.5	0.4	0.1	0.6	-0.3	***-0.2***	-0.7	-1.9	2.4	0.2	-0.2	***-0.1***	NO
EA	81.0	***2.5***	***2.8***	0.1	0.4	2.3	0.4	0.1	-0.4	0.7	2.4	0.1	0.7	1.6	***-0.4***	0.5	-1.4	0.5	0.4	-0.3	***0.1***	EA
EU27	80.7	***2.5***	***2.9***	0.2	0.5	2.2	0.5	0.1	-0.3	0.6	2.4	0.1	0.8	1.5	***-0.5***	0.5	-1.8	0.8	0.5	-0.4	***0.1***	EU27

Source: European Commission, EPC.

Box I.2.3: **Assumptions on structural unemployment**

The structural unemployment rate estimates (NAWRU) ([1]), based on the methodology developed by the Output Gap Working Group (OGWG) attached to the Economic Policy Committee (EPC), are used as a proxy for the structural unemployment rate in the baseline scenario.

As a general rule, actual unemployment rates are assumed to converge to NAWRU rates in 5 years (currently 2024), corresponding to the closure of the output gap. On their turn, NAWRU rates are assumed to gradually ([2]) converge to the minimum of country-specific 'anchors' ([3]) or the median of national 'anchors', whichever is the lowest.

Anchor values are country-specific values for the NAWRU that are calculated on the basis of the coefficients of a panel estimation model in which the short-term NAWRU for old EU member states is regressed on a set of structural variables (unemployment benefit replacement rates, expenditure on active labour market policies, the power of unions proxied by union density and the tax wedge), together with a set of cyclical variables (TFP, fraction of employment in construction and the real interest rate). To derive country-specific anchors, it is assumed then that the non-structural variables are set at their average values ([4]).

Capping country-specific NAWRU values to the non-weighted median ([5]) is done in order to avoid extrapolating very high unemployment rates into the far future. It should be noted that this cap on unemployment rates is a crucial assumption for some countries that currently register high unemployment. Higher long-term unemployment assumptions would, through weaker employment growth, lead to lower potential output growth. Capping unemployment rates, as done in some cases, leads to higher employment, employment growth and GDP growth, and essentially assumes the implementation of future policy measures in the labour market. Therefore, this approach is not aligned with a 'no-policy-change' approach.

In order to avoid changes in total/average unemployment rates as a result of the interaction between cohort-specific structural unemployment rates and the structure of the labour force, the age-specific unemployment rates (by gender) for each projection year are calculated as follows:

$$u_{a,g}^{t} = \frac{u_{total}^{t}}{\sum_{a,g}\{u_{a,g}^{2019} * l_{a,g}^{t}\}} * u_{a,g}^{2019}$$

where

$$l_{a,g}^{t} = \frac{LF_{a,g}^{t}}{LF_{total}^{t}}$$

where $u_{a,g}^{t}$ is the unemployment rate in age group a with gender g in period t; u_{total}^{t} is the total unemployment rate in period t; and $l_{a,g}^{t}$ is the fraction of the total labour force.

([1]) Non-accelerating wage rate of unemployment. For further details on the Commission's NAWRU methodology, see Havik et al. (2014).
([2]) In addition, if the estimated NAWRU ten years ahead (2029) is lower than the country-specific anchor, the former is assumed to replace the anchor. The gradual convergence, for countries whose NAWRU is higher than the EU median, is assumed to be completed by 2050.
([3]) Under the guidance of the EPC-OGWG and with the twin objectives of improving the medium-term framework for fiscal surveillance up to T+10 (currently 2029), DG ECFIN carried out some econometric work (Orlandi, 2012) leading to the estimation of anchor values for the NAWRU.
([4]) Over the estimation sample.
([5]) The use of weighted or non-weighted averages makes a difference of around 0.2-0.3 pps. Weights are based on the labour force.

(Continued on the next page)

Box (continued)

This means that the unemployment rate structure (by age and gender) observed in the base year (2019) is kept unchanged throughout the projection period, with age/gender values adjusted proportionally in order to satisfy a given total unemployment rate target.

Table 1 presents the unemployment rate assumptions. In the EU, the unemployment rate is assumed to decline from 6.0% in 2019 to 5.8% in 2070. In the euro area, the unemployment rate is expected to fall from 6.7% in 2019 to 6.2% in 2070.

Table 1: Unemployment rate assumptions (15-64y, %)

	2019	2029	2050	2070	
BE	5.4	6.4	6.4	6.4	**BE**
BG	4.2	5.4	5.4	5.4	**BG**
CZ	2.0	3.7	3.7	3.7	**CZ**
DK	5.0	3.6	3.6	3.6	**DK**
DE	3.2	4.2	4.2	4.2	**DE**
EE	4.4	6.6	6.6	6.6	**EE**
IE	5.0	7.6	7.0	7.0	**IE**
EL	17.3	12.5	7.2	7.0	**EL**
ES	14.1	14.6	7.2	7.0	**ES**
FR	8.5	8.5	7.0	7.0	**FR**
HR	6.6	8.2	7.0	7.0	**HR**
IT	10.0	9.4	7.1	7.0	**IT**
CY	7.1	8.6	7.0	7.0	**CY**
LV	6.3	9.4	7.1	7.0	**LV**
LT	6.3	7.2	7.0	7.0	**LT**
LU	5.6	4.9	4.9	4.9	**LU**
HU	3.4	4.2	4.2	4.2	**HU**
MT	3.4	4.4	4.3	4.3	**MT**
NL	3.4	5.0	5.0	5.0	**NL**
AT	4.5	4.3	4.3	4.3	**AT**
PL	3.3	5.2	5.2	5.2	**PL**
PT	6.5	6.4	6.4	6.4	**PT**
RO	3.9	4.8	4.8	4.8	**RO**
SI	4.5	5.8	5.8	5.8	**SI**
SK	5.8	8.3	7.0	7.0	**SK**
FI	6.7	6.9	6.9	6.9	**FI**
SE	6.8	5.6	5.6	5.6	**SE**
NO	3.7	3.7	3.6	3.6	**NO**
EA	6.7	7.4	6.2	6.2	**EA**
EU27	6.0	6.7	5.9	5.8	**EU27**

Source: European Commission, EPC.

Table I.2.11: **Employment rate projections by age group – total**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	70.6	70.9	43.0	44.4	80.8	78.6	52.4	60.8	0.3	1.4	-2.2	8.5	BE
BG	75.2	73.5	40.9	40.3	82.3	81.9	64.5	64.5	-1.7	-0.6	-0.4	0.0	BG
CZ	80.4	78.5	50.2	49.4	87.4	86.6	67.1	68.3	-1.9	-0.8	-0.9	1.3	CZ
DK	78.4	80.9	66.3	70.3	82.6	83.0	71.9	79.7	2.5	4.0	0.5	7.8	DK
DE	80.6	80.7	67.3	66.4	85.4	85.4	72.6	73.4	0.2	-0.9	0.0	0.7	DE
EE	80.2	82.5	65.6	64.7	84.3	85.1	72.7	82.7	2.3	-0.9	0.9	10.0	EE
IE	75.1	75.9	65.3	63.1	80.1	81.1	61.8	66.8	0.7	-2.2	1.0	5.0	IE
EL	60.9	76.5	27.9	39.6	70.8	82.1	43.7	76.4	15.6	11.7	11.3	32.7	EL
ES	68.1	76.2	39.1	48.2	75.8	81.3	53.9	73.5	8.2	9.1	5.6	19.6	ES
FR	71.6	74.5	51.1	54.2	80.9	81.8	53.0	63.3	2.9	3.1	0.9	10.2	FR
HR	66.8	69.6	45.2	47.3	78.4	79.4	44.3	52.5	2.8	2.1	1.0	8.2	HR
IT	63.6	69.8	33.1	37.1	70.5	72.9	54.4	73.2	6.2	4.0	2.4	18.8	IT
CY	75.1	80.1	52.9	57.0	82.6	85.0	61.2	75.4	5.0	4.1	2.4	14.2	CY
LV	77.6	77.4	59.1	62.2	83.1	84.5	67.7	64.7	-0.2	3.1	1.4	-3.0	LV
LT	78.3	80.4	56.2	57.9	84.9	87.9	68.7	69.1	2.2	1.8	3.0	0.4	LT
LU	72.7	74.1	44.3	47.5	84.3	88.6	43.3	43.6	1.4	3.2	4.2	0.3	LU
HU	75.4	81.9	49.1	50.6	84.5	86.7	56.9	81.4	6.5	1.4	2.3	24.5	HU
MT	77.3	82.7	72.6	71.8	85.1	89.6	51.5	67.5	5.5	-0.7	4.5	16.0	MT
NL	80.2	80.7	71.4	71.9	85.2	84.2	69.7	74.7	0.6	0.5	-1.0	4.9	NL
AT	76.8	79.5	68.3	69.6	85.3	87.0	54.6	62.1	2.7	1.2	1.6	7.5	AT
PL	73.3	72.1	55.9	53.0	82.9	82.3	49.9	53.1	-1.2	-2.8	-0.6	3.2	PL
PT	76.2	80.4	48.7	49.6	85.2	87.3	60.4	73.8	4.2	0.9	2.1	13.3	PT
RO	71.0	72.7	41.7	42.0	81.4	83.5	47.9	55.7	1.7	0.3	2.1	7.8	RO
SI	76.4	78.3	55.3	54.5	88.6	88.5	48.0	60.7	1.9	-0.7	0.0	12.8	SI
SK	73.6	71.3	43.9	44.0	82.0	80.9	57.7	56.4	-2.3	0.1	-1.1	-1.3	SK
FI	77.1	79.7	61.3	64.5	83.2	83.4	66.8	76.0	2.6	3.3	0.2	9.2	FI
SE	82.1	83.0	61.5	66.9	86.4	87.9	77.9	76.0	0.8	5.4	1.6	-1.9	SE
NO	79.4	78.7	65.4	67.0	83.6	83.7	72.8	69.2	-0.7	1.7	0.1	-3.6	NO
EA	72.6	76.3	51.8	55.0	79.7	81.7	60.0	70.2	3.7	3.2	2.0	10.2	EA
EU27	73.1	76.2	51.9	54.7	80.6	82.2	59.1	68.7	3.1	2.8	1.6	9.6	EU27

Source: European Commission, EPC.

2.6. EMPLOYMENT PROJECTIONS

The total employment rate in the EU is projected to increase from 73% in 2019 to 76% in 2070. This change mostly reflects higher employment rates among older people and women in general.

The Ageing Report methodology calculates employment as a residual variable. It is determined on the basis of the population projections from Eurostat, future participation rates derived using the CSM and the unemployment rate assumptions (see Box I.2.3).

The employment rate among people aged 20-64 is expected to rise from around 73% in 2019 to about 76% in 2070 (see Table I.2.11). This overall increase in the employment rate by 3 pps includes increases by 5 pps in the female employment rate and a small increase of 1 pp in the male one (see Tables I.2.12 and I.2.13). In spite of the strong increase in female employment, a higher share of the male population aged 20-64 would nevertheless be employed in 2070: 80% compared to 72% for women.

Employment among older workers is expected to rise considerably over the projection horizon for both sexes, with increases of 6 pps and 13 pps in the respective employment rates of men and women aged 55-64. This reflects how recent pension and labour market reforms in many Member States incentivise older workers to retire later. Only few Member States show a decrease in the employment rate for this age bracket. By 2070, the employment rate for people aged 55-64 would be inferior to 60% in Croatia, Luxembourg, Poland, Romania and Slovakia, which under current legislation all cap the statutory retirement at 65 years – less in the case of Slovakia and for Romanian and Polish women – with early retirement possible several years earlier (see Table II.A5.2 in Annex 5).

Table I.2.12: **Employment rate projections by age group – men**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	74.6	74.0	44.2	44.4	84.7	82.3	57.6	63.5	-0.6	0.2	-2.4	5.9	BE
BG	79.4	77.6	46.2	45.7	86.1	86.4	69.3	67.3	-1.8	-0.5	0.4	-2.1	BG
CZ	87.8	84.8	57.3	55.9	94.5	93.6	75.0	72.4	-3.0	-1.3	-0.9	-2.7	CZ
DK	82.0	84.8	67.5	71.9	86.3	87.3	76.1	83.3	2.8	4.4	1.0	7.2	DK
DE	84.6	82.9	69.0	67.6	89.5	88.1	77.0	74.2	-1.7	-1.4	-1.4	-2.8	DE
EE	84.0	86.0	70.4	70.1	89.5	89.6	70.0	82.8	2.0	-0.4	0.0	12.8	EE
IE	81.4	80.4	66.2	63.3	86.7	86.8	69.9	70.3	-0.9	-2.8	0.0	0.5	IE
EL	70.9	80.6	29.5	42.7	80.9	86.4	56.7	80.0	9.6	13.2	5.5	23.3	EL
ES	74.0	79.6	42.3	51.7	81.6	85.6	61.1	74.9	5.6	9.3	4.0	13.8	ES
FR	75.2	77.0	53.4	56.5	85.1	84.4	55.3	65.5	1.8	3.1	-0.8	10.2	FR
HR	72.2	73.5	52.9	55.4	81.7	82.6	53.2	56.5	1.4	2.6	0.9	3.3	HR
IT	73.3	76.7	37.9	42.3	80.8	80.9	64.8	78.1	3.4	4.4	0.1	13.4	IT
CY	80.9	84.3	49.9	55.9	88.3	89.7	72.2	80.8	3.4	6.0	1.4	8.6	CY
LV	79.4	78.1	61.6	64.0	85.1	85.1	67.6	65.3	-1.3	2.4	0.0	-2.3	LV
LT	79.1	81.2	57.0	59.1	85.3	88.6	69.9	69.6	2.1	2.0	3.3	-0.2	LT
LU	77.2	74.8	47.9	50.0	88.6	89.0	49.2	44.8	-2.3	2.1	0.4	-4.4	LU
HU	83.2	86.6	55.4	56.2	90.8	92.0	69.0	84.2	3.5	0.8	1.2	15.2	HU
MT	86.8	86.4	72.3	72.3	94.2	93.2	67.0	72.5	-0.4	0.0	-1.0	5.5	MT
NL	84.8	83.4	71.3	71.4	89.3	86.6	78.3	79.3	-1.4	0.0	-2.6	1.0	NL
AT	81.2	81.1	70.0	72.1	88.5	89.3	63.4	61.1	0.0	2.2	0.8	-2.4	AT
PL	81.0	79.0	62.2	58.6	89.3	88.0	61.4	63.4	-2.0	-3.6	-1.2	2.0	PL
PT	79.9	82.2	53.1	53.9	88.1	88.4	66.6	76.8	2.2	0.8	0.3	10.2	PT
RO	80.5	81.0	50.0	49.8	89.6	91.4	60.3	65.1	0.6	-0.3	1.7	4.9	RO
SI	79.7	80.4	60.7	60.0	90.9	90.6	52.4	61.7	0.8	-0.7	-0.3	9.3	SI
SK	80.0	78.5	55.7	55.0	88.4	87.9	60.9	62.2	-1.6	-0.6	-0.5	1.2	SK
FI	78.5	80.7	62.1	64.6	85.6	85.3	65.1	74.9	2.1	2.5	-0.3	9.8	FI
SE	84.5	84.8	63.1	67.5	88.9	89.7	80.0	78.5	0.3	4.4	0.7	-1.5	SE
NO	81.9	80.1	65.9	67.5	86.0	84.6	76.8	72.5	-1.9	1.6	-1.4	-4.3	NO
EA	78.1	79.6	54.4	57.4	85.3	85.5	66.1	72.6	1.6	3.0	0.2	6.5	EA
EU27	78.9	80.1	55.3	57.6	86.3	86.4	66.1	72.0	1.1	2.3	0.1	6.0	EU27

Source: European Commission, EPC.

Table I.2.13: **Employment projections by age group – women**

	Total		Young		Prime-age		Older		change 2019-2070 (pps)				
	20-64		20-24		25-54		55-64		Total	Young	Prime-age	Older	
	2019	2070	2019	2070	2019	2070	2019	2070	20-64	20-24	25-54	55-64	
BE	66.6	67.8	41.7	44.4	76.8	74.8	47.3	58.2	1.2	2.6	-2.0	11.0	BE
BG	70.8	69.1	35.4	34.7	78.3	77.2	60.0	61.6	-1.8	-0.7	-1.1	1.6	BG
CZ	72.7	71.8	42.7	42.5	79.9	79.1	59.3	64.1	-1.0	-0.2	-0.9	4.8	CZ
DK	74.8	77.0	65.1	68.6	78.8	78.7	67.7	76.0	2.2	3.6	-0.1	8.3	DK
DE	76.5	78.6	65.5	65.1	81.1	82.6	68.3	72.5	2.1	-0.3	1.5	4.2	DE
EE	76.3	78.9	60.5	59.1	78.7	80.4	75.0	82.7	2.5	-1.4	1.7	7.6	EE
IE	69.1	71.5	64.4	62.9	73.7	75.6	53.9	63.5	2.4	-1.5	2.0	9.6	IE
EL	51.3	72.1	26.2	36.3	60.8	77.3	32.2	72.6	20.8	10.1	16.5	40.4	EL
ES	62.2	72.8	35.7	44.6	69.9	77.1	47.0	72.2	10.7	8.9	7.2	25.2	ES
FR	68.1	72.2	48.7	51.9	76.8	79.3	50.9	61.2	4.1	3.2	2.5	10.3	FR
HR	61.5	65.5	37.0	38.7	74.9	75.9	36.0	48.3	4.0	1.7	1.0	12.3	HR
IT	53.8	62.3	27.8	31.5	60.2	64.2	44.6	68.0	8.4	3.7	4.0	23.4	IT
CY	69.6	76.2	55.7	58.2	77.1	80.5	50.4	70.8	6.6	2.5	3.4	20.3	CY
LV	75.9	76.5	56.4	60.3	81.1	83.8	67.7	64.1	0.6	3.9	2.7	-3.7	LV
LT	77.5	79.6	55.2	56.7	84.5	87.2	67.8	68.5	2.1	1.5	2.6	0.7	LT
LU	68.0	73.2	40.5	44.9	79.9	88.1	37.1	42.3	5.3	4.3	8.2	5.2	LU
HU	67.6	76.9	42.5	44.6	77.9	81.2	46.4	78.5	9.3	2.1	3.3	32.1	HU
MT	66.6	78.4	72.9	71.3	74.8	85.3	35.7	61.5	11.8	-1.6	10.6	25.8	MT
NL	75.5	78.1	71.4	72.4	81.1	81.7	61.2	70.1	2.6	0.9	0.6	8.9	NL
AT	72.4	77.8	66.6	66.8	82.1	84.6	46.0	63.1	5.4	0.3	2.5	17.1	AT
PL	65.5	64.8	49.2	47.1	76.3	76.3	39.4	42.6	-0.7	-2.1	0.0	3.2	PL
PT	72.7	78.8	44.2	45.3	82.5	86.3	55.0	71.2	6.1	1.1	3.8	16.1	PT
RO	61.3	63.2	32.8	33.6	72.6	74.6	36.5	45.2	2.0	0.7	2.0	8.7	RO
SI	72.8	75.9	49.2	48.6	86.1	86.2	43.6	59.7	3.1	-0.6	0.1	16.1	SI
SK	67.1	63.8	31.5	32.3	75.4	73.5	54.6	50.4	-3.3	0.8	-1.9	-4.2	SK
FI	75.7	78.7	60.4	64.5	80.7	81.3	68.4	77.1	3.0	4.2	0.6	8.7	FI
SE	79.7	81.1	59.7	66.3	83.7	86.1	75.8	73.4	1.4	6.6	2.4	-2.4	SE
NO	76.8	77.3	64.8	66.5	81.1	82.9	68.6	65.8	0.4	1.8	1.8	-2.9	NO
EA	67.1	72.9	49.0	52.4	74.0	77.8	54.2	67.8	5.8	3.4	3.8	13.6	EA
EU27	67.2	72.3	48.3	51.5	74.7	77.9	52.6	65.4	5.1	3.2	3.2	12.8	EU27

Source: European Commission, EPC.

Table I.2.14: **Share of older workers (55-64y) in total employment (20-64y)**

	Total			Men			Women			
	2019	2045	2070	2019	2045	2070	2019	2045	2070	
BE	16.7	19.2	20.0	17.2	18.9	19.8	16.1	19.5	20.2	BE
BG	19.6	24.7	22.0	19.0	23.9	21.4	20.4	25.7	22.6	BG
CZ	17.1	22.0	20.1	16.9	21.5	19.7	17.2	22.6	20.7	CZ
DK	19.8	20.3	22.1	19.8	20.5	22.0	19.8	20.1	22.2	DK
DE	22.2	21.5	20.2	21.9	20.7	19.8	22.4	22.3	20.7	DE
EE	20.1	25.3	24.9	16.9	24.6	24.0	23.6	26.1	26.1	EE
IE	15.3	19.4	20.6	16.0	18.9	20.2	14.5	19.9	21.1	IE
EL	16.0	23.0	24.8	17.0	22.2	24.5	14.6	24.1	25.2	EL
ES	17.1	23.3	24.2	17.4	22.2	23.3	16.7	24.5	25.2	ES
FR	16.7	19.6	20.0	16.3	19.3	19.6	17.2	19.8	20.3	FR
HR	16.1	19.1	19.1	17.2	19.3	19.4	14.8	18.9	18.7	HR
IT	20.1	24.4	27.1	20.1	22.9	26.1	20.0	26.5	28.5	IT
CY	15.4	17.8	20.0	17.0	17.9	19.7	13.5	17.7	20.4	CY
LV	20.9	23.5	20.6	18.7	23.1	20.4	23.2	23.8	20.8	LV
LT	21.5	22.6	21.1	19.7	22.5	21.1	23.2	22.6	21.0	LT
LU	11.4	13.9	14.1	12.2	14.2	14.4	10.3	13.6	13.8	LU
HU	15.9	23.8	23.4	16.2	23.1	22.8	15.4	24.7	24.2	HU
MT	13.1	20.2	19.8	14.5	20.9	20.5	10.9	19.3	18.8	MT
NL	20.0	19.4	21.1	21.1	20.1	21.5	18.7	18.6	20.6	NL
AT	16.0	18.2	18.0	17.2	17.2	17.2	14.5	19.3	18.8	AT
PL	15.0	20.5	19.1	15.9	21.9	20.5	13.8	18.6	17.2	PL
PT	18.4	21.6	22.1	18.8	21.7	21.8	18.0	21.5	22.4	PT
RO	13.9	20.4	18.8	14.6	20.8	19.6	13.0	19.8	17.7	RO
SI	14.7	19.8	19.2	14.9	19.9	19.1	14.5	19.7	19.3	SI
SK	16.4	21.7	19.0	15.2	21.4	18.9	17.8	22.1	19.1	SK
FI	20.2	21.4	24.8	18.8	20.6	24.0	21.7	22.2	25.7	FI
SE	19.1	19.8	20.6	18.8	19.9	20.8	19.5	19.6	20.3	SE
NO	18.4	18.8	20.5	18.6	19.7	21.1	18.1	17.9	19.8	NO
EA	19.1	21.5	22.0	19.1	20.9	21.5	19.0	22.2	22.4	EA
EU27	18.3	21.4	21.6	18.4	21.0	21.3	18.2	21.9	21.9	EU27

Source: European Commission, EPC.

Mainly as a result of the ageing process, the age structure of the working population will undergo a number of significant changes. The share of older workers in total employment at EU level is projected to rise from 18% in 2019 to around 21% in 2045 and to remain around this level thereafter (see Table I.2.14). The highest increase is expected in Greece, with older workers' share rising by more than half by 2070, followed by Malta, Hungary, Spain, Italy and Romania. At 27%, Italian older workers would have the highest share in total employment in 2070. At the other end stands Luxembourg, where people aged 55-64 are projected to represent only 14% of total workers ([21]).

The share of the older workers rises generally more for women, due to cohort effects and reflecting the need for staying longer in employment to fulfil qualifying conditions for retirement because of a later labour market entrance or interrupted working careers. Exceptions are countries were older women are working currently more often than men, e.g. the Baltic countries, or countries with more favourable retirement conditions for women, e.g. Poland and Slovakia.

([21]) See Part III - Statistical Annex for employment rates for the age group 15-74.

2.7. ECONOMIC DEPENDENCY RATIOS

The economic old-age dependency ratio (inactive elderly versus employed people) is projected to rise significantly in all Member States, especially in the first half of the projection period. Similarly, the ratio between the total inactive population and employed people (economic dependency ratio) would rise strongly amid demographic ageing with large variability across countries.

An important indicator to assess the impact of ageing on budgetary expenditure, particularly on its pension component, is the economic old-age dependency ratio. This indicator expresses the inactive elderly population (+65) as a share of total employment (aged 20-64 or 20-74). The economic old-age dependency ratio is projected to rise significantly in the EU: from 45% in 2019 to 67% in 2045 and to 72% in 2070 (from 44% to 64% and 68% in terms of employment in the 20-74 age group) (see Table I.2.15). This means that there will be less than 6 employed persons for 4 inactive persons aged more than 65 in 2070, down from 9 employed persons in 2019.

Across EU Member States, the projected economic old-age dependency ratio for 2070 ranges from a minimum of 56% in Sweden and Denmark to a maximum of 90% in Poland. The bulk of the expected increase is generally concentrated in the first half of the projection period, 2019-2045, though with some notable exceptions. The largest overall increases would be in Slovakia, Poland, Luxembourg, Lithuania, Romania, Croatia, Latvia and Malta.

The economic old-age ratio is expected to be above or equal to 80% in 2070 (less than 5 employed persons for 4 inactive persons aged more than 65) in Croatia, Italy, Poland, Romania

Table I.2.15: **Economic old-age dependency ratio**

	(Inactive population +65) / (employment 20-64y)					(Inactive population +65) / (employment 20-74y)					
	2019	2045	2070	*Change 2019-2045*	*Change 2045-2070*	2019	2045	2070	*Change 2019-2045*	*Change 2045-2070*	
BE	44.9	63.7	71.9	18.8	8.2	44.5	61.8	69.8	17.4	7.9	BE
BG	44.8	70.5	78.1	25.7	7.6	43.5	66.6	74.7	23.1	8.1	BG
CZ	38.3	61.4	65.3	23.1	3.9	37.3	58.9	63.4	21.6	4.5	CZ
DK	39.9	53.5	56.0	13.6	2.5	38.5	50.3	50.8	11.7	0.5	DK
DE	41.8	60.1	62.7	18.3	2.6	40.7	57.4	59.9	16.8	2.4	DE
EE	35.9	53.8	61.4	17.9	7.6	33.9	50.3	55.8	16.4	5.5	EE
IE	29.1	49.1	63.0	20.0	13.9	28.3	46.1	59.0	17.8	13.0	IE
EL	59.7	80.2	77.2	20.5	-3.0	58.4	75.8	71.7	17.3	-4.0	EL
ES	46.0	73.9	75.6	27.8	1.7	45.6	68.9	71.1	23.3	2.2	ES
FR	49.4	67.6	72.0	18.2	4.5	48.7	65.1	69.2	16.4	4.1	FR
HR	50.6	74.6	89.8	24.0	15.2	49.9	72.5	87.2	22.6	14.7	HR
IT	58.4	86.1	82.2	27.7	-3.9	56.9	79.4	73.6	22.5	-5.7	IT
CY	31.9	42.8	56.9	10.9	14.0	31.1	41.2	53.5	10.1	12.3	CY
LV	39.9	71.0	78.4	31.2	7.4	38.1	68.0	75.6	29.9	7.6	LV
LT	38.3	70.6	78.9	32.2	8.3	37.0	68.3	76.5	31.4	8.1	LT
LU	30.5	55.0	74.6	24.5	19.6	30.4	54.4	73.8	24.1	19.3	LU
HU	41.0	56.8	66.9	15.8	10.0	40.3	54.8	64.8	14.5	10.0	HU
MT	36.3	45.7	73.2	9.4	27.5	35.6	44.8	71.6	9.3	26.7	MT
NL	37.5	56.6	60.5	19.0	3.9	36.3	54.0	56.3	17.7	2.3	NL
AT	38.5	59.8	67.5	21.4	7.7	37.9	58.3	65.7	20.4	7.4	AT
PL	37.5	65.3	90.0	27.8	24.7	36.8	62.5	86.4	25.8	23.9	PL
PT	44.8	76.3	76.4	31.5	0.1	43.1	71.2	71.3	28.2	0.0	PT
RO	40.5	70.7	79.8	30.2	9.1	39.2	66.3	75.5	27.1	9.2	RO
SI	42.3	68.7	72.4	26.3	3.8	41.9	66.6	70.6	24.7	4.0	SI
SK	33.6	69.1	86.7	35.5	17.6	33.1	67.6	85.2	34.5	17.6	SK
FI	47.1	59.3	70.9	12.2	11.6	45.6	57.0	66.0	11.4	8.9	FI
SE	38.7	46.4	55.9	7.7	9.5	37.2	44.7	53.7	7.5	9.0	SE
NO	33.0	49.6	61.6	16.6	12.0	31.7	47.5	58.7	15.8	11.1	NO
EA	46.3	68.3	71.0	22.0	2.7	45.3	64.8	66.9	19.5	2.1	EA
EU27	44.7	66.9	71.7	22.2	4.9	43.6	63.5	67.8	19.9	4.3	EU27

Source: European Commission, EPC.

Table I.2.16: **Total economic dependency ratio**

	(Total inactive population) / (employment 20-64y)					(Total inactive population) / (employment 20-74y)					
	2019	2045	2070	*Change 2019-2045*	*Change 2045-2070*	2019	2045	2070	*Change 2019-2045*	*Change 2045-2070*	
BE	133.6	147.7	157.1	14.1	9.4	132.2	143.2	152.3	11.1	9.1	BE
BG	115.0	148.2	156.8	33.2	8.6	111.6	140.0	150.0	28.3	10.0	BG
CZ	102.5	132.5	137.3	30.0	4.8	99.8	127.0	133.3	27.2	6.3	CZ
DK	105.2	118.3	119.5	13.1	1.2	101.6	111.1	108.4	9.5	-2.8	DK
DE	98.0	120.1	125.2	22.1	5.1	95.2	114.7	119.4	19.5	4.7	DE
EE	99.1	110.8	117.3	11.7	6.5	93.4	103.6	106.5	10.1	2.9	EE
IE	114.8	124.7	137.0	10.0	12.3	111.4	117.0	128.4	5.6	11.4	IE
EL	156.4	149.2	143.7	-7.2	-5.5	153.0	140.9	133.4	-12.1	-7.4	EL
ES	123.0	138.6	141.1	15.6	2.5	121.8	129.2	132.7	7.5	3.5	ES
FR	138.4	149.2	152.2	10.8	3.0	136.3	143.7	146.1	7.3	2.4	FR
HR	140.2	155.3	172.1	15.0	16.8	138.3	150.8	167.1	12.5	16.3	HR
IT	151.5	166.3	162.1	14.8	-4.2	147.6	153.3	145.1	5.7	-8.2	IT
CY	102.1	105.5	118.2	3.4	12.7	99.3	101.5	111.1	2.1	9.6	CY
LV	105.8	138.8	146.3	33.0	7.5	101.2	133.0	141.1	31.8	8.1	LV
LT	100.6	128.7	138.1	28.1	9.4	97.0	124.6	133.9	27.5	9.3	LT
LU	106.4	125.3	147.7	18.9	22.4	105.9	124.0	146.0	18.1	22.0	LU
HU	112.0	116.2	128.1	4.2	11.9	110.1	112.1	124.2	2.0	12.1	HU
MT	97.5	92.5	123.9	-5.0	31.4	95.6	90.9	121.2	-4.7	30.4	MT
NL	97.2	115.9	118.7	18.7	2.8	94.1	110.7	110.5	16.5	-0.2	NL
AT	101.2	119.7	129.0	18.5	9.3	99.8	116.7	125.5	16.8	8.9	AT
PL	114.4	140.9	166.6	26.5	25.7	112.1	135.0	160.1	22.8	25.2	PL
PT	110.3	139.3	137.9	29.0	-1.4	106.1	130.2	128.8	24.1	-1.4	PT
RO	125.1	151.0	159.5	25.9	8.4	121.1	141.6	150.9	20.6	9.3	RO
SI	110.0	132.1	136.7	22.2	4.6	108.8	128.1	133.3	19.3	5.1	SI
SK	107.2	151.2	169.4	44.1	18.2	105.6	147.9	166.5	42.3	18.6	SK
FI	114.2	116.2	126.1	2.1	9.9	110.6	111.8	117.5	1.2	5.7	FI
SE	99.5	104.5	114.3	5.0	9.8	95.7	100.7	109.8	5.0	9.2	SE
NO	100.3	114.2	126.8	13.9	12.6	96.5	109.5	120.8	13.0	11.3	NO
EA	120.9	137.9	140.9	16.9	3.0	118.2	130.8	132.8	12.6	2.0	EA
EU27	119.2	136.9	141.9	17.7	5.1	116.4	130.0	134.2	13.6	4.2	EU27

Source: European Commission, EPC.

and Slovakia. For Italy, this would be already the case in 2045, when also for Greece the ratio exceeds 80% according to the projections. The ratio would slightly decrease in the second part of the projections in both countries.

Another relevant indicator is the total economic dependency ratio, calculated as the ratio between the total inactive population and employment. It gives a measure of the average number of individuals that each employed person 'supports' economically, which is relevant for potential GDP per capita growth. This broadest definition of the dependency ratio is expected to constantly grow over the projection period, from an average of 119% in 2019 to 142% in 2070 (see Table I.2.16).

The projected development of this indicator reflects the profound societal impact of the changes in life expectancy and fertility rates during the next few decades in nearly all Member States. There are, however, large cross-country differences. While Bulgaria, Latvia, Luxemburg Poland and Slovakia have increases of more than 40 pps and up to 62 pps in the case of Slovakia, other countries show more limited increases, with even a steady decrease projected for Greece. Overall, a smaller increase is projected when considering employment in the age group 20-74.

2.8. PROJECTION OF TOTAL HOURS WORKED

The number of hours worked are expected to fall by 12% in the EU over the projection period, with decreases projected for most countries ([22]).

([22]) The projection of weekly hours in Table I.2.17 is calculated using the CSM described in this chapter, which is different from the projection of hours worked in Chapter 3. To

Table I.2.17: **Projection of total weekly hours worked (thousands) and breakdown in full- and part-time work**

	2019			2045			2070			% change (total)			
	Total	*Full-time*	*Part-time*	*Total*	*Full-time*	*Part-time*	*Total*	*Full-time*	*Part-time*	2019-2045	2045-2070	**2019-2070**	
BE	175.400	83.7%	16.3%	172.703	83.1%	16.9%	165.359	82.6%	17.0%	-1.5	-4.3	**-5.7**	BE
BG	128.070	99.0%	1.0%	93.879	99.0%	1.0%	78.163	99.0%	1.0%	-26.7	-16.7	**-39.0**	BG
CZ	205.756	96.6%	3.4%	178.171	96.4%	3.6%	167.550	96.3%	3.6%	-13.4	-6.0	**-18.6**	CZ
DK	96.518	86.8%	13.2%	97.630	86.8%	13.2%	100.038	86.8%	13.1%	1.2	2.5	**3.6**	DK
DE	1.481.429	84.7%	15.3%	1.340.503	84.4%	15.6%	1.293.597	84.3%	15.6%	-9.5	-3.5	**-12.7**	DE
EE	25.349	93.8%	6.2%	22.803	93.7%	6.3%	21.134	93.5%	6.4%	-10.0	-7.3	**-16.6**	EE
IE	83.503	89.9%	10.1%	98.601	89.5%	10.5%	100.220	89.1%	10.6%	18.1	1.6	**20.0**	IE
EL	157.946	95.4%	4.6%	156.570	95.4%	4.6%	143.874	95.4%	4.6%	-0.9	-8.1	**-8.9**	EL
ES	733.760	92.5%	7.5%	767.696	92.3%	7.7%	725.531	92.2%	7.8%	4.6	-5.5	**-1.1**	ES
FR	989.060	89.2%	10.8%	1.005.073	88.9%	11.1%	988.928	88.7%	11.1%	1.6	-1.6	**0.0**	FR
HR	64.331	97.6%	2.4%	52.382	97.5%	2.5%	42.804	97.4%	2.5%	-18.6	-18.3	**-33.5**	HR
IT	856.456	89.0%	11.0%	827.109	89.1%	10.9%	785.281	89.1%	10.8%	-3.4	-5.1	**-8.3**	IT
CY	16.144	94.8%	5.2%	18.688	94.6%	5.4%	19.070	94.6%	5.4%	15.8	2.0	**18.1**	CY
LV	35.125	95.4%	4.6%	23.067	95.3%	4.7%	18.123	95.2%	4.7%	-34.3	-21.4	**-48.4**	LV
LT	52.625	96.5%	3.5%	36.912	96.5%	3.5%	29.044	96.5%	3.4%	-29.9	-21.3	**-44.8**	LT
LU	11.080	89.4%	10.6%	12.472	88.8%	11.2%	11.837	88.4%	11.2%	12.6	-5.1	**6.8**	LU
HU	175.723	97.6%	2.4%	165.421	97.3%	2.7%	149.602	97.2%	2.7%	-5.9	-9.6	**-14.9**	HU
MT	9.830	93.1%	6.9%	13.034	92.7%	7.3%	12.204	92.4%	7.3%	32.6	-6.4	**24.2**	MT
NL	286.207	65.3%	34.7%	273.941	64.9%	35.1%	270.521	64.4%	35.3%	-4.3	-1.2	**-5.5**	NL
AT	155.909	84.1%	15.9%	151.473	83.6%	16.4%	144.499	83.6%	16.3%	-2.8	-4.6	**-7.3**	AT
PL	686.111	96.8%	3.2%	564.413	96.6%	3.4%	452.278	96.5%	3.3%	-17.7	-19.9	**-34.1**	PL
PT	185.303	96.4%	3.6%	154.701	96.2%	3.8%	137.555	96.1%	3.8%	-16.5	-11.1	**-25.8**	PT
RO	337.791	96.2%	3.8%	254.354	95.9%	4.1%	209.774	95.8%	4.0%	-24.7	-17.5	**-37.9**	RO
SI	37.677	95.6%	4.4%	33.925	95.4%	4.6%	31.130	95.2%	4.7%	-10.0	-8.2	**-17.4**	SI
SK	100.429	97.8%	2.2%	79.707	97.7%	2.3%	67.137	97.7%	2.3%	-20.6	-15.8	**-33.2**	SK
FI	91.305	91.8%	8.2%	88.055	92.1%	7.9%	80.599	91.7%	8.1%	-3.6	-8.5	**-11.7**	FI
SE	180.703	85.3%	14.7%	207.854	85.1%	14.9%	216.910	84.7%	15.1%	15.0	4.4	**20.0**	SE
NO	90.643	84.3%	15.7%	99.645	84.5%	15.5%	101.811	84.3%	15.6%	9.9	2.2	**12.3**	NO
EA	5.484.536	87.7%	12.3%	5.277.033	87.5%	12.5%	5.045.643	87.3%	12.7%	-3.8	-4.4	**-8.0**	EA
EU27	7.359.539	89.6%	10.4%	6.891.138	89.1%	10.9%	6.462.763	88.7%	11.1%	-6.4	-6.2	**-12.2**	EU27

Hours worked by people aged 15-74y.
Source: European Commission, EPC.

Total hours worked are projected to decrease by 6% in 2019-2045 in the EU (see Table I.2.17) ([23]). A similar decrease is expected in the second half of the projection period so that the number of hours worked would fall by 12% in 2019-2070.

There are major differences across Member States, reflecting different demographic outlooks. A reduction in total hours worked of 30-50% between 2019 and 2070 is projected for Bulgaria, Croatia, Latvia, Lithuania, Poland, Romania and Slovakia. Only seven countries are expected to see an increase in the number of hours people work in total, with increases of 20-25% in Ireland, Malta and Sweden. The share of part-time work would remain broadly unchanged so that the current large differences between countries would remain. Part-time labour accounts for less than 4% of total hours worked in Bulgaria, the Czech Republic, Croatia, Lithuania, Hungary, Poland, Portugal and Slovakia, as compared to 35% of total hours in the case of the Netherlands.

2.9. COMPARING THE 2021 AND 2018 LABOUR MARKET PROJECTIONS

Labour market figures for the base year were better than assumed in the 2018 Ageing Report. The improved starting point for employment, participation and unemployment rates reverberates in the labour market assumptions,

calculating potential GDP, the estimated potential hours worked using the production function approach were used (see Chapter 3 and Annex 3). Specifically, for the potential GDP projections until 2029, the growth rates of hours worked were estimated using the production function approach; thereafter the growth rates estimated by the CSM are used (see Table I.3.2 in Chapter 3). Due to the different data sources and projection models, there may be some differences between the two projections.

([23]) The total number of hours worked is the product between employment and hours worked per person. Regarding hours worked, the following assumptions are made: i) total amount of hours worked per person (in the base year 2019) are kept constant by gender and type of work (part-time versus full-time); and ii) the part-time share of total work by gender and age groups (20-24, 25-54 and 55-74) are kept constant over the entire projection period.

which are generally more favourable than in the previous exercise. Yet, the revised population projections result in considerably lower employment for several countries in 2070.

This section provides a summary comparison of the main labour market assumptions discussed higher with those underlying the 2018 Ageing Report. In most countries, the total labour force and total employment were larger in 2019 than anticipated in the 2018 Ageing Report (see Table I.2.18). In the EU as a whole, 3.3 million more people were employed in 2019 than expected in the previous exercise, with the labour force showing 1.1 million more people as two thirds of the higher employment stems from people previously presumed unemployed.

The employment rate – which also accounts for difference in the population size – was 1.4 pps higher on average in 2019 than projected in the 2018 Ageing Report (see Table I.2.19). Only in Denmark, Sweden and Norway was it lower. The biggest upward revisions for the base year were for Bulgaria, Malta, Latvia, Slovenia, Cyprus, Estonia, Croatia and Portugal. Actual employment rates among people aged 55-64 were also higher in 2019 for most countries, especially in the Eastern and Central European Member States.

As shown in Table I.2.19, participation rates were higher than previously projected in most countries in 2019, which is again driven by the oldest age bracket. Unemployment came in lower than assumed in the 2018 Ageing Report on average.

Using a simple identity ([24]), Table I.2.20 provides a breakdown of the change in the employment projection for 2070 between the 2021 and 2018 Ageing Reports. For the EU as a whole, total employment in 2070 was revised downward by 1.1%. This revision is due to the downward revision of population projections (-2.7%), which is only partly offset by the upward revision in participation rates (+0.8%) and the lower unemployment rate (+0.8%). There are significant downward revisions in the 2070 employment projections for Luxembourg, Belgium, France, Croatia and Latvia because of the new population projections.

The breakdown of revisions in employment levels underscores the close link between employment/labour force and population variables. In fact, there is a high cross-country correlation between revisions in employment and those for the population projections (see Graph I.2.7).

Table I.2.18: **Labour force projections: revisions AR2021 vs. AR2018 (thousands)**

	Labour force (20-64)		Employment (20-64)	
	2019	2070	2019	2070
BE	-26	-952	92	-808
BG	190	221	226	232
CZ	128	213	181	226
DK	-63	-254	-57	-220
DE	133	2817	358	2883
EE	16	49	34	53
IE	182	311	188	287
EL	31	502	65	494
ES	38	-1916	537	-1598
FR	-169	-4155	24	-3616
HR	-11	-165	70	-143
IT	-196	440	-14	581
CY	6	69	23	61
LV	22	-67	45	-57
LT	64	48	68	52
LU	6	-81	5	-77
HU	67	168	91	194
MT	49	96	50	95
NL	129	-642	251	-650
AT	-53	-261	-8	-230
PL	96	431	348	480
PT	57	381	210	404
RO	258	-30	339	45
SI	38	33	59	32
SK	-16	-188	55	-156
FI	60	-182	71	-155
SE	57	-221	14	-198
NO	-23	-126	-31	-127
EA	369	-3698	2113	-2404
EU27	1090	-3334	3326	-1788

Source: European Commission, EPC.

([24]) The labour force identity: $L = E + U$ can be written as follows: $E = P * PR * [1\text{-}UR]$ where L is the labour force; E is employment; U is unemployment; P is population; PR is the participation rate; and UR the unemployment rate.

Taking the logarithm of the above expression, revisions in employment level projections can be approximated as follows:

$$\log\left(\frac{E_1}{E_0}\right) \approx \log\left(\frac{P_1}{P_0}\right) + \log\left(\frac{PR_1}{PR_0}\right) - \left(UR_1 - UR_0\right)$$

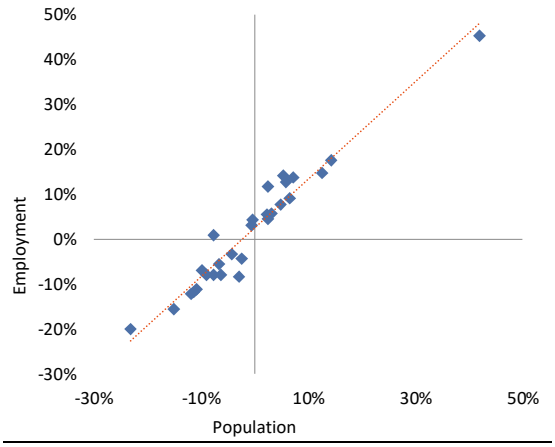
where indices 0 and 1 refer to two distinct projection exercises.

Table I.2.19: **Labour force projections: revisions AR2021 vs. AR2018 (pps)**

	Employment rate				Participation rate				Unemployment rate		
	(20-64)		(55-64)		(20-64)		(55-64)		(20-64)		
	2019	2070	2019	2070	2019	2070	2019	2070	2019	2070	
BE	1.6	-0.4	2.2	-1.5	-0.1	-1.7	1.6	-1.8	-2.3	-1.5	BE
BG	5.4	5.7	9.0	5.1	4.5	5.0	8.3	4.4	-1.4	-1.3	BG
CZ	2.5	1.9	8.9	3.4	1.6	1.5	8.4	3.3	-1.1	-0.5	CZ
DK	-0.7	1.0	-0.4	4.8	-0.8	0.3	-0.3	4.7	-0.1	-0.9	DK
DE	1.7	1.9	3.5	2.4	1.3	1.5	3.1	1.9	-0.6	-0.5	DE
EE	3.6	6.8	7.8	17.7	1.2	6.1	4.9	16.6	-2.9	-1.4	EE
IE	3.0	4.6	2.6	4.2	2.6	5.0	2.2	4.6	-0.7	0.2	IE
EL	0.4	2.2	3.1	5.8	-0.3	1.6	2.7	5.5	-0.9	-0.9	EL
ES	0.4	-1.4	-2.1	-3.1	-1.6	-2.3	-3.5	-3.5	-2.2	-0.9	ES
FR	0.6	-0.3	0.3	-1.1	0.1	-1.0	0.5	-1.1	-0.6	-0.8	FR
HR	3.4	-0.3	4.6	0.6	0.1	-1.0	2.7	-0.3	-4.6	-0.8	HR
IT	0.4	2.5	-1.1	2.7	0.0	2.0	-1.0	2.8	-0.6	-0.9	IT
CY	3.8	1.5	5.7	2.7	0.8	2.3	3.9	3.4	-3.9	0.8	CY
LV	3.9	-0.2	8.3	-2.7	1.9	-1.2	7.7	-3.0	-2.6	-1.1	LV
LT	2.9	2.1	8.8	0.8	2.5	1.4	9.3	0.8	-0.7	-0.9	LT
LU	1.1	2.9	0.6	2.3	1.1	2.9	0.9	2.7	0.0	-0.1	LU
HU	1.5	2.5	6.6	3.4	1.1	1.8	6.1	2.3	-0.6	-0.9	HU
MT	5.4	2.0	8.1	-0.5	4.7	1.0	7.5	-0.9	-1.2	-1.2	MT
NL	2.3	-0.3	5.8	0.2	1.1	0.1	4.2	-0.2	-1.5	0.4	NL
AT	0.9	0.9	1.5	2.8	0.1	0.5	1.0	2.6	-1.0	-0.5	AT
PL	1.5	1.4	1.3	2.3	0.4	1.0	0.8	2.2	-1.4	-0.6	PL
PT	3.4	4.6	3.8	9.4	0.8	3.6	2.0	9.1	-3.2	-1.5	PT
RO	3.1	6.1	2.5	6.5	2.4	5.4	2.4	6.5	-1.1	-1.4	RO
SI	3.9	3.6	3.0	2.6	2.2	3.6	2.7	3.7	-2.3	-0.2	SI
SK	1.9	-4.3	6.9	-14.9	-0.1	-5.5	5.5	-16.7	-2.6	-1.0	SK
FI	2.4	2.5	3.9	1.2	2.1	2.1	4.6	1.8	-0.6	-0.7	FI
SE	-0.2	0.7	2.6	1.5	0.5	0.6	2.9	1.2	0.8	-0.2	SE
NO	-0.4	-1.6	1.0	-2.6	-0.1	-1.5	1.2	-2.5	0.3	0.1	NO
EA	1.2	1.0	1.5	0.9	0.3	0.4	1.0	0.7	-1.1	-0.8	EA
EU27	1.4	1.2	1.9	1.4	0.5	0.7	1.5	1.2	-1.1	-0.8	EU27

The downward revisions in the employment and participation rates for SK are driven by the reforms adopted since the 2018 Ageing Report (see Box I.2.2).
Source: European Commission, EPC.

Graph I.2.7: **Population and employment projections: revisions AR2021 vs. AR2018, 2070 (percentage change)**



Source: European Commission, EPC.

Table I.2.21 provides an overview of the revisions in the participation rates in 2070 by age group. Average EU participation rates are revised slightly upward for young people (20-24), prime-age workers (25-54) and older workers (55-64). However, for 'very old' workers (65-74), there is on average a downward revision. Pension reforms legislated since the previous Ageing Report (see Box I.2.2) clearly come to the fore in some cases. For Estonia, which will start increasing the statutory retirement age in line with changes in life expectancy as of 2027, there is a large upward revision in the 2070 participation rates for people aged 55-64 and 65-74. Conversely, Slovakia abandoned the life expectancy link, capping the statutory retirement age at 64 years so that participation rates are expected to be considerably lower than assumed in the 2018 Ageing Report. Croatia withdrew a planned increase in the early/statutory retirement age to 62/67 years,

Table I.2.20: **Breakdown of revisions in employment projection for 2070 (AR2021 vs. AR2018) (%)**

	Employment	Population	Participation rate	Unemployment rate	Discrepancy
	(20-64) (1)»(2)+(3)-(4)	(20-64) (2)	(20-64) (3)	(20-64) (4)	(1)-(2)-(3)+(4)
BE	-16.8%	-16.3%	-2.2%	1.5%	0.1%
BG	13.2%	5.1%	6.7%	1.3%	0.1%
CZ	5.6%	3.2%	1.9%	0.5%	0.0%
DK	-8.2%	-9.5%	0.3%	0.9%	0.0%
DE	8.8%	6.4%	1.8%	0.5%	0.0%
EE	11.1%	2.5%	7.1%	1.4%	0.1%
IE	11.9%	5.7%	6.4%	-0.2%	0.0%
EL	16.2%	13.3%	1.9%	0.9%	0.1%
ES	-8.3%	-6.6%	-2.7%	0.9%	0.1%
FR	-13.0%	-12.6%	-1.3%	0.8%	0.1%
HR	-12.6%	-12.1%	-1.3%	0.8%	0.1%
IT	3.1%	-0.5%	2.7%	0.9%	0.1%
CY	13.8%	11.9%	2.7%	-0.8%	-0.1%
LV	-11.8%	-11.5%	-1.4%	1.1%	0.1%
LT	7.4%	4.7%	1.7%	0.9%	0.1%
LU	-22.3%	-26.3%	3.8%	0.1%	0.0%
HU	5.3%	2.2%	2.2%	0.9%	0.0%
MT	37.4%	35.0%	1.2%	1.2%	0.1%
NL	-8.3%	-7.9%	0.1%	-0.4%	0.0%
AT	-5.8%	-6.9%	0.6%	0.5%	0.0%
PL	4.4%	2.5%	1.3%	0.6%	0.0%
PT	12.9%	7.0%	4.3%	1.5%	0.1%
RO	0.9%	-7.9%	7.3%	1.4%	0.1%
SI	4.2%	-0.4%	4.4%	0.2%	0.0%
SK	-8.8%	-2.9%	-6.9%	1.0%	0.1%
FI	-7.2%	-10.4%	2.5%	0.7%	0.0%
SE	-3.4%	-4.3%	0.7%	0.2%	0.0%
NO	-4.4%	-2.4%	-1.9%	-0.1%	0.0%
EA	-1.8%	-3.1%	0.5%	0.8%	0.1%
EU27	-1.1%	-2.7%	0.8%	0.8%	0.0%

Source: European Commission, EPC.

limiting the increase instead to 60/65 years. As a result, projected participation rates among people aged 65-74 are lower.

Table I.2.21: **Participation rate projections for 2070: revisions AR2021 vs. AR2018 (pps)**

	20-74	20-64	20-24	25-54	55-64	65-74	
BE	-1.9	-1.7	1.8	-2.0	-1.8	-0.3	BE
BG	3.9	5.0	1.4	5.6	4.4	1.0	BG
CZ	1.1	1.5	0.3	0.7	3.3	0.6	CZ
DK	1.5	0.3	0.4	-1.1	4.7	4.7	DK
DE	2.1	1.5	2.0	1.4	1.9	0.8	DE
EE	8.2	6.1	3.4	2.5	16.6	22.0	EE
IE	2.8	5.0	6.0	4.9	4.6	1.1	IE
EL	-0.5	1.6	-1.1	0.0	5.5	-9.0	EL
ES	-4.0	-2.3	0.9	-2.8	-3.5	-1.7	ES
FR	-1.7	-1.0	0.3	-0.8	-1.1	-0.3	FR
HR	-2.6	-1.0	-7.9	-0.1	-0.3	-6.3	HR
IT	1.7	2.0	-0.5	1.9	2.8	1.4	IT
CY	2.7	2.3	2.9	2.0	3.4	-3.2	CY
LV	-3.9	-1.2	5.0	-1.7	-3.0	-7.4	LV
LT	-1.6	1.4	4.2	1.3	0.8	0.6	LT
LU	2.3	2.9	4.3	3.6	2.7	0.0	LU
HU	1.1	1.8	2.9	1.3	2.3	0.4	HU
MT	0.4	1.0	4.2	1.6	-0.9	2.5	MT
NL	-1.0	0.1	0.6	0.2	-0.2	-4.9	NL
AT	-0.3	0.5	0.2	0.0	2.6	-7.4	AT
PL	0.1	1.0	3.4	0.4	2.2	-0.5	PL
PT	1.7	3.6	-0.2	1.8	9.1	-9.4	PT
RO	4.1	5.4	3.6	5.5	6.5	1.9	RO
SI	2.2	3.6	2.9	3.6	3.7	1.8	SI
SK	-8.8	-5.5	-2.6	-2.0	-16.7	-23.4	SK
FI	0.2	2.1	3.5	2.0	1.8	-3.3	FI
SE	0.1	0.6	1.7	0.2	1.2	0.5	SE
NO	-1.6	-1.5	1.9	-1.6	-2.5	-0.8	NO
EA	-0.2	0.4	1.3	0.2	0.7	-1.0	EA
EU27	0.0	0.7	1.5	0.4	1.2	-0.8	EU27

Source: European Commission, EPC.

3. LABOUR PRODUCTIVITY AND POTENTIAL GDP

3.1. INTRODUCTION

3.1.1. A production function approach for the long-term GDP projections

To project potential GDP growth in the long term, a production function framework with the standard specification of the Cobb-Douglas production function with constant returns to scale is used. In this framework, potential GDP growth is driven by long-term developments in labour input and labour productivity.

Projections of labour productivity are based on assumptions about long-run developments in its underlying determinants, namely labour-augmenting total factor productivity and capital stock per worker (also referred to as capital deepening). The long-run projection is based on the central assumption of convergence of all Member States towards the same value of labour productivity by the end of the projection horizon. Labour input projections are based on assumptions taken from Eurostat's latest population projections.

A detailed description of the production function framework and the key assumptions underpinning the long-term GDP projections presented in this section are summarised in Annex 3. All assumptions have been approved by the EPC, including the methodology developed by the EPC's Output Gap Working Group (OGWG) to calculate potential GDP over a time horizon of T+10, and are used in their work by other Council committees.

Following the practice used for the 2018 Ageing Report, the OGWG T+10 methodology is used for projecting potential growth and its components over the medium term – namely up to 2029 (Annex 3). The long-term projections, and T+10 projections, in this report are based on the Commission spring 2020 forecast. Thus, the EPC's working groups, the OGWG and the AWG, are fully aligned ([25])([26]).

The rest of this section summarises (i) the long-term GDP projections in the baseline and risk scenario; (ii) cross-country differences within the EU; (iii) the main differences between these projections and those of the 2018 Ageing Report.

3.2. LONG-TERM POTENTIAL GDP PROJECTIONS

Relatively stable potential annual GDP growth of almost 1½% is projected over the long term in the EU in the baseline scenario. This is much lower than in previous decades and involves downside risks should future TFP growth develop less favourably than assumed.

3.2.1. Baseline scenario

Annual potential GDP growth in the EU is projected to average 1.3% over the period 2019-70 under the baseline scenario. It will average 1.2% up to 2030, rising slightly to 1.3% during 2031-40 and further to 1.4% in the 2040s. It is then expected to remain at this level up to 2070 (see Table I.3.1).

The projections for the euro area follow a similar, though slightly lower, trajectory at the beginning of the projection horizon, with annual growth of 1% through 2030, 1.2% in 2031-40, rising to 1.4% during 2041-70. Overall, the average growth rate over the period 2019-70 is projected to be 1.3%.

However, there is currently exceptional uncertainty concerning GDP growth in the wake of the COVID-19 crisis. For this reason, additional scenarios are run, described in Box I.3.1.

The contribution of labour input – total hours worked – to potential growth in the EU and the euro area is projected to be negative as of the early 2020s. The demographic assumptions result in a decline in the working-age population and, by extension, a negative contribution of labour input to potential growth for most EU countries. Hence, the increase in the participation rate will not be sufficient to counterbalance the decline of working age population (see Chapter 2).

([25]) The output gap estimates are used to calculate structural budgetary developments, which are used within the framework of the Stability and Growth Pact (SGP).

([26]) Yet, the T+10 methodology relies on population growth in the age bracket 15-74, which is based on Europop2018 (the latest one available at the spring 2020 forecast), whereas the long-term projections adopted by the Ageing Working Group are based on Eurostat Europop2019.

Table I.3.1: **Potential GDP annual growth rate - Period average (%)**

	2019-2030	2031-2040	2041-2050	2051-2060	2061-2070	**2019-2070**	**2019-2070 (TFP risk scenario)**
BE	1.0	1.1	1.3	1.3	1.4	**1.2**	**1.0**
BG	1.3	1.2	1.1	1.1	1.3	**1.2**	**0.9**
CZ	2.0	1.6	1.3	1.5	1.7	**1.6**	**1.3**
DK	1.9	1.5	1.7	1.7	1.5	**1.7**	**1.3**
DE	0.9	1.1	1.4	1.3	1.5	**1.2**	**1.0**
EE	2.9	2.0	1.4	1.3	1.5	**1.9**	**1.3**
IE	2.4	1.8	1.6	1.6	1.6	**1.8**	**1.4**
EL	0.2	1.4	1.6	1.5	1.4	**1.2**	**1.2**
ES	1.5	1.6	1.4	1.4	1.4	**1.4**	**1.2**
FR	1.0	1.3	1.5	1.5	1.5	**1.3**	**1.2**
HR	0.8	1.2	1.4	1.1	1.0	**1.1**	**0.9**
IT	0.3	0.9	1.3	1.5	1.4	**1.0**	**1.0**
CY	1.7	2.1	2.3	1.8	1.6	**1.9**	**1.7**
LV	2.0	1.3	0.7	0.7	1.1	**1.2**	**0.7**
LT	2.2	1.2	0.9	0.7	1.0	**1.2**	**0.7**
LU	2.0	2.1	1.8	1.6	1.5	**1.8**	**1.4**
HU	2.7	1.9	1.5	1.5	1.4	**1.8**	**1.3**
MT	3.7	2.8	1.7	1.2	1.4	**2.2**	**1.5**
NL	0.9	1.1	1.6	1.5	1.4	**1.3**	**1.1**
AT	1.2	1.4	1.4	1.3	1.4	**1.3**	**1.1**
PL	2.7	1.8	1.0	0.9	1.1	**1.5**	**0.9**
PT	1.0	1.0	1.2	1.4	1.3	**1.2**	**1.0**
RO	3.0	1.7	1.1	1.2	1.1	**1.7**	**1.0**
SI	2.5	1.6	1.1	1.3	1.4	**1.6**	**1.1**
SK	1.7	1.5	1.1	1.1	1.3	**1.3**	**0.9**
FI	1.0	1.4	1.2	1.2	1.2	**1.2**	**1.0**
SE	1.8	1.9	1.8	1.7	1.7	**1.8**	**1.5**
NO	1.8	1.7	1.8	1.6	1.6	**1.7**	**1.3**
EA	1.0	1.2	1.4	1.4	1.4	**1.3**	**1.1**
EU27	1.2	1.3	1.4	1.4	1.4	**1.3**	**1.1**

Source: European Commission, EPC.

After a recovery in the first years of the projection, total hours worked will fall in the EU and the euro area., by 0.2% and 0.1%, respectively. The negative contribution of labour input will become slightly lower by the 2060s (Table I.3.2).

Table I.3.2: **Labour input (total hours worked), annual growth rate - Period average (%)**

	2019-2030	2031-2040	2041-2050	2051-2060	2061-2070	**2019-2070**
BE	0.5	-0.1	-0.2	-0.2	-0.1	**0.0**
BG	-0.9	-1.1	-1.2	-0.8	-0.4	**-0.9**
CZ	-0.2	-0.6	-0.7	-0.3	0.0	**-0.3**
DK	0.4	0.0	0.2	0.1	0.0	**0.2**
DE	-0.2	-0.3	-0.1	-0.2	0.0	**-0.2**
EE	-0.4	-0.2	-0.5	-0.4	-0.1	**-0.3**
IE	0.7	0.4	0.1	0.1	0.0	**0.3**
EL	-0.1	-0.3	-0.5	-0.4	-0.2	**-0.3**
ES	0.6	0.0	-0.4	-0.2	-0.2	**0.0**
FR	0.3	0.1	0.0	-0.1	-0.1	**0.1**
HR	-0.5	-0.7	-0.9	-0.9	-0.7	**-0.7**
IT	0.0	-0.4	-0.4	-0.2	-0.2	**-0.2**
CY	1.0	0.6	0.4	0.1	0.0	**0.4**
LV	-1.3	-1.2	-1.3	-1.2	-0.5	**-1.1**
LT	-0.8	-1.3	-1.2	-1.2	-0.6	**-1.0**
LU	2.1	0.8	0.3	0.1	-0.1	**0.7**
HU	0.5	-0.5	-0.7	-0.5	-0.3	**-0.3**
MT	1.5	0.9	0.0	-0.4	-0.2	**0.4**
NL	0.1	-0.3	0.1	0.0	-0.1	**0.0**
AT	0.3	0.0	-0.2	-0.2	-0.1	**0.0**
PL	-0.5	-0.7	-1.1	-1.0	-0.6	**-0.8**
PT	0.0	-0.9	-0.8	-0.4	-0.4	**-0.5**
RO	-0.9	-1.1	-1.2	-0.8	-0.5	**-0.9**
SI	0.1	-0.5	-0.7	-0.4	-0.1	**-0.3**
SK	-0.6	-0.8	-1.0	-0.8	-0.3	**-0.7**
FI	-0.2	-0.1	-0.3	-0.4	-0.3	**-0.3**
SE	0.9	0.5	0.3	0.1	0.2	**0.4**
NO	0.5	0.2	0.2	0.1	0.0	**0.2**
EA	0.1	-0.2	-0.2	-0.2	-0.1	**-0.1**
EU27	0.0	-0.3	-0.4	-0.3	-0.2	**-0.2**

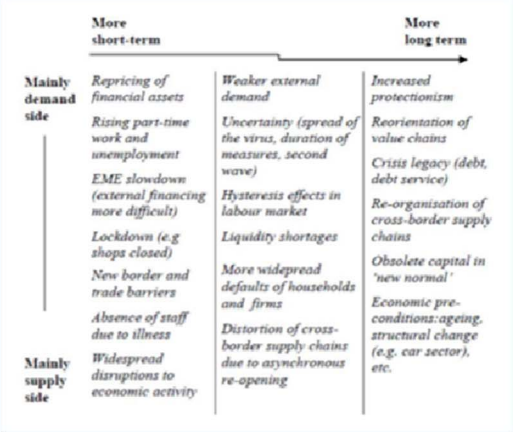
For Luxembourg, an adjustment has been made to take account of the non-resident work force (cross-border workers).
Source: European Commission, EPC.

Box I.3.1: The COVID-19 crisis and macroeconomic prospects

The economic impact of the COVID-19 crisis: exceptionally large uncertainty with downside risks

The COVID-19 pandemic and the resulting containment measures have profoundly disrupted people's lives and the economy. Global demand, supply chains, labour markets, industrial output, commodity prices, foreign trade and capital flows have all been affected. The pandemic struck the European economy when it was growing at a moderate pace and still vulnerable to new shocks. It also snuffed out nascent hopes that a trough might have been reached when manufacturing activity and foreign trade showed signs of bottoming out early-2020. Given the severity of this unprecedented global shock, it is clear that the EU experiences the deepest economic recession in its history.

Graph 1: **Possible impact of the COVID-19 crisis over the short, medium and long term**



Source: European Commission.

Overall, the COVID-19 pandemic's economic impact is likely to be highly complex and widely varied. However, the economic effects differ with respect to their relevance for demand and supply and with respect to the time horizon of their impact (see Graph 1). The duration of the effects depends on the duration of the pandemic, but also on whether changes to trade policies and globalisation attitudes, consumer behaviour, working methods and production chains become permanent. Moreover, debt accumulated during the downturn may exert a lasting impact on firms (e.g. bankruptcies), investor risk perception (e.g. debt sustainability concerns) and the banking sector (e.g. non-performing loans). In addition, the interplay of pre-existing economic conditions and the impact of the pandemic could make some effects longer lasting.

COVID-19 crisis scenarios supplementing the baseline scenario

The baseline scenario in the 2021 Ageing Report takes the Commission's spring 2020 forecast as a starting point, reflecting the crisis impact and assuming recovery as per May 2020 and a rebound of growth in 2021, broadly resulting in a narrow 'U-shaped' recovery scenario. Also, it incorporates the 't+10'projections according to the methodology agreed by the OGWG (see Annex 3). This forecast/scenario assumes that the pandemic impact occured in Q1-2020 and especially in Q2-2020, after which a recovery sets in (see Commission spring 2020 forecast for details ([1])).

To cater for the elevated uncertainty due to the length and the impact of the crisis that could have a long and lasting impact, two scenarios are proposed in addition to the baseline scenario, both of which are described below. Graphs 2 and 3 provide illustrations for the EU27.

Lagged recovery scenario: this *lagged recovery scenario* maintains the assumption of a relatively limited impact on potential growth (slightly higher than in the baseline scenario), but with a much more pronounced cyclical downturn and a longer recovery phase, resulting in a wide 'U-shaped' recovery instead ([2]).

Specifically, the initial growth rate shock in 2020 is 50% higher than in the baseline, 50% lower recovery in 2021 and subsequently a higher recovery in the following two years, after which GDP growth follows the baseline assumptions. The output gap is assumed to be closed in 2028 instead of in 2025. The resulting GDP growth shock is split equally between labour and labour productivity growth.

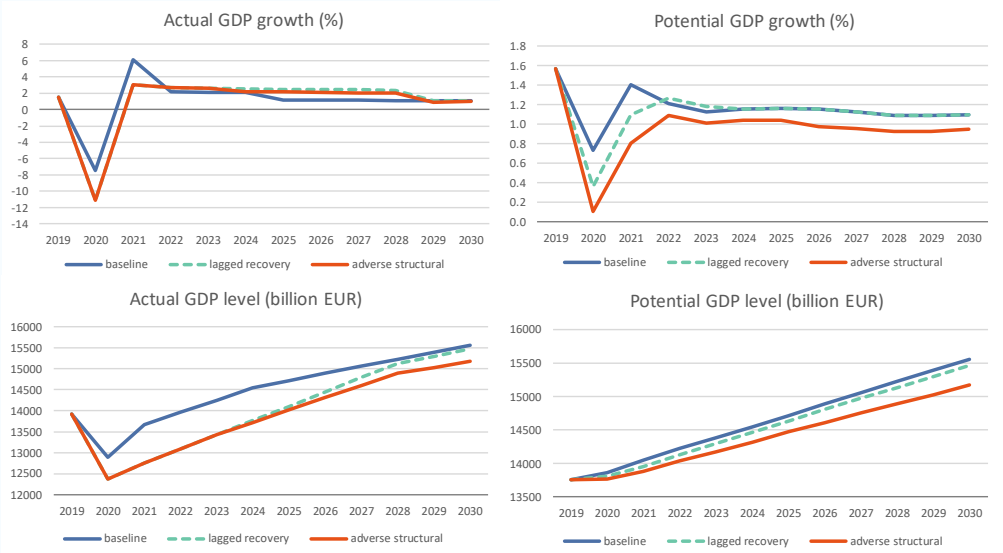
([1]) https://ec.europa.eu/info/sites/info/files/economy-finance/ip125_en.pdf

([2]) More severe COVID scenarios were estimated in the ECB Economic Bulletin 3/2020, available here: https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202003_01~767f86ae95.en.html

(Continued on the next page)

Box (continued)

Graph 2: **Baseline and COVID-19 crisis scenarios, medium-term impact (EU27)**

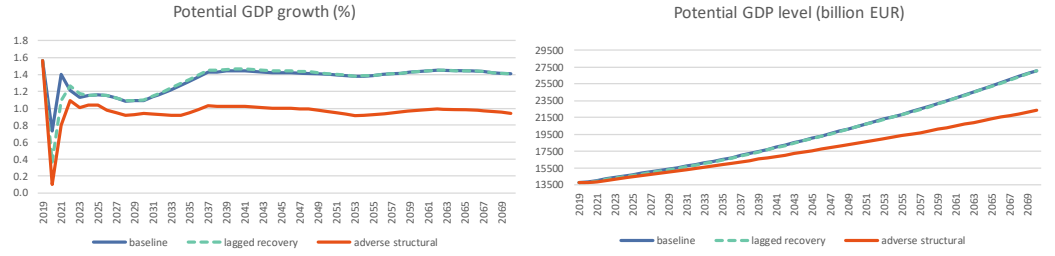


Source: European Commission, EPC.

Adverse structural scenario: on top of the stronger cyclical downturn in the lagged recovery scenario described above, this *adverse structural scenario* additionally assumes that the growth potential would be lower over the next decade and potential output growth will thus be permanently lower than in the baseline. First, labour productivity growth would recover to a lower trend growth, through lower investment and/or TFP growth stemming from reduced business activity for a long period of time, with the crisis contributing to the historical downward trend. Second, the deeper recession and slower recovery would lead to unemployment becoming permanently higher due to lower business activity, leading to a hysteresis effect and permanently higher unemployment.

Specifically, the structural labour impact is assumed to lead to 25% higher country-specific NAWRU anchors (or country-specific NAWRU t+10 values) for all Member States (leading to a 25% higher EU median NAWRU (baseline NAWRU EU anchor median 7%, crisis scenario: 8.75%). The structural labour productivity impact is assumed to lead to 30% lower labour productivity growth vs. the baseline (technically done by 30% lower TFP target growth rate for all Member States, (baseline TFP target growth: 1%, crisis scenario: 0.7%). Aside of the new values, the convergence assumptions for the NAWRUs and the TFP growth are the same as in the baseline scenario.

Graph 3: **Baseline and COVOD-19 crisis scenarios, long-term impact (EU27)**



Source: European Commission, EPC.

As a result, potential GDP growth in the EU and the euro area will be driven almost entirely by labour productivity. Annual growth in labour productivity per hour worked is projected to increase in the period to the 2030s from less than 1% to 1.5% and to remain fairly stable at around 1.6% thereafter throughout the remaining projection period. As a result, the average annual growth rate is projected to be equal to 1.6% throughout the projection period (2019-2070). A similar trajectory is envisaged in the euro area, with labour productivity rising from an average of 0.9% up to 2030 to about 1.6% in the 2040s, with an overall average of 1.4% over the entire period (Table I.3.3).

Table I.3.3: **Labour productivity per hour, annual growth rate - Period average (%)**

	2019-2030	2031-2040	2041-2050	2051-2060	2061-2070	**2019-2070**	**2019-2070 (TFP risk scenario)**
BE	0.5	1.3	1.5	1.5	1.5	**1.2**	**1.0**
BG	2.2	2.4	2.3	2.0	1.7	**2.1**	**1.9**
CZ	2.2	2.2	2.0	1.8	1.6	**2.0**	**1.7**
DK	1.5	1.5	1.5	1.5	1.5	**1.5**	**1.3**
DE	1.1	1.5	1.5	1.5	1.5	**1.4**	**1.2**
EE	3.2	2.3	1.8	1.7	1.6	**2.2**	**1.9**
IE	1.6	1.4	1.5	1.5	1.5	**1.5**	**1.3**
EL	0.3	1.7	2.1	1.9	1.6	**1.5**	**1.3**
ES	0.9	1.6	1.8	1.7	1.6	**1.5**	**1.3**
FR	0.7	1.3	1.5	1.5	1.5	**1.3**	**1.1**
HR	1.3	2.0	2.3	2.0	1.7	**1.8**	**1.6**
IT	0.3	1.3	1.7	1.7	1.6	**1.3**	**1.1**
CY	0.7	1.5	1.9	1.7	1.6	**1.5**	**1.3**
LV	3.3	2.5	2.1	1.9	1.6	**2.3**	**2.1**
LT	2.9	2.4	2.1	1.9	1.6	**2.2**	**1.9**
LU	0.0	1.3	1.5	1.5	1.5	**1.1**	**0.8**
HU	2.2	2.3	2.2	1.9	1.7	**2.1**	**1.8**
MT	2.2	1.9	1.6	1.6	1.6	**1.8**	**1.5**
NL	0.8	1.4	1.5	1.5	1.5	**1.3**	**1.1**
AT	0.9	1.4	1.5	1.5	1.5	**1.4**	**1.1**
PL	3.2	2.6	2.2	1.9	1.7	**2.3**	**2.0**
PT	1.1	1.9	2.1	1.9	1.6	**1.7**	**1.5**
RO	3.9	2.8	2.3	2.0	1.7	**2.6**	**2.4**
SI	2.3	2.1	1.8	1.7	1.6	**1.9**	**1.6**
SK	2.3	2.3	2.1	1.9	1.7	**2.1**	**1.8**
FI	1.2	1.5	1.5	1.5	1.5	**1.5**	**1.2**
SE	0.9	1.4	1.5	1.5	1.5	**1.4**	**1.1**
NO	1.3	1.5	1.5	1.5	1.5	**1.5**	**1.1**
EA	0.9	1.5	1.7	1.6	1.6	**1.4**	**1.2**
EU27	1.2	1.6	1.8	1.7	1.6	**1.6**	**1.3**

Source: European Commission, EPC.

Total factor productivity (TFP) growth explains around two-thirds of labour productivity growth during the projection period. Annual TFP growth converges to 1% by 2070 at the latest for all Member States.

For the EU as a whole, TFP growth averages 0.8% per year over 2019-30, rising to just above 1% over 2031-40 and converging to 1% by the end of the projection horizon. The resulting average annual growth rate over 2019-70 is 1%, just under two-thirds of average annual labour productivity growth during this period (Table I.3.4).

The annual TFP growth rate in the euro area follows a similar path, albeit from a lower starting point over 2019-30 (0.6%) and rising more slowly in the coming decades, with an average growth rate of 0.9% over 2016-70, just under two-thirds of labour productivity growth over the projection period.

Table I.3.4: **Annual total factor productivity growth rate - Period average (%)**

	2019-2030	2031-2040	2041-2050	2051-2060	2061-2070	**2019-2070**	**2019-2070 (TFP risk scenario)**
BE	0.3	0.8	1.0	1.0	1.0	**0.8**	**0.7**
BG	1.3	1.4	1.5	1.3	1.1	**1.3**	**1.2**
CZ	1.5	1.4	1.3	1.2	1.1	**1.3**	**1.1**
DK	1.1	1.0	1.0	1.0	1.0	**1.0**	**0.9**
DE	0.7	1.0	1.0	1.0	1.0	**0.9**	**0.8**
EE	1.9	1.4	1.2	1.1	1.0	**1.4**	**1.2**
IE	1.3	1.0	1.0	1.0	1.0	**1.1**	**0.9**
EL	0.5	1.2	1.4	1.2	1.1	**1.0**	**0.9**
ES	0.6	1.0	1.1	1.1	1.0	**1.0**	**0.8**
FR	0.4	0.9	1.0	1.0	1.0	**0.8**	**0.7**
HR	0.5	1.3	1.5	1.3	1.1	**1.1**	**1.0**
IT	0.3	0.9	1.1	1.1	1.0	**0.8**	**0.7**
CY	0.2	1.0	1.2	1.1	1.0	**0.9**	**0.8**
LV	1.9	1.6	1.3	1.2	1.1	**1.4**	**1.2**
LT	1.6	1.5	1.3	1.2	1.1	**1.3**	**1.1**
LU	0.0	0.8	1.0	1.0	1.0	**0.7**	**0.5**
HU	1.3	1.5	1.4	1.3	1.1	**1.3**	**1.1**
MT	1.4	1.2	1.1	1.0	1.0	**1.2**	**1.0**
NL	0.5	0.9	1.0	1.0	1.0	**0.9**	**0.7**
AT	0.5	0.9	1.0	1.0	1.0	**0.9**	**0.7**
PL	1.9	1.6	1.4	1.2	1.1	**1.5**	**1.3**
PT	0.8	1.2	1.3	1.2	1.1	**1.1**	**1.0**
RO	2.4	1.7	1.5	1.3	1.1	**1.6**	**1.5**
SI	1.9	1.4	1.1	1.1	1.0	**1.3**	**1.1**
SK	1.3	1.5	1.4	1.2	1.1	**1.3**	**1.1**
FI	0.6	1.0	1.0	1.0	1.0	**0.9**	**0.7**
SE	0.7	0.9	1.0	1.0	1.0	**0.9**	**0.7**
NO	0.7	1.0	1.0	1.0	1.0	**0.9**	**0.6**
EA	0.6	1.0	1.1	1.0	1.0	**0.9**	**0.8**
EU27	0.8	1.1	1.2	1.1	1.0	**1.0**	**0.9**

Source: European Commission, EPC.

The contribution of capital deepening to labour productivity for the EU averages 0.5% per year during 2019-2070 but starts from a lower level of 0.4% on average over 2019-30 (see Table I.3.5). For countries whose GDP per capita is below the EU average, the capital deepening contribution is projected to be considerably higher than the EU average in the first part of the projection period, reflecting the assumed catching-up process of converging economies.

For the euro area, the contribution from capital deepening averages just 0.3% per year during

2019-30 but rises to 0.5-0.6% thereafter, with an average of 0.5% for the entire projection period.

Table I.3.5: **Annual contribution of capital deepening - Period average (%)**

	2019-2030	2031-2040	2041-2050	2051-2060	2061-2070	**2019-2070**
BE	0.2	0.4	0.5	0.5	0.5	**0.4**
BG	0.9	0.9	0.8	0.7	0.6	**0.8**
CZ	0.7	0.8	0.7	0.6	0.6	**0.7**
DK	0.4	0.5	0.5	0.5	0.5	**0.5**
DE	0.4	0.5	0.5	0.5	0.5	**0.5**
EE	1.3	0.9	0.6	0.6	0.6	**0.8**
IE	0.3	0.4	0.5	0.5	0.5	**0.5**
EL	-0.1	0.5	0.7	0.7	0.6	**0.4**
ES	0.3	0.6	0.6	0.6	0.6	**0.5**
FR	0.3	0.4	0.5	0.5	0.5	**0.5**
HR	0.8	0.7	0.8	0.7	0.6	**0.7**
IT	0.1	0.4	0.6	0.6	0.6	**0.4**
CY	0.5	0.6	0.7	0.6	0.6	**0.6**
LV	1.4	1.0	0.7	0.7	0.6	**0.9**
LT	1.4	0.9	0.7	0.7	0.6	**0.9**
LU	0.0	0.4	0.5	0.5	0.5	**0.4**
HU	0.9	0.8	0.8	0.7	0.6	**0.7**
MT	0.8	0.7	0.6	0.6	0.5	**0.6**
NL	0.3	0.5	0.5	0.5	0.5	**0.5**
AT	0.4	0.5	0.5	0.5	0.5	**0.5**
PL	1.3	1.0	0.8	0.7	0.6	**0.9**
PT	0.2	0.6	0.7	0.7	0.6	**0.6**
RO	1.5	1.1	0.8	0.7	0.6	**0.9**
SI	0.4	0.8	0.6	0.6	0.6	**0.6**
SK	1.0	0.8	0.8	0.7	0.6	**0.8**
FI	0.6	0.5	0.5	0.5	0.5	**0.5**
SE	0.2	0.5	0.5	0.5	0.5	**0.5**
NO	0.6	0.5	0.5	0.5	0.5	**0.5**
EA	0.3	0.5	0.6	0.6	0.6	**0.5**
EU27	0.4	0.6	0.6	0.6	0.6	**0.5**

Source: European Commission, EPC.

A summary of the relative contribution to potential GDP growth of labour productivity and labour utilisation (and their determinants) in the baseline scenario over the entire projection horizon 2019-70 is provided by the standard growth accounting framework reported in Table I.3.6.

For the EU and for the euro area, the total population and the change in total hours worked over the entire projection period are projected to remain quite stable while an assumed increase in employment rates makes a positive contribution to potential growth (0.1 pps). However, this is more than offset by a decline in the share of the working-age population, which is a substantial negative drag on growth, with an annual average of -0.2 percentage points. As a result, labour input contributes negatively to annual potential output growth on average over the projection period (by 0.2 pps, in the EU and by 0.1 pps in the euro area). Hence, growth in labour productivity (production per hour worked) becomes the sole source of potential output growth in both the EU and the euro area, averaging 1.6 pps and 1.4 pps respectively. As a result, over the projection horizon annual potential GDP growth in the EU and euro area will average 1.4% and 1.3% respectively.

While most EU Member States are projected to experience a slowdown in the contribution of labour input (total hours worked) to potential growth rates due to the adverse impact of demographic developments, overall potential growth rates differ substantially across countries over the projection horizon.

Specifically, under the baseline scenario, average labour input growth is positive for Denmark, Ireland, France, Cyprus, Luxembourg, Malta, Sweden and Norway (see also Table I.3.2).

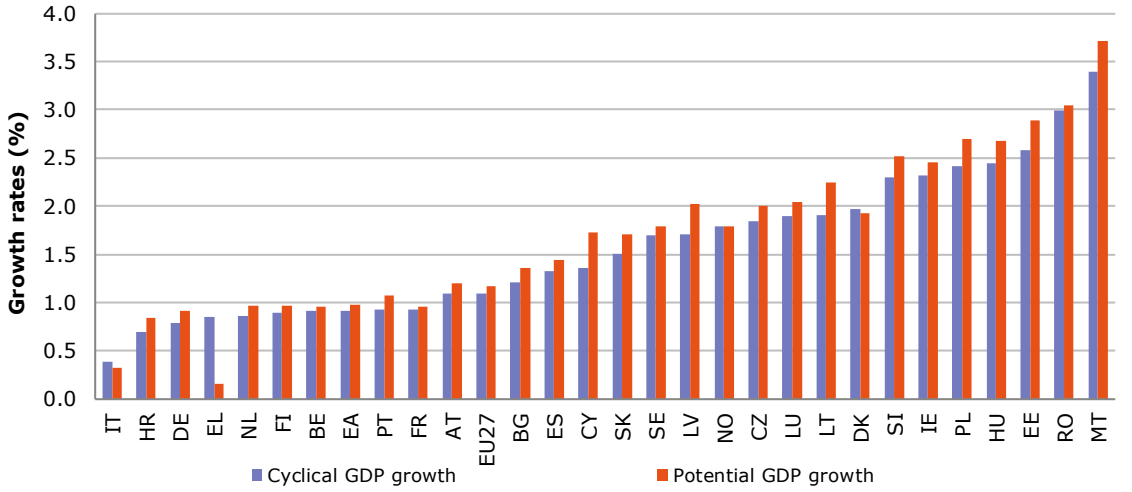
By contrast, particularly for countries with GDP per capita below the EU average, growth rates are projected to be higher. This is because in the first half of the projection period, TFP growth is the main source of discrepancy across countries, reflecting different productivity growth rates at the outset of the projection and the assumed different future paths given the catching-up potential (see description in Box I.3.2 . TFP growth is above 1% for those countries with GDP per capita below the EU average, which are thus assumed to have high catch-up potential. For these countries, annual TFP growth peaks during the 2040s before gradually falling to 1%. For countries with GDP per capita above the EU average, annual TFP growth is generally below 1%, before converging to 1% by 2045 and remaining at that level until 2070.

Table I.3.6: **Breakdown of potential GDP growth (baseline), 2019-70**

	GDP growth in 2019-2070	*Labour prod. (GDP per hour worked)*	*TFP*	*Capital deepening*	*Labour input*	*Total population*	*Employment rate*	*Share of working-age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	**1.2**	**1.2**	0.8	0.4	**0.0**	0.1	0.1	-0.2	0.0	**1.2**
BG	**1.2**	**2.1**	1.3	0.8	**-0.9**	-0.6	0.0	-0.3	0.0	**1.9**
CZ	**1.6**	**2.0**	1.3	0.7	**-0.3**	-0.1	0.0	-0.3	0.0	**1.7**
DK	**1.7**	**1.5**	1.0	0.5	**0.2**	0.1	0.3	-0.2	0.0	**1.6**
DE	**1.2**	**1.4**	0.9	0.5	**-0.2**	0.0	0.0	-0.2	0.0	**1.3**
EE	**1.9**	**2.2**	1.4	0.8	**-0.3**	-0.2	0.1	-0.2	-0.1	**2.1**
IE	**1.8**	**1.5**	1.1	0.5	**0.3**	0.6	-0.1	-0.1	0.0	**1.3**
EL	**1.2**	**1.5**	1.0	0.4	**-0.3**	-0.4	0.3	-0.2	0.0	**1.6**
ES	**1.4**	**1.5**	1.0	0.5	**0.0**	0.0	0.2	-0.2	0.0	**1.4**
FR	**1.3**	**1.3**	0.8	0.5	**0.1**	0.1	0.1	-0.2	0.0	**1.3**
HR	**1.1**	**1.8**	1.1	0.7	**-0.7**	-0.6	0.1	-0.2	0.0	**1.7**
IT	**1.0**	**1.3**	0.8	0.4	**-0.2**	-0.2	0.2	-0.2	0.0	**1.3**
CY	**1.9**	**1.5**	0.9	0.6	**0.4**	0.5	0.2	-0.2	0.0	**1.4**
LV	**1.2**	**2.3**	1.4	0.9	**-1.1**	-0.9	0.1	-0.2	0.0	**2.2**
LT	**1.2**	**2.2**	1.3	0.9	**-1.0**	-0.8	0.1	-0.2	0.0	**2.1**
LU	**1.8**	**1.1**	0.7	0.4	**0.7**	0.5	0.4	-0.2	0.0	**1.3**
HU	**1.8**	**2.1**	1.3	0.7	**-0.3**	-0.2	0.2	-0.2	0.0	**2.0**
MT	**2.2**	**1.8**	1.2	0.6	**0.4**	0.7	0.1	-0.3	-0.1	**1.5**
NL	**1.3**	**1.3**	0.9	0.5	**0.0**	0.1	0.1	-0.2	0.0	**1.2**
AT	**1.3**	**1.4**	0.9	0.5	**0.0**	0.1	0.1	-0.2	0.0	**1.2**
PL	**1.5**	**2.3**	1.5	0.9	**-0.8**	-0.4	-0.1	-0.3	0.0	**1.9**
PT	**1.2**	**1.7**	1.1	0.6	**-0.5**	-0.4	0.1	-0.3	0.0	**1.6**
RO	**1.7**	**2.6**	1.6	0.9	**-0.9**	-0.7	0.0	-0.2	0.0	**2.4**
SI	**1.6**	**1.9**	1.3	0.6	**-0.3**	-0.1	0.1	-0.2	0.0	**1.7**
SK	**1.3**	**2.1**	1.3	0.8	**-0.7**	-0.3	-0.1	-0.3	0.0	**1.6**
FI	**1.2**	**1.5**	0.9	0.5	**-0.3**	-0.2	0.1	-0.2	0.0	**1.4**
SE	**1.8**	**1.4**	0.9	0.5	**0.4**	0.5	0.1	-0.1	0.0	**1.3**
NO	**1.7**	**1.5**	0.9	0.5	**0.2**	0.5	-0.1	-0.1	0.0	**1.2**
EA	**1.3**	**1.4**	0.9	0.5	**-0.1**	0.0	0.1	-0.2	0.0	**1.3**
EU27	**1.3**	**1.6**	1.0	0.5	**-0.2**	-0.1	0.1	-0.2	0.0	**1.4**

Source: European Commission, EPC.

Graph I.3.1: **Average annual cyclical and potential GDP growth projections (2019-2029)**



Source: European Commission, EPC.

Taking account of the cyclical position of the economy in the long-term projections

To bridge the current situation and the assumed longer-term prospects under the baseline scenario, there is a need to take account of the cyclical position of the economy in the short- to medium-term horizon.

In making actual and potential growth rate projections, the general rule is that the output gap is closed at the latest three years after the end of the 2020 spring forecast, that is, by 2024. Taking account of the small positive output gaps prevailing in most Member States in 2019, actual growth is assumed to be lower than potential growth until the output gap is closed in 2024 (see Graph I.3.1).

3.2.2. TFP risk scenario

A risk scenario reflecting more conservative assumptions regarding TFP growth rates is also examined, in the light of the trend decline in TFP growth over the last decades (see Box I.3.2).

The risk scenario forecasts annual average potential GDP growth during 2019-70 of 1.1% in the EU and euro area (Table I.3.7), as opposed to 1.3% in the baseline. This is driven by average annual TFP growth over 2019-2070 under the risk scenario of 0.9% and 0.8% respectively, as opposed to 1% and 0.9% respectively in the baseline.

Table I.3.7: **Breakdown of potential GDP growth (TFP risk scenario), 2019-70**

	GDP growth in 2019-2070	Labour prod. (GDP per hour worked)	TFP	Capital deepening	Labour input
	1=2+5	**2=3+4**	*3*	*4*	**5**
BE	**1.0**	**1.0**	0.7	0.4	**0.0**
BG	**1.0**	**1.9**	1.2	0.7	**-0.9**
CZ	**1.4**	**1.7**	1.1	0.6	**-0.3**
DK	**1.5**	**1.3**	0.9	0.4	**0.2**
DE	**1.0**	**1.2**	0.8	0.4	**-0.2**
EE	**1.6**	**1.9**	1.2	0.7	**-0.3**
IE	**1.6**	**1.3**	0.9	0.4	**0.3**
EL	**1.0**	**1.3**	0.9	0.4	**-0.3**
ES	**1.2**	**1.3**	0.8	0.4	**0.0**
FR	**1.1**	**1.1**	0.7	0.4	**0.1**
HR	**0.9**	**1.6**	1.0	0.6	**-0.7**
IT	**0.8**	**1.1**	0.7	0.4	**-0.2**
CY	**1.7**	**1.3**	0.8	0.5	**0.4**
LV	**0.9**	**2.1**	1.2	0.8	**-1.1**
LT	**0.9**	**1.9**	1.1	0.8	**-1.0**
LU	**1.5**	**0.8**	0.5	0.3	**0.7**
HU	**1.6**	**1.8**	1.1	0.7	**-0.3**
MT	**1.9**	**1.5**	1.0	0.6	**0.4**
NL	**1.1**	**1.1**	0.7	0.4	**0.0**
AT	**1.1**	**1.1**	0.7	0.4	**0.0**
PL	**1.3**	**2.0**	1.3	0.8	**-0.8**
PT	**1.0**	**1.5**	1.0	0.5	**-0.5**
RO	**1.5**	**2.4**	1.5	0.9	**-0.9**
SI	**1.4**	**1.6**	1.1	0.5	**-0.3**
SK	**1.0**	**1.8**	1.1	0.7	**-0.7**
FI	**0.9**	**1.2**	0.7	0.5	**-0.3**
SE	**1.6**	**1.1**	0.7	0.4	**0.4**
NO	**1.3**	**1.1**	0.6	0.4	**0.2**
EA	**1.1**	**1.2**	0.8	0.4	**-0.1**
EU27	**1.1**	**1.3**	0.9	0.5	**-0.2**

Source: European Commission, EPC.

Box I.3.2: Assumptions on the components of the production function used for long-run potential growth projections

For the period 2019-2029 the medium-term potential growth estimation was based on the T+10 methodology described in Annex 3. The long-run projection is based on convergence rules toward the same value of labour productivity growth at the end of the projection horizon. There is therefore a need to ensure consistency between the medium term projection based on country-specific trends and the long-run projection based on horizontal convergence assumptions. There is also an overriding constraint to ensure comparability across the EU through the use of a common methodology for all Member States.

The key assumptions on Total Factor Productivity

Concerning total factor productivity growth, the AWG and EPC decided that the long-run level of annual TFP growth in the baseline scenario should remain as in the 2018 Ageing Report, namely 1%. As in the previous report, convergence to this annual TFP growth rate is reached at the earliest by 2045. In addition, due visibility and prominence should also be given to the risk of lower TFP growth in the future, in light of the trend decline on TFP growth performance over the last decades. Thus, a risk scenario should be included, with a lower TFP growth rate (0.8%). In both cases, allowance for higher TFP growth for countries with below average GDP per capita is factored in for a period of time, as in the previous projection exercise, to cater for catching-up potential (see Table 1). Moreover, in order to avoid undue changes in relative GDP per capita terms, the catching up TFP growth potential is revaluated (in 2037). Similarly, in both scenarios, the labour share is assumed to stay constant at 0.65 over the projection horizon (see Annex 3 for details).

Baseline scenario

The assumption for TFP is that country-specific TFP growth rates converge to 1% in the baseline scenario. Likewise, the speed and the year of convergence to the long-run TFP growth rate are to be determined by the relative income position in the different Member States (Table 2), and it is assumed that the lower the GDP per capita, the higher the real catching up potential (real convergence process). In the long term, labour productivity broadly coincides with TFP growth divided by labour share, equalling 1.5%.

Table 1: **GDP per capita, % of EU27 (2029)**

	GDP per capita (% of EU27)
LU	310.8
IE	227.4
DK	186.8
SE	161.6
NL	139.0
AT	138.9
FI	138.7
DE	128.4
BE	125.4
FR	113.4
EA	109.0
EU27	**100.0**
IT	90.9
MT	87.5
ES	84.3
SI	81.1
CY	76.1
EE	72.7
PT	65.0
CZ	64.1
LT	59.8
EL	59.1
SK	57.6
LV	57.3
PL	52.5
HU	51.9
RO	44.3
HR	41.8
BG	27.2

Source: AMECO, European Commission.

The specific assumptions agreed for the baseline scenario by the EPC are as follows:

- the 'leader' is the group of countries that have a GDP per capita above the EU27 average. For these countries, TFP growth is assumed to converge from the estimated value in 2029 to a 1% growth rate by 2045;
- the 'follower' group of countries are those with GDP per capita below the EU27 average, for whom a differentiation is made depending on the distance to the EU average.

(Continued on the next page)

Box (continued)

Table 2: **Baseline scenario TFP (1%): assumptions on speed of convergence and criteria for selection - 2021 AR**

GDP per capita (% of EU27)	Countries, 2029	Years (from/to)	Values	Countries, 2037	Years (from/to)	Values	Years (from/to)	Values
"Leaders" (per capita GDP higher than the EU average)								
Above 100%	LU, IE, DK, SE, NL, AT, FI, DE, BE, FR	2029 to 2037	From value in 2029 to 1%, by linear interpolation	LU, IE, DK, SE, FI, AT, NL, DE, BE, FR	2037 to 2045	From value in 2038 to 1%, by linear interpolation	2046 to 2070	1.0%
"Followers" (per capita GDP lower than the EU average)								
Below 100%	IT, MT, ES, SI, CY, EE, PT, CZ, LT, EL, SK, LV, PL, HU, RO, HR, BG	2029 to 2037	From value in 2029 to $\frac{1.5\% * \left(1 - \frac{GDP_{i,2029}}{GDP_{EU,2029}}\right) + 1\% * \left(\frac{GDP_{i,2029}}{GDP_{EU,2029}}\right) - 0.5}{0.5}$ by linear interpolation	MT, IT, ES, SI, EE, CY, CZ, PT, LT, LV, SK, EL, PL, HU, RO, HR, BG	2037 to 2045	From value in 2038 to $\frac{1.5\% * \left(1 - \frac{GDP_{i,2037}}{GDP_{EU,2037}}\right) + 1\% * \left(\frac{GDP_{i,2037}}{GDP_{EU,2037}}\right) - 0.5}{0.5}$ by linear interpolation	2046 to 2070	From value in 2045 to 1%, by linear interpolation

Source: European Commission, EPC.

Table 3: **Risk scenario TFP (0.8%): assumptions on speed of convergence and criteria for selection - 2021 AR**

GDP per capita (% of EU27)	Countries, 2029	Years (from/to)	Values	Countries, 2037	Years (from/to)	Values	Years (from/to)	Values
"Leaders" (per capita GDP higher than the EU average)								
Above 100%	LU, IE ,NL, DK, AT, DE, SE, MT, BE, FI, UK	2029 (t+1) to 2037	From value in 2029 (t+1) to 0.8%, by linear interpolation	LU, IE , MT, NL, DK, AT, SE, DE, SK, FI,BE, SI, PL, UK, LT	2038 to 2045	From value in 2038 to 0.8%, by linear interpolation	2046 to 2070	0.8%
"Followers" (per capita GDP lower than the EU average)								
Below 100%	FR, SK, SI, CZ, LT, PL, IT, HU, EE,ES, LV, RO,CY, PT, EL, HR, BG	2029 (t+1) to 2037	From value in 2029 (t+1) to $\frac{1.3\% * \left(1 - \frac{GDP_{i,2028}}{GDP_{EU,2028}}\right) + 0.8\% * \left(\frac{GDP_{i,2028}}{GDP_{EU,2028}}\right) - 0.5}{0.5}$ by linear interpolation	CZ, FR, LV, EE, HU, RO, ES, IT, CY, PT, EL, BG, HR	2038 to 2045	From value in 2038 to $\frac{1.3\% * \left(1 - \frac{GDP_{i,2037}}{GDP_{EU,2037}}\right) + 0.8\% * \left(\frac{GDP_{i,2037}}{GDP_{EU,2037}}\right) - 0.5}{0.5}$ by linear interpolation	2046 to 2070	From value in 2045 to 0.8%, by linear interpolation

Source: European Commission, EPC.

TFP risk scenario

The core assumptions for the risk scenario are that (i) country-specific TFP growth rates converge to 0.8%, and (ii) the lower the GDP per capita, the higher the catch-up potential (Table 3).

In the long term, labour productivity broadly coincides with TFP growth divided by the labour share, namely 1.2%.

Specifically, the assumptions agreed for the risk scenario by the EPC are as follows:

- For the 'leader' group, TFP growth is assumed to converge from the estimated value in 2019 to 0.8% by 2045;
- For the 'follower' group, a differentiation is made depending on the distance to the EU27 average.

Key assumptions regarding capital formation

With regard to capital deepening, the assumption in the previous exercises to keep the long-run capital to labour ratio in efficiency units constant (the 'capital rule') is kept. It is assumed therefore that in the long run, the capital stock adjusts to the steady state path according to the 'capital rule': the growth rate of capital is equal to the sum of labour and labour augmenting technical progress.

This fulfils the steady state property, as the ratio of capital to labour expressed in efficiency unit remains constant over time. Consequently, labour productivity growth coincides with that of labour-augmenting technical progress.

However, the application of this rule would lead to sharp shifts in investment rates for the year in which it is applied. For example, introducing the rule in 2029 results in pessimistic productivity projections for many of the catching-up countries, while making little difference for countries that are already close to their long-run TFP growth rate.

A transition between the investment rule and the capital rule is therefore applied to smooth the investment profile:

- First, the transition to the constant capital/labour (in efficiency units) ratio is introduced gradually in the period 2030-2039 in a linear manner *('transition rule')*;
- Second, the capital/labour (in efficiency units) ratio is constant from 2040 *('capital rule')*.

3.3. COMPARING THE 2021 AND 2018 GDP PROJECTIONS

Over the whole projection period, potential GDP growth is similar in the 2021 and 2018 exercises; however, there are some differences by sub-periods, especially during 2019-2035.

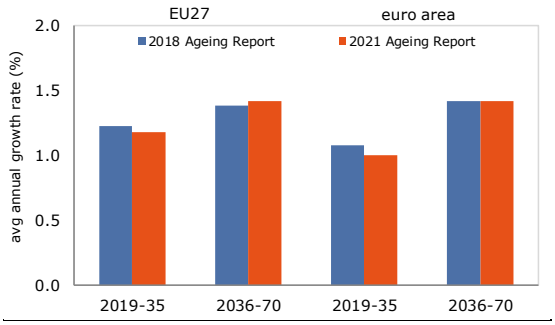
Under the baseline scenario of the 2021 Ageing Report, the annual average potential GDP growth rate over the period 2019-2070 in the EU and in the euro area is projected to be 1.3%, the same as in the 2018 Ageing Report (Table I.3.8).

For the EU, the annual contribution from labour productivity growth during 2019-70 is 0.1 pps higher than in the 2018 projection, while for the euro area, labour productivity growth is the same. Labour input growth (hours worked) is projected to be the same as in the 2018 Ageing Report for both the EU and the euro area.

However, there is substantial variation across countries in the differences between the 2021 and 2018 potential GDP growth projections under the baseline scenario. The largest downward revisions in average annual potential GDP growth rates are for Latvia (-0.7 pps) and Slovakia (-0.5 pps), due to the contributions of both labour productivity and labour input being notably lower than in the 2018 exercise. The largest upward revisions concern Estonia and Cyprus (+0.4 pps), both of which benefiting from stronger labour productivity and labour input.

The differences between the 2021 and 2018 potential GDP growth projections under the baseline scenario materialise primarily in the first part of the projections (2019-35), particularly for the euro area (Graph I.3.2).

Graph I.3.2: **Annual GDP growth rates 2019-70 (%) in 2021 and 2018 baseline scenario projections - period average**



Source: European Commission, EPC.

For the EU, annual potential GDP growth over the period 2019-35 is now projected to average 1.18% (as compared with 1.22% in the 2018 projection). Over the period 2036-70, average GDP growth is projected at 1.42% and 1.39% respectively. For the euro area, annual potential GDP growth over the period 2019-35 is projected in the 2021 Ageing Report to average 1.1% (compared with 1% in the 2018 Ageing Report). Over the period 2036-70, it is projected to remain the same at 1.42%.

A comparison between the current *TFP risk scenario* projection and that in the 2018 Ageing Report shows that for the EU, annual potential GDP growth is forecast to be on average 0.1 pps higher than in the 2018 projection. For the euro area, the projections coincide (Table I.3.9). The upward revisions for the EU vis-à-vis the 2018 Ageing Report are driven entirely by higher labour productivity growth forecasts, with only marginal differences in the labour input contribution.

Table I.3.8: **Difference between 2021 and 2018 baseline scenarios, annual average GDP growth, 2019-2070 (pps)**

	GDP growth in 2019-2070	Labour prod. (GDP per hour worked)	TFP	Capital deepening	Labour input	Total population	Employment rate	Share of working-age population	change in average hours worked	GDP per capita growth in 2019-2070
	1=2+5	2=3+4	3	4	5=6+7+8+9	6	7	8	9	10=1-6
BE	**-0.3**	**-0.1**	-0.1	0.0	**-0.3**	-0.3	0.0	0.0	0.0	**0.0**
BG	**-0.1**	**-0.2**	-0.1	-0.1	**0.2**	0.1	0.1	0.0	0.0	**-0.1**
CZ	**0.2**	**0.1**	0.1	0.0	**0.1**	0.0	0.0	0.0	0.0	**0.2**
DK	**0.1**	**0.1**	0.1	0.0	**0.0**	-0.2	0.2	0.0	0.0	**0.3**
DE	**0.1**	**-0.1**	0.0	0.0	**0.2**	0.1	0.0	0.0	0.0	**0.0**
EE	**0.4**	**0.3**	0.2	0.1	**0.1**	0.0	0.1	0.0	-0.1	**0.4**
IE	**-0.1**	**0.0**	0.0	0.0	**0.0**	0.1	-0.1	0.0	0.0	**-0.2**
EL	**0.3**	**0.2**	0.2	0.0	**0.1**	0.2	-0.1	0.0	0.0	**0.1**
ES	**-0.1**	**0.1**	0.1	0.0	**-0.2**	-0.1	-0.1	0.0	0.0	**0.1**
FR	**-0.2**	**0.0**	0.0	0.0	**-0.2**	-0.2	0.0	0.0	0.0	**0.0**
HR	**-0.1**	**0.1**	0.1	0.1	**-0.3**	-0.2	-0.1	0.0	0.0	**0.1**
IT	**0.2**	**0.2**	0.1	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.2**
CY	**0.4**	**0.2**	0.1	0.1	**0.2**	0.1	0.0	0.1	0.0	**0.3**
LV	**-0.7**	**-0.4**	-0.3	-0.1	**-0.3**	-0.2	0.0	0.0	0.0	**-0.4**
LT	**0.2**	**0.2**	0.1	0.1	**0.1**	0.1	0.0	0.0	0.0	**0.1**
LU	**-0.4**	**-0.3**	-0.2	-0.1	**0.0**	-0.5	0.5	0.0	0.0	**0.2**
HU	**0.2**	**0.1**	0.0	0.1	**0.1**	0.0	0.1	0.0	0.0	**0.2**
MT	**0.1**	**-0.1**	-0.1	-0.1	**0.2**	0.4	-0.2	0.0	-0.1	**-0.3**
NL	**-0.2**	**0.0**	0.0	0.0	**-0.2**	-0.2	0.0	0.0	0.0	**0.0**
AT	**-0.1**	**-0.1**	-0.1	0.0	**-0.1**	-0.2	0.1	0.0	0.0	**0.0**
PL	**0.2**	**0.2**	0.1	0.0	**0.0**	0.0	0.0	0.1	0.0	**0.2**
PT	**0.3**	**0.1**	0.1	0.0	**0.2**	0.1	0.1	0.0	0.0	**0.2**
RO	**0.0**	**0.1**	0.0	0.1	**-0.1**	-0.2	0.1	0.0	0.0	**0.2**
SI	**0.1**	**0.1**	0.1	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.1**
SK	**-0.5**	**-0.2**	-0.2	0.0	**-0.3**	-0.1	-0.2	0.0	0.0	**-0.4**
FI	**-0.1**	**0.1**	0.1	0.0	**-0.2**	-0.2	0.0	0.0	0.0	**0.1**
SE	**-0.1**	**-0.1**	-0.1	0.0	**0.0**	-0.1	0.1	0.0	0.0	**0.0**
NO	**-0.1**	**0.0**	0.0	0.0	**-0.1**	-0.1	0.0	0.0	0.0	**0.0**
EA	**0.0**	**0.0**	0.0	0.0	**0.0**	-0.1	0.0	0.0	0.0	**0.0**
EU27	**0.0**	**0.1**	0.1	0.0	**0.0**	-0.1	0.0	0.0	0.0	**0.1**

Source: European Commission, EPC.

Table I.3.9: **Difference between 2021 and 2018 TFP risk scenarios, annual average GDP growth, 2019-2070 (pps)**

	GDP growth in 2019-2070	Labour prod. (GDP per hour worked)	TFP	Capital deepening	Labour input	Total population	Employment rate	Share of working-age population	change in average hours worked	GDP per capita growth in 2019-2070
	1=2+5	2=3+4	3	4	5=6+7+8+9	6	7	8	9	10=1-6
BE	**-0.3**	**0.0**	0.0	0.0	**-0.3**	-0.3	0.0	0.0	0.0	**0.0**
BG	**0.1**	**-0.1**	0.0	-0.1	**0.2**	0.1	0.1	0.0	0.0	**0.0**
CZ	**0.3**	**0.3**	0.2	0.1	**0.1**	0.0	0.0	0.0	0.0	**0.3**
DK	**0.2**	**0.2**	0.2	0.1	**0.0**	-0.2	0.2	0.0	0.0	**0.4**
DE	**0.1**	**-0.1**	-0.1	0.0	**0.2**	0.1	0.0	0.0	0.0	**0.0**
EE	**0.5**	**0.4**	0.3	0.1	**0.1**	0.0	0.1	0.0	-0.1	**0.5**
IE	**-0.3**	**-0.2**	-0.1	-0.1	**0.0**	0.1	-0.1	0.0	0.0	**-0.4**
EL	**0.5**	**0.4**	0.3	0.1	**0.1**	0.2	-0.1	0.0	0.0	**0.3**
ES	**0.0**	**0.1**	0.1	0.0	**-0.2**	-0.1	-0.1	0.0	0.0	**0.1**
FR	**-0.2**	**0.0**	0.0	0.0	**-0.2**	-0.2	0.0	0.0	0.0	**0.0**
HR	**-0.1**	**0.1**	0.1	0.1	**-0.3**	-0.2	-0.1	0.0	0.0	**0.1**
IT	**0.2**	**0.2**	0.1	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.2**
CY	**0.5**	**0.3**	0.1	0.1	**0.2**	0.1	0.0	0.1	0.0	**0.3**
LV	**-0.4**	**-0.2**	-0.2	0.0	**-0.3**	-0.2	0.0	0.0	0.0	**-0.2**
LT	**0.5**	**0.4**	0.3	0.1	**0.1**	0.1	0.0	0.0	0.0	**0.4**
LU	**-0.3**	**-0.3**	-0.2	-0.1	**0.0**	-0.5	0.5	0.0	0.0	**0.2**
HU	**0.4**	**0.3**	0.2	0.1	**0.1**	0.0	0.1	0.0	0.0	**0.4**
MT	**0.1**	**-0.1**	-0.1	-0.1	**0.2**	0.4	-0.2	0.0	-0.1	**-0.3**
NL	**-0.1**	**0.1**	0.0	0.0	**-0.2**	-0.2	0.0	0.0	0.0	**0.0**
AT	**-0.1**	**0.0**	0.0	0.0	**-0.1**	-0.2	0.1	0.0	0.0	**0.1**
PL	**0.4**	**0.3**	0.2	0.1	**0.0**	0.0	0.0	0.1	0.0	**0.4**
PT	**0.3**	**0.2**	0.1	0.0	**0.2**	0.1	0.1	0.0	0.0	**0.2**
RO	**0.2**	**0.2**	0.1	0.1	**-0.1**	-0.2	0.1	0.0	0.0	**0.3**
SI	**0.2**	**0.2**	0.2	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.2**
SK	**-0.3**	**-0.1**	-0.1	0.1	**-0.3**	-0.1	-0.2	0.0	0.0	**-0.3**
FI	**0.0**	**0.2**	0.1	0.1	**-0.2**	-0.2	0.0	0.0	0.0	**0.2**
SE	**-0.1**	**-0.1**	-0.1	0.0	**0.0**	-0.1	0.1	0.0	0.0	**0.0**
NO	**-0.2**	**0.0**	-0.1	0.0	**-0.1**	-0.1	0.0	0.0	0.0	**-0.1**
EA	**0.0**	**0.0**	0.0	0.0	**0.0**	-0.1	0.0	0.0	0.0	**0.1**
EU27	**0.1**	**0.1**	0.1	0.0	**0.0**	-0.1	0.0	0.0	0.0	**0.1**

Source: European Commission, EPC

4. INTEREST RATES

In the 2021 Ageing Report, long-term interest rates will first converge to country-specific forward market rates at T+10 (2030), then converge to 2% real by T+30 (2050) (4% nominal for most EU countries) and remain constant thereafter. ([27]) Compared to previous Ageing Reports, this approach revises the assumption on the level of long-term interest rates downward, in line with recent changes in the Commission's fiscal sustainability analysis.

4.1. BACKGROUND

Assumptions regarding the evolution of long-term interest rates over the projection period until 2070 influence the projections of private pensions, which countries report voluntarily. The Ageing Working Group (AWG) agreed that projections of privately funded pensions (expenditure and revenue) are voluntary.

The long-term interest rate assumptions that underpinned previous Ageing Report (AR) projections contained features dating back to 2006. In the 2018 AR, the long-term interest rate used to project private pensions until 2070 was assumed to converge linearly to 3% real (5% nominal, given an inflation rate of 2% ([28])) in 10 years' time (i.e. by T+10), from current country-specific levels, staying constant thereafter (Table I.4.1). This approach was identical to the one applied in the AR projection rounds since 2006, with some differences. In particular, in all AR rounds since 2006, the target value for the long-term interest rate was 3% real (5% nominal). Yet in the 2006 and 2009 AR rounds, this value remained constant throughout the projection period, whereas from the 2012 AR onwards a gradual convergence to this value was agreed, with faster linear convergence (up to T+5) in the 2012 AR and slower convergence (up to T+10) in the 2015 and 2018 ARs. In all cases, long-term interest rates were kept constant beyond the convergence year.

A conventional approach of this kind was also used by the Commission in the past to assess the Member States' fiscal sustainability, but was recently revised to reflect market expectations. Given that conventional assumptions contrasted with interest rate trends in recent decades (see Section 4.3 below), in 2019 the Commission adjusted the interest rate assumption underpinning the Commission's debt projections up to T+10 (2030) to reflect market expectations. In particular, the long-term interest rates on new and rolled-over debt now converge linearly from country-specific current values to country-specific market-based forward (nominal) rates by T+10 ([29]). Beyond T+10, fiscal sustainability analysis currently uses the former conventional target of 3% real (5% nominal), deferred to T+30 (2050). This target stays constant thereafter (Table I.4.1).

4.2. INTEREST RATE ASSUMPTIONS IN THE 2021 AGEING REPORT

Interest rates used to project private pensions will be lower this round in comparison with those in past ageing reports. In this report, nominal interest rates will first converge to country-specific forward market rates at T+10 (2030), in line with the Commission's fiscal sustainability analysis framework. Then, interest rates will have a common target of a 2% long-term real rate for all EU countries by T+30 (2050). This would imply convergence to 4% nominal rates by the same year, for all EU countries except Poland and Romania (4.5% nominal) and Hungary (5% nominal), given higher inflation targets in these countries ([30]). All interest rates would remain constant thereafter, until T+50 (2070). **(**Table I.4.1**).**

The downward revision of interest rate assumptions in this Ageing Report has a double rationale. On the one hand, the linear convergence principle maintains the advantage of accounting for country-specific situations in the short run,

([27]) 4.5% nominal for Poland and Romania, and 5% nominal for Hungary, given these countries' higher inflation targets)

([28]) Inflation was assumed to reach 2% progressively from current country specific levels.

([29]) This approach is similar to that used in the Commission Forecasts. For more details of the new and previous interest rate assumptions used for fiscal sustainability analysis, the rationale for the change and the impact on debt ratio projections, see Chapter 3 and Box 3.1 of the European Commission (2020), 'Debt Sustainability Monitor 2019', European Economy, Institutional Paper, No. 120.

([30]) Inflation is still assumed to reach 2% for most countries (see footnote 1). In a few non-euro area countries, however, the convergence value is now higher, in line with the respective national central banks' inflation targets (2.5% in Poland and Romania, and 3% in Hungary).

Table I.4.1: **Selected macroeconomic assumptions in subsequent projection rounds (baseline scenario)**

	Long-term market interest rate	Inflation target	Potential GDP growth
Ageing Report 2021	Linear convergence to: - country-specific forward market rates at T+10 (2030) - 2% real (4% nominal in all EU27 except PL, RO (4.5%) and HU (5%)), by T+30 (2050) - maintained thereafter, until the end of projection period T+50 (2070).	2% for all EU27, except PL, RO (2.5%) and HU (3%)	1.4% real, EU27 average at the end of projection period T+50 (2070)(1)
Ageing Report 2018	Linear convergence to: - 3% real (5% nominal) by T+10 - maintained thereafter, until the end of projection period T+50 (2070).	2% for all EU28	1½% real, EU28 average at the end of projection period T+50 (2070)(1)
Debt Sustainability Monitor 2019	Linear convergence to: - country-specific forward market rates at T+10 (2030) - 3% real in all EU28 except PL, RO (2.5%) and HU (2%), (5% nominal in all EU28) by T+30 (2050) - maintained thereafter, until the end of projection period T+50 (2070).	2% for all EU28, except PL, RO (2.5%) and HU (3%)	1½% real, EU28 average at the end of projection period T+50 (2070)

(1) Individual Member States' growth rates are country-specific. See Chapter 3 of this report and Chapter 3 of the 2018 Ageing Report, Underlying Assumptions & Projection Methodologies.
Source: European Commission

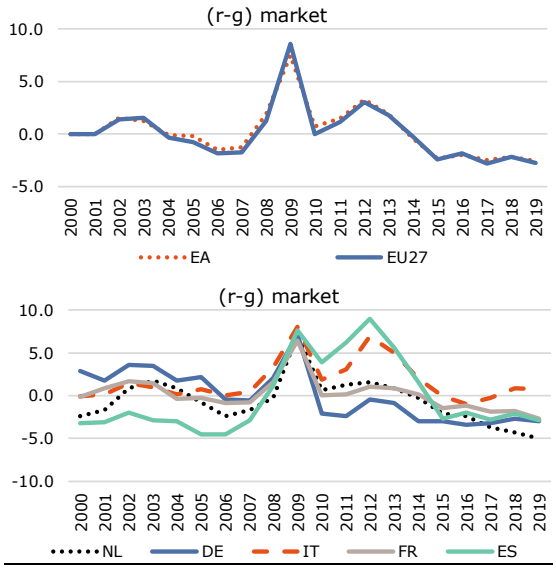
while still maintaining the assumption of a common real interest rate in the long run. On the other hand, compared with the previous Ageing Reports, the proposal would entail a significant reduction in the EA/EU-27 interest rate-growth rate (r-g) differential by 2070, reflecting declining and even negative past trends (Graph I.4.1) and in line with the recent literature ([31]). Under the new assumptions, the EU economy would tend towards a modest (0.5) positive interest rate – growth rate differential in 2070.

4.3. ECONOMIC RATIONALE FOR THE DOWNWARD REVISION

The conventional assumptions about long-term interest rates that have underpinned the work of the AWG over the past 15 years reflect historical averages in some countries ([32]). However, the macroeconomic environment has changed substantially over the past few decades, as acknowledged in a vast amount of literature.

Even before the start of the COVID crisis, risk-free nominal interest rates in advanced economies had been trending downward for several decades (Graph I.4.2). Real rates declined in parallel, though to a slightly lesser extent. Persistently low inflation and sluggish economic growth suggest a secular decline of the real equilibrium rate to historically low levels, as reflected in market expectations of persistently low interest rates in the years to come. This global phenomenon is well documented in the literature. It is attributed both to

Graph I.4.1: **(R-g) based on market long-term interest rates, aggregates and selected countries, %**

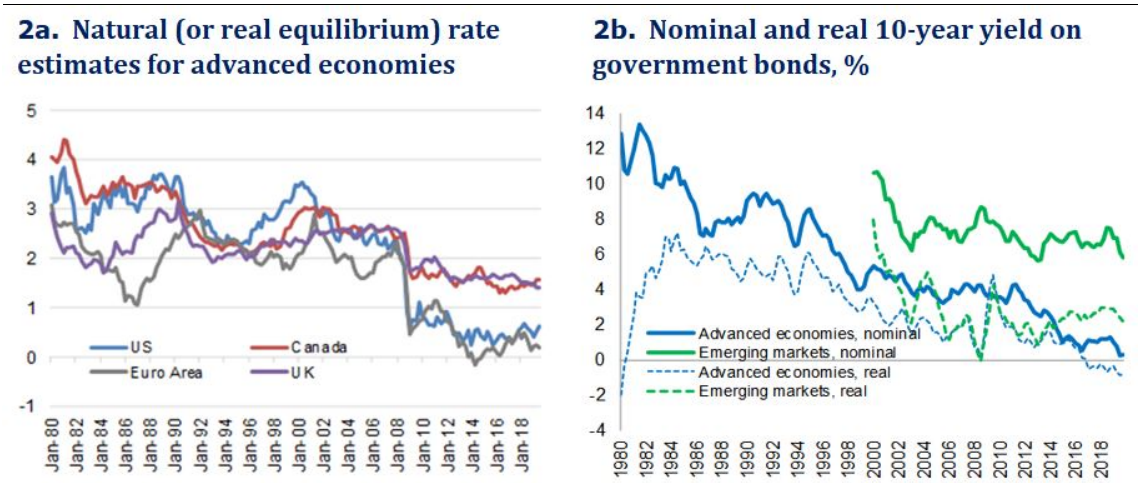


(1) (r-g) series are based on historical long-term nominal interest rates (market) and the growth rate of nominal GDP in national currency, between 2010 and 2019;
Source: AMECO and Commission staff calculations

([31]) See for example Abbas, S. A., Pienkowski, A., and Rogoff, K. (Editors) (2020). 'Sovereign Debt: A Guide for Economists and Practitioners', *Oxford University Press* and Blanchard, O. (2019). 'Public Debt and Low Interest Rates', *American Economic Review* 190(4).

([32]) See European Commission (2017), 'The 2018 Ageing Report: Underlying Assumptions and Projection Methodologies', European Economy Institutional Paper, No. 065, Part I.4. Table I.4.1.

Graph I.4.2: **Interest rate decline**



(1) 2a: Estimates provided by the New York Fed, following Holston, Laubach, Williams (2017).
(2) 2b: Simple averages of available data for selected countries.
Source: DG ECFIN based on New York Fed (2a), Macrobond, and national sources (2b).

'structural factors' having triggered an excess ofreal savings over investment and to more circumstantial or policy-related drivers. The former include ageing and low productivity, sluggish invention and innovation, low investment profitability, income growth in emerging economies, rising income or wealth inequality, and deleveraging. The latter include the scarcity of safe assets and increased demand for them amidst global uncertainty, especially in the euro area after the sovereign debt crisis.

Currently, several economists take the view that the COVID crisis could further depress the equilibrium real interest rate, possibly for decades ahead. Recent evidence indicates that the real natural rate of interest could decline for decades in the aftermath of pandemics, as the latter induce labour scarcity and/or a shift to greater precautionary savings (Jordà *et al*, 2020)([33]). Similarly, the channel of excess savings, which played an important role in past decades, is expected to play a significant role again in the context of falling private-sector demand associated with the current crisis, driving down the equilibrium real interest rate (Goy, G. and van den En, 2020). Some upward effects on interest rates could be noted if there was persistent supply of 'safe' government bonds. However, if potential growth falls and risk premia remain elevated, or even rise as a result of increased risk aversion, the crisis would have an additional downward effect on the equilibrium rate ([34]).

European authorities such as the European Insurance and Occupational Pensions Authority (EIOPA) have already weighed the implications of low and even negative long-term interest rates for certain financial sectors. In this context, EIOPA proposed a review of its long-term risk-free interest rates modelling used to estimate insurers' solvency and calculate their capital requirements. EIOPA considers options for extrapolating the basic risk-free interest rate term structure (government bond yields) for periods of up to 60 years ahead (or the last liquid point + 40 years, for non-EA countries) and making this term structure more market-consistent ([35]).

([33]) Jordà, O, S R Singh and A M Taylor (2020), 'Longer-Run Economic Consequences of Pandemics', Federal Reserve Bank of San Francisco Working Paper 2020-09. https://doi.org/10.24148/wp2020-09. This study, focused on European countries, relies on a dataset covering France (1387–2018), Germany (1326–2018), Italy (1314–2018), the Netherlands (1400–2018), Spain (1400–1729, 1800–2018), and the UK (1314–2018).

([34]) Goy, G. and van den En, J.W. (2020), 'The impact of the COVID-19 crisis on the equilibrium interest rate', Vox 20 April 2020, https://voxeu.org/article/impact-covid-19-crisis-equilibrium-interest-rate.

([35]) EIOPA (2019), 'Consultation Paper on the Opinion on the 2020 review of Solvency II', EIOPA-BoS-19/465, 15 October 2019 and EIOPA (2019), 'Technical documentation of the methodology to derive EIOPA's risk-free interest rate term structures', EIOPA-BoS-19/408, 12 September 2019.

5. SENSITIVITY TESTS AND ALTERNATIVE SCENARIOS

5.1. INTRODUCTION

The Ageing Report baseline projections attempt to measure how population ageing can influence economic and budgetary developments over the long term. However, given the inherent uncertainty of the assumptions underpinning any long-run projections, it is essential to carry out a number of sensitivity tests to quantify the responsiveness of projection results to changes in key underlying assumptions. Moreover, additional scenarios are included given the high level of uncertainty about the magnitude and duration of the COVID-19 crisis.

The sensitivity tests introduce a change or shock to an underlying assumption/parameter in the projection framework. For each sensitivity test, a uniform shock is applied to all Member States. The presentation and assessment of the impact of ageing populations on particular age-related expenditure items should be made with reference to all scenarios (baseline plus sensitivity tests): this is needed so that a clear picture emerges of the key factors driving the projection results and the potential sources of risk to future public expenditure developments. In addition, alternative scenarios are simulated, in order to reflect the impact of potential future policy changes.

The sensitivity scenarios do not provide a stress test of the baseline projections as they consider both unfavourable and favourable changes in the underlying assumptions. Moreover, no overall adverse scenario is run to evaluate the compounded impact of several unfavourable circumstances occurring simultaneously. Rather, the different sensitivity tests rather provide useful information on the dynamics of the projection results with respect to possible changes in the underlying assumptions. The relative impact can also be read as an 'elasticity' parameter.

The tests would also be applied to the other age-related public expenditure items, as was the case in the 2018 Ageing Report.

5.2. PROJECTIONS UNDER DIFFERENT SENSITIVITY TESTS AND ALTERNATIVE SCENARIOS

The macroeconomic projections under the different sensitivity tests are provided in Tables I.5.2 to I.5.10. The assumptions are described in the following section and summarised in Table I.5.1.

To produce the overall set of assumptions, a bottom-up approach was followed, i.e. from population projections through labour input and to GDP growth projections. Each sensitivity test may therefore involve recalculating all assumptions and re-running of the labour force and productivity function-based models, in order to keep a consistent macroeconomic framework.

The selection of sensitivity tests draws on experience from previous rounds of Ageing Report. In general, the set of scenarios applied in the 2018 Ageing Report was appropriate to conducting a sensitivity analysis of changes in age-related expenditure. Reproducing these tests ensures consistency and enables comparison between projection exercises. At the same time, experience and the need to assess new types of risks warrant a number of modifications.

Compared with the previous round, the higher/lower total employment rate tests are not carried out. Nevertheless, the scenario assuming a higher employment rate among older workers (age 55-74) is maintained. The latter had a more profound estimated impact in 2018, highlighting how the policy challenge of increasing employment among older people can be benefit the economy. The 2018 Ageing Report also included three alternative labour productivity scenarios. In this round, a '*TFP risk scenario*' is performed, as well as a '*Higher TFP growth*' scenario.

Sensitivity tests

The following sensitivity tests have been formulated.

Life expectancy: mortality rates are adjusted so as to achieve an increase in life expectancy at birth of about two years by 2070 compared to the baseline.

Table I.5.1: **Overview of the sensitivity tests and alternative scenarios**

<table>
<tr><th colspan="3">Population</th><th colspan="2">Labour force</th><th colspan="3">Policy risk scenarios</th></tr>
<tr><th>Higher life expectancy</th><th>Lower/higher net migration</th><th>Lower fertility</th><th>Higher employment rate older workers</th><th>Higher TFP growth and TFP risk scenario</th><th>Linking retirement age</th><th>Unchanged retirement age</th><th>Offset declining pension benefit ratio</th></tr>
<tr><td rowspan="3">Increase in life expectancy at birth of two years by 2070 compared with the baseline projection.</td><td rowspan="3">33% less/more net migration compared with the baseline over the entire projection horizon.</td><td rowspan="3">20% lower fertility compared with the baseline over the entire projection horizon.</td><td>Employment rate of older workers (55-74y) 10 pps higher compared with the baseline projection.</td><td>TFP growth assumed to converge to 0.8%/1.2% (instead of 1%). As done for the baseline scenario, a period of fast convergence for 'followers' is assumed (i.e. rising by up to 0.8%+0.5% and 1.2%+0.5%, respectively).</td><td rowspan="3">The retirement age is shifted year-over-year in line with 3/4 of the change in life expectancy at current retirement ages (in the Cohort Simulation Model).</td><td rowspan="3">The early and statutory retirement ages, as well as career requirements, are frozen at the situation in the base year.</td><td rowspan="3">When the earnings related public pension benefit ratio declines by 10% as compared to the base year level, measures are taken to stabilise the benefit ratio.</td></tr>
<tr><td>The increase is introduced linearly over the period 2021-2033 and remains 10 pps higher thereafter.</td><td>Convergence to the target rate in 2045 from the latest outturn year, i.e. 2019.</td></tr>
<tr><td>The higher employment rate of this group of workers is assumed to be achieved through a reduction of the inactive population.</td><td></td></tr>
</table>

Source: European Commission, EPC.

Specifically, this would be introduced by reducing the age-specific mortality rates linearly over the 2018-2070 period.

Net migration: in line with the 2018 Ageing Report, it is decided to run sensitivity tests for both higher and lower migration. Compared to the baseline, net migration flows are assumed to be 33% higher/lower over the entire projection horizon. This highlights the economic and budgetary impact of alternative migratory population developments.

Lower fertility: under this scenario, the fertility rate is assumed to be 20% lower than under the baseline scenario throughout the entire projection horizon. As with the net migration tests, this scenario allows the impact of alternative natural population developments on economic and budgetary systems to be highlighted.

Older workers' employment rate: through a reduction in the inactive population, the employment rate of older workers (55 to 74) is increased by 10 pps for the remainder of the projection period.

Higher TFP growth and TFP risk: under these scenarios, total factor productivity growth is assumed to converge to a steady-state growth rate of 0.8%/1.2%. The convergence speed follows the same principles and time points as under the baseline scenario, with a period of fast convergence for 'followers' for which TFP can grow by up to 0.8%+0.5% and 1.2%+0.5% under the respective scenarios.

Policy scenarios

In addition to testing changes in the macroeconomic and demographic assumptions, three policy scenarios are formulated:

Linking retirement age to life expectancy: this scenario considers the adoption of an automatic mechanism to revise the effective retirement age (the exit age from the labour market as estimated by the Cohort Simulation Model), thereby changing the statutory and early retirement ages in line with changes in life expectancy. For those countries where a link between the retirement age and the increase in life expectancy is already laid down by law (and is thus an integral part of the baseline), no deviations are expected in terms of the pension expenditure-to-GDP ratio ([36]).

([36]) The same applies if the legislation provides for increases in statutory retirement that are higher than the gains in life expectancy.

Unchanged retirement age: this scenario assumes that the main eligibility requirements (early and statutory retirement age, career requirement) remain unchanged from the starting point and throughout the projection horizon. This makes it possible to isolate the expected impact of reforms already adopted in law but which have not yet taken effect (as reflected in the baseline projection) and the risk of such reforms being reversed.

Offset declining pension benefit ratio: this scenario assumes policy measures are taken if the (earnings-related) public pension benefit ratio would start to decrease by more than 10% relative to the base year. In this scenario the benefit ratio is kept constant at this 10% lower point for the remainder of the projection period.

Additional adverse macroeconomic scenarios due to COVID-19 related risks

The 2021 Ageing Report also includes additional scenarios relating to the COVID-19 crisis, given the high level of uncertainty about its magnitude, duration and economic impact.

Hence, two adverse macroeconomic scenarios are proposed in addition to the baseline scenario ([37]), both of which are described below. An illustration of these scenarios (for the EU27) and a detailed description are provided in Chapter 3, Box I.3.1. The macroeconomic projections under the two adverse scenarios are provided in Tables I.5.11 and I.5.12.

Lagged recovery scenario: this scenario maintains the assumption of a relatively limited impact on potential growth (slightly higher than in the baseline scenario), but with a much more pronounced cyclical downturn and a longer recovery phase, resulting in a wide '*U-shaped'* recovery instead ([38]).

Adverse structural scenario: on top of the stronger cyclical downturn in the lagged recovery scenario described above, this *adverse structural scenario* additionally assumes that the growth potential will be lower over the next decade and potential output growth will thus be permanently lower than under the baseline scenario. First, labour productivity growth would recover to a lower trend growth, through lower investment and/or TFP growth stemming from reduced business activity for a long period of time, with the crisis contributing to the historical downward trend. Second, the deeper recession and slower recovery would lead to unemployment becoming permanently higher as a result of lower business activity, leading to a hysteresis effect and permanently higher unemployment.

([37]) The baseline scenario in the 2021 Ageing Report takes the Commission's spring 2020 forecast as a starting point, reflecting the impact of the crisis and assuming recovery as per May 2020 and a rebound of growth in 2021, broadly resulting in a narrow '*U-shaped'* recovery scenario. In addition, it incorporates the't+10' projections according to the methodology agreed by the OGWG.

([38]) More severe COVID crisis scenarios were estimated in the ECB Economic Bulletin 3/2020, available here:https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202003_01~767f86ae95.en.html

Table I.5.2: **Sensitivity test: Higher life expectancy**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.2	1.2	0.8	0.4	**0.0**	0.1	0.1	-0.2	0.0	1.1
BG	1.2	2.1	1.3	0.8	**-0.9**	-0.6	0.0	-0.3	0.0	1.8
CZ	1.6	2.0	1.3	0.7	**-0.3**	0.0	0.0	-0.3	0.0	1.7
DK	1.7	1.5	1.0	0.5	**0.2**	0.2	0.3	-0.2	0.0	1.5
DE	1.2	1.4	0.9	0.5	**-0.2**	0.0	0.1	-0.2	-0.1	1.2
EE	1.9	2.2	1.4	0.8	**-0.3**	-0.2	0.2	-0.2	-0.1	2.0
IE	1.8	1.5	1.1	0.5	**0.3**	0.6	-0.1	-0.2	0.0	1.2
EL	1.2	1.5	1.0	0.4	**-0.2**	-0.4	0.4	-0.3	0.0	1.6
ES	1.5	1.5	1.0	0.5	**0.0**	0.1	0.2	-0.3	0.0	1.4
FR	1.3	1.3	0.8	0.5	**0.1**	0.1	0.1	-0.2	0.0	1.2
HR	1.1	1.8	1.1	0.7	**-0.7**	-0.5	0.1	-0.3	0.0	1.6
IT	1.1	1.3	0.8	0.4	**-0.2**	-0.2	0.2	-0.2	0.0	1.3
CY	1.9	1.5	0.9	0.6	**0.5**	0.5	0.2	-0.2	0.0	1.4
LV	1.2	2.3	1.4	0.9	**-1.1**	-0.9	0.1	-0.3	0.0	2.1
LT	1.2	2.2	1.3	0.9	**-1.0**	-0.8	0.1	-0.3	0.0	2.0
LU	1.8	1.1	0.7	0.4	**0.7**	0.5	0.4	-0.2	0.0	1.3
HU	1.8	2.1	1.3	0.7	**-0.2**	-0.1	0.2	-0.3	0.0	1.9
MT	2.2	1.8	1.2	0.6	**0.4**	0.8	0.1	-0.3	-0.1	1.4
NL	1.3	1.3	0.9	0.5	**0.0**	0.1	0.1	-0.2	0.0	1.2
AT	1.3	1.4	0.9	0.5	**0.0**	0.1	0.1	-0.2	0.0	1.2
PL	1.6	2.3	1.5	0.9	**-0.8**	-0.4	-0.1	-0.3	0.0	1.9
PT	1.2	1.7	1.1	0.6	**-0.4**	-0.3	0.2	-0.3	0.0	1.6
RO	1.7	2.6	1.6	0.9	**-0.9**	-0.6	0.0	-0.3	0.0	2.3
SI	1.6	1.9	1.3	0.6	**-0.3**	-0.1	0.1	-0.3	0.0	1.7
SK	1.3	2.1	1.3	0.8	**-0.7**	-0.2	-0.1	-0.4	0.0	1.6
FI	1.2	1.4	0.9	0.5	**-0.2**	-0.1	0.1	-0.2	0.0	1.4
SE	1.8	1.4	0.9	0.5	**0.4**	0.5	0.1	-0.2	0.0	1.3
NO	1.7	1.5	0.9	0.5	**0.2**	0.5	-0.1	-0.2	0.0	1.2
EA	1.3	1.4	0.9	0.5	**-0.1**	0.0	0.1	-0.2	0.0	1.3
EU27	1.4	1.6	1.0	0.5	**-0.2**	-0.1	0.1	-0.2	0.0	1.4

Source: European Commission, EPC.

Table I.5.3: **Sensitivity test: Higher migration**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.3	1.2	0.8	0.4	0.1	0.2	0.1	-0.1	0.0	1.2
BG	1.2	2.1	1.3	0.8	-0.9	-0.6	0.0	-0.3	0.0	1.9
CZ	1.7	2.0	1.3	0.7	-0.2	0.0	0.0	-0.2	0.0	1.7
DK	1.8	1.5	1.0	0.5	0.3	0.2	0.3	-0.2	0.0	1.6
DE	1.4	1.4	0.9	0.5	0.0	0.1	0.1	-0.2	-0.1	1.3
EE	1.9	2.2	1.4	0.8	-0.2	-0.1	0.1	-0.2	-0.1	2.1
IE	1.9	1.5	1.1	0.4	0.4	0.7	-0.1	-0.1	0.0	1.2
EL	1.3	1.5	1.0	0.4	-0.2	-0.3	0.3	-0.2	0.0	1.6
ES	1.6	1.5	1.0	0.5	0.2	0.2	0.2	-0.2	0.0	1.4
FR	1.4	1.3	0.8	0.5	0.1	0.1	0.1	-0.2	0.0	1.3
HR	1.1	1.8	1.1	0.7	-0.7	-0.6	0.1	-0.2	0.0	1.7
IT	1.2	1.3	0.8	0.4	-0.1	-0.1	0.2	-0.2	0.0	1.3
CY	2.1	1.4	0.9	0.6	0.7	0.6	0.2	-0.2	0.0	1.5
LV	1.1	2.3	1.4	0.9	-1.3	-1.1	0.1	-0.3	0.0	2.1
LT	1.1	2.2	1.3	0.9	-1.1	-0.9	0.1	-0.3	0.0	2.1
LU	2.0	1.1	0.7	0.4	0.9	0.7	0.4	-0.2	0.0	1.3
HU	1.9	2.1	1.3	0.7	-0.1	-0.1	0.2	-0.2	0.0	2.0
MT	2.5	1.7	1.2	0.6	0.7	1.0	0.1	-0.2	-0.1	1.5
NL	1.4	1.3	0.9	0.5	0.1	0.2	0.1	-0.2	0.0	1.2
AT	1.5	1.3	0.9	0.5	0.2	0.2	0.1	-0.2	0.0	1.3
PL	1.6	2.3	1.5	0.9	-0.7	-0.3	-0.1	-0.3	0.0	2.0
PT	1.3	1.7	1.1	0.5	-0.4	-0.3	0.2	-0.3	0.0	1.6
RO	1.6	2.6	1.6	1.0	-1.0	-0.8	0.0	-0.2	0.0	2.4
SI	1.7	1.9	1.3	0.6	-0.2	0.0	0.1	-0.2	0.0	1.8
SK	1.4	2.1	1.3	0.8	-0.7	-0.2	-0.1	-0.3	0.0	1.6
FI	1.3	1.4	0.9	0.5	-0.1	-0.1	0.1	-0.2	0.0	1.4
SE	2.0	1.3	0.9	0.4	0.6	0.6	0.1	-0.1	0.0	1.3
NO	1.9	1.5	0.9	0.5	0.4	0.6	-0.1	-0.1	0.0	1.2
EA	1.4	1.4	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.3
EU27	1.5	1.6	1.0	0.5	-0.1	0.0	0.1	-0.2	0.0	1.5

Source: European Commission, EPC.

Table I.5.4: **Sensitivity test: Lower migration**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.1	1.2	0.8	0.5	-0.2	0.0	0.1	-0.2	0.0	1.1
BG	1.2	2.1	1.3	0.8	-0.9	-0.7	0.0	-0.3	0.0	1.9
CZ	1.5	2.0	1.3	0.7	-0.5	-0.2	0.0	-0.3	0.0	1.7
DK	1.6	1.5	1.0	0.5	0.1	0.0	0.2	-0.2	0.0	1.5
DE	1.1	1.4	0.9	0.5	-0.4	-0.2	0.1	-0.2	-0.1	1.2
EE	1.8	2.2	1.4	0.8	-0.4	-0.3	0.1	-0.2	-0.1	2.1
IE	1.7	1.6	1.1	0.5	0.2	0.4	-0.1	-0.1	0.0	1.3
EL	1.1	1.5	1.0	0.4	-0.4	-0.5	0.3	-0.2	0.0	1.6
ES	1.2	1.5	1.0	0.5	-0.3	-0.2	0.2	-0.2	0.0	1.4
FR	1.3	1.3	0.8	0.5	0.0	0.0	0.1	-0.2	0.0	1.3
HR	1.1	1.8	1.1	0.7	-0.8	-0.6	0.1	-0.2	0.0	1.7
IT	0.9	1.3	0.8	0.5	-0.4	-0.4	0.2	-0.2	0.0	1.3
CY	1.7	1.5	0.9	0.6	0.2	0.3	0.2	-0.2	0.0	1.4
LV	1.4	2.3	1.4	0.9	-0.9	-0.8	0.1	-0.2	0.0	2.2
LT	1.3	2.2	1.3	0.9	-0.9	-0.7	0.1	-0.2	0.0	2.1
LU	1.6	1.2	0.7	0.4	0.4	0.3	0.4	-0.3	0.0	1.3
HU	1.7	2.1	1.3	0.8	-0.4	-0.3	0.2	-0.3	0.0	2.0
MT	1.9	1.8	1.1	0.7	0.0	0.4	0.1	-0.3	-0.1	1.5
NL	1.2	1.4	0.9	0.5	-0.2	0.0	0.1	-0.2	0.0	1.2
AT	1.1	1.4	0.9	0.5	-0.2	-0.1	0.1	-0.2	0.0	1.2
PL	1.5	2.3	1.5	0.9	-0.9	-0.5	-0.1	-0.3	0.0	1.9
PT	1.1	1.7	1.1	0.6	-0.6	-0.5	0.1	-0.3	0.0	1.6
RO	1.7	2.6	1.6	0.9	-0.8	-0.6	0.0	-0.2	0.0	2.3
SI	1.5	1.9	1.3	0.6	-0.4	-0.3	0.1	-0.2	0.0	1.7
SK	1.3	2.1	1.3	0.8	-0.8	-0.3	-0.1	-0.3	0.0	1.6
FI	1.1	1.5	0.9	0.6	-0.4	-0.3	0.1	-0.2	0.0	1.4
SE	1.6	1.4	0.9	0.5	0.2	0.3	0.1	-0.1	0.0	1.3
NO	1.5	1.5	0.9	0.6	0.0	0.3	-0.1	-0.2	0.0	1.2
EA	1.1	1.4	0.9	0.5	-0.3	-0.2	0.1	-0.2	0.0	1.3
EU27	1.2	1.6	1.0	0.6	-0.4	-0.2	0.1	-0.2	0.0	1.4

Source: European Commission, EPC.

Table I.5.5: **Sensitivity test: Lower fertility**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	**1=2+5**	**2=3+4**	*3*	*4*	**5=6+7+8+9**	*6*	*7*	*8*	*9*	**10=1-6**
BE	**1.0**	**1.2**	0.8	0.4	**-0.3**	-0.2	0.0	-0.1	0.0	**1.2**
BG	**1.0**	**2.1**	1.3	0.8	**-1.2**	-0.9	0.0	-0.3	0.0	**1.9**
CZ	**1.4**	**2.0**	1.3	0.7	**-0.6**	-0.3	0.0	-0.2	0.0	**1.7**
DK	**1.4**	**1.5**	1.0	0.5	**-0.1**	-0.2	0.2	-0.2	0.0	**1.6**
DE	**1.0**	**1.4**	0.9	0.5	**-0.4**	-0.3	0.0	-0.2	-0.1	**1.3**
EE	**1.6**	**2.2**	1.4	0.8	**-0.6**	-0.5	0.1	-0.2	-0.1	**2.1**
IE	**1.6**	**1.5**	1.1	0.5	**0.0**	0.3	-0.1	-0.1	0.0	**1.3**
EL	**1.0**	**1.5**	1.0	0.4	**-0.5**	-0.6	0.3	-0.2	0.0	**1.6**
ES	**1.3**	**1.5**	1.0	0.5	**-0.2**	-0.2	0.2	-0.2	0.0	**1.4**
FR	**1.1**	**1.3**	0.8	0.5	**-0.2**	-0.2	0.1	-0.1	0.0	**1.3**
HR	**0.8**	**1.8**	1.1	0.7	**-1.0**	-0.8	0.0	-0.2	0.0	**1.6**
IT	**0.9**	**1.3**	0.9	0.4	**-0.4**	-0.4	0.2	-0.2	0.0	**1.3**
CY	**1.7**	**1.5**	0.9	0.6	**0.2**	0.2	0.2	-0.2	0.0	**1.5**
LV	**0.9**	**2.3**	1.4	0.9	**-1.4**	-1.2	0.1	-0.2	0.0	**2.1**
LT	**0.9**	**2.2**	1.3	0.9	**-1.3**	-1.1	0.1	-0.2	0.0	**2.0**
LU	**1.6**	**1.1**	0.7	0.4	**0.5**	0.3	0.4	-0.2	0.0	**1.3**
HU	**1.6**	**2.1**	1.3	0.8	**-0.5**	-0.4	0.2	-0.2	0.0	**2.0**
MT	**2.0**	**1.8**	1.2	0.6	**0.2**	0.6	0.1	-0.3	-0.1	**1.5**
NL	**1.0**	**1.3**	0.9	0.5	**-0.3**	-0.2	0.0	-0.2	0.0	**1.2**
AT	**1.1**	**1.4**	0.9	0.5	**-0.3**	-0.1	0.1	-0.2	0.0	**1.2**
PL	**1.3**	**2.3**	1.5	0.9	**-1.1**	-0.6	-0.1	-0.3	0.0	**1.9**
PT	**0.9**	**1.7**	1.1	0.6	**-0.7**	-0.6	0.1	-0.2	0.0	**1.6**
RO	**1.4**	**2.6**	1.6	0.9	**-1.2**	-1.0	0.0	-0.2	0.0	**2.3**
SI	**1.4**	**1.9**	1.3	0.6	**-0.5**	-0.4	0.0	-0.2	0.0	**1.7**
SK	**1.1**	**2.1**	1.3	0.8	**-1.0**	-0.5	-0.1	-0.3	0.0	**1.6**
FI	**1.0**	**1.5**	0.9	0.5	**-0.5**	-0.4	0.1	-0.2	0.0	**1.4**
SE	**1.6**	**1.4**	0.9	0.5	**0.2**	0.2	0.1	-0.1	0.0	**1.3**
NO	**1.5**	**1.5**	0.9	0.5	**0.0**	0.2	-0.1	-0.1	0.0	**1.2**
EA	**1.1**	**1.4**	0.9	0.5	**-0.4**	-0.3	0.1	-0.2	0.0	**1.3**
EU27	**1.1**	**1.6**	1.0	0.5	**-0.5**	-0.3	0.1	-0.2	0.0	**1.4**

Source: European Commission, EPC.

Table I.5.6: **Sensitivity test: Higher employment rate of older workers**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	**1=2+5**	**2=3+4**	*3*	*4*	**5=6+7+8+9**	*6*	*7*	*8*	*9*	**10=1-6**
BE	**1.3**	**1.2**	0.8	0.4	**0.1**	0.1	0.2	-0.2	0.0	**1.2**
BG	**1.3**	**2.1**	1.3	0.8	**-0.8**	-0.6	0.1	-0.3	0.0	**1.9**
CZ	**1.7**	**2.0**	1.3	0.7	**-0.3**	-0.1	0.1	-0.3	0.0	**1.8**
DK	**1.7**	**1.5**	1.0	0.5	**0.2**	0.1	0.3	-0.2	0.0	**1.6**
DE	**1.3**	**1.4**	0.9	0.5	**-0.1**	0.0	0.2	-0.2	-0.1	**1.3**
EE	**1.9**	**2.2**	1.4	0.8	**-0.2**	-0.2	0.2	-0.2	-0.1	**2.1**
IE	**1.9**	**1.5**	1.1	0.4	**0.4**	0.6	0.0	-0.1	0.0	**1.3**
EL	**1.3**	**1.4**	1.0	0.4	**-0.2**	-0.4	0.4	-0.2	0.0	**1.7**
ES	**1.5**	**1.4**	1.0	0.5	**0.1**	0.0	0.3	-0.2	0.0	**1.5**
FR	**1.4**	**1.3**	0.8	0.4	**0.1**	0.1	0.2	-0.2	0.0	**1.3**
HR	**1.2**	**1.8**	1.1	0.7	**-0.6**	-0.6	0.2	-0.2	0.0	**1.8**
IT	**1.1**	**1.2**	0.8	0.4	**-0.1**	-0.2	0.3	-0.2	0.0	**1.3**
CY	**2.0**	**1.4**	0.9	0.6	**0.5**	0.5	0.3	-0.2	0.0	**1.5**
LV	**1.3**	**2.3**	1.4	0.8	**-1.0**	-0.9	0.2	-0.2	0.0	**2.2**
LT	**1.3**	**2.2**	1.3	0.8	**-0.9**	-0.8	0.2	-0.2	0.0	**2.1**
LU	**1.9**	**1.1**	0.7	0.4	**0.8**	0.5	0.5	-0.2	0.0	**1.4**
HU	**1.9**	**2.0**	1.3	0.7	**-0.1**	-0.2	0.3	-0.2	0.0	**2.1**
MT	**2.3**	**1.8**	1.2	0.6	**0.5**	0.7	0.2	-0.3	-0.1	**1.6**
NL	**1.4**	**1.3**	0.9	0.4	**0.0**	0.1	0.2	-0.2	0.0	**1.3**
AT	**1.4**	**1.3**	0.9	0.5	**0.1**	0.1	0.2	-0.2	0.0	**1.3**
PL	**1.6**	**2.3**	1.5	0.8	**-0.7**	-0.4	0.1	-0.3	0.0	**2.0**
PT	**1.3**	**1.6**	1.1	0.5	**-0.4**	-0.4	0.3	-0.3	0.0	**1.6**
RO	**1.8**	**2.5**	1.6	0.9	**-0.8**	-0.7	0.2	-0.2	0.0	**2.4**
SI	**1.7**	**1.9**	1.3	0.6	**-0.2**	-0.1	0.1	-0.2	0.0	**1.8**
SK	**1.4**	**2.0**	1.3	0.8	**-0.6**	-0.3	0.0	-0.3	0.0	**1.7**
FI	**1.3**	**1.4**	0.9	0.5	**-0.1**	-0.2	0.2	-0.2	0.0	**1.4**
SE	**1.8**	**1.3**	0.9	0.4	**0.5**	0.5	0.2	-0.1	0.0	**1.4**
NO	**1.8**	**1.4**	0.9	0.5	**0.3**	0.5	0.0	-0.1	0.0	**1.3**
EA	**1.3**	**1.4**	0.9	0.5	**0.0**	0.0	0.2	-0.2	0.0	**1.4**
EU27	**1.4**	**1.5**	1.0	0.5	**-0.1**	-0.1	0.2	-0.2	0.0	**1.5**

Source: European Commission, EPC.

Table I.5.7: **Sensitivity test: TFP risk**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.0	1.0	0.7	0.4	0.0	0.1	0.1	-0.2	0.0	1.0
BG	1.0	1.9	1.2	0.7	-0.9	-0.6	0.0	-0.3	0.0	1.7
CZ	1.4	1.7	1.1	0.6	-0.3	-0.1	0.0	-0.3	0.0	1.5
DK	1.5	1.3	0.9	0.4	0.2	0.1	0.3	-0.2	0.0	1.3
DE	1.0	1.2	0.8	0.4	-0.2	0.0	0.1	-0.2	-0.1	1.0
EE	1.6	1.9	1.2	0.7	-0.3	-0.2	0.1	-0.2	-0.1	1.8
IE	1.6	1.3	0.9	0.4	0.3	0.6	-0.1	-0.1	0.0	1.1
EL	1.0	1.3	0.9	0.4	-0.3	-0.4	0.3	-0.2	0.0	1.4
ES	1.2	1.3	0.8	0.4	0.0	0.0	0.2	-0.2	0.0	1.2
FR	1.1	1.1	0.7	0.4	0.1	0.1	0.1	-0.2	0.0	1.1
HR	0.9	1.6	1.0	0.6	-0.7	-0.6	0.1	-0.2	0.0	1.5
IT	0.8	1.1	0.7	0.4	-0.2	-0.2	0.2	-0.2	0.0	1.1
CY	1.7	1.3	0.8	0.5	0.4	0.5	0.2	-0.2	0.0	1.3
LV	0.9	2.1	1.2	0.8	-1.1	-0.9	0.1	-0.2	0.0	1.9
LT	0.9	1.9	1.1	0.8	-1.0	-0.8	0.1	-0.2	0.0	1.7
LU	1.5	0.8	0.5	0.3	0.7	0.5	0.4	-0.2	0.0	1.0
HU	1.6	1.8	1.1	0.7	-0.3	-0.2	0.2	-0.2	0.0	1.7
MT	1.9	1.5	1.0	0.6	0.4	0.7	0.1	-0.3	-0.1	1.2
NL	1.1	1.1	0.7	0.4	0.0	0.1	0.1	-0.2	0.0	1.0
AT	1.1	1.1	0.7	0.4	0.0	0.1	0.1	-0.2	0.0	1.0
PL	1.3	2.0	1.3	0.8	-0.8	-0.4	-0.1	-0.3	0.0	1.7
PT	1.0	1.5	1.0	0.5	-0.5	-0.4	0.1	-0.3	0.0	1.4
RO	1.5	2.4	1.5	0.9	-0.9	-0.7	0.0	-0.2	0.0	2.1
SI	1.4	1.6	1.1	0.5	-0.3	-0.1	0.1	-0.2	0.0	1.5
SK	1.0	1.8	1.1	0.7	-0.7	-0.3	-0.1	-0.3	0.0	1.3
FI	0.9	1.2	0.7	0.5	-0.3	-0.2	0.1	-0.2	0.0	1.1
SE	1.6	1.1	0.7	0.4	0.4	0.5	0.1	-0.1	0.0	1.1
NO	1.3	1.1	0.6	0.4	0.2	0.5	-0.1	-0.1	0.0	0.8
EA	1.1	1.2	0.8	0.4	-0.1	0.0	0.1	-0.2	0.0	1.1
EU27	1.1	1.3	0.9	0.5	-0.2	-0.1	0.1	-0.2	0.0	1.2

Source: European Commission, EPC.

Table I.5.8: **Sensitivity test: Higher TFP growth**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.5	1.5	1.0	0.5	0.0	0.1	0.1	-0.2	0.0	1.4
BG	1.5	2.4	1.5	0.9	-0.9	-0.6	0.0	-0.3	0.0	2.1
CZ	1.9	2.2	1.5	0.8	-0.3	-0.1	0.0	-0.3	0.0	2.0
DK	1.9	1.8	1.2	0.6	0.2	0.1	0.3	-0.2	0.0	1.8
DE	1.5	1.7	1.1	0.6	-0.2	0.0	0.1	-0.2	-0.1	1.5
EE	2.1	2.4	1.5	0.9	-0.3	-0.2	0.1	-0.2	-0.1	2.3
IE	2.1	1.8	1.3	0.5	0.3	0.6	-0.1	-0.1	0.0	1.5
EL	1.5	1.8	1.3	0.5	-0.3	-0.4	0.3	-0.2	0.0	1.9
ES	1.7	1.7	1.2	0.6	0.0	0.0	0.2	-0.2	0.0	1.7
FR	1.6	1.6	1.0	0.5	0.1	0.1	0.1	-0.2	0.0	1.6
HR	1.4	2.1	1.3	0.8	-0.7	-0.6	0.1	-0.2	0.0	2.0
IT	1.3	1.6	1.0	0.5	-0.2	-0.2	0.2	-0.2	0.0	1.5
CY	2.2	1.8	1.1	0.7	0.4	0.5	0.2	-0.2	0.0	1.7
LV	1.4	2.5	1.6	1.0	-1.1	-0.9	0.1	-0.2	0.0	2.4
LT	1.4	2.4	1.4	1.0	-1.0	-0.8	0.1	-0.2	0.0	2.2
LU	2.0	1.3	0.9	0.5	0.7	0.5	0.4	-0.2	0.0	1.5
HU	2.0	2.3	1.5	0.8	-0.3	-0.2	0.2	-0.2	0.0	2.2
MT	2.4	2.0	1.3	0.7	0.4	0.7	0.1	-0.3	-0.1	1.7
NL	1.6	1.6	1.0	0.6	0.0	0.1	0.1	-0.2	0.0	1.5
AT	1.6	1.6	1.0	0.6	0.0	0.1	0.1	-0.2	0.0	1.5
PL	1.7	2.5	1.6	0.9	-0.8	-0.4	-0.1	-0.3	0.0	2.1
PT	1.5	2.0	1.3	0.6	-0.5	-0.4	0.1	-0.3	0.0	1.9
RO	1.9	2.8	1.8	1.0	-0.9	-0.7	0.0	-0.2	0.0	2.6
SI	1.8	2.1	1.5	0.7	-0.3	-0.1	0.1	-0.2	0.0	2.0
SK	1.5	2.2	1.4	0.9	-0.7	-0.3	-0.1	-0.3	0.0	1.8
FI	1.4	1.7	1.0	0.6	-0.3	-0.2	0.1	-0.2	0.0	1.6
SE	2.0	1.6	1.1	0.5	0.4	0.5	0.1	-0.1	0.0	1.6
NO	1.8	1.5	0.9	0.6	0.2	0.5	-0.1	-0.1	0.0	1.3
EA	1.5	1.7	1.1	0.6	-0.1	0.0	0.1	-0.2	0.0	1.6
EU27	1.6	1.8	1.2	0.6	-0.2	-0.1	0.1	-0.2	0.0	1.7

Source: European Commission, EPC.

Table I.5.9: **Policy scenario: Linking retirement age to life expectancy**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	3	4	5=6+7+8+9	6	7	8	9	10=1-6
BE	1.3	1.2	0.8	0.4	0.1	0.1	0.2	-0.2	0.0	1.3
BG	1.4	2.1	1.3	0.8	-0.7	-0.6	0.2	-0.3	0.0	2.0
CZ	1.8	2.0	1.3	0.7	-0.2	-0.1	0.1	-0.3	0.0	1.8
DK	1.7	1.5	1.0	0.5	0.2	0.1	0.3	-0.2	0.0	1.6
DE	1.3	1.4	0.9	0.5	-0.1	0.0	0.2	-0.2	-0.1	1.4
EE	1.9	2.2	1.4	0.8	-0.3	-0.2	0.1	-0.2	-0.1	2.1
IE	1.9	1.5	1.1	0.5	0.4	0.6	0.0	-0.1	0.0	1.4
EL	1.2	1.5	1.0	0.4	-0.3	-0.4	0.3	-0.2	0.0	1.6
ES	1.5	1.5	1.0	0.5	0.0	0.0	0.2	-0.2	0.0	1.5
FR	1.4	1.3	0.8	0.5	0.1	0.1	0.2	-0.2	0.0	1.3
HR	1.3	1.8	1.1	0.7	-0.6	-0.6	0.2	-0.2	0.0	1.8
IT	1.0	1.3	0.9	0.4	-0.2	-0.2	0.2	-0.2	0.0	1.3
CY	1.9	1.5	0.9	0.6	0.4	0.5	0.2	-0.2	0.0	1.4
LV	1.4	2.3	1.4	0.9	-1.0	-0.9	0.3	-0.2	0.0	2.3
LT	1.4	2.2	1.3	0.9	-0.8	-0.8	0.2	-0.2	0.0	2.2
LU	2.0	1.1	0.7	0.4	0.8	0.5	0.6	-0.2	0.0	1.5
HU	1.9	2.1	1.3	0.7	-0.1	-0.2	0.3	-0.2	0.0	2.1
MT	2.3	1.8	1.2	0.6	0.5	0.7	0.2	-0.3	-0.1	1.6
NL	1.3	1.3	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.2
AT	1.4	1.3	0.9	0.5	0.1	0.1	0.2	-0.2	0.0	1.3
PL	1.7	2.3	1.5	0.8	-0.6	-0.4	0.1	-0.3	0.0	2.1
PT	1.2	1.7	1.1	0.5	-0.4	-0.4	0.2	-0.3	0.0	1.6
RO	1.9	2.6	1.6	0.9	-0.7	-0.7	0.2	-0.2	0.0	2.5
SI	1.7	1.9	1.3	0.6	-0.2	-0.1	0.2	-0.2	0.0	1.9
SK	1.5	2.0	1.3	0.8	-0.5	-0.3	0.1	-0.3	0.0	1.8
FI	1.2	1.5	0.9	0.5	-0.3	-0.2	0.1	-0.2	0.0	1.4
SE	1.9	1.3	0.9	0.4	0.6	0.5	0.2	-0.1	0.0	1.4
NO	1.8	1.5	0.9	0.5	0.3	0.5	0.1	-0.1	0.0	1.3
EA	1.3	1.4	0.9	0.5	-0.1	0.0	0.2	-0.2	0.0	1.4
EU27	1.4	1.6	1.0	0.5	-0.2	-0.1	0.2	-0.2	0.0	1.5

Source: European Commission, EPC.

Table I.5.10: **Policy scenario: Unchanged retirement age**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	3	4	5=6+7+8+9	6	7	8	9	10=1-6
BE	1.2	1.3	0.8	0.5	-0.1	0.1	0.0	-0.2	0.0	1.1
BG	1.2	2.1	1.3	0.8	-0.9	-0.6	0.0	-0.3	0.0	1.8
CZ	1.6	2.0	1.3	0.7	-0.4	-0.1	-0.1	-0.3	0.0	1.7
DK	1.5	1.5	1.0	0.5	0.0	0.1	0.1	-0.2	0.0	1.4
DE	1.2	1.4	0.9	0.5	-0.2	0.0	0.0	-0.2	-0.1	1.2
EE	1.7	2.2	1.4	0.8	-0.5	-0.2	0.0	-0.2	-0.1	1.9
IE	1.8	1.5	1.1	0.5	0.2	0.6	-0.2	-0.1	0.0	1.2
EL	1.0	1.5	1.0	0.5	-0.5	-0.4	0.1	-0.2	0.0	1.4
ES	1.4	1.6	1.0	0.6	-0.2	0.0	0.0	-0.2	0.0	1.3
FR	1.3	1.3	0.8	0.5	-0.1	0.1	0.0	-0.2	0.0	1.2
HR	1.1	1.8	1.1	0.7	-0.8	-0.6	0.0	-0.2	0.0	1.6
IT	0.9	1.3	0.8	0.5	-0.4	-0.2	0.0	-0.2	0.0	1.1
CY	1.8	1.5	0.9	0.6	0.3	0.5	0.1	-0.2	0.0	1.3
LV	1.2	2.3	1.4	0.9	-1.2	-0.9	0.1	-0.2	0.0	2.1
LT	1.2	2.2	1.3	0.9	-1.0	-0.8	0.0	-0.2	0.0	2.0
LU	1.8	1.1	0.7	0.4	0.7	0.5	0.4	-0.2	0.0	1.3
HU	1.7	2.1	1.3	0.8	-0.4	-0.2	0.1	-0.2	0.0	1.9
MT	2.2	1.8	1.2	0.6	0.4	0.7	0.0	-0.3	-0.1	1.4
NL	1.2	1.4	0.9	0.5	-0.1	0.1	0.0	-0.2	0.0	1.1
AT	1.3	1.4	0.9	0.5	-0.1	0.1	0.1	-0.2	0.0	1.2
PL	1.5	2.3	1.5	0.9	-0.8	-0.4	-0.1	-0.3	0.0	1.9
PT	1.1	1.7	1.1	0.6	-0.6	-0.4	0.1	-0.3	0.0	1.5
RO	1.7	2.6	1.6	0.9	-0.9	-0.7	0.0	-0.2	0.0	2.4
SI	1.6	1.9	1.3	0.6	-0.3	-0.1	0.0	-0.2	0.0	1.7
SK	1.3	2.1	1.3	0.8	-0.7	-0.3	-0.1	-0.3	0.0	1.6
FI	1.1	1.5	0.9	0.6	-0.4	-0.2	0.0	-0.2	0.0	1.2
SE	1.8	1.4	0.9	0.5	0.4	0.5	0.1	-0.1	0.0	1.3
NO	1.7	1.5	0.9	0.5	0.2	0.5	-0.1	-0.1	0.0	1.2
EA	1.2	1.5	0.9	0.5	-0.2	0.0	0.0	-0.2	0.0	1.3
EU27	1.3	1.6	1.0	0.6	-0.3	-0.1	0.0	-0.2	0.0	1.4

Source: European Commission, EPC.

Table I.5.11: **Adverse macroeconomic scenario – Lagged recovery**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	1.2	1.2	0.8	0.4	0.0	0.1	0.1	-0.2	0.0	1.1
BG	1.2	2.1	1.3	0.8	-0.9	-0.6	0.0	-0.3	0.0	1.9
CZ	1.6	2.0	1.3	0.7	-0.4	-0.1	0.0	-0.3	0.0	1.7
DK	1.7	1.5	1.0	0.5	0.2	0.1	0.2	-0.2	0.0	1.5
DE	1.2	1.4	0.9	0.5	-0.2	0.0	0.0	-0.2	0.0	1.3
EE	1.9	2.2	1.4	0.8	-0.3	-0.2	0.1	-0.2	-0.1	2.0
IE	1.8	1.5	1.1	0.5	0.3	0.6	-0.1	-0.1	0.0	1.3
EL	1.2	1.5	1.0	0.4	-0.3	-0.4	0.3	-0.2	0.0	1.6
ES	1.5	1.5	1.0	0.5	0.0	0.0	0.2	-0.2	0.0	1.5
FR	1.3	1.3	0.8	0.5	0.0	0.1	0.1	-0.2	0.0	1.3
HR	1.1	1.8	1.1	0.7	-0.7	-0.6	0.1	-0.2	0.0	1.7
IT	1.0	1.3	0.8	0.4	-0.2	-0.2	0.2	-0.2	0.0	1.3
CY	1.9	1.5	0.9	0.6	0.4	0.5	0.2	-0.2	0.0	1.4
LV	1.2	2.3	1.4	0.9	-1.1	-0.9	0.1	-0.2	0.0	2.2
LT	1.2	2.2	1.3	0.9	-1.0	-0.8	0.1	-0.2	0.0	2.1
LU	1.8	1.1	0.7	0.4	0.7	0.5	0.4	-0.2	0.0	1.3
HU	1.8	2.1	1.3	0.7	-0.3	-0.2	0.2	-0.2	0.0	2.0
MT	2.2	1.8	1.2	0.6	0.4	0.7	0.1	-0.3	-0.1	1.5
NL	1.3	1.3	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.2
AT	1.3	1.4	0.9	0.5	0.0	0.1	0.1	-0.2	0.0	1.2
PL	1.5	2.3	1.5	0.9	-0.8	-0.4	-0.1	-0.3	0.0	1.9
PT	1.2	1.7	1.1	0.6	-0.5	-0.4	0.1	-0.3	0.0	1.6
RO	1.7	2.6	1.6	0.9	-0.9	-0.7	0.0	-0.2	0.0	2.4
SI	1.6	1.9	1.3	0.6	-0.3	-0.1	0.1	-0.2	0.0	1.7
SK	1.3	2.1	1.3	0.8	-0.7	-0.3	-0.1	-0.3	0.0	1.6
FI	1.2	1.5	0.9	0.5	-0.3	-0.2	0.1	-0.2	0.0	1.4
SE	1.8	1.4	0.9	0.5	0.4	0.5	0.1	-0.1	0.0	1.3
NO	1.7	1.5	0.9	0.5	0.2	0.5	-0.1	-0.1	0.0	1.2
EA	1.3	1.4	0.9	0.5	-0.1	0.0	0.1	-0.2	0.0	1.3
EU27	1.3	1.6	1.0	0.5	-0.2	-0.1	0.1	-0.2	0.0	1.4

Source: European Commission, EPC.

Table I.5.12: **Adverse macroeconomic scenario – Adverse structural**

		Due to:								
	GDP growth in 2019-2070	***Labour productivity*** *(GDP per hour worked)*	*TFP*	*Capital deepening*	***Labour input***	*Total population*	*Employment rate*	*Share of Working age population*	*change in average hours worked*	GDP per capita growth in 2019-2070
Country	1=2+5	2=3+4	*3*	*4*	5=6+7+8+9	*6*	*7*	*8*	*9*	10=1-6
BE	0.8	0.9	0.6	0.3	-0.1	0.1	0.0	-0.2	0.0	0.8
BG	0.9	1.8	1.1	0.7	-0.9	-0.6	0.0	-0.3	0.0	1.5
CZ	1.3	1.6	1.1	0.6	-0.4	-0.1	0.0	-0.3	0.0	1.3
DK	1.3	1.2	0.8	0.4	0.1	0.1	0.2	-0.2	0.0	1.2
DE	0.9	1.1	0.7	0.4	-0.2	0.0	0.0	-0.2	0.0	0.9
EE	1.5	1.8	1.1	0.7	-0.4	-0.2	0.1	-0.2	-0.1	1.7
IE	1.4	1.2	0.8	0.3	0.2	0.6	-0.2	-0.1	0.0	0.9
EL	0.9	1.2	0.8	0.3	-0.3	-0.4	0.3	-0.2	0.0	1.3
ES	1.1	1.1	0.7	0.4	0.0	0.0	0.2	-0.2	0.0	1.1
FR	1.0	1.0	0.6	0.3	0.0	0.1	0.1	-0.2	0.0	0.9
HR	0.7	1.5	0.9	0.6	-0.7	-0.6	0.0	-0.2	0.0	1.3
IT	0.7	1.0	0.6	0.3	-0.3	-0.2	0.2	-0.2	0.0	0.9
CY	1.5	1.1	0.7	0.5	0.4	0.5	0.2	-0.2	0.0	1.1
LV	0.8	2.0	1.2	0.8	-1.2	-0.9	0.1	-0.2	0.0	1.8
LT	0.8	1.9	1.1	0.8	-1.0	-0.8	0.0	-0.2	0.0	1.7
LU	1.4	0.8	0.5	0.3	0.6	0.5	0.4	-0.2	0.0	0.9
HU	1.4	1.7	1.1	0.6	-0.3	-0.2	0.1	-0.2	0.0	1.6
MT	1.8	1.5	0.9	0.5	0.3	0.7	0.0	-0.3	-0.1	1.1
NL	0.9	1.0	0.6	0.4	-0.1	0.1	0.0	-0.2	0.0	0.8
AT	1.0	1.0	0.6	0.4	-0.1	0.1	0.1	-0.2	0.0	0.9
PL	1.2	2.0	1.2	0.8	-0.8	-0.4	-0.1	-0.3	0.0	1.6
PT	0.8	1.3	0.9	0.4	-0.5	-0.4	0.1	-0.3	0.0	1.2
RO	1.3	2.2	1.4	0.8	-1.0	-0.7	0.0	-0.2	0.0	2.0
SI	1.2	1.6	1.1	0.5	-0.4	-0.1	0.0	-0.2	0.0	1.4
SK	1.0	1.7	1.1	0.7	-0.8	-0.3	-0.1	-0.3	0.0	1.2
FI	0.8	1.1	0.7	0.4	-0.3	-0.2	0.1	-0.2	0.0	1.0
SE	1.4	1.0	0.7	0.3	0.4	0.5	0.0	-0.1	0.0	0.9
NO	1.3	1.1	0.7	0.4	0.2	0.5	-0.1	-0.1	0.0	0.9
EA	0.9	1.1	0.7	0.4	-0.2	0.0	0.1	-0.2	0.0	1.0
EU27	1.0	1.2	0.8	0.4	-0.3	-0.1	0.1	-0.2	0.0	1.1

Source: European Commission, EPC.

Part II

Age-related expenditure items: coverage, projection methodologies and data sources

1. PENSIONS

1.1. MAIN FEATURES OF PENSION PROJECTIONS

To gauge the fiscal impact of population ageing, long-term projections of public pension expenditure are made based on the commonly agreed underlying assumptions described in Part I of this report, using national models. These projections reflect in detail the institutional features of the pension systems in each country.

Despite the different arrangements in national healthcare, long-term care and education systems, the Commission (DG ECFIN) and the AWG have been able to develop common models to carry out long-term projections for these public expenditure items. For pensions, a different approach is followed, as the specificities of pension systems across the EU proved difficult to capture in a single framework. Given this diversity in pension system design, pension expenditure projections are prepared by the Member States using national models and the commonly agreed demographic and macroeconomic assumptions discussed in Part I.

On the one hand, this decentralised approach makes it possible to incorporate the specific institutional features and legal settings of individual countries ([39]). On the other hand, using different, country-specific projection models may introduce an element of non-comparability to the results, despite relying on an agreed, common methodology.

To ensure high quality and strengthen the comparability of the projection results, an in-depth peer review is being carried out by the AWG members and the Commission. The discussion and validation of the projection results is intended to: (i) verify whether the Member States are all following the agreed methodology and the macroeconomic assumptions; and (ii) check how Member States interpret the pension legislation in force. When deemed necessary, the peer review by the AWG can ask the Member State to revise the projections.

([39]) For a complete description of pension schemes in the Member States, please consult the PENSREF database, available at: https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases_en.

1.2. COVERAGE OF PENSION PROJECTIONS

The core of the pension-projection exercise continues to be government expenditure on public pension schemes (see Annex 6 for a comprehensive description of the pension schemes covered by the projections). Building on the previous exercises, the members of the AWG agreed to provide pension projections for the following items: gross pension expenditure; taxes on pensions; benefit ratio and gross average replacement rates; number of pensions/pensioners; revenues from contributions and the number of contributors; breakdown of new pension expenditure (earnings-related); and assets and reserves of public and private pension schemes.

The reporting framework for the 2021 Ageing Report builds on the framework used for the 2018 exercise. Changes remain limited in number and scope. The main changes, as agreed by the AWG/EPC, are listed below.

Firstly, the updated reporting framework puts all tax-related variables in a separate block, which also includes net pension expenditure, i.e. gross spending minus reported taxes for the relevant scheme. In the past, these indicators were included in the block covering gross pension expenditure. This change, which does not entail any new reporting, clarifies the structure of the pension questionnaire. The reporting by Member States of taxes on public pensions makes it possible to analyse developments in net pension expenditure. Moreover, the Commission's fiscal sustainability indicators consider ageing costs net of taxes and contributions paid on pensions.

Secondly, the updated framework clarifies that public pension contributions by the State (line 124 in the pension questionnaire) and other revenues (line 125) should only be reported if such contributions are based on legislation (the questionnaire is provided in Annex 4). This way, a better distinction can be made between, on the one hand, contributions based on a specific rate and, on the other hand, de facto transfers to make up for any shortfalls that arise within the system.

Thirdly, the breakdown of new pension expenditure for point systems is further refined. The 2018 questionnaire introduced a specific

breakdown for the earnings-related part of the three broad pension system types: defined benefit (DB), notional defined contribution (NDC), and point system (PS). However, the PS template sometimes failed to reflect the way these systems operate. As a result, consistency with the new earnings-related pension expenditure as reported in Block 1 was lost. Member States also had the choice to report under the same reporting line either the average contributory period or the average amount of pension points accumulated per year. Moreover, the point value was considered as a component of the accrual rate rather than a determinant of the pension benefit in its own right.

Therefore, the new pension questionnaire includes a reshuffling and extension of the breakdown of new pensions for the point system. The main changes concern: (i) the accrual rate – which now shows the average number of points accrued per contributing year; and (ii) the addition of a 'correction coefficient' to reflect any additional correction that applies and that is not a sustainability factor (i.e. correction of pension benefit for life expectancy) or automatic balancing mechanism. For countries like France in which there is a point cost, the 'point value' indicator is normalised by this point cost and the indicator 'total points at retirement' takes into account the point cost, thus reflecting total contributions at retirement.

Fourthly, a reporting block on pension assets and returns was reintroduced. A comparable, voluntary block was included in the questionnaire until 2012, although few countries reported data. Considering the rising importance of funded schemes across Member States – and the central role such schemes already fulfil in a number of Member States – the voluntary block was reintroduced to give Member States the opportunity to report relevant figures.

Fifthly, the questionnaire consistently distinguishes between mandatory individual schemes and non-mandatory ones. Although the latter are more prevalent as they exist in all Member States, when Member States report figures they mostly relate to the mandatory schemes. The 2018 questionnaire often lumped together both types in a single reporting line.

Finally, for streamlining reasons, some reporting lines included in the 2018 framework were not retained. The 'total number of contributors to all pension schemes' did not provide a meaningful indicator, because nearly all employees contributing to any kind of supplementary scheme supposedly also contribute to the public scheme. Finally, the gross average replacement rate for the overall public pension is no longer included. This is because it is the earnings-related pension benefit – including the flat component – that matters for replacement rates.

As a result, the 2021 reporting sheet is organised around 11 groups of indicators (see Annex 4):

1. gross pension expenditure;
2. taxes on pensions & net pension expenditure;
3. benefit ratio;
4. gross average replacement rates;
5. number of pensions;
6. number of pensioners;
7. contributions;
8. number of contributors;
9. indexation factors;
10. breakdown of new earnings-related pensions;
11. pension assets & return on assets.

The reporting sheet consists of 195 variables (189 if the country has a DB system), of which 80 can be provided on a voluntary basis and 5 are input data provided by the Commission. A complete list of items covered by the 2021 pension-projection exercise is presented in Annex 4.

Adhering to the principle of not changing the modality of the variables that were classified as voluntary in the previous exercise, variables are reported on a voluntary basis for private schemes (occupational, individual mandatory, and individual non-mandatory). Moreover, the following are classified as voluntary: (i) the break-down by age of the total number of pensions; (ii) the total number of pensioners; (iii) the taxes on

pensions([40]); and (iv) data on pension assets and returns.

In parallel to the pension questionnaire, Member States report administrative data on the number of new pensioners by sex and public scheme. While 2016-2019 figures are reported on a mandatory basis, 2010-2015 figures are voluntary. During the 2018 projection cycle, most Member States reported administrative data for 2015.

Building on the mapping of special pension schemes for the situation in 2016 in the 2018 Ageing Report, Member States have the possibility to report, on a voluntary basis, details for these schemes. All special pension schemes should be included in the overall projections. The scope and nature of special schemes would also be discussed in the country fiche. The structure of the reporting sheet is based on the 2018 exercise (see Annex 4). Reporting on special schemes makes it possible to monitor changes in the weight of these schemes, which are often the subject of specific reforms. Detailed descriptions of special schemes are included in the online PENSREF database.

1.3. DEFINITIONS OF THE VARIABLES

1.3.1. Reporting norms and input data

Member States will run projections for the period 2019-2070. For each year of the projection period, annual data are to be provided. Both the historical data for the years 2000-2018 and the projections for 2019-2070 must be presented in current prices. The base year of the projections is 2019.

The GDP projections for each country over the period 2019-2070 are those generated by the Commission (DG ECFIN) using the production function model on the basis of the agreed assumptions.

Average wages are calculated as the ratio of total gross wages from national account data and employed persons (both employees and self-employed) aged 15-74. The change in the gross wage total is projected for each country in accordance with labour productivity growth and changes in the number of hours worked ([41]).

Figures on the economy-wide average wage at retirement must be reported by the Member States. The assumptions used when projecting this variable should be reported separately and will be peer reviewed.

Values are expressed in millions of euro. For non-euro area countries, the conversion should be made on the basis of the average exchange rate for 2019, except for the ERM II countries for which the conversion is based on the central rates.

Member States should report outturn data back to 2000 and, in the country fiche accompanying the pension-projection data, discuss actual developments since 2000. This should clarify the reasons behind: (i) notable changes in pension spending; (ii) overall trends in pension spending in the recent past; and (iii) the possible implications of these changes and trends for the projections.

The pension projections include the impact of the most recent pension reforms that will have entered into legislation before the cut-off date (1 December 2020) for submitting the pension projections. To this end, in their country fiches Member States provide detailed descriptions of the projections, including: (i) recently introduced reforms; (ii) the implementation of these reforms; and (iii) how these reforms are reflected in the projection results.

1.3.2. Variables: definitions and clarifications

Pension expenditure

Definition: Pension expenditures should cover pensions and equivalent cash benefits granted for a long period (over 1 year) for old age, early retirement, disability, survivors (widows and orphans), and other specific purposes which should be considered as equivalents or substitutes for the above-mentioned types of pensions (i.e. pensions or pension-type benefits granted because of reduced work capacity or because of labour market conditions).

([40]) With the exception of taxes on pensions for the base year (2019). For those Member States that have difficulties in providing the requested information on taxes on pensions in the base year, detailed information of the tax system are included in the pension country fiches.

([41]) In line with the assumption of constant labour share. Gross wages include employers' social security contributions.

Clarification: Pension expenditures are projected according to the current legislation in force. Pensions should include: (i) earnings-related pensions; (ii) flat-rate pensions; (iii) means-tested benefits that aim at providing a social minimum pension; and (iv) supplements that are a part of the pension and are granted for an indefinite period on the basis of fulfilling certain criteria but which are not directly linked to the remuneration of costs (i.e. supplements aimed at supporting the purchase of home or healthcare services). Pensions and benefits can be paid out from specific schemes or directly from government budgets. In particular, social assistance should be included if it is equivalent to a minimum pension (i.e. similar to a non-earnings-related minimum pension). Housing subsidies should be excluded from pensions and considered as other means-tested social transfers. To ensure the consistency of the projections with the underlying assumptions, the reporting of pension expenditures should include pensions paid overseas.

Short-term disability benefits should be considered as sickness benefits, while prolonged unemployment benefits to older workers should be considered as unemployment benefits.

Pensions should not include social security contributions paid by pension schemes on behalf of their pensioners to other social protection schemes, notably to health schemes.

Pension expenditure by age

Many countries have introduced pension reforms that will increase the retirement age. To better understand the impact of these reforms, Member States have to report pension expenditure disaggregated by age groups -54, 55-59, 60-64, 65-69, 70-74 and 75+ for both public pensions and total pensions. This breakdown increases transparency and consistency between population, labour force and projections of pensioners. The sum of public/total pension expenditures for all age groups should be equal to the overall projected values for public/total pension expenditures.

New pension expenditure

To monitor reforms and increase transparency, Member States provide annual projections on new pensions expenditure for each of the pension schemes: (i) old-age and early pensions (earnings-related, flat component, and minimum pensions); (ii) disability pensions; (iii) survivors' pensions; and (iv) other pensions (see descriptions below). New pension expenditures for earnings-related and basic pensions should match the breakdown of new pension expenditures under Block 9.

Gross pension expenditure

In Block 1 of the reporting framework, pensions expenditure should be recorded in gross terms, i.e. without deducting taxes and compulsory social security contributions paid by beneficiaries on benefits. In countries where pensions are treated as non-taxable income, gross pensions equal net pensions.

Net pension expenditure

Pensions should be recorded as net pensions, after deducting taxes on pensions and compulsory social security contributions paid by beneficiaries from gross public pension expenditure. Projections should be made for overall net public pension expenditures as well as the absolute share of non-earnings-related minimum pensions and minimum income guarantees.

Taxes on pensions

Member States must provide data on taxes on pensions for the base year. Consistent and comparable projections of taxes on all pensions can be provided on a voluntary basis: public, private occupational, and private individual pensions (both mandatory and non-mandatory). In particular, attention should be paid to the progressivity of the tax system on this source of public revenue. The Commission proposes to project taxes in a way that tax revenues as a share of pension expenditures stay constant over time. This implicitly means that: (i) 'value' parameters, such as tax allowances or tax-contribution ceilings, are adjusted annually in line with pension expenditures; while (ii) 'rate' parameters, such as the implicit average tax rate on pensions remain unchanged. These assumptions on tax projections should hold for every single scheme, both public and private pillar schemes.

Countries that provide figures for taxes on private occupational and private individual pensions are

asked to provide all other data on private occupational and private individual pensions (the provision of this other data is voluntary for all other countries). They also have a mandatory requirement to give a breakdown of new pension expenditures for private occupational and private individual pensions. These requirements make it possible to increase the transparency of private pension taxation and check its consistency.

Categories of pension expenditure

EU Member States generally have a variety of pension schemes in place (e.g. for employees in different sectors). The parameters across systems might differ, and the share of population covered by each system might change over time. To address these issues, Member States should fill in the questionnaire for each scheme separately where possible, in addition to the questionnaire that they fill in on aggregated public pension expenditure.

Public schemes and other non-occupational public pensions

Definition: Public schemes and other public pensions are the schemes that are statutory and that the general government sector administers ([42]).

Clarification: The aim is to cover those pension schemes that affect public finances, in other words schemes that are considered to belong to the general government sector in the national accounts system. Usually, there is a specific or general social-security contribution to the scheme, which is defined as part of total taxes in the national accounting system. However, the scheme can also be financed, either partially or fully, by general taxes. Thus, ultimately, the government bears the financial cost and risk attached to the scheme. The pensions provided by the social-security schemes can be either earnings-related, flat rate, or means-tested. In addition, this category should cover pensions that are paid directly by the government budget or other public-sector entity without forming a specific scheme for special pensions for public sector and defence employees. Cash benefits equivalent to pensions, notably social assistance to older, retired people should be included in this category.

On the boundaries between public and occupational pensions – and the identification of pension schemes within these categories – see Annex 5.

The statutorily funded part of old-age pension schemes that are attached to notional defined contribution schemes in some countries should be excluded from public schemes and included in the private-sector schemes in accordance with the Eurostat decision on the matter ([43]).

Occupational private pensions

Definition: Pensions provided by occupational schemes are those that, rather than being statutory by law, are linked to an employment relationship with the scheme provider. They are based on contractual agreements between employers and employees, either at the company or sector/industry level. Private pension funds, insurance companies, or the sponsoring companies themselves run the schemes.

([42]) In line with Eurostat (2004): "If a government unit is responsible for the management of a defined-contribution funded scheme for which no government guarantee exists for the risks of defaulting payments covering the majority of the participants, the scheme is not treated in the national accounts as a social security scheme in the government sector. In such schemes, the schemes are not financed by the government nor does the government define the level of pensions to be paid (the members have a say in how much they contribute and how their contributions are invested). Thus, the contributions and payments in respect of such schemes have no impact on the EDP deficit, as they are stripped out of general government revenue and general government expenditure, respectively."
Moreover, the same source, with regards to funded schemes, underlines the following: "In recent years, some countries have set up defined-contributions funded pension schemes (or identifiable as such – see below) where a government imposes or encourages participation, collects contributions from employers and pays pension benefits to households, fixes the level of contributions and maybe change the rules, but where it is explicitly stated that pension benefits will predominantly depend on accumulated assets. Under these conditions, it seems that all ESA95 criteria for classifying such schemes as social security schemes are not fulfilled, as government is not fixing the level of the pension benefit and it is difficult to consider that it is 'financing' the scheme."
Further information can be found in Eurostat (2004). 'Classification of funded pension schemes and impact on government finance', Economy and finance collection: Methodologies and working papers, Luxemburg.

([43]) Classification of funded pension schemes in case of government responsibility and guarantee, Eurostat 30/2004, 2 March 2004.

Clarification: These schemes can be quasi-mandatory in the sense that, based on a nation- or industry-wide bargaining agreement, the employers are obliged to provide a private occupational pension scheme to their employees. However, the participation of an individual remains voluntary. Private occupational schemes can be equivalent to statutory, earnings-related pension schemes or complementary to them. In particular, it is important to include in the projections the schemes that play a role equivalent to social-security schemes in pension provision. The AWG agreed that, for the projection of private pensions in the 2021 Ageing Report, the real rate of return on private funded pensions should reflect the real interest-rate assumptions (see Chapter 4 in Part 1).

Private individual pensions

For the most part, private individual pension schemes are non-mandatory, but they can also be mandatory. The insured persons have ownership of the pension assets. This means that the owner enjoys the rewards and bears the risks regarding the value of the assets. The insurance contract specifies a schedule of contribution in exchange for which benefits will be paid when the members reach a specific retirement age. The scheme provider administers the scheme by managing the pension assets through a separate account on behalf of its members. Access to such a scheme does not require an employment relationship, even though in some cases the contribution may be set based on a wage amount.

Mandatory private individual pensions

Definition: Mandatory private pension schemes are similar to public schemes. Transactions occur between the individual and the insurance provider. Transactions are not recorded as government revenues or government expenditure and, therefore, do not have an impact on the government balance. Pension expenditure projections should cover the individual schemes that switch – at least in part – either voluntarily or statutorily (especially for new labour market entrants) – from the current social security scheme to private funds. Such schemes have an increasing relevance in a number of countries.

Clarification: In some cases, there are government guarantees to these pension schemes. Nevertheless, such a guarantee is a contingent liability by nature, and these liabilities are not considered as economic transactions until they materialise. Thus, the cited Eurostat decision further specifies that a government guarantee is not an adequate condition to classify such schemes as social security schemes.

Non-mandatory individual private pensions

Definition: Non-mandatory private pensions are based on individual insurance contracts between the individual and the private pension scheme provider, usually an insurance company or a pension fund. They include pension schemes for which membership is not required by law and is independent of any employment link (even if members are mostly employed people). However, in some cases employers or the State may contribute to the plan. Such schemes may also be joined through membership of an association.

Clarification: The main difficulty in analysing individual provision stems from the fact that it is difficult to distinguish among different types of savings those that are clearly for retirement purposes. Part of the savings that are not specifically labelled as pension savings may be used for retirement purposes, whereas part of the savings collected by retirement schemes may – depending on national rules – in fact be used for purposes other than providing periodic retirement income (such as one-off lump-sum benefits or early withdrawal options). The extent to which these schemes are used for retirement savings depends in particular on the conditions attached to them. For example, the conditions could include: (i) tax incentives linked to the condition that the bulk of such savings must be used for a regular income (annuity) rather than for paying out a lump sum; or (ii) the minimum age at which a person can access his or her savings. In some cases, pension instruments are used as investment vehicles with noticeable tax advantages, for instance when a number of years of participation in the plan are required to benefit from a lower tax rate.

Breakdown of public pensions

Gross public pensions are split into four different categories: (i) old-age and early pensions; (ii) disability pensions; (iii) survivors' pensions (earnings-related); and (iv) other pensions (earnings-related). The sum of the different subcategories should be equal to the overall projected number of gross public pension expenditures.

Old-age and early pensions

Old-age and early pensions include both earnings-related and non-earnings-related pensions. Earnings-related pensions reflect all those pensions for which entitlements are dependent on personal earnings/contributions to the old-age and early pension scheme. Non-earnings-related pensions are often social-assistance benefits financed by taxes that nevertheless match the definition of pension expenditure.

Three sub-categories of old-age and early pensions are considered: basic pensions, earnings-related pensions, and non-contributory minimum pensions.

- Basic pensions (flat component) are reported separately from other earnings-related supplementary public pensions for those countries where the concept of a flat pension component exists. These represent pension benefits in flat amounts allocated to beneficiaries meeting certain requirements, for instance a minimum number of contributory years. For some countries (i.e. DK, IE, NL), the flat component is non-contributory with residency being the qualifying condition. In such cases, the expenditure should be included in the old-age pension expenditure but projected separately from the earnings-related component.

- Earnings-related pensions other than basic pensions concern all pensions for which entitlements depend on personal earnings/contributions to the old-age and early pension scheme. Earnings-related old-age and early pensions should be considered as a single pension category, given that in many countries a proper distinction between the two cannot be made (this is either because early retirement is built into the old-age pension system, or because the standard retirement age varies between gender and will increase or become more flexible with time). Early pensions should include – in addition to genuine (actuarial) early retirement schemes – other early retirement schemes that are not disability pensions and are granted, primarily on the basis of reduced work capacity or labour-market reasons, to a specified (age or work) group at an age below the statutory retirement age. This category also includes minimum pensions that are contributory-based.

- Non-contributory minimum pensions and minimum income guarantees are reported. The variable 'minimum pensions (non-contributory, i.e. minimum income guarantees for retired people)' in the reporting framework includes all pension expenditures for which entitlements are not dependent on contribution requirements, e.g. means-tested minimum pensions. In line with the general definition of pension expenditure, social assistance (if it is equivalent to a minimum pension and targeted to people aged over the early retirement age, e.g. 60) must be included in the projections through this variable. If a non-contributory benefit is granted because of disability or other reasons, this benefit should be included under 'Disability pensions' or 'Other pensions'.

Disability pensions

Expenditure related to disability should be reported separately, although without making a distinction between earnings- and non-earnings-related disability pensions. Some countries consider disability pensions (benefits) as part of their sickness insurance scheme, while in others they belong to the pension scheme ([44]). While in some countries the pension classification remains unchanged between the time it is first granted and the moment payments end, in most countries an early disability pension is transformed into an old-

([44]) In general, disability pensions as defined above should be covered by the pension projections, even though some countries consider them as part of their sickness insurance scheme. If countries wish to keep disability pensions as part of health expenditures, it should be clarified in the peer-review process that those expenditures are indeed covered by one of the two projections.

age pension once the beneficiary reaches the standard old-age retirement age.

These issues and assumptions on disability rates should be made clear during the peer-review process. Take-up ratios of disability pensions are supposed to stay broadly constant over time if there are no reforms affecting retirement ages, although a small decreasing variation may occur due to cohort effects.

In line with the agreements on the long-term care and healthcare projection methodologies (see Chapters 2 and 3 in Part II), two categories of expenditure must be considered as long-term care expenditure: (i) care allowances (benefits paid to disabled people who need frequent or constant assistance to help them meet the extra costs of attendance); and (ii) expenditure on the economic integration of handicapped people (allowances paid to disabled people when they undertake work adapted to their condition, normally in a sheltered workshop, or when they undergo vocational training). These two categories of expenditure should not be included when calculating disability pensions.

Survivors' pensions

Survivors' pensions, without any age limit, must be included separately in the projections. These should include both earnings-related pensions and flat-rate or similar means-tested minimum pensions. The country fiche should provide a detailed description of the assumptions behind the projection of survivors' pension expenditure in terms of household composition, joint probability to survive, etc.

Other pensions

The category 'other' is used for pensions or social assistance with a similar purpose that do not fit under any of the above categories.

1.3.3. Benefit ratio and replacement rate at retirement

For a better understanding of projected expenditure, the following components of the reporting framework are key.

Benefit ratio

Definition: The benefit ratio is the average pension benefit (including all its components i.e. contributory and non-contributory) divided by an economy-wide average wage, as calculated by the Commission.

Clarification: Changes in the benefit ratio are crucial to analyse and understand the projection results, because they reflect the legal features of the pension framework as far as the rules for calculating and indexing the pension entitlement are concerned.

The benefit ratio captures several features at the same time. Firstly, it reflects the assumed increases in average pensions due to: (i) indexation rules; (ii) the maturation of the pension system; (iii) longer contribution periods; and (iv) changes in the pension formula. Secondly, it reflects the changes in average wages driven by the assumptions on labour-productivity growth rates. Thirdly, it captures the changes in the structure of the respective population groups, namely the share of pensioners and wage earners in each year of the projection exercise.

1.3.4. Gross average replacement rate at retirement

Definition: The gross average replacement rate at retirement is the ratio of the first average pension of those who retire in a given year over the average wage at retirement. The latter usually differs from the overall economy-wide average wage, unless a flat wage profile over the entire working career is assumed in the projection exercise.

As already underlined earlier, in order to ensure the consistency of the projected replacement at retirement, the series on the economy-wide average wage at retirement is included in the reporting framework. This wage series is the one to be used for projecting the replacement rate and the adopted assumptions will be part of the peer review.

Clarification: For public pension schemes, the gross average replacement rate (at retirement) reflects only earnings-related pensions, including the flat component if relevant. The gross average replacement rate at retirement for old-age

earnings-related pensions should equal the average new pension benefit (new earnings-related old-age and early pension expenditures divided by the number of new earnings-related old-age and early pensions) divided by the average wage at retirement, as reported in the pension questionnaire.

1.3.5. Disaggregation of pension expenditure into stocks and flows

New public earnings-related pensions

Definition: New pensions expenditure is to be calculated separately for those who retire in the considered year (males, females, total). The projected data concern only new entitlements, thus excluding disability benefits that are transformed into old-age benefits upon reaching retirement age.

Changes in the flows of pensions and pension expenditure over time should properly reflect the impact of recently legislated reforms on the functioning of pension systems. Therefore, the questionnaire includes a disaggregation of the projected annual flow of earnings-related old-age and early new pensions in its main drivers.

Clarification: Publicly provided earnings-related pension schemes can be subdivided into the following three broad types: DB, NDC, and PS. 16 of the 28 considered countries have DB schemes, 6 of them have NDC systems and 8 are PS schemes (see Table II.1.1) ([45]).

Table II.1.1: **Pension schemes across Member States**

Country	Type	Country	Type
BE	DB	LT	PS
BG	DB	LU	DB
CZ	DB	HU	DB
DK	Flat rate + DB	MT	Flat rate + DB
DE	PS	NL	Flat rate + DB
EE	PS	AT	DB
IE	Flat rate + DB	PL	NDC
EL(1)	Flat rate + DB + NDC	PT	DB
ES	DB	RO	PS
FR(2)	DB + PS	SI	DB
HR	PS	SK	PS
IT	NDC	FI	DB
CY	PS	SE	NDC
LV	NDC	NO	NDC

(1) The NDC is an auxiliary mandatory pension scheme; (2) PS refers to the complementary schemes AGIRC and ARRCO.
Source: European Commission, EPC.

New pension expenditures for DB and NDC systems can be disaggregated as follows:

$$P_{new} = \bar{C}_{new}\ \bar{A}_{new}\ \bar{P}\bar{E}_{new}\ \bar{N}_{new} \qquad [1.1]$$

With total spending on new pensions; $\bar{C}_{new}$ the average contributory period or years of service of new pensions; $\bar{A}_{new}$ the average accrual rate of the new pensions; $\overline{PE}_{new}$ the average pensionable earnings over the contributory period related to the new pensions; and $\bar{N}_{new}$ the number of new pensions (pensioners).

For some countries, an additional sustainability factor or adjustment factor might apply. In the case of DB systems, the accrual rate is predefined. For NDC systems, it is determined by the contribution rate to the notional accounts and the annuity factor.

For PS, the disaggregation along the lines defined for DB and NDC systems is either not possible (because, for example, pensionable earnings are not explicitly considered but rather accounted for through the pension-point accumulation) or not meaningful because of the inherent nature of a point system. For this reason, an alternative formula is used for the PS reporting block:

$$P_{new} = N_{new}\bar{P}_{new} = N_{new}\, v_T\, \overline{pp}_T \qquad [1.2]$$

Where total new pension expenditure P_{new} is the product of the number of new pensioners N_{new} and the average new pension benefit $\bar{P}_{new}$. The latter equals the pension point value at retirement v_T,

([45]) Counting twice France (once in the DB group and once in the PS group) and Greece (once in the DB group and once in the NDC group).

multiplied by the average number of accumulated pension points of new pensioners $\overline{pp}_T$. For some countries, an additional sustainability factor or adjustment factor might apply.

The average number of pension points ($\overline{pp}_T$) can be further disaggregated. Under some social-security regimes, pension points can be accrued in ways other than contributions, and those points can be considerable in terms of the final amount. Accordingly, it is relevant to have information on the time span needed to accumulate pension points, independently of how they were accrued, so the formula is:

$$\overline{pp}_T = \bar{C}_T \, \overline{pp}_t \qquad [1.3]$$

With $\bar{C}_T$ the average contributory period (actual and virtual) and $\overline{pp}_t$ the average yearly number of pension points (which can be interpreted as the effective accrual rate in the case of PS, i.e. the number of pension points at retirement over the contributory period).

The breakdown for PS thus shows strong similarities with that for DB and NDC systems (e.g. contributory periods and accrual rates exist in all three). This makes it possible to assess the effects of a broad range of possible systemic reforms.

To cater for the way DB, NDC and PS schemes operate, there are three different versions of the block collecting data on *Breakdown of new pension expenditure – public pensions, earnings-related* (see Table II.A4.2 – Table II.A4.4 in Annex 4). Reporting lines under the three blocks to some extent correspond to each other, but they also contain scheme-specific elements. To assure the sustainability of their pension systems, several Member States introduced automatic balancing mechanisms that are referred to as 'sustainability/adjustment factors' in the questionnaire. The specific way these factors apply needs to be taken into account when dealing with new projections for pension expenditure.

If the old-age pension includes a flat component or a basic pension (contributory or non-contributory), the relevant subcomponents need to be projected separately: for males, females and total (see Table II.A4.2 – Table II.A4.4 in Annex 4).

Because not all the new pensioners will retire on 1 January, new pension benefits are calculated as monthly averages. To be consistent with the data on total expenditure on new pensions (reporting lines 15, 17 and 19 in the reporting sheet – Annex 4 Table II.A4.1), and to allow for a check of the reported data, countries are asked to provide the average number of months of pension paid the first year. If there is no specific constraint due to legislation, the new pensioners are spread over the year according to some distribution. If a symmetrical distribution over the year is assumed (or empirically fitted the data), the average number of months of pension paid the first year turns out to be six. If the distribution is asymmetrical, the average should be calculated according to the assumed distribution. If there is a single retirement date fixed by law, the average number of months of pension paid the first year will be the difference with the end of the year. If more than one retirement date is fixed by law, the average number of months of pension paid the first year should be calculated as an average of the remaining months, weighted by the number of people that retire on each specific date.

An alternative use of the data on new public earnings-related pensions is to analyse the development and internal consistency of the stock of old pensions (those already existing at the beginning of the year to be calculated as the difference between the total and the 'new' pensions in the reporting sheet). At every point in time *t*, the projection of average pension expenditure related to 'old pensions' must be close to the value of the average pension expenditure in *t-1* indexed by the rule applied in each country and scheme, and thus:

$$\frac{(P_{t-1} / N_{t-1})(1+e)}{P_t^{old} / N_t^{old}} \gg 1 \qquad [1.6]$$

where:

P_{t-1} is the projection of total public earnings-related pensions expenditure (including the flat component) in year *t-1*;

N_{t-1} is the number of pensioners entitled to a public earnings-related pension in year *t-1*;

(1+ε) is the pension indexation rule applied in each country and scheme;

P_t^{old} is the projection of the 'old' pensions expenditure at time *t* (total public earnings-related pensions expenditure minus the expenditure related to 'new' public earnings-related pensions);

and N_t^{old} is the number of old pensioners in year *t*. It can be calculated as the difference between total pensioners entitled to a public earnings-related pension minus the new pensioners in the same typology of pension as reported in the last block of the reporting sheet.

Such an indicator is expected to take a value close to 1 if projections are internally consistent and the distribution of the retired people has not been selected by mortality ([46]).

1.3.6. Additional information on number of pensioners, contributors and contributions, and applied indexation

The number of pensions

The number of pensions reflects the number of cases in which a pension is paid to an individual. Each type of pension should be considered separately (earnings-related old-age and early pensions, minimum pensions, disability pensions, survivors' pensions, other public pensions, private occupational pensions and private individual mandatory/non-mandatory pensions). To ensure the consistency of the exercise, the reporting of the number of pensioners and pensions should include pensions paid overseas.

The number of all pensions and public pensions must be reported by age groups. This breakdown, which is mandatory for the public scheme, increases transparency and consistency between population, labour force and pension projections.

The number of pensioners

The number of pensioners in each of the pension schemes should be reported separately, allowing for the fact that the same person may be a recipient of several types of pensions (for instance, a social-security pension and a private mandatory pension). Thus, the detailed lines should reflect the number of recipients of the specific pension. However, the figures on summary lines, in particular the number of all (public) pensioners, are not likely to match with the sum of the subtotals. Ideally, the total number of pensioners (line 108) should be the number of persons who receive pension benefits, but calculated only once for those receiving multiple pensions. If an exact figure is not available, an estimate is preferred instead of simply summing up. If such a rule is applied, a minimum requirement of the projections is that the number of pensioners does not exceed the number of pensions.

In the projections, the ratio between pensions and pensioners should be held constant if there is no reform affecting the pension take-up ratio or any process of merging/closing of pension schemes. Any departure from this hypothesis should be documented and will be part of the peer-review process.

The overall number of pensioners by age group should be consistent with agreed labour force figures. The share of pensioners in each age group should be below – but very close to – the number of inactive people in the same group.

A breakdown of pensioners by age and sex must be provided by Member States for public pensions (and a similar breakdown can be provided on a voluntary basis for all pensions). This breakdown is needed to increase transparency and consistency between projections for population, labour force and pensioner numbers. In particular, this breakdown will make it possible to carry out a consistency check between gender-specific labour-force participation rates and gender-specific data on the number of pensioners. Some form of correlation should be evident, once mortality rates have been taken into account, between today's participation rates and pensioners projected 30-40 years in the future. This data should be particularly interesting when analysing the effects of reforms on the effective retirement age. In addition,

([46]) If the assumption of orthogonality between mortality and pension distribution is removed, we are left with the empirical evidence that mortality rates are higher for older people, and that these people receive, on average, smaller pensions. This will result in P_t^{old} / N_t^{old} being larger than P_{t-1} / N_{t-1}. In terms of the proposed indicator, a value smaller than (but still close to) 1 is to be expected.

comparing the overall number of pensioners with the size of the inactive/total population for different age groups might result in further insights.

The availability of data on pensioners (or pensions as a second best) is particularly relevant when disaggregating the pension expenditure-to-GDP ratio. In particular, this data allows for the calculation of the coverage ratio.

The coverage ratio is defined as the number of pensioners of all ages to the number of people aged 65 or older. The analysis of the coverage ratio provides information about how the developments of the effective exit age and the percentage of population covered by a pension scheme have an impact on pension spending. The coverage ratio should also be disaggregated by age group and calculated in relation to the inactive population (to check for consistency with the labour force projections).

Contributions to pension schemes

Contributions to pension schemes paid by both employers and employees – as well any legislated contribution by the state or other revenue sources (e.g. nuisance charges, people transferring rights and savings from private schemes to the public scheme) – provide information on whether or not there is a potential future financial gap in the pension system to be closed by state contributions. If the pension contribution is part of a broader social-security contribution rate, an estimate should be provided, if possible, for the share of the pension contribution, e.g. based on the most recent expenditure structure. If general tax revenues are used to finance pensions, no estimate should be provided here. Total contributions should be provided, as well as employers', employees' and state contributions individually.

It is relevant to include estimates of pension contributions (in millions of euro) to: (i) public schemes; (ii) private occupational schemes; and (iii) private individual mandatory/non-mandatory schemes. It is especially relevant to include these if statutory contributions are divided between a public scheme and a private pension scheme. The sum of contributions to public, private occupational, and private individual pension schemes provides the number of total pension contributions.

Number of contributors

As is the case with the number of pensioners, the number of contributors to each type of pension should be considered separately, allowing for the fact that the same person may be a contributor to several schemes. This is the case, for instance, for pension systems in which part of a public scheme is switched to a private (mandatory) pension scheme. However, the line of total pension contributors should count contributors only once if the person contributes to more than one scheme at the same time. Thus, the number of contributors should be close to the number of employed persons or the working-age population as projected by the Commission and the AWG.

The number of contributors should correspond to an estimate of the number of persons covered by pension schemes without regard to the amount of the contribution. Thus, a contributor in a short-term contract should count as a contributor based on a permanent (full-time) contract. However, in practice, a contributor in a short-term contract may appear as a contributor several times during a year, and it may not be possible to disentangle the number of contributors during a year from the number of contribution periods. Therefore, a better proxy for the number of persons covered by pension schemes should be the number of contributors at a given point in time, e.g. at the end of the year.

Applied indexation

These variables concern a simple recording of the indexation factor used for projecting gross pension expenditure. The following must be provided: indexation effectively applied to earnings-related public pensions, indexation applied to the flat components of old-age pensions, and indexation applied to minimum pensions. This reporting is particularly relevant for pension components, for which the effectively assumed future indexation differs from the legally stipulated mechanism.

Of particular concern is the indexation factor that is applied to minimum pensions and the interpretation of the AWG's standard no-policy-change assumption in this regard. Past experience

shows that the no-policy-change assumption was not always fully applied with respect to the treatment of non-earnings-related minimum pensions and was interpreted in different ways by Member States. When a lower-than-wage indexation rule (e.g. a pure price indexation or a Swiss rule) also applies to minimum pensions/minimum income guarantees according to legislation, the expenditure on that specific part of the pension scheme is projected to shrink rapidly over time. Past practice across Member States with regard to the application of such an ungenerous indexation rule to the minimum pension has shown that those mechanisms resulted in several ad hoc interventions beyond the legal indexation. This occurred in order to re-align minimum pension benefits to the up-to-date standard of living, which, ultimately, is the main objective of providing a minimum pension scheme.

During the 2018 projection round, a common methodology for the indexation of non-contributory minimum pensions was therefore agreed, to ensure that the projections reflect the 'safety net' role minimum pension schemes play. This was done by assuming adjustment in line with average wage developments. In practice, all Member States should apply full wage indexation after a maximum of 10 years. This concerns all Member States with below-wage indexation (pure price indexation, partial wage indexation, indexation to GDP, no fixed rule).

2. HEALTHCARE

One of the components of public age-related expenditure, spending on healthcare, in the EU is high and continues to rise. This makes public spending on healthcare an integral part of the debates on the long-term sustainability of public finances.

This chapter presents a number of scenarios to project public expenditure on healthcare in the 27 Member States of the EU and Norway up to 2070. The general methodology is explained below.

2.1. OVERVIEW OF THE PROJECTION METHODOLOGY

The Commission (DG ECFIN) simulation model will be used to project public health expenditure, as outlined in the 2018 Ageing Report.

This simulation model assumes that the whole population is divided into groups which are assigned certain characteristics (e.g. age, sex, per capita expenditure, health status, etc.) ([47]). Changes in these groups lead to expenditure changes over time. These types of models are widely used when running long-term expenditure projections, especially when the precise micro information on the individuals and their transition rates from one health status to another is missing or unreliable.

The choice of methodology and various scenarios is constrained by the availability, accessibility and quality of healthcare data. Therefore, the model may not include all the relevant factors identified as affecting healthcare spending.

In general, the long-term budgetary projections and certainly the base-case scenario illustrate a policy-neutral situation. This is the situation where future possible changes in government policy are not considered. In other words, any potential future institutional or legal changes to the financing and organisation of healthcare systems are not reflected in the methodology used for projecting expenditure. Such institutional and legal changes would include for example changes in the degree of regulation of markets for pharmaceuticals or the introduction of referral systems. Instead, the only changes modelled in these projections are those deemed automatic and adequate responses to new needs resulting directly from changes in population structure, health status or income. Therefore, the determinants of expenditure considered in the projections can be seen as mostly independent of government activity or public policy.

The general methodology used to project public expenditure on healthcare is the following (See Graph II.2.1):

Step 1: take baseline population projection (i.e. number of individuals) by age and sex provided by Eurostat for each year up to 2070;

Step 2: take age/sex specific public expenditure per capita on healthcare i.e. the age/sex specific expenditure profiles provided by Member States;

Step 3: calculate age/sex expenditure profiles for each projection year up to 2070 based on various assumptions i.e. the projection scenarios;

Step 4: for each projection year, multiply the projected number of people in each age/sex group by the respective age/sex expenditure profiles;

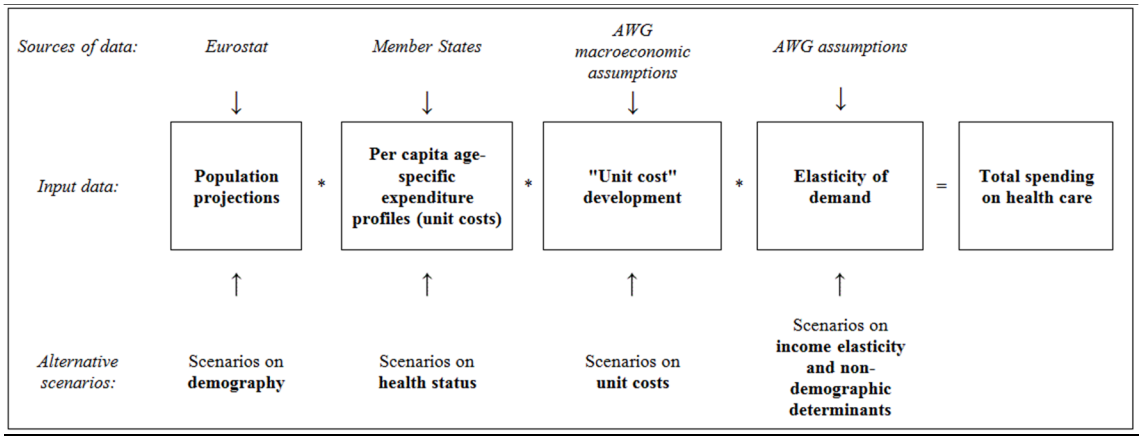
Step 5: for each projection year, sum all the groups' expenditure to obtain the total projected public expenditure on healthcare.

There are three important aspects of the projection exercise to be stressed.

First, the analysis assumes that the determinants of public expenditure on healthcare, such as government health policy and actions by any individual participant in the health market stay constant. This means that changes in the way health systems are financed and organised are not modelled. The adjustments observed relate to healthcare provision adjusting automatically to needs resulting from changes in population structure and health status, and changes in income. It is assumed that such changes force an automatic change in the amount of goods and services provided to the population by the publicly financed

([47]) For the most recent projections, see: "The 2018 Ageing Report Economic and budgetary projections for the 28 EU Member States (2016-2070)", European Economy, No 079, 5/2018.

Graph II.2.1: **Schematic presentation of the projection methodology**



Source: European Commission.

health system. As such, most scenarios should be considered as "no-policy change" scenarios ([48]).

Second, many of the determinants of expenditure described in the next section, notably supply side determinants of spending are either not quantifiable or depend on ad-hoc policy decisions. This is why the methodology used in the previous 2018 EPC-EC Ageing Report to project public healthcare expenditure and used again here reflects mainly demand-side factors such as demographic structure, income and health status of the population. That said, a regression analysis attempts to quantify the impact of non-demographic factors such as technology and institutional settings, while controlling for income and the demographic structure of the population.

Third, the analysis tries to identify the impact of each quantifiable determinant separately based on hypothetical assumptions (estimated guess or a "what if" scenario). Therefore, the results of the projections should not be interpreted as forecasts of expenditure.

The proposed methodology for the coming projection exercise builds on the 2018 EPC-EC projections exercise and maintains the existing scenarios and sensitivity tests. The schematic methodology to project healthcare expenditure is presented in Graph II.2.1above.

As in 2018, the projections on healthcare need to be viewed in the context of the overall projection exercise. Therefore, the common elements of all scenarios will be the 2019-based population projections provided by Eurostat and the baseline assumptions on labour force and macroeconomic variables agreed by the EC and the AWG-EPC. The age and sex-specific per capita public expenditure on healthcare profiles are provided by Member States. They are applied to the population projections provided by Eurostat to calculate nominal spending on healthcare. In a further step, the age profiles applied to the population structure are adjusted to add up to the total expenditure on healthcare in the specific year of reference ([49]). It was agreed for previous exercises to do this adjustment by keeping the base year proportions between specific age cohorts constant while adjusting the total (calculated as sum of per capita weighted by population in each cohort) to correspond to the aggregate figure as reported to the international databases and confirmed by the AWG delegates in the healthcare questionnaire.

To reflect the effects of the different determinants on public expenditure on healthcare, changes are made to three main inputs: 1) the population projections; 2) the age-related expenditure profiles

([48]) Only the "*EU27 cost convergence scenario*" can be considered as a policy change scenario for the countries with below the EU average public spending on healthcare in the base year.

([49]) Total headline data on total expenditure may differ from the figures resulting from the combination of age profiles with underlying population. Discrepancies between the two measures on health expenditure can result from differences in their computation. While total expenditure is calculated from aggregate budgetary perspective, cost per capita is in many countries estimated on the basis of hospital inpatient data, in most countries based on the diagnosis-related groups.

(capturing unit costs); and 3) assumptions on the development of unit costs over time driven by the macroeconomic variables or assumptions on health status for example. As in the 2018 projections exercise, the list of determinants to be modelled is not exhaustive. The different scenarios are summarised in Table II.2.1. and explained in the next section.

Country-specific information regarding any relevant recent reforms legislated and/or implemented that could have an impact on public healthcare expenditure (e.g. binding spending ceilings, etc.) will be taken into account in the current projections, according to technical feasibility. Information on legislated policy reforms and their quantification ([50]), both increases and reductions, are provided by Member States. The annual percentage reduction / increase is deducted from / added to the level of spending, effectively changing the level of total healthcare spending. Further, the age-cost profiles are adjusted proportionally to the change in the level of spending in the base year.

2.2. DIFFERENT SCENARIOS FOR PROJECTING PUBLIC HEALTHCARE EXPENDITURE

The purpose of the healthcare systems is to "improve the health of the population they serve; respond to people's expectations and provide financial protection against the costs of ill-health"([51]). In the seminal WHO report from 2000 ([52]), health systems are attributed four vital functions: 1) service provision i.e. the delivery of personal and non-personal health services; 2) financing i.e. the revenue collection, the pooling of funds (insurance function) and purchasing of services (the process by which pooled funds are paid to providers in order to deliver the health interventions to care users); 3) resource creation i.e. investment in equipment, buildings and people (training); and 4) stewardship or oversight of all the functions i.e. the careful and responsible management of the health system.

([50]) Including COVID-19 measures in 2020 and 2021.
([51]) World Health Organization (2000), "Health Systems: Improving Performance", The World Health Report 2000, p.8.
([52]) Ibid.

In this context, public expenditure on healthcare depends on a number of factors that affect the demand and supply of health services and goods.

These include:

- the health status of the population;
- economic growth and development;
- new technologies and medical progress;
- the organisation and financing of the healthcare system; and
- healthcare resource inputs, both human and capital.

The long-term projection scenarios on public healthcare expenditure, described below, capture demand and supply-side factors, and include demographic and non-demographic variables ([53]).

2.2.1. Demographic scenario

The aim of a *"demographic scenario"* is to estimate in isolation the effect of an ageing population on future public expenditure on healthcare. It assumes that age/sex specific morbidity rates and provision structure of health treatments do not change over time. This, in turn, means that age/sex specific per capita public expenditure (on healthcare) profiles can be considered as proxies for the morbidity rates ([54]), remain constant in real terms over the whole projection period. It also assumes a gradual increase in life expectancy on the basis of underlying population projections. An increase in life expectancy and no changes in health status as compared to today's health status mean that all the gains in life expectancy are implicitly assumed to be spent in bad health. The number of years spent in good health remains constant. This is in line

([53]) See also Annex 9 for mathematical illustration of the healthcare scenarios.
([54]) Strictly speaking, age profiles of expenditure illustrate exclusively public healthcare spending per person of a given age cohort. As such, it is not a measure of health status or morbidity. However, given the lack of a reliable and comparable data on the latter, one can plausibly assume that the shape of the profile follows the evolution of health status over the lifespan, i.e., over time, we assume that the same segments of the curve (early childhood, old age and motherhood) follow the same pattern.

Table II.2.1: **Overview of scenarios to project healthcare expenditure**

	Demographic scenario	High life expectancy scenario	Healthy ageing scenario	Death-related costs scenario	Income elasticity scenario	EU27 cost convergence scenario	Labour intensity scenario	Sector-specific composite indexation scenario	Non-demographic determinants scenario	AWG reference scenario	AWG risk scenario
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Population projection	Eurostat 2019-based population projections	Alternative higher life expectancy scenario (**+2 years**)	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections	Eurostat 2019-based population projections
Age-related expenditure profiles	2019 profiles held constant over the projection period	2019 profiles held constant over the projection period	2019 profiles shift in line with changes in age-specific life expectancy	2019 profiles split into profiles of decedents and survivors and adjust in line with changes in age-specific life expectancy	2019 profiles held constant over the projection period	Individual country profiles converging upwards to the EU27 average profile over the projection period	2019 profiles held constant over the projection period	2019 profiles held constant over the projection period	2019 profiles held constant over the projection period	Intermediate scenarios I and III whereby 2019 profiles shift by half the change in age-specific life expectacy	Intermediate scenarios I and III whereby 2019 profiles shift by half the change in age-specific life expectacy
Unit cost development	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per hours worked	Input-specific indexation	GDP per capita	GDP per capita	GDP per capita
Elasticity of demand	1	1	1	1	Cost sensitivity of **1.1** in 2019 converging to 1 by 2070	1	1	1	Cost sensitivity of **1.5** in 2019 converging to 1 by 2070	Cost sensitivity of **1.1** in 2019 converging to 1 by 2070	Cost sensitivity of **1.5** in 2019 converging to 1 by 2070

Source: European Commission, EPC.

with the *expansion of morbidity* hypothesis, which suggests that falling mortality is largely due to a decreasing fatality rate

of diseases and is therefore accompanied by an increase in morbidity and disability.

To calculate future public expenditure on healthcare ([55]), the age/sex specific per capita public expenditure profiles are multiplied by the respective age/sex population group in each projection year. These age/sex groups change in line with the population projections up to 2070. This scenario also assumes that "unit costs" – i.e. the healthcare expenditure per capita for each year of age – evolves in line with GDP per capita. Such cost development applied to the baseline age/sex-specific per capita public expenditure profiles can be considered neutral in macroeconomic terms – if no change in the age structure of the population occurred, the share of public expenditure on healthcare to GDP would remain the same over the projection period.

([55]) The projected total public expenditure on healthcare do not include spending on LTC (health).

2.2.2. High life expectancy scenario

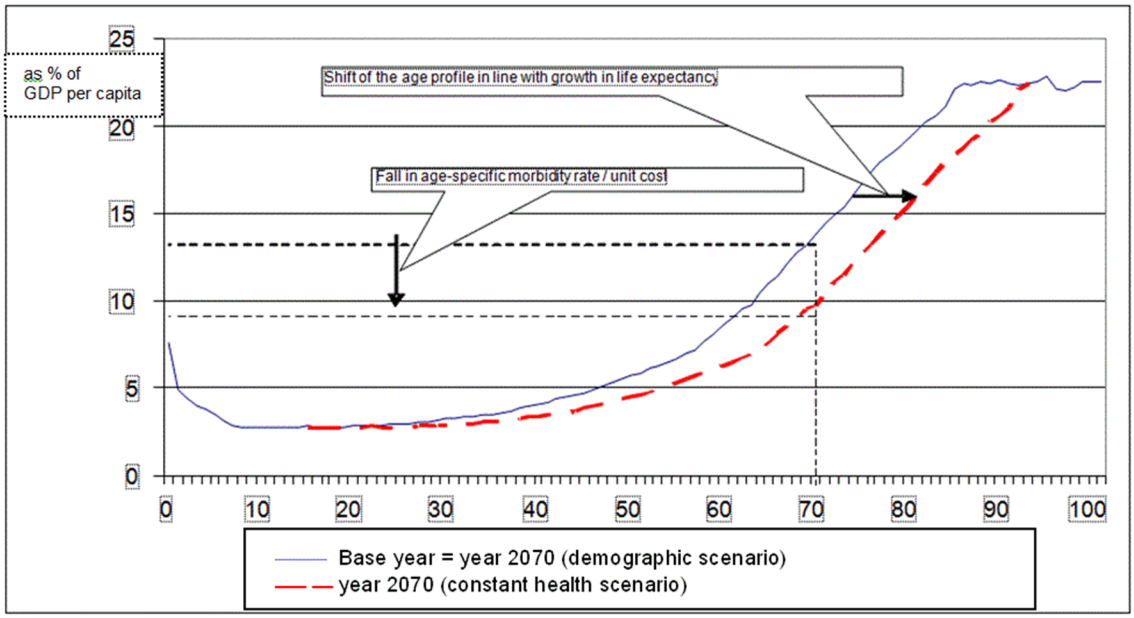
A variant of the demographic scenario is the "*high life expectancy scenario*". This is a sensitivity test to measure the impact of alternative assumptions on mortality rates. This scenario assumes, as in the sensitivity tests run for pension projections, that life expectancy at birth in 2070 exceeds the projected life expectancy used in the "*demographic scenario*" by two years. This scenario is methodologically identical to the "*demographic scenario*", but alternative demography and GDP data are used ([56]).

2.2.3. Healthy ageing scenario

The "*healthy ageing scenario*" is based on the *relative compression of morbidity* hypothesis. It mimics improving health status in line with declines in mortality rates and increasing life expectancy. It assumes that the number of years spent in bad health during a life time remains constant over the whole projection period. This means that all future gains in life expectancy are spent in good health. Consequently, the morbidity rate and therefore the age/sex specific per capita

([56]) Based on the approach applied to assess the sensitivity of pension spending, GDP data captures the life expectancy change through the impact of the latter on the labour force projections.

Graph II.2.2: **Stylised illustration of the constant healthy ageing scenario using age-profiles of healthcare costs**



Note: The healthy ageing scenario is identical with the constant health scenario from previous Ageing Reports.
Source: European Commission.

public expenditure profiles are declining with the mortality rate.

Under this scenario, the country specific age/sex per capita expenditure profiles are progressively shifted outwards, in line with increasing life expectancy ([57]). This "outward" shift is proportional to the projected gains in life expectancy. First, for each projection year the change in life expectancy in relation to the base year in calculated. For example, the life expectancy of a 50-year-old man is expected to increase by 4 years from 30 years in year *t* to 34 years in year *t+20* in a specific Member State. Then, the scenario assumes that in *t+20* a 50-year-old man will have a per capita public expenditure profile of a (50-4) = 46-year old man in year *t* (the latter adjusted as usual with the GDP per capita growth rate over the last 20 years).

In Graph II.2.2, the dotted line illustrates the new age-specific per capita public expenditure profile that would be applied in each projection year up to the year 2070. As in the "*demographic scenario*", each age and sex group in each projection year is multiplied by the modified age/sex specific per capita public expenditure profiles to calculate the future public expenditure on healthcare.

2.2.4. Death-related costs scenario

The "*death-related costs scenario*" employs an alternative method to project public expenditure on healthcare. The methodology links per capita public expenditure on healthcare to the number of remaining years of life. Indeed, there is empirical evidence that a large share of the total expenditure on healthcare during a person's life is concentrated in the final years of life ([58]). As life expectancy increases and mortality rates decline, a smaller share of each age cohort is in a terminal phase of life and mortality is concentrated in very old age cohorts. If more people die at very old ages there may be a reduction in public expenditure on healthcare because per capita public expenditure in very old ages does actually decrease.

In practical terms, for countries which provide the relevant data for running the model, it is proposed

([57]) The method is applied to those age/gender groups where expenditure per capita is growing. For the young and the oldest old, the reference age/gender and therefore age/gender per capita public expenditure profile remains the same over the whole projection period.

([58]) For an overview of empirical studies, see: Raitano M. (2006), "The Impact of Death-Related Costs on Health-Care Expenditure: A Survey", ENEPRI Research Report No 17.

to use an average profile of *death-related costs by age ([59])*.

Next, the age/sex specific mortality rates are used as probabilities, to split each age group into two sub-groups according to the number of remaining years of life: 1) that of decedents, i.e. those who are expected to die within a certain number of years, and 2) that of survivors, i.e. those who are not expected to die within those number of years.

Each of the two sub-groups within each age/sex group is assigned a specific and different per capita public expenditure profile – the *death-related costs* profiles, ideally differentiating expenditure occurring a full year before for decedents versus survivors. The ratio between the health costs of survivors and decedents is called the k-ratio.

Then the number of individuals in each subgroup of decedents and survivors is multiplied by its respective per capita public expenditure profile. This gives the total public expenditure of each age group in each year.

Summing total expenditure of each age group in a given year corresponds to the total public expenditure on healthcare in that year.

Note that the death-related costs profiles are as usual indexed to GDP per capita growth as in the previous scenarios.

As in the 2018 EPC/EC Ageing Report, the k-ratio is projected according to a cohort approach. This allows capturing changes in perceived healthcare needs and therefore treatment expectations of the very old as life expectancy increases.

The k-ratio decreases in the older ages, where the probabilities of death increase dramatically. This is because normal and death-related costs have different correlations with age. In particular, while the former are likely to increase along with age because of the progressive worsening of health status, the latter are likely to follow an opposite path insofar as the event of death, for elderly people, is not as costly as for younger people. Such results are confirmed by empirical evidence from a number of studies ([60]).

Therefore, the k-ratio cost profile varies over time, as longevity increases. Essentially, this means that it is the distance to time period before death rather than age per se which influences the k-ratio for people of a specific age/sex group.

Maintaining the relationship between the k-ratio and life expectancy unchanged, as observed in the base year (cross-sectional analysis), implies that the age profile of the k-ratio moves over time according to changes in longevity (intertemporal analysis).

2.2.5. Income elasticity scenario

The *"income elasticity scenario"* attempts to capture the effect of changes in national income on demand for healthcare goods and services. This effect is the result of a number of factors: higher living standards, the fulfilment of the basic needs and therefore growing expectations and social pressure to catch-up with the healthcare quality, and the coverage provided in richer neighbouring countries ([61]).

To calculate the possible effect of income, different levels of income elasticities to the basic GDP per capita evolution path can be used. More specifically, this scenario shows the effect of an income elasticity of demand higher than 1, i.e. ε = 1.1 ([62]), on the evolution of public expenditure on healthcare. An income elasticity exceeding 1 indicates that healthcare is considered by society as a 'luxury good'. An elasticity of 1.1 at the beginning of the period is chosen based on existing

([59]) Ideally, the death-related cost profiles should exclude expenditure on LTC (health). However, not all countries providing death-related cost profiles can separate the expenditure on LTC (health), when compiling them.

([60]) Aprile, R. (2013); Gabriele et al. (2005); Lubitz and Riley (1993); Van Vliet and Lamers (1998); Madsen (2004); Raitano (2006).

([61]) The demand for higher quality care may translate into demand for the most modern medical knowledge and technologies. In this context the impact of income could to a certain extent capture the impact of technology. The impact of technological development is assessed in a separate scenario, using econometric analysis of past trends in public expenditure on healthcare, demographic, income and non-income variables.

([62]) Recent studies show that the income elasticity of health services in advance economies is lower than 1. However, the EPC-AWG decided to keep the income elasticity scenario with income elasticity of 1.1 to keep comparability with the previous report and to allow for comparability with the non-demographic indexation used in the “AWG reference scenario”.

reviews of empirical evidence gathered over the recent decades ([63]). It is also assumed that economic growth and the process of real convergence between countries over the long run will drive elasticity down towards common unity level, by 2070 ([64]).

This scenario is identical to the "*demographic scenario"* except that the income elasticity of demand is set equal to 1.1 in the base year (rather than 1 in the case of the *"demographic scenario"*), converging in a linear manner to 1 by the end of projection horizon in 2070.

2.2.6. EU27 cost convergence scenario

The "*EU27 cost convergence scenario*" is a policy change scenario meant to capture the possible effect of an upward convergence in real living standards (which emerges from the macroeconomic assumptions) on healthcare spending. In other words, this scenario proposes to take into account the convergence of citizens' expectations towards a similar basket of health goods.

This scenario considers the convergence of all countries that are below the EU27 average in terms of percent of GDP per capita health expenditure to that average. This is illustrated as follows: the relative age/sex per capita public expenditure profiles below the corresponding (calculated) EU27 average age/sex per capita public expenditure in the base year are assumed to progressively increase to this EU27 average age/sex specific per capita public expenditure profile (as a percent of GDP per capita). The convergence is achieved by 2070. As a result, the convergence speed for all the countries below the EU27 average would take into account the differences in the initial situation, i.e. the extent of the initial gap between country-specific and EU27 average profile.

2.2.7. Labour intensity scenario

The "*labour intensity scenario*" is an attempt to estimate the evolution of public expenditure on healthcare taking into account that healthcare is and will remain a highly labour-intensive sector. Therefore, unit costs (and therefore the age/sex specific per capita public expenditure profiles) are assumed to evolve in line with changes in labour productivity, rather than growth in GDP per capita. This assumption implies that the cost of public provision of healthcare is supply-driven rather than demand-driven. In practical terms, the proposed scenario is similar to the "*demographic scenario*" except that unit costs are assumed to evolve in line with the evolution of GDP per hours worked (which is usually higher than GDP per capita) ([65]).

As wages are projected to grow in line with productivity and generally faster than GDP per capita, this scenario provides an insight into the effects of unit costs in the healthcare sector being driven mostly by increases in wages and salaries. Note that this scenario still assumes that wages in the health sector grow at the same rate as wages in the whole economy, and that wages in the whole economy generally follow the trend of economy-wide productivity. Therefore, expenditures per head are assumed to grow at the same rate as productivity in the whole economy.

2.2.8. Sector-specific composite indexation scenario

Given the special character of the healthcare sector (high level of government regulation, investment in new technologies, high labour intensity), it might be preferable to use sector-specific rather than economy-wide elements as determinants of unit costs in the model. While a significant share of public expenditure on health corresponds to expenditure on staff (wages), one could go further and consider other inputs and therefore sectoral components of public expenditure on healthcare. These components may have evolved at a pace different from that of wages. The "*sector-specific composite indexation scenario*" tries to capture the importance and evolution of various components to healthcare provision. This scenario looks at each of these different components separately and

([63]) See Getzen T. E. (2000), "Healthcare is an individual necessity and a national luxury: Applying multilevel decision models to the analysis of healthcare expenditures", Journal of Health Economics, Vol. 19(2), pp. 259-270.

([64]) This is also a common technical assumption in many long-run projection models, to avoid "explosive" path of some of the variables used in the exercise.

([65]) The 2009 "*labour intensity scenario*" used GDP per worker.

indexes each of them in a separate/different way, creating a sort of country-specific composite indexation for "unit cost development".

To capture the importance and evolution of various components, a set of such components is chosen and their respective share in public expenditure on healthcare is calculated. It is considered that expenditure on healthcare can be disaggregated in its different components, broadly reflecting the different sectors of the health system, including: 1) inpatient care; 2) outpatient care and ancillary services; 3) pharmaceuticals and therapeutic appliances; 4) preventive care; 5) governance and administration; and 6) capital investment ([66]). For each of these components the share in total public expenditure on healthcare is calculated and then applied to the age-specific per capita expenditure. In doing this, each age-specific per capita expenditure is divided (mechanically) into six sub-items of expenditure.

Next, the past evolution of public expenditure on each of those inputs is considered. In other words, the average annual growth of the expenditure associated with each of those components for the past 10 years is calculated. Further, the ratio of each of these growth rates to the GDP growth rate ([67]) is calculated.

Then each sub-item of the age-specific per capita expenditure by this growth ratio is multiplied. This allows for different evolution patterns for each component of expenditure so that in the future the share of each of these components is allowed to change, something which was not captured by previous scenarios. It is then assumed that the growth ratio multiplying each sub-item of expenditure converges to 1 in a certain year in the future (i.e. grows at the same pace as productivity or GDP) ([68]).

Due to high volatility in the relative growth rates for the sub-components on prevention, governance and administration, and capital formation, these items are excluded from the indexation. The relative growth rates of the other three components (hospitals, outpatient care and medical goods), as applied in previous Ageing Reports, are capped at their respective 25th and 75th percentiles.

2.2.9. Non-demographic determinants scenario

Since the second half of the 20th century, healthcare expenditure has been growing faster than income. Econometric studies show that demographic factors (e.g. ageing) have a positive but relatively minor impact on spending when compared with other drivers, such as income, technology, relative prices and institutional settings ([69]). In the 2018 EPC-EC Ageing Report, the non-demographic scenario for healthcare expenditure was projected to have a substantial impact, relatively to the AWG reference scenario, raising public health expenditure in the EU (over the 2016-70 period) by 1.4 pps of GDP in the EU27 compared with only 0.7 pps in the AWG reference scenario ([70]). By ignoring the effects due to non-ageing drivers, the AWG reference scenario implicitly assumes a substantial progressive downward tilt of past trends in healthcare spending, flattening out at the end of the period ([71]).

([66]) In the 2018 and current projection exercise, they are largely based on the SHA 2011 classification of healthcare functions (see Annex 5, Table II.A5.2).

([67]) In previous Ageing Reports, GDP per capita was used instead.

([68]) Let us assume that per capita public expenditure on healthcare for 20-year old men is €2000 in year t. Assume too, that in line with total public expenditure on healthcare, 40% is inpatient care, 30% outpatient care and ancillary services, 5% capital investment, 17% pharmaceuticals and therapeutic appliances, 3% preventive care, and 5% other inputs. Therefore, per capita public expenditure is divided into 6 sub-items: €800 in for inpatient care, €600 outpatient care and ancillary services, €100 capital investment, €340 in pharmaceuticals and therapeutic appliances, €60 preventive care and €100 in other inputs. Then in year t+1 we have that expenditure increases as follows (numbers are just illustrative): €800x1.2 + €600x1.1 + €100x1.4 + €340x1.3 + €60x1.1 + €100x1, where 1.2, 1.1, 1.4, 1.3, 1.1 and 1 are the (past observed) growth ratios of each component. As to the pattern of convergence, we can use past observations to determine the convergence pattern of the growth ratios.

([69]) Maisonneuve C. and Martins J.O. (2013), "A projection method of public health and long-term care expenditures", OECD Economic Department WP No 1048.

([70]) European Commission and Economic Policy Committee (2015), "The 2015 Ageing Report Economic and budgetary projections for the 28 EU Member States (2013-2060)", European Economy, No. 3/2015.

([71]) The reason for the convergence of the elasticity is that only a partial continuation of past trends related to non-demographic determinants in the future is expected. In the past, extensions of insurance to universal coverage of the population were an important trigger of increases in public health expenditures. As universal coverage is nearly reached in the EU, this one-time shock will not occur again in the future. Note that by "coverage" is not only meant coverage in terms of percentage of population covered, but

To address this critical aspect of past exercises and following analytical work carried out for the 2009 Ageing Report ([72]) and for the 2012 Ageing Report ([73]), this scenario reassesses the impact of non-demographic factors (NDF) (e.g. technology, relative prices) on healthcare expenditure. It uses the *residual approach* to identify the impact of NDF on healthcare spending. In practice, the effect of demographic changes is subtracted from the total increase in expenditure and the remaining part (i.e. the residual) is attributed to changes in NDF ([74]).

This scenario uses panel regression techniques to estimate country-specific non-demographic cost (NDC) of healthcare. NDC is defined as the excess of growth in real per-capita healthcare expenditure over the growth in real per-capita GDP after controlling for demographic composition effects. Alternatively, results can also be expressed in terms of country-specific "average" income elasticities of healthcare expenditure.

Panel regressions are run using data in growth rates ([75]) and assuming country fixed effects. Multiple model specifications were tried using the datasets, namely estimates including and excluding country-fixed effects and a period dummy.

On the implementation of the NDD scenario, and based on the technical work carried out by Commission, the AWG decided to use a common elasticity (h) of 1.5 ([76]) throughout the projection period, which will be reduced to 1 in 2070, following a non-linear path.

2.2.10. AWG reference scenario

The *"AWG reference scenario"* is used as the central scenario when calculating the overall budgetary impact of ageing. It is the point of reference for comparisons with the 2018 Ageing Report. In this scenario, healthcare expenditures are driven by the assumption that half of the future gains in life expectancy are spent in good health and an income elasticity of healthcare spending is converging linearly from 1.1 in 2019 to unity in 2070.

2.2.11. AWG risk scenario

The "*AWG risk scenario*", as the "AWG reference scenario", keeps the assumption that half of the future gains in life expectancy are spent in good health. That said, it attempts to take into account technological changes and institutional mechanisms which have stimulated expenditure growth in recent decades, following the same approach as described in the "non-demographic determinants scenario". A proxy for the non-demographic costs (NDC) with estimated EU average elasticity of 1.5, based on Commission research ([77]) and endorsed by the Ageing Working Group, is used in 2019, which then converges linearly to 1 until the end of the projection period ([78]). This elasticity is added to the effect of ageing as modelled in the "demographic scenario".

2.2.12. Other sensitivity scenarios

Alternative sensitivity tests are applied to the *"Demographic scenario", "AWG reference scenario" and "AWG risk scenario"* to show the effect of key demographic and macroeconomic

also in terms of the "depth" of the coverage, i.e. the size of the benefits basket and the coverage rates of benefits. However, data availability at the level of individual countries to correct for coverage effects is suboptimal.

([72]) Dybczak K. and Przywara B. (2010), "The role of technology in healthcare expenditure in the EU", European Economy, Economic Papers No 400.

([73]) Medeiros J. and Schwierz C. (2013), "Estimating the drivers and projecting long-term public health expenditure in the European Union: Baumol's 'cost disease' revisited", European Economy, Economic Papers No 507.

([74]) Ideally, in order to identify the impact of technology on healthcare expenditure, besides income one should also control for other non-demographic factors, such as the health status, relative prices, and institutional variables. Limitations on data coverage prevent us from using a broader set of regressors. However, in some specifications a proxy variable for relative prices of healthcare goods and services will also be used.

([75]) This avoids the difficult and largely unsettled issue in the literature regarding the co-integration of healthcare expenditure and income variables.

([76]) Corresponding to the weighted median of country-specific estimates.

([77]) Medeiros J. and Schwierz C. (2013), "Estimating the drivers and projecting long-term public health expenditure in the European Union: Baumol's 'cost disease' revisited", European Economy, Economic Papers No 507.

([78]) Ideally, in order to identify the impact of NDD on healthcare expenditure one should also control for other variables, such as the health status, relative prices, and institutional variables. However, limitations on data and methodological concerns prevent the use of a broader set of regressors.

assumptions on long-term public health expenditure projections. These alternative sensitivity tests are applied to all age-related items and are therefore described in Part I, Chapter 5.

3. LONG-TERM CARE

3.1. INTRODUCTION

This chapter presents several different scenarios and sensitivity tests designed to assess the potential impact of each of the determinants of long-term care expenditure on future public expenditure. These are broadly in line with those used for the 2018 Ageing Report.

3.2. OVERVIEW OF THE PROJECTION METHODOLOGY AND MODEL STRUCTURE

3.2.1. Methodology

As in previous projection exercises conducted jointly by the European Commission (EC) and the Ageing Working Group (AWG), the methodology to project long-term care expenditure is based on a simple macro-simulation model. This model is based on the assumption that the whole population is divided into groups that are assigned certain characteristics (e.g. age, gender, per capita expenditure, health status, need for care and type of care, etc.). When over time the (relative) size or features of these groups change, the long-term care expenditure changes in line with the change in those characteristics. These types of models are often used in long-term expenditure projections, in particular in cases where precise information at micro level on the individuals and their transition from one status to the next are not available or unreliable.

The choice for the methodology to be used and the various scenarios to be run is limited by the availability, accessibility and quality of long-term care data. For the projection exercise, System of Health Accounts (SHA) expenditure data are used where available – complemented with some proxies calculated on the basis of categories from the European System of Integrated Social Protection Statistics (ESSPROS) and supplemented by national data sources when necessary ([79]). Data on the number of recipients is however only available from national sources.

([79]) For dependency rates, EU-SILC data are used (EU-SILC: The European Statistics on Income and Living Conditions; see the Eurostat website at: http://epp.eurostat.ec.europa.eu/ortal/page/portal/microdata/eu_silc).

The approach aims to examine as many of the factors affecting future long-term care expenditure as is possible. At the same time, it is necessary to ensure the necessary data to run the projections is available for a large number of Member States. A schematic presentation of the projected methodology can be found in Graph II.3.1 below. Specifically, the methodology aims at analysing the impact of changes in the assumptions made about:

- the number of elderly people (through changes in the population projections used);
- the number of dependent elderly people([80]) (changes to the prevalence rates of dependency);
- the balance between formal and informal care provision (assuming a given shift in demand or exogenous changes in the availability of informal carers);
- the balance between home care and institutional care within the formal care system; and
- the unit costs of care per recipient.

The methodology allows projecting the future need for long-term services in terms of number of people who are assumed to need long-term care services. This is achieved by using dependency rates, to estimate the fraction of the elderly population that is dependent, i.e. with a severe disability requiring care.

Firstly, a projection is made of the dependent population, on the basis of the baseline population projection and dependency rates. Secondly, the dependent elderly population is split, by age and gender, following the type of care received (informal, formal in-kind at home, formal in-kind in institutions and cash benefits). Thirdly, average expenditure (i.e. age-sex profiles) is calculated for each type of care, and then multiplied by the projected number of recipients to obtain the projected public expenditure. More specifically, the necessary steps are:

([80]) Based on a proposal by Comas-Herrera et al. (2005).

Step 1: taking the baseline population projection (by age and gender), a projection is made of the dependent population, who are assumed to need some form of long-term care, and the non-dependent population who are assumed not to be in need of long-term care. This projection is made by taking age and gender-specific dependency rates at the value observed in the base year estimated using existing indicators of disability from comparable sources) and applying them to the baseline population projection. Dependency rates refer to the concept of dependency understood as difficulties in performing at least one activity of daily living (ADL) (Katz et al., 1963) ([81]) or at least one instrumental activities of daily living (IADL) (Lawton and Brody, 1969) ([82]).Long-term care is usually defined as a set of services required by people with a reduced degree of functional capacity (whether physical or cognitive) and who, because of this, are dependent for an extended period of time on help with these activities. EU-SILC data are used to obtain a proxy ([83]) of 'dependency' rates. For these dependency rates, an average over the last five years will be used, excluding data breaks.

The model has been set up so that the projected amount of dependent people (i.e. people with disability) will not decrease due to increasing life expectancy, by ensuring that the amount of dependent people in a five-year age class cannot be inferior to that in the preceding one. Note that the practical implications of this adjustment may be rather small.

Step 2: the projected dependent elderly population is split, by age and gender, into four groups depending on the type of care they receive, namely (1) informal care, which is assumed to have no impact on public spending, (2) formal care at home, (3) formal in-kind care in institutions (both of which impact on public spending but their unit costs may differ) and (4) cash benefits. The model implicitly assumes that all those receiving home care or institutional care have difficulties with one or more ADLs or IADLs, and that all persons deemed -dependent either receive informal care, home care, institutional care and cash benefits. The split by type of care received is performed by calculating the 'probability of receiving different types of long-term care by age and gender'. This is calculated for a base year using data on the numbers of people with dependency (projected in step 1), and the numbers of people receiving formal in-kind care at home and in institutions and cash benefits (provided by Member States). It is assumed that the difference between the total number of dependent people and the total number of people receiving formal care (at home or in institutions) is the number of people who rely exclusively on informal care.

Step 3: involves calculating average public spending for the three types of formal long-term care services: (i.e. 'age-sex profiles of expenditure') for a base year using data on total public expenditure in home care, institutional care and cash benefits and the numbers of people receiving in-kind care at home, in long-term care institutions and receiving cash benefits (provided by Member States). Two assumptions are required:

- current expenditure in services divided by the number of users equals the long-run unit costs of services;
- average expenditure per user increases with the age of the user ([84]), in contrast to the average expenditure per head of population.

Step 4: involves calculating public spending for the three care services, by multiplying the number of people receiving each type of care (at home, in institutions and receiving cash benefits) by the average age-specific public expenditure (respectively at home, in institutions and for cash

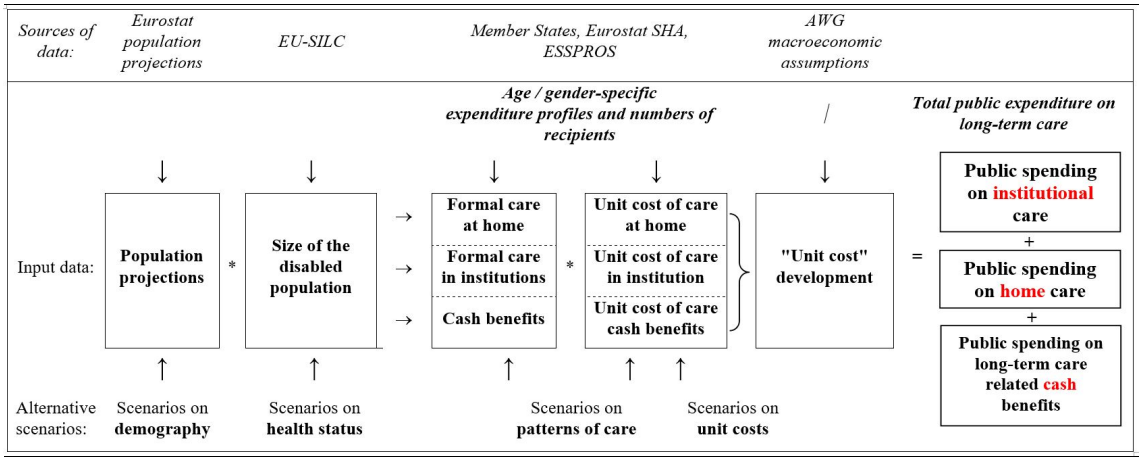
([81]) Activities of daily living (ADL) are the things people normally do in daily living including any daily activity they perform for self-care (such as feeding, bathing, dressing, grooming), work, homemaking and leisure (see: Webster's New World Medical Dictionary, Wiley Publishing, 2008). If a person has difficulty in performing at least one of them, he is considered as ADL-dependent.

([82]) IADL are shopping, laundry, vacuuming, cooking and performing housework, managing finances, using the telephone, etc.

([83]) Please note that this is a conservative proxy as EU-SILC is used to identify 'severe' disability and the AWG definition of long-term care is wider, encompassing people who have one IADL and whose level of disability is therefore relatively mild.

([84]) In practice, average expenditure (aged 15 and above), for each type of service, is disaggregated into average expenditure by age groups, by assuming the same rate of increase in spending by age as in the age-related expenditure profile. This is done for each care setting. The model uses average public expenditure in formal care to project future expenditure in both types of services.

Graph II.3.1: **Schematic presentation of the projection methodology / in-kind long-term care benefits**



(1) As in 2018, the projections need to be viewed in the context of the overall projection exercise. Consequently, the common elements of all scenarios will be the population projections provided by Eurostat and the baseline assumptions on labour force and macroeconomic variables agreed by the Commission and the AWG-EPC. The age and gender-specific per capita public expenditure (on long-term care) profiles are provided by Member States. They are applied to the demographic projections provided by Eurostat to calculate nominal spending on long-term care.
(2) This schematic representation shows the methodology for projecting long-term care benefits. Total public expenditure on long-term care is the sum of public expenditure on long-term care in-kind benefits plus public expenditure on long-term care in cash benefits.
Source: European Commission.

benefits) per year and per user. By adding up the expenditure on each setting total public expenditure on long-term care services is obtained.

3.2.2. Estimating dependency

Overall, given the availability of a numerical measure for disability, the projection methodology described above is more precise than that used for healthcare expenditure where there is no direct indicator of health status and the age-related expenditure profile is used as a proxy. However, an important caveat is that while dependency rates are an indicator of the need for care, those needs may not necessarily translate into real public expenditure, for at least two reasons.

First, the links between disability levels and demand/use of long-term care are not straightforward. Each step involves some uncertainty. Many people with some form of disability can lead completely independent lives without the need for care services. Furthermore, dependency also depends on a person's perception of their ability to perform activities associated with daily living. On the one hand, survey data can underestimate some forms of disability. People may not report certain socially stigmatised conditions, such as alcohol and drug related conditions, schizophrenia and mental degeneration. On the other hand, disability data can be too inclusive and measure minor difficulties in functioning that do not require community care. To attempt to minimise these potential issues, the focus is on those dependency levels reported as 'severe' ([85]) according to EU-SILC.

Second, most long-term care is still provided by unpaid informal carers. Expenditure profiles contain information about the propensity to receive paid formal care, which depends on a number of factors other than dependency that affect demand for paid care such as household type, availability of informal carers, income or housing situation. Most of these factors are also correlated with age.

3.2.3. Country-specific legislation on indexation of long-term care benefits

Where countries can demonstrate that they apply price indexation for cash benefits, this is allowed

([85]) As these people are most in need of income support and services, such as long-term care. This minimises the chance to mistakenly capture people who are not dependent, although some people with lower levels of dependency may be missed. Therefore, this measure of dependency may underestimate the dependency rates for those EU MS with comprehensive long-term care systems that cover relatively light levels of dependency.

for 10 years from the base year of the projections. There are however two exceptions where the impact of legislation is modelled for the whole projection period.

For Germany, this relates to the impact of German legislation on the ceiling of long-term care expenditure. According to the standard assumptions (explained below), unit costs are indexed to GDP per hours worked or GDP per capita. Under current German rules, both in-kind and cash, long-term care benefits are indexed to prices. With contribution rates indexed by inflation, long-term care expenditure shares would be almost unchanged until 2070. The difference between the amounts financed by the German government and the costs of long-term care are either recovered by private insurance or are paid by the beneficiaries themselves. The German government is required by law to check every three years the need and extent of adjusting long-term care benefits based on inflation.

For France, this relates to the fact that the most cash benefits are required by lawto be indexed according to prices.

For Slovenia, this relates to the fact that all cash benefits are required by law to be indexed according to prices.

Although this legislation binds these states to these indexations methodology, there are limits to the extent to which it can be taken into account in the projection. In an extreme case, indexing all benefits to prices for the duration of the projection period could lead to a noticeable reduction in long-term care expenditure as a share of GDP and in per capita terms compared to the standard assumptions. This would in fact represent a policy change scenario and breach the no-policy change scenario requirement.

To account for this legislation and the financial precaution principle while preserving the realism of the projections, the following assumptions are set to be used for the 'AWG reference scenario' projections as outlined in the 2018 Ageing Report, if the specific countries confirm that this legislation is still in place:

For Germany, two thirds of in-kind benefit expenditure are indexed in line with the Ageing Report standard assumptions and the remaining one third in line with prices. For cash benefits, two thirds of expenditure are indexed in line with prices and the remaining one third in line with standard Ageing Report assumptions. This applies for the entire projection period.

For France, price indexation would be applied to cash benefit expenditure, with the rest being indexed according to standard assumptions. This applies for the entire projection period.

For Slovenia, price indexation is applied to cash benefit expenditure, with the rest being indexed according to standard assumptions. This applies for the first 10 years of the projection.

Any further exceptions will be set out in the Ageing Report.

Table II.3.1: **Overview of the different scenarios to project long-term care expenditure**

	Demographic scenario	Base case scenario	High life expectancy scenario	Healthy ageing scenario	Shift to formal care scenario	Coverage convergence scenario	Cost convergence scenario	Cost and coverage convergence scenario	AWG reference scenario	AWG risk scenario
	I	II	III	IV	V	VI	VII	VIII	IX	X
Population projection	Eurostat population projections	Eurostat population projections	Alternative higher life expectancy scenario	Eurostat population projections	Eurostat population projections	Eurostat population projections	Eurostat population projections	Eurostat population projections	Eurostat population projections	Eurostat population projections
Dependency status	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	2016-2019 average disability rates held constant over projection period	Half of projected gains in life expectancy are spent without disability.	Half of projected gains in life expectancy are spent without disability.
Age-related expenditure profiles	2019 cost profiles	2019 cost profiles	2019 cost profiles	2019 profiles shift in line with changes in age-specific life expectancy	2019 cost profiles	2019 cost profiles	Cost profiles per Member State converge upwards to the EU27 average by 2070	Cost profiles per Member State converge upwards to the EU27 average by 2070	2019 cost profiles	Cost profiles per Member State converge upwards to the EU27 average by 2070
Policy setting / Care mix	Probability of receiving each type of care held constant at 2019 level	Probability of receiving each type of care held constant at 2019 level	Probability of receiving each type of care held constant at 2019 level	Probability of receiving each type of care held constant at 2019 level	Gradual increase (1% per year during 10 years) of the share of the disabled population receiving formal care (at home or in an institution).	Probability of receiving any type of formal in-kind care converging until 2070 upwards to the EU27 average.	Probability of receiving each type of care held constant at 2019 level	Probability of receiving any type of formal in-kind care converging until 2070 upwards to the EU27 average.	Probability of receiving each type of care held constant at 2019 level	Probability of receiving any type of formal in-kind care converging until 2070 upwards to the EU27 average.
Unit cost development	GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita	*In-kind*: GDP per hours worked; *cash benefits*: GDP per capita
Elasticity of demand	1	1	1	1	1	1	1	1	1 for MS in highest LTc expenditure quartile in 2019, for the rest 1.1 in 2019 converging to 1 by 2070	1

* Alternative indexation rules for unit costs in the 'Reference scenario' in order to reflect the specific institutional arrangements of specific countries are discussed in Section 3.22
Source: European Commission.

3.3. DIFFERENT SCENARIOS PROJECTING PUBLIC LONG-TERM CARE EXPENDITURE

Several scenarios and sensitivity tests are made to assess the potential impact of each of the determinants of long-term care expenditure on future public expenditure on long-term care.

The examination of different scenarios helps identify how sensitive the projections are to changes in key assumptions such as the evolution of dependency rates, unit costs and policy settings. Building on the 2018 Ageing Report, the present exercise maintains most of the existing scenarios and sensitivity tests while adding a new specific sensitivity scenario to account for the impact of the COVID pandemic. The overview of the scenarios is presented in Table II.3.1 above ([86]). The analysis identifies the impact of each quantifiable determinant separately, based on hypothetical assumptions or a 'what if' situation. Therefore, the results of the projections should not be interpreted as forecasts of expenditure since particular policy/institutional settings in Member States or future policy reforms beyond those already legislated and reported by Member States are not taken into account.

3.3.1. Demographic Scenario

The 'demographic scenario' assumes that the shares of the older disabled population who receive either informal care, formal care at home or institutional care are kept constant over the projection period. Those constant shares are then applied to the projected changes in the dependent population. Since the prevalence of ADL-dependency is also kept constant over the projection horizon, the dependent population evolves precisely in line with the total elderly population. This implies that none of the gains in life expectancy translate into an improvement in health. Arguably, it is a pessimistic scenario with respect to dependency status, since it assumes that average lifetime consumption of long-term care services will increase over time in line with population ageing. It is a 'no policy change

([86]) See Annex 10, Mathematical illustration of the long-term care scenarios.

scenario' as the probability of receiving care (either at home or in an institution) is assumed to remain constant at the 2019 level. The scenario is similar to the analogous scenario for healthcare expenditure, and costs are also assumed to evolve in line with GDP per capita growth (for all types of long-term care expenditure).

3.3.2. Base case scenario

While in the above-mentioned elements the 'demographic scenario' is similar to the analogous scenario for healthcare expenditure, the actual 'base case scenario' is not exactly equivalent to the former, as in this case, the long-term care unit cost is linked to GDP per worker, rather than to GDP per capita. Indeed, there exists a current imbalance of care mix, with a relative deficit of formal care provision. Further, this sector is highly labour-intensive and productivity gains can be expected to be particularly slow in this sector. Therefore, public expenditure on long-term care is expected to be rather more supply than demand-driven. For that reason, GDP per worker (which is also assumed to reflect wage evolution in all sectors, including in the care sector), rather than GDP per capita had been chosen as the main (but not only) driver of unit costs. In this sense, it is more similar to the 'labour intensity scenario' run for the healthcare expenditure projections.

Similar to the 2018 exercise, the projections will link unit cost to GDP per hours worked for in-kind benefits (services), while unit cost of cash benefits will evolve in line with GDP per capita growth (as cash benefits are more related to a form of income support).

3.3.3. High life expectancy scenario

The 'high life expectancy scenario' presents the budgetary effects of an alternative demographic scenario that assumes life expectancy to be higher for all ages than in the baseline scenario. This scenario is methodologically identical to the base case scenario, but alternative demography and GDP data are used (in the same way that it is used to assess the sensitivity of pension and health expenditure to higher life expectancy). The rationale is twofold. First, the marked increase in public expenditure for older people (i.e. 80+). In fact, the overall age profile for long-term care expenditure has a different shape than that for health expenditure, partly because the costs related to long-term care are very high for institutionalised individuals, and the share of institutionalised individuals increases sharply among persons aged over 80. Second, the higher age groups are also the part of the demographic projections that are likely to be the most uncertain. The model ensures that the value in a five-year age class cannot be less than that in the preceding one.

3.3.4. Healthy ageing scenario

This scenario reflects an alternative assumption about trends in age-specific dependency rates. Being inspired by 'relative compression of morbidity', it is analogous to the 'constant health scenario' performed in healthcare expenditure projections in that the number of years spent in bad health remains constant over the projection period. The age-sex specific dependency rates are shifted in line with changes in life expectancy (e.g. if life expectancy for a 50-year old has increased by 2 years in year 2030, then the dependency rate of a 50-year person in 2030 is that of a 48-year old today). This results in a gradual decrease over time in the prevalence of disability for each age cohort, as the increase in life expectancy adds new cohorts and the total number of years in bad health remains the same. Lower dependency rates over the whole population translate in lower proportional demand for and therefore lower expenditure on long-term care services. As in the 'base case scenario', public expenditure on long-term care in-kind services is assumed to evolve in line with GDP per hours worked, while expenditure on cash benefits evolves in line with GDP per capita.

3.3.5. Shift to formal care scenario

Ultimately, the public funding of long-term care – and the policy orientation – will determine whether future needs for long-term care translate into (direct) public expenditure or not, as neither informal care provision nor private expenditure on long-term care are formally part of public expenditure on long-term care.

Indeed, pressure for increased public provision and financing of in-kind long-term care services may grow substantially in the coming decades, particularly in Member States where the bulk of long-term care is currently provided informally

([87]). To illustrate the impact of possible future policy changes, such as Member States deciding to provide more formal in-kind care services to the elderly, additional scenarios have been prepared.

This policy-change scenario is run to assess the impact of a given – demand-driven – increase in the (public) provision of formal in-kind care replacing care provided in an informal setting. In particular, this sensitivity test examines the budgetary impact of a progressive shift into the formal in-kind sector of care of 1% per year of disabled elderly who have so far received only informal care. This extra shift compared to the 'base case scenario' takes place during the first ten years of the projection period only. Therefore, it adds up to about 10% shift from informal to formal in-kind care.

The shift from informal to formal in-kind care is considered in line with the current shares of home care and institutional care in total formal care. In other words, if currently 10% of the dependents receiving in-kind care receive care at home, the shift/increase will also go for 10% to home care (and 90% to institutional care).

3.3.6. Coverage convergence scenario

This scenario, similar to the one in the 2018 Ageing Report, assumes that the real convergence across Member States, the exchange of best practices and growing expectations of the populations will drive an expansion of publicly financed formal in-kind care provision into the groups of population that have not been covered by the public programmes so far. Similarly to the scenarios assessing the effect of a shift from informal to formal care, this scenario should also be considered as a policy-change scenario, as it assumes a considerable shift in the current long-term care provision policy, while aiming to take into account the high diversity of country-specific current care mix.

The Member States where the formal in-kind coverage rate is below the EU27 average in the starting year would be assumed to converge to the average by 2070.

Convergence would be calculated for each age group and relative proportions of each type of formal in-kind care are kept constant. As in the 'base case scenario', public expenditure on long-term care in-kind services is assumed to develop in line with GDP per hours worked, while expenditure on cash benefits evolves in line with GDP per capita. More specifically, the Member States where the formal in-kind coverage rate is below the EU27 average in the starting year are assumed to converge to this average by 2070 for that age group. By contrast, for countries with coverage above the EU average in the base year this scenario is equivalent to the base case scenario for that age group.

3.3.7. Cost convergence scenario

This scenario is proposed in parallel with the scenario on healthcare expenditure projections, similar to the 2018 Ageing Report. For those Member States with high levels of informal care, and therefore relatively low costs for long-term care, an increase in public expectations for more formal care (and therefore an increase in the average cost of long-term care) might be expected. For example, an increase in the costs of care (as per cent of GDP per capita) towards the average for EU Member States could be expected. The 'cost convergence scenario' is meant to capture the possible effect of a convergence in real living standards (which emerges from the macroeconomic assumptions) on long-term care spending. It assumes an upward convergence of the age-sex specific per beneficiary expenditure profiles (as per cent of GDP per capita) of all countries below the corresponding EU27 average to the EU27 average, for each type of formal care coverage (i.e. formal care in institutions, formal care at home and cash benefits). Note that the convergence is calculated for each age group separately, based on the coverage gap for all services in kind. Again, for countries with unit costs above the EU average in the base year, this scenario is equivalent to the base case scenario.

([87]) Another reason being the difficulties of the private insurance market for long-term care to develop in most Member States (see OECD (2011), "Help Wanted?" www.oecd.org/els/health-systems/47884985.pdf).

3.3.8. Cost and coverage convergence scenario

As described in the sections above, this scenario combines the coverage convergence scenario and the cost convergence scenario.

It assumes a shift in the current in-kind long-term care provision policy leading to an upward coverage convergence to the EU27 average by 2070. More specifically, the Member States where the formal in-kind coverage rate is below the EU27 average in the starting year are assumed to converge to this average by 2070. In addition, this scenario assumes an upward convergence of the expenditure profiles (as per cent of GDP per capita) of all countries below the corresponding EU27 average to the EU27 average.

This scenario is a balanced and plausible distribution of risks stemming from future needs that lead to a convergence in both costs and coverage. From the perspective of country-specific needs in these convergence processes, it is evident that countries are very differently affected by these convergence processes. For countries with coverage and unit costs above the EU average in the base year in all age groups, this scenario is equivalent to the base case scenario.

3.3.9. AWG reference scenario

The 'AWG reference scenario' is the 'central scenario' used by the AWG to calculate the overall budgetary impact of ageing. It shows the combined effect of a set of interrelated determinants of public expenditure on long-term care, while other scenarios measure the separate effect of individual determinants and therefore provide only a partial analysis. It is meant to provide a plausible path for the underlying variables, while acknowledging that the projection outcome is subject to uncertainty.

The AWG reference scenario combines the assumptions of the 'base case scenario' and the 'constant disability scenario'. It assumes that half of the projected longevity gains up to the end of the projection period will be spent in good health and free of disability/dependency. So, accordingly, age-specific disability rates shift along the age profile by half of the projected increase in life expectancy. Furthermore, the unit costs are linked to GDP per hour worked in case of long-term care in-kind services and to GDP per capita in case of cash benefits ([88]).

As countries become richer, they are likely to spend a larger proportion of their GDP on long-term care. This is modelled in the reference and risk scenarios by including the assumption that income elasticity starts at 1.1 in the base year of 2019, falling to 1 by the end of the projection period. Since the GDP projections include a degree of catching-up, this leads to a degree of convergence in long-term care expenditure, albeit more moderate than in the cost and coverage convergence scenario.

Taking into account this increase in long-term care expenditure may not affect countries that already have highly developed long-term care systems, those EU Member States in the highest quartile of long-term care expenditure as a proportion of GDP in the base year are excluded from this and therefore their income elasticity will be assumed to remain 1.

3.3.10. AWG risk scenario

There is considerable uncertainty as to future developments of age-related public expenditure, in particular related to the challenge to cope with trend increases in public spending and in particular, on healthcare and long-term care expenditure. For this reason and to contribute to the wider policy debate on fiscal challenges the EU will be facing in the future, an AWG risk scenario will be prepared for the Ageing Report.

The 'AWG risk scenario' retains the assumption that half of the future gains in life expectancy are spent without care-demanding disability, as in the 'AWG reference scenario'. In addition, it combines this scenario with the 'cost and coverage convergence scenario' by assuming convergence upwards of unit costs to the EU-average as well as coverage convergence upwards to the EU-average. In comparison to the 'AWG reference scenario', this scenario thus captures the impact of additional cost drivers to demography and health status. In comparison to the 'AWG risk scenario' for healthcare, this scenario models the impact that increased GDP has on expenditure in a different more specific way, by first modelling the impact

([88]) With the specific exceptions set out in Section 3.2.2.

on coverage and unit costs and then deriving from this the increase in expenditure.

3.3.11. Other sensitivity scenarios

A number of sensitivity scenarios modify the 'AWG reference scenario' by making alternative assumptions on factors such as migration, fertility, employment rate, Total Factor Productivity and life expectancy (the full list and description of the assumptions can be found in Part I, Chapter 3 of this report).

4. EDUCATION

4.1. INTRODUCTION

The projection exercise aims at quantifying the impact of demographic changes over the long term on general government education expenditure. Therefore, baseline projections are carried out under the assumption of 'no policy change' ([89]). In addition, projections under a scenario of higher enrolment rates are also carried out.

Table II.4.1: **Education expenditure, % of GDP**

	2003	2007	2012	2017	avg 2003-2017
BE	5.9	5.5	6.2	6.3	6.0
BG	4.2	3.6	3.3	3.6	3.8
CZ	5.2	4.7	5.0	4.6	4.9
DK	6.6	5.9	7.0	6.5	6.7
DE	4.1	3.9	4.2	4.1	4.1
EE	6.6	5.9	6.3	5.8	6.2
IE	4.1	4.3	4.9	3.3	4.2
EL	4.3	3.6	4.5	3.9	4.1
ES	4.0	4.0	4.2	4.0	4.1
FR	5.8	5.3	5.5	5.4	5.5
HR	5.3	4.8	4.9	4.7	5.0
IT	4.6	4.5	4.1	3.8	4.2
CY	6.2	5.9	6.3	5.7	6.2
LV	5.3	5.6	5.7	5.8	5.8
LT	5.7	5.3	5.8	4.9	5.7
LU	5.0	4.5	5.8	4.7	5.0
HU	6.4	5.5	4.7	5.1	5.4
MT	5.9	5.2	5.8	4.9	5.5
NL	5.2	5.0	5.4	5.1	5.3
AT	5.3	4.7	5.0	4.8	4.9
PL	6.1	5.7	5.4	4.9	5.5
PT	6.7	6.2	5.8	5.0	6.2
RO	3.5	3.9	3.0	2.8	3.5
SI	6.3	5.9	6.4	5.4	6.2
SK	4.2	3.5	4.1	3.8	3.9
FI	6.3	5.8	6.4	5.7	6.2
SE	6.8	6.3	6.5	6.7	6.5
NO	6.1	4.9	4.9	5.6	5.3
EA	4.8	4.6	4.8	4.5	4.7
EU27	5.4	5.0	5.3	4.9	5.2

Source: Eurostat, Classification of the functions of government (COFOG) data.

A priori, the impact of ageing on public education expenditure is undetermined, somewhat contrasting with the expected increasing effect of ageing on other major expenditure items, such as on pensions and health. In fact, on the one hand, the expected decline in the number of young people is likely to allow for some savings, but on the other, the trends of higher enrolment rates, longer periods spent in education, and persistently rising costs of tertiary education might put upward pressure on total education expenditure. The methodology used is highly stylised and, as such, it cannot fully reflect the complexities of Member States education systems. It has been set out to use harmonised datasets, secure equal treatment across countries, and be consistent with wide labour market developments, particularly on participation rates.

On average in 2003-2017, education expenditure represented 5.2% of GDP in the EU (around 11.7% of total general government expenditure) ([90]). Expenditure ratios vary considerably across Member States from a minimum of 3.5% of GDP in Romania to a maximum of 6.7% in Denmark (see Table II.4.1). Projecting education expenditure requires a number of important methodological issues to be considered, namely (i) the definition (or perimeter) of education activities; (ii) taking into account that studying can take place on a part-time basis after compulsory education; and (iii) considering that there are various outlays for public spending on education ([91]).

4.2. SHORT OVERVIEW OF THE METHODOLOGY USED TO PROJECT EXPENDITURE ON EDUCATION

The methodology uses a 'quasi-demographic' approach, meaning that not only demographic projections are used but also participation rate projections. A strong point of the methodology is the use of the UOE ([92]) data collection, which covers enrolment rates, staff levels, the labour force status of students (i.e. part-time versus full-

([89]) Many other factors have also an important bearing on government education expenditure, such as the involvement of the general government in the education system, the duration of mandatory education, progress in enrolment rates in upper secondary and tertiary education, relative wages in the education sector, the average size of classes, discretionary saving measures to curb expenditure trends, etc.

([90]) Classification of the functions of government (COFOG) data. In the same period, 2003-2017, health expenditure represented 6.1% of GDP (and 13.5% of total general government expenditure), while 'social protection' represented 16.3% (and 35.8% of total general government expenditure). 'Social protection' includes the 'old age' (pensions) function.

([91]) The latter takes two main forms: (i) direct purchases by the government of educational resources to be used by educational institutions (e.g. direct payments of teachers' wages by the education ministry); or (ii) payments by the government to educational institutions that have the responsibility for purchasing educational resources themselves (e.g. a block grant to a university).

([92]) UNESCO-UIS/OECD/Eurostat Data Collection on Education Statistics. The current version of the classification is ISCED 2011, which replaced ISCED 1997, and it has already been used in the 2018 Ageing Report.

time)([93]), and detailed data on total public expenditure. Data are disaggregated by single age and international standard classification of education (ISCED) levels. As in the 2018 Ageing Report, projections should be run separately for four ISCED groupings, representing primary education (ISCED 1), lower secondary education (ISCED 2), upper secondary education (ISCED 3 and 4), and tertiary education (ISCED 5 to 8).

In order to simplify, it is assumed that enrolment in primary and lower secondary education levels is compulsory ([94]), while enrolment in upper secondary and tertiary education levels depends on labour market outcomes, as changes in participation rates affect enrolment rates (in the opposite direction).

Projections are broken down in two components: (1) number of students; and (2) per capita expenditure per student (see Graph II.4.1).

4.2.1. Number of students

Compulsory levels

Enrolment rates per single age are assumed to remain constant at the level observed in a base period/year for the compulsory levels considered (ISCED 1 and 2). In order to obtain the projected number of students enrolled in ISCED levels 1 and 2, demographic projections are multiplied by enrolment rates in the base period.

Non-compulsory levels

Enrolment rates for ISCED groupings 3-4 and 5-8 take into account labour market developments according to the formula (see Annex 13 for a derivation):

$$e_{i,t} = \frac{1-p_{i,t}-i^*_{i,t}}{1-\alpha_{i,t}} \qquad (4.1)$$

where $e_{i,t}$ is the total enrolment rate (both full and part-time students) for single age cohort *i* in period *t*; $p_{i,t}$ is the participation rate; $\alpha_{i,t}$ is the fraction of part-time students in the total; and $i^*_{i,t}$ is the fraction of inactive individuals minus full-time students over the total population.

Equation (4.1) will be implemented in terms of differences to a base period (*b*):

$$e_{i,t} - e_{i,b} = -\frac{\overline{\kappa}_{i,b}}{1-\overline{\alpha}_{i,b}} * \left(p_{i,t} - p_{i,b}\right) \qquad (4.2)$$

where

$$0 \leq \overline{\kappa}_{i,b}, \overline{\alpha}_{i,b} \leq 1$$

where $\overline{\kappa}_{i,b}$ is the ratio between full-time students and total inactive individuals; $\overline{\alpha}_{i,b}$ is the fraction of part-time students over the total number of students. These two ratios are assumed to remain constant throughout the projection period.

According to equation (4.2), an increase in the participation rate leads to a decrease in the enrolment rate ([95]).

Enrolment rates per age are then broken down into ISCED levels (3-4 and 5-8) values, based on student shares in the base period/year.

4.2.2. Expenditure per student

Annual expenditure per student in public educational institutions varies significantly across education level and country (see Table II.4.2) ([96]). This variability reflects a number of factors, such as labour costs of teachers and non-teaching staff, different class sizes, differences in capital expenditure, as well as specific national circumstances ([97]).

([93]) Students are classified as full-time and part-time on the basis of the intended study-load of the student within the reference school or academic year. A full-time student is one who is enrolled in an education programme whose intended study-load amounts to at least 75% of the normal full-time annual study-load. A part-time student is one who is enrolled in an education programme whose intended study load is less than 75% of the normal full-time annual study load (UNESCO-UIS/OECD/EUROSTAT (UOE), 2019).

([94]) In the baseline scenario, enrolment rates for the two compulsory groupings are fixed at their historical levels.

([95]) To the extent that individuals entering the labour force are likely to have been previously involved in education activities. The LFS variable MAINSTAT, which describes the main labour market status, was used to assess the distribution of inactive individuals by age, distinguishing between schooling and other forms of inactivity, such as retirement and domestic tasks.

([96]) For those countries where data are missing for the base period, AWG delegates will be asked to provide them to the Commission.

([97]) For example, small EU Member States tend to send abroad a higher fraction of their tertiary students. Other things being equal, this tends to raise expenditure levels.

Table II.4.2: **Total public expenditure on education per pupil in EUR PPS (1) in 2016**

	ISCED 1	ISCED 2	ISCED 3-4	ISCED 5-8	Total*
BE	7560	9544	10153	12884	9060
BG	3126	3610	2899	2774	3309
CZ	3555	5978	5391	5395	4674
DK	:	:	:	:	:
DE	6335	7856	8515	13049	8381
EE	4561	4849	4947	8538	:
IE	6077	7605	8740	8710	:
EL	4022	4662	3811	:	:
ES	4718	5910	6686	6785	5560
FR	5312	7291	9394	9957	7230
HR	:	:	:	:	:
IT	5591	6271	6628	6910	6091
CY	7812	9476	9765	5893	7293
LV	4607	4645	5513	3924	4510
LT	4298	3985	3899	4183	4042
LU	12322	15293	14613	34293	14705
HU	3725	4004	5731	5795	4769
MT	5029	7315	10109	15764	8202
NL	6226	8988	8826	14653	8892
AT	8824	11682	11337	13618	10799
PL	4658	4900	4417	5837	4778
PT	5080	6992	6037	5633	5507
RO	1359	2647	2481	4720	2470
SI	5698	6926	5415	7501	5876
SK	:	:	:	:	:
FI	6843	10894	:	13960	:
SE	8248	8907	9776	20291	10607
NO	9180	9932	12794	20537	11980

(1) Public expenditure on education per pupil/student by education level and programme orientation, 'educ_uoe_fine09'. Based on full-time equivalent. The category 'Total' includes pre-primary education (ISCED 02).
Source: Eurostat.

4.2.3. Expenditure-to-GDP ratios are calculated using indexes

As a rule, expenditure data given by the average of the two last available years, generally 2015 and 2016 (or more recent data if available), are chosen. This is then uprated until the base year using COFOG data ([98]). Total public expenditure on education is broken down into four components: i) expenditure on staff compensation (i.e. gross wages and salaries of teaching and non-teaching staff), ii) other current expenditure, iii) capital expenditure, and iv) transfers (e.g. scholarships and public subsidies to private education institutions).

The objective is to project the total (education) expenditure-to-GDP ratio. The ISCED levels considered are: ISCED 1, ISCED 2, ISCED 3-4, and ISCED 5-8 ([99]).

$$\frac{\sum_i EDU_t^i}{GDP_t} = \frac{\sum_i \left[W_t^i + O_t^i + K_t^i + R_t^i\right]}{GDP_t} \qquad (4.3)$$

where EDU_t^i is expenditure on education in ISCED level i and year t, W_t^i is expenditure on staff compensation, O_t^i is other current expenditure, K_t^i is capital expenditure, R_t^i is transfers; and i stands for the ISCED groups: 1, 2, 3-4, and 5-8.

In the baseline scenario, the main assumptions are the following:

Per-capita costs grow in line with labour productivity. Per-capita values are defined in terms of education staff or students. Specifically, the average compensation is defined per staff member: $\left(W_t^i / T_t^i\right)$, while the other three expenditure variables are defined in terms of student ratios:

$$\left(O_t^i / S_t^i, K_t^i / S_t^i, R_t^i / S_t^i\right)$$

Where T and S are the numbers of workers in the education sector and students, respectively ([100]).

The education staff-to-student ratio will remain constant over the projection period, which implies that staff adjusts instantaneously and fully to demographic and macroeconomic changes.

Assuming that per capita variables grow in line with labour productivity is sufficient to derive the following compact general formula for the expenditure in education-to-GDP ratio:

$$\frac{\sum_i EDU_t^i}{GDP_t} = \left[\frac{\sum_i W_0^i}{GDP_0} * \overline{IT_t} + \frac{\sum_i \left[O_0^i + K_0^i + R_0^i\right]}{GDP_0} * \overline{IS_t}\right] * \frac{IP_t}{IG_t} + CE_t \qquad (4.4)$$

Where IT_t^i, IS_t^i, IP_t^i, and IG_t^i are indexes of respectively, staff, students, labour productivity,

([98]) If data for 2018 is not available, the latest available public expenditure data as a share of GDP is used. See Annex 12 for a description of data sources and methodology.

([99]) It should be stressed that no attempt is made to project total expenditure on education, as ISCED 0 level expenditure (pre-primary and not allocated by level) is not covered by the analysis.

([100]) These modelling assumptions involve considerable simplifications of the determinants of the unit costs of education. A key variable missing is class size. Research suggests that costs tend to change discontinuously with the creation/destruction of classes. Given the difficulty in obtaining data on the relationship between class size and costs, a reasonable approximation may be that of using student-to-staff ratios.

and GDP ([101]). A bar over an index represents one calculated over all ISCED levels considered ([102]). CE_t is the composition effect, which is usually a small number compared with the total expenditure-to-GDP ratio ([103]).

Equation (4.4) expresses the expenditure in education-to-GDP ratio as a function of base period ratios, and indexes for staff, students, labour productivity and GDP.

In the baseline scenario, which assumes a constant ratio of staff-to-students (i.e $IT_t^i = IS_t^i$), equation (4.4) can be further simplified to:

$$\frac{\sum_i EDU_t^i}{GDP_t} = \frac{\sum_i EDU_0^i}{GDP_0} * \frac{\overline{IS}_t * IP_t}{IG_t} + CE_t \qquad (4.5)$$

Equivalently, equation (4.5) can also be written as:

$$\frac{\sum_i EDU_t^i}{GDP_t} = \frac{\sum_i EDU_0^i}{GDP_0} * \frac{\overline{IS}_t}{IE_t} + CE_t \gg \frac{\sum_i EDU_0^i}{GDP_0} * \frac{\overline{IS}_t}{IE_t} \qquad (4.6)$$

where *IEt* is the employment index ([104]).

In the baseline scenario, equation (4.5) allows the following clear-cut interpretation: projections for the expenditure-to-GDP ratio are obtained by 'inflating' base period values by a students and labour productivity indexes and by 'deflating' them by a GDP index ([105]). There are two sources for the increase in expenditure (ratios): i) the (average) number of students and, ii) per-capita costs that are assumed to grow in line with labour productivity, conversely GDP growth 'deflates' expenditure ratios.

4.3. SENSITIVITY ANALYSIS

In addition to the baseline scenario described above, a sensitivity test is run.

High enrolment rates – as carried out in the 2018 Ageing Report, a sensitivity analysis of the impact of a gradual upward convergence is performed (to be completed by 2045); namely an assumption that raises the enrolment rates in ISCED levels 3-4 and 5-8 towards the average of the 3 best performers in the EU.

([101]) An index measures the ratio between the values of variable X in the current period t and in the base period *0:* $IX_t = \frac{X_t}{X_0}$

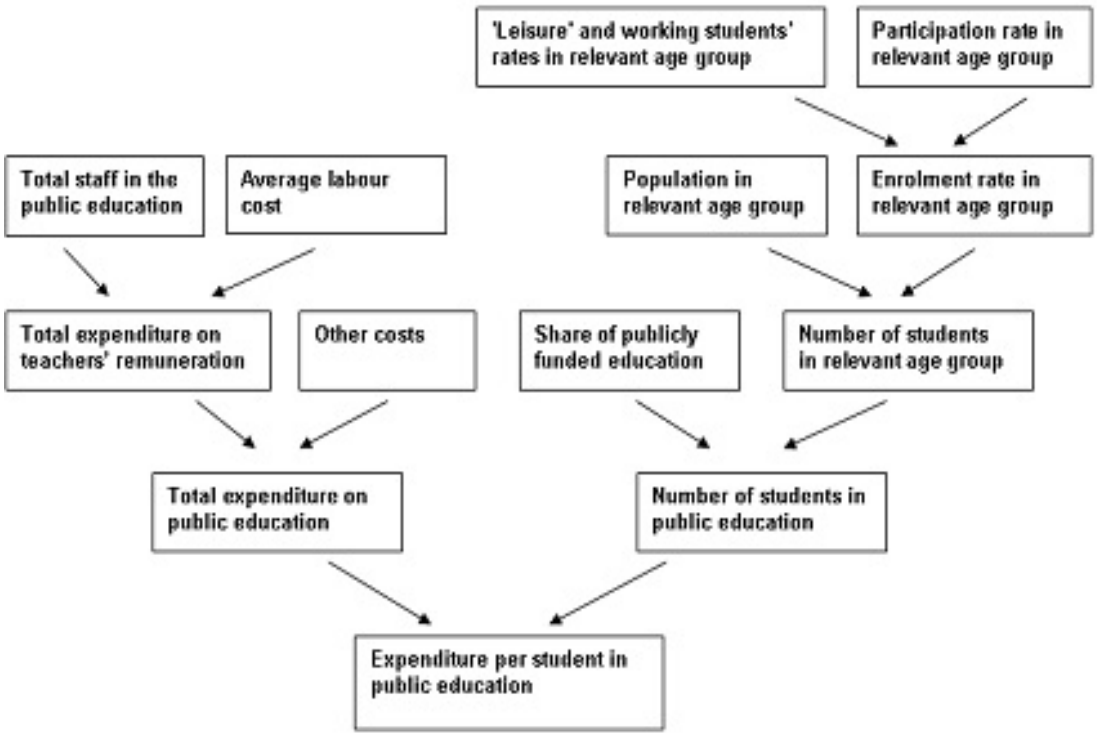
([102]) $\overline{IT}_t = \frac{\sum_i T_t^i}{\sum_i T_0^i}$ and $\overline{IS}_t = \frac{\sum_i S_t^i}{\sum_i S_0^i}$.

([103]) The composition effect is given by: $CE_t = \left[\frac{\sum_i W_0^i * \{IT_t^i - \overline{IT}_t\}}{GDP_0} + \frac{\sum_i \{D_0^i + K_0^i + R_0^i\} * \{IS_t^i - \overline{IS}_t\}}{GDP_0}\right] * \frac{IP_t}{IG_t}$

([104]) The approximation assumes that CE_t is a small number.

([105]) The discrepancy being given by the composition effect (CE_t).

Graph II.4.1: **Implicit breakdown of expenditure per student**



Source: European Commission, EPC.

ANNEX 1

Projecting labour force developments using the cohort simulation model (CSM)

Overall approach of the CSM

The CSM calculates entry and exit rates in the labour market by gender and cohort ([106]). The dynamic cohort approach is based on the estimates of exit and entry rates in the labour market of a 'synthetic' generation/cohort. The cohort is synthetic because, due to the lack of individual longitudinal data on labour market transitions, the same individual cannot be followed over time. Instead, it is assumed that those individuals aged x+1 at year t+1 are representative of the same generation observed in the previous year (aged x at time t). Due to the lack of specific information on each individual's behaviour, this assumption neglects inflows and outflows from the labour market that cancel out ([107]).

Participation rate projections are produced by applying the average entry and exit rates observed over the period 2010-2019 by gender and single age to the period 2020-2070. Specifically, average entry rates for the period 2010-2019 are kept constant over the entire projection period. For example, average entry rates in 2010-2019 for people aged x (with x varying between 15 and 74 years of age), are applied to persons aged x over the projection horizon in order to calculate future participation rates. In this way, the CSM captures 'cohort effects', namely those resulting from the stronger attachment of younger women of more recent cohorts to the labour market.

The CSM is also able to incorporate a broad typology of pension reforms, inter alia, increases in the statutory retirement age, the convergence of lower female statutory retirement ages to male ones, the linking of the statutory retirement age to changes in life expectancy, changes in conditions for early retirement, and changes in (price) incentives affecting the retirement decision. The likely impact of pension reforms is incorporated in the labour force projections by appropriately changing the average labour market exit probabilities for people aged 51-74, as calculated for the period 2010-2019.

The calculation of entry rates

Entry rates from inactivity to labour market participation are calculated as follows. The calculation of the number of persons that enter the labour market takes into account the size of each gender/age group. It can be expressed as:

$$NLF_x^{t+1} = (Popmax_{wa} - LF_x^t) - (Popmax_{wa} - LF_{x+1}^{t+1})$$

where $LF_x^t + NLF_{x+1}^{t+1} \leq Popmax_{wa}$

where *NLF* is the number of people expected to become active between ages x and x+1; $Popmax_{wa}$ is the maximum population at working age that can potentially enter the labour force (which is usually slightly lower than the overall population at working age, due for example to illness or inability) and *LF* is the number of active persons (in the labour force) aged x in year t and aged x+1 in year t+1.

Multiplying and dividing by the population aged x at time t (which is supposed to be the same as the population aged x+1 at time t+1), the following equation is obtained:

$$NLF_x^{t+1} = [(PR_{max} - PR_x^t) - (PR_{max} - PR_{x+1}^{t+1})] * Pop_x^t$$

where PR_{max} is the upper limit to the participation rate (0.99 for both men and women). Next, one can calculate the rate of entry, R_{en} by dividing the number of people expected to become active by the number of people inactive at time t:

$$R_{en} = \frac{NLF_x^{t+1}}{(Popmax_{wa} - LF_x^t)}$$

$$= [(PR_{max} - PR_x^t) - (PR_{max} - PR_{x+1}^{t+1})] * \frac{Pop_x^t}{(Popmax_{wa} - LF_x^t)}$$

which, taking into account that $PR_x^t = \frac{Pop_x^t}{LF_x^t}$ and $PR_{max} = \frac{Popmax_{wa}{}_x^t}{Pop_x^t}$, can be reformulated as:

$$R_{en_{x+1}} = [(PR_{max} - PR_x^t) - (PR_{max} - PR_{x+1}^{t+1})] * \frac{1}{(PR_{max} - PR_x^t)}$$

or $R_{en_{x+1}} = 1 - \frac{(PR_{max} - PR_{x+1}^{t+1})}{(PR_{max} - PR_x^t)} \geq 0$

([106]) See Burniaux et al. (2003) and Carone (2005).

([107]) For example, this means that if in year t there are 100 persons aged x in the labour force and the next year these same individuals (aged x+1) leave the labour force (because of, for example, discouragement, death or emigration) but they are replaced by 100 other individuals aged x+1, previously not in the labour force, we do not observe any change in the size of the 'synthetic' cohort. Therefore, the calculated net rates of exit and entry are equal to zero, while the actual (gross) values are 100%.

or $R_{en_{x+1}} = \frac{(PR_{x+1}^{t+1} - PR_x^t)}{(1 - PR_x^t)} \geq 0$ when $PR_{max} = 1$

After re-arranging, we obtain the analytical formulation used for projecting participation rates:

$$PR_{x+1}^{t+1} = R_{en_{x+1}} * (PR_{max} - PR_x^t) + PR_x^t$$

Thus, projections of participation rates for each single-year cohort (x+1) can be calculated by applying the entry rates observed in a given year or period over the period of projections (t = 2020-2070). In practical terms, the entry rates for each age are calculated based on the average of the participation rates observed over 2010-2019.

The calculation of exit rates

In the same way, when participation rates for two adjacent single-year age groups are falling, we calculate an exit rate (that is the net reduction in the labour force relative to the number of people who were initially in the labour force in the same cohort the year before) as follows.

The number of persons that leave the labour market at time t+1 is equivalent to:

$$OP_x^{t+1} = LF_x^t - LF_{x+1}^{t+1}$$

where *OP* is the number of individuals expected to become inactive between ages x and x+1, and *LF* is the number of active people (in the labour force) aged x in year t and aged x+1 in year t+1.

Multiplying and dividing by the population aged x at time t, which is supposed to be the same as the population aged x+1 at time t+1, result in:

$$OP_x^{t+1} = (PR_x^t - PR_{x+1}^{t+1}) * Pop_x^t$$

where *PR* are the participation rates.

Thus, we can calculate the (conditional) rate of exit, R_{ex} by dividing the number of people that become inactive at time t+1 by the number of people active at time t:

$$R_{ex} = \frac{OP_x^{t+1}}{LF_x^t} = (PR_x^t - PR_{x+1}^{t+1}) * \frac{Pop_x^t}{LF_x^t}$$

which can also be re-arranged as follows:

$$R_{ex} = \frac{OP_x^{t+1}}{LF_x^t} = 1 - \frac{PR_{x+1}^{t+1}}{PR_x^t}$$

Thus, we can use this *Rex* to project participation rates of older workers as:

$$PR_{x+1}^{t+1} = \left(1 - R_{ex_{x+1}}\right) * PR_x^t$$

and

$$PR_{x+n}^{t+n} = \left(1 - R_{ex_{x+1}}\right) * \left(1 - R_{ex_{x+2}}\right) * \ldots * \left(1 - R_{ex_{x+n-1}}\right) * PR_x^t$$

ANNEX 2

Estimation of the average exit age from the labour market

Average exit age from the labour force

In order to estimate the 'average exit age' from the labour force, the CSM is used, which is basically a probabilistic model using gender/single year participation rates ([108]). The methodology is based on the comparison of labour force participation rates over time.

The conditional probability for each person to stay in the labour force at age *a* in year *t* (conditional upon staying in the labour force in year t-1), can be calculated on the basis of the observed participation rates *PR*.

Probability to stay

$$cProb_{a,t}^{stay} = \frac{PR_a^t}{PR_{a-1}^{t-1}}$$

where $0 \leq cProb_{a,t}^{stay} \leq 1$

Thus, at time *t*, the conditional probability for each person to exit at age *a* is simply equal to:

Probability of exit

$$cProb_{a,t}^{exit} = 1 - \frac{PR_a^t}{PR_{a-1}^{t-1}} = 1 - cProb_{a,t}^{stay}$$

where $0 \leq cProb_{a,t}^{exit} \leq 1$

Assuming that nobody retires before the minimum age *m* (e.g. before m = 60), the (unconditional) probability that any person will still be in the labour force (or the probability of not retiring before a given age *a*), can be calculated as the product of all the conditional probabilities to stay in the labour force from age *m* to age *a*-1.

Probability of not retiring before

$$Prob_{a,t}^{not\_ret} = \prod_{i=m}^{a-1} cProb_i^{stay}$$

Thus, the probability of retiring at age *a* can be calculated as the product of the unconditional probability of not retiring from age *m* to *a* and the (conditional) probability of exit, that is:

Probability of retiring

$$Prob_{a,t}^{ret} = Prob_{a,t}^{not\_ret} * cProb_{a,t}^{exit}$$

By assuming that everybody will be retired at a given age *M* (e.g. *M = 75)*, the sum of the probability of retiring between the minimum age *m* and the maximum age *M* is equal to 1:

$$\sum_{a=m}^{M} Prob_a^{ret} = 1$$

The '*average exit age'* or effective age of retirement from the labour market is then calculated as the weighted sum of the retirement ages (between the minimum and the maximum age of retirement, e.g. 60-74), where the weights are the probability of retiring at each age *a*, as follows:

Average exit age

$$average\ exit\ age = \sum_{a=m}^{M} Prob_a^{ret} * a$$

([108]) See Carone (2005).

ANNEX 3

Methodology underpinning potential GDP growth projections

A3.1. DESCRIPTION OF THE PRODUCTION FUNCTION FRAMEWORK

The production function framework used is based on the standard specification of the Cobb-Douglas production with constant returns to scale, where potential GDP can be expressed formally as total output represented by a combination of factor inputs multiplied with total factor productivity (TFP), which embeds the technological level ([109]).

$$Y = TFP * L^{b} * K^{1-b} =$$

$$\left(TFP^{\frac{1}{b}} * L \right)^{b} * K^{1-b} =$$

$$(E * L)^{b} * K^{1-b}$$

where:

Y is total output (GDP);

L is the supply of labour (total hours worked);

K is the stock of capital;

E is the labour-augmenting technical progress (i.e. Harrod-neutral technical progress).

$E.L$ is then interpretable as total labour in efficiency units. TFP and the labour-augmenting technical progress are linked with a simple relationship: $TFP = (E)^{b}$

β is the labour share, i.e. the share of labour costs in total value-added. It is set at 0.65 ([110]).

As a result, potential labour productivity growth comes down to the following expression (where Y, L, E and TFP denote potential output, potential labour, trend labour-augmenting technical progress and trend TFP).

Thus, the projection of TFP growth and the growth in capital per hour worked, so called *capital deepening*, are the key drivers of projected labour productivity over the medium run.

In the long-run, according to the standard neo-classical growth model ([111]), the economy should reach its equilibrium, also called steady state or balanced growth path, where the ratio of capital stock to labour expressed in efficiency unit, K/(L.E), remains constant over time. As a result, the capital stock per hour worked grows at the same pace as labour augmenting technical progress E. Therefore, labour productivity growth (i.e. output per hour worked growth) coincides with TFP growth divided by the labour share:

$$\left(\frac{\dot{Y}}{L}\right) = \left(\frac{\dot{K}}{L}\right) = \dot{E} = \frac{\dot{TFP}}{b}$$

It should also be noted that, in the steady state, the contribution of capital deepening to output growth is a simple function of TFP([112]), which becomes the single driver of labour productivity ([113]).

$$contrib\left(\frac{\dot{K}}{L}\right) = (1-b)\left(\frac{\dot{K}}{L}\right) = \frac{(1-b)}{b}\dot{TFP}$$

([109]) See K. Havik, K. Mc Morrow, F. Orlandi, C. Planas, R. Raciborski, W. Röger, A. Rossi, A. Thum-Thysen, V. Vandermeulen, "The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps", European Economy Economic Papers No. 535, 2014.

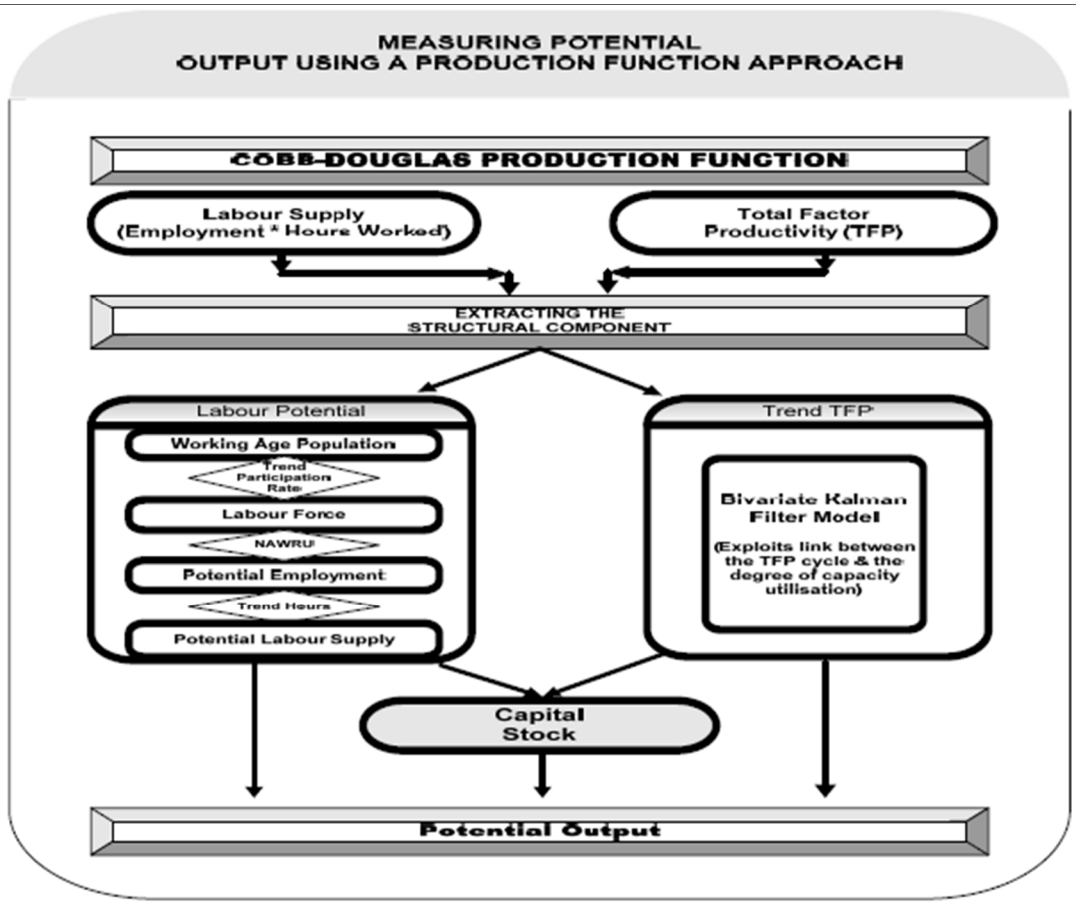
([110]) Although there is some debate about the recent and observed decline of the labour share, most economists assume that it will remain broadly constant in a long run perspective, while allowing for a variation in the short-term. This rule is uniformly applied in the projections to all Member States in order to allow for consistent cross-country comparisons of the results. The assumption is also well-founded in economic theory. If the real wage is equal to the marginal productivity of labour, it follows that under the standard features of the production function, real wage growth is equal to labour productivity growth and real unit labour costs remain constant.

([111]) Also known as the Solow growth model - See Solow R. (1956) "A contribution to the theory of economic growth". Quarterly Journal of Economics. ***70*** *(1)*: 65-94

([112]) With the assumption of a long-run TFP growth rate equivalent to 1% per annum in the baseline scenario (see section 3.5), this implies a long-run contribution of capital deepening to labour productivity growth equal to 0.5% and hence a labour productivity growth rate of 1.5%.

([113]) This in turn implies that, in the long run, the growth rate of the capital stock is set equal to the sum of the growth rate of labour and labour-augmenting technological progress, the so-called “capital rule”.

Graph II.A3.1: **Overview of the production function approach**



Source: European Economy Economic Papers No. 535, November 2014

As all these variables can be influenced by the business cycle in the short term, it is safer to project the potential output, i.e. the output adjusted for cyclical movements in the economy. This requires estimating the trend components for the individual production factors, except for the capital stock, which can only adjust in the long run.

Estimating potential output therefore amounts to removing the cyclical component from both TFP and labour. Trend TFP is obtained using a detrending technique. Potential labour input is the total labour obtained when the unemployment rate equals the structural unemployment rate (NAWRU). It equals *LF*(1-NAWRU)*Hours*, where *LF* stands for total labour force and *Hours* for average hours worked per worker. The potential output denoted *Yp* can be expressed in logarithm as the sum (in logarithm) of *trend TFP*, potential labour input weighted by the labour share in total value-added and the total capital stock multiplied by one minus the labour share. More formally, we get:

$$Log(Yp)=Log(trendTFP)+\beta Log(LF*(1-Nawru)*Hours)+(1-\beta)logK)$$

Graph II.A3.1 illustrates the building blocks of the production function used in the medium-term potential growth projection and the T+10 methodology developed by the Commission and EPC (Output Gap Working Group).

Following the practice used for the 2018 Ageing Report, the AWG and EPC decided to use the OGWG methodology for potential growth and its components until T+10 (2029), see section A3.2 for details.

A3.2. POTENTIAL GDP PROJECTIONS FOR THE FIRST TEN YEARS ('T+10' PROJECTIONS)

The T+10 methodology was first used for the 2015 Ageing Report for projecting potential GDP growth for the initial ten years of the forecast because it had a number of advantages vis-à-vis previous approaches:

More structural information: The T+10 approach marks an improvement with respect to the incorporation of additional information regarding the structural determinants of growth. This is explicitly the case with respect to the T+10 NAWRU anchor and is implicitly driving the rationale behind the capital formation and participation rate forecasts over the period T+6 to T+10. There are clear advantages from introducing more structural information into the T+10 methodology, including (i) it is easier to explain country differences; and (ii) it permits a quantitative evaluation of structural reforms.

T+10 NAWRU anchor versus reversion to a pre-crisis NAWRU level: The T+10 NAWRU anchor represents a significant methodological improvement over the previous method by anchoring medium term NAWRU developments to a long run unemployment rate which is estimated from the main structural determinants of labour market trends. Alternative approaches that do not rely on economic information were discussed and eventually abandoned. In particular, approaches relying on the concept of a return to the pre-crisis level for the NAWRU appeared impractical.

"Structural" approach to investment: The debate in relation to the assumption to be used for the T+10 capital formation projections was initiated with a discussion on the relative merits of pursuing a structural model of investment. This option was not pursued however since there would be only limited gains relative to the "capital rule" approach which was finally adopted. The latter approach effectively amounts to a structural model of investment since it links investment to its fundamental long run drivers, namely labour supply and TFP.

A more credible evolution for the path of participation rates: The approach adopted for projecting participation rates up to T+10 constitutes a balanced mixture of the information emanating from time series trends with the solid structural information derived from the cohort method. An important improvement is the introduction of a technical transition rule for smoothing the unacceptable breaks in participation rates which occurred in the forecasts using the T+5 and the T+10 methodologies.

Internally consistent TFP projections up to T+10: Despite the fact that attempts to anchor the trend TFP projections using policy and structural variables (which have been identified in the literature as relevant determinants of long run TFP growth) have been abandoned, the current T+6 to T+10 TFP projections are arguably superior to those used until the 2015 Ageing Report since the T+5 and T+10 estimates are now both produced with the same bivariate Kalman filter approach & consequently are internally consistent.

The T+10 methodology has been changed slightly since the 2018 Ageing Report with respect to the estimation of the NAWRU anchor. The anchor uses additional structural labour market information to anchor the short and medium-term NAWRU estimates, resulting in less pro-cyclical NAWRU estimates. While the earlier version of the anchor worked reasonably well in practice, it used some quick fixes to deal with certain limitations of the data. Most importantly, the coefficients for the anchor were only estimated for those Member States that had joined the European Union before 2004. In addition, a closer analysis of the residuals suggested that some variables were missing in the specification of the anchor. In order to address these limitations, the new approach estimates the coefficients for the anchor using information for all countries. It also partly solves the missing variable problem by including a demographic control variable for all Member States.

Following these changes to the methodology, the AWG and the EPC endorsed the use of the Spring 2020 T+10 potential GDP growth projections for the 2021 Ageing Report.

ANNEX 4

Pension projection reporting sheet

Table II.A4.1: **Pension projection reporting sheet: blocks common to all schemes**

	European Commission							
	DG ECFIN Unit C2							
	2021 Ageing Report: reporting framework on pensions (expenditure, pensioners, contributions and taxes)							
	Country							
	Scenario							
	Pension system type							
	Reporting of variable on voluntary basis							
	Variable calculated by formula							
	A. Fixed table	**2000**	**2019**	**2030**	**2040**	**2050**	**2060**	**2070**
1	GDP (used in projections, in current prices - billion EUR)							
2	GDP deflator							
3	Economy-wide gross wage total (current prices - billion EUR)							
4	Average gross wage (current prices - 1000 EUR)							
5	Consumer price inflation							
	0 - AVERAGE GROSS WAGE AT RETIREMENT							
6	Average gross wage at retirement (current prices - 1000 EUR)							
	1 - PENSION EXPENDITURE (gross, million EUR, current prices)							
7	**Public pensions scheme, gross (8+9+10+11+12+13) and (14+22+24+26)**							
	Of which							
8	*aged -54*							
9	*aged 55-59*							
10	*aged 60-64*							
11	*aged 65-69*							
12	*aged 70-74*							
13	*aged 75+*							
14	Old-age and early pensions (16+18+20)							
15	*Of which new pensions (17+19+21)*							
16	*Of which flat component (basic pension)*							
17	*Of which new pensions (161*162*163)*							
18	*Of which earnings-related pensions*							
19	*Of which new pensions (DB/NDC: 155*156*157*158*159*160; PS: 155*176*177*159*178*160)*							
20	*Of which minimum pensions (non-contributory, i.e. minimum income guarantees for retired people)*							
21	*Of which new pensions*							
22	Disability pensions							
23	*Of which new pensions*							
24	Survivors' pensions							
25	*Of which new pensions*							
26	Other pensions							
27	*Of which new pensions*							
28	**Private occupational schemes, gross**							
29	*Of which new pensions (179*180*181*182*183*184)*							
30	**Private individual mandatory schemes, gross**							
31	*Of which new pensions (185*186*187*188*189*190)*							
32	**Private individual non-mandatory schemes, gross**							
33	*Of which new pensions (191*192*193*194*195*196)*							
34	**Total pension expenditure, gross (35+36+37+38+39+40) and (7+28+30+32)**							
	Of which							
35	*aged -54*							
36	*aged 55-59*							
37	*aged 60-64*							
38	*aged 65-69*							
39	*aged 70-74*							
40	*aged 75+*							
	2 - TAXES ON PENSIONS & NET PENSION EXPENDITURES (million EUR, current prices)							
41	**Public pension scheme, tax revenues (including compulsory social security contributions paid by pensioners)**							
42	**Private occupational schemes, tax revenues**							
43	**Private individual mandatory schemes, tax revenues**							
44	**Private individual non-mandatory schemes, tax revenues**							
45	Total revenues from taxes on pensions (41+42+43+44)							
46	Public pensions scheme, net of taxes on pensions (7-41)							
47	*Of which minimum pensions (non-contributory, i.e. minimum income guarantees for retired people)*							
48	Private occupational schemes, net of taxes on pensions (28-42)							
49	Private individual mandatory schemes, net of taxes on pensions (30-43)							
50	Private individual non-mandatory schemes, net of taxes on pensions (32-44)							
51	**Total pension expenditure, net of taxes on pensions (34-45) and (46+48+49+50)**							
	3 - BENEFIT RATIO							
52	**Public pensions (7/86)/4**							
53	*Of which old-age earnings-related pensions (including the flat component) ((16+18)/100)/4*							
54	Private occupational schemes (28/105)/4							
55	Private individual mandatory schemes (30/106)/4							
56	Private individual non-mandatory schemes (32/107)/4							
57	**Total benefit ratio (34/108)/4**							
	4 - GROSS AVERAGE REPLACEMENT RATES (at retirement)							
58	**Public pensions: old-age earnings-related pensions (including the flat component)**							
59	Private occupational schemes (29/179)/6							

(Continued on the next page)

Table (continued)

60	Private individual mandatory schemes (31/185)/6							
61	Private individual non-mandatory schemes (33/191)/6							
62	**Total replacement rate**							
5 - NUMBER OF PENSIONS (in 1000)								
63	**Public pensions (64+65+66+67+68+69) and (70+73+74+75)**							
	Of which							
64	*aged -54*							
65	*aged 55-59*							
66	*aged 60-64*							
67	*aged 65-69*							
68	*aged 70-74*							
69	*aged 75+*							
70	Old-age and early pensions (71+72)							
71	*Of which earnings-related pensions and the flat component*							
72	*Of which minimum pensions (non-contributory, i.e.minimum income guarantees for retired people)*							
73	Disability pensions							
74	Survivors' pensions							
75	Other pensions							
76	**Private occupational schemes**							
77	**Private individual mandatory schemes**							
78	**Private individual non-mandatory schemes**							
79	**All pensions (63+76+77+78) and (80+81+82+83+84+85)**							
	Of which							
80	*aged -54*							
81	*aged 55-59*							
82	*aged 60-64*							
83	*aged 65-69*							
84	*aged 70-74*							
85	*aged 75+*							
6 - NUMBER OF PENSIONERS (in 1000)								
86	**Public pensioners (87+89+91+93+95+97) and (99+102+103+104)**							
	Of which							
87	*aged -54*							
88	*Of which female*							
89	*aged 55-59*							
90	*Of which female*							
91	*aged 60-64*							
92	*Of which female*							
93	*aged 65-69*							
94	*Of which female*							
95	*aged 70-74*							
96	*Of which female*							
97	*aged 75+*							
98	*Of which female*							
99	Old-age and early pensions (100+101)							
100	*Of which earnings-related pensions or flat component*							
101	*Of which minimum pensions (non-contributory, i.e.minimum income guarantees for retired people)*							
102	Disability							
103	Survivors pensions							
104	Other pensions							
105	**Private occupational schemes**							
106	**Private individual mandatory schemes**							
107	**Private individual non-mandatory schemes**							
108	**All pensioners (109+111+113+115+117+119)**							
	Of which							
109	*aged -54*							
110	*Of which female*							
111	*aged 55-59*							
112	*Of which female*							
113	*aged 60-64*							
114	*Of which female*							
115	*aged 65-69*							
116	*Of which female*							
117	*aged 70-74*							
118	*Of which female*							
119	*aged 75+*							
120	*Of which female*							
7 - CONTRIBUTIONS (million EUR, current prices)								
121	Public pensions (122+123+124+125)							
122	*Of which employer*							
123	*Of which employee*							
124	*Of which state (only if contribution is legislated)*							
125	*Of which other revenues, i.e. private pension funds, nuisance charges (only if legislated)*							
126	Private occupational schemes (total contributions)							
127	Private individual mandatory schemes (total contributions)							
128	Private individual non-mandatory schemes (total contributions)							
129	Total pension contributions (121+126+127+128)							

(Continued on the next page)

Table (continued)

8 - NUMBER OF CONTRIBUTORS (employees, in 1000)								
130	Public pensions							
131	Private occupational schemes							
132	Private individual mandatory schemes							
133	Private individual non-mandatory schemes							
9 - INDEXATION FACTORS (percentage)								
134	Indexation factor earnings-related pensions							
135	Indexation factor flat component							
136	Indexation factor minimum pensions							
10 - BREAKDOWN OF NEW PENSION EXPENDITURES								
	PUBLIC PENSIONS							
	PRIVATE OCCUPATIONAL SCHEMES - TOTAL (calculated in line 29)							
179	Number of new pensions (in 1000)							
180	Average contributory period (in years)							
181	Average accrual rate							
182	Monthly average pensionable earning							
183	Adjustment factors (1 if not applicable)							
184	Average number of months paid the first year							
	PRIVATE INDIVIDUAL MANDATORY SCHEMES - TOTAL (calculated in line 31)							
185	Number of new pensions (in 1000)							
186	Average contributory period (in years)							
187	Average accrual rate							
188	Monthly average pensionable earning							
189	Adjustment factors (1 if not applicable)							
190	Average number of months paid the first year							
	PRIVATE INDIVIDUAL NON-MANDATORY SCHEMES - TOTAL (calculated in line 33)							
191	Number of new pensions (in 1000)							
192	Average contributory period (in years)							
193	Average accrual rate							
194	Monthly average pensionable earning							
195	Adjustment factors (1 if not applicable)							
196	Average number of months paid the first year							
11 - ASSETS AND RESERVES & RETURN (million EUR, current prices)								
197	**Public pension scheme: assets and reserves**							
198	Public pension scheme: average return (%)							
199	**Private occupational schemes: assets and reserves**							
200	Private occupational schemes: average return (%)							
201	**Private individual mandatory schemes: assets and reserves**							
202	Private individual mandatory schemes: average return (%)							
203	**Private individual non-mandatory schemes: assets and reserves**							
204	Private individual non-mandatory schemes: average return (%)							
B. Additional information								
205								
206								
207								

Source: European Commission, EPC.

Table II.A4.2: **Pension projections reporting sheet: disaggregation of new public pensions expenditure – earnings-related for defined benefit (DB) schemes**

10 - BREAKDOWN OF NEW PENSION EXPENDITURES		**2000**	**2019**	**2030**	**2040**	**2050**	**2060**	**2070**
	PUBLIC PENSIONS **- DEFINED BENEFIT**							
	TOTAL - Earnings-related pension (calculated in line 19)							
155	Number of new pensions (in 1000)							
156	Average contributory period (in years)							
157	Average accrual rate (contributory only)							
158	Monthly average pensionable earning (in 1000 EUR)							
159	Sustainability/adjustment factors (1 if not applicable)							
160	Average number of months paid the first year							
	TOTAL - Flat component (basic pension) (calculated in line 17)							
161	Number of new pensions (in 1000)							
162	Average monthly new pension (EUR)							
163	Average number of months paid the first year							

Data to be provided also by gender.
Source: European Commission, EPC.

Table II.A4.3: **Pension projection reporting sheet: disaggregation of new public pension expenditure - earnings-related for notional defined contribution (NDC) schemes**

	10 - BREAKDOWN OF NEW PENSION EXPENDITURES	2000	2019	2030	2040	2050	2060	2070
	PUBLIC PENSIONS **- NOTIONAL DEFINED CONTRIBUTION**							
	TOTAL - Earnings-related pension (calculated in line 19)							
155	Number of new pensions (in 1000)							
156	Average contributory period (in years)							
157	Average accrual rate (c/A)							
168	*Notional-accounts contribution rate (c)*							
169	*Annuity factor (A)*							
158	Monthly average pensionable earning							
159	Sustainability/adjustment factors (1 if not applicable)							
160	Average number of months paid the first year							
	TOTAL - Flat component (basic pension) (calculated in line 17)							
161	Number of new pensions (in 1000)							
162	Average monthly new pension (EUR)							
163	Average number of months paid the first year							

Data to be provided also by gender.
Source: European Commission, EPC.

Table II.A4.4: **Pension projection reporting sheet: disaggregation of new public pension expenditure - earnings-related for point systems (PS)**

	10 - BREAKDOWN OF NEW PENSION EXPENDITURES	2000	2019	2030	2040	2050	2060	2070
	PUBLIC PENSIONS **- POINT SYSTEM**							
	TOTAL - Earnings-related pension (calculated in line 19)							
155	Number of new pensions (in 1000)							
176	Point value (EUR/month)							
157	Average accrual rate (points/year; 177/156)							
177	*Total pension points at retirement*							
156	*Average contributory period (years)*							
159	Sustainability/adjustment factors (1 if not applicable)							
178	Correction coefficient (1 if not applicable)							
160	Average number of months paid the first year							
	TOTAL - Flat component (basic pension) (calculated in line 17)							
161	Number of new pensions (in 1000)							
162	Average monthly new pension (EUR)							
163	Average number of months paid the first year							

Data to be provided also by gender.
Source: European Commission, EPC.

Table II.A4.5: **Reporting sheet for special pension schemes (voluntary reporting)**

Are special pension schemes included in the projections? (SELECT) *YES/NO*
Where they included in the previous projections? *YES/NO*

		2009	2019	2030	2040	2050	2060	2070
	1 - Special public pension schemes: expenditure (million EUR)							
1	Total (4+5+6)							
2	*Of which new pensions*							
3	Total (%GDP)							
4	Difficult conditions							
5	Security and defence							
6	Other (7+8+9+10+11+12+13)							
7	of which self-employed							
8	of which merit and deprived							
9	of which judicial staff							
10	of which railway staff							
11	of which teachers							
12	of which civil servants (not included in the above categories)							
13	of which atypical (all other)							
	2 - Special public pension schemes: number of pensioners (in 1000)							
14	Total (17+18+19)							
15	*Of which new pensioners*							
16	Total (% of public pensioners)							
17	Difficult conditions							
18	Security and defence							
19	Other (20+21+22+23+24+25+26)							
20	of which self-employed							
21	of which merit and deprived							
22	of which judicial staff							
23	of which railway staff							
24	of which teachers							
25	of which civil servants (not included in the above categories)							
26	of which atypical (all other)							

Source: European Commission, EPC.

ANNEX 5
Overview of pension systems in the Member States

Table II.A5.1: **Pension schemes in EU Member States and projection coverage**

		Public pensions[3]					Private pension scheme		
	Pension scheme type	Minimum Pension[4]	Old-age pensions	Early retirement pensions	Disability pensions	Survivors' pensions	Occupational pension scheme	Mandatory private individual	Voluntary private individual
BE	DB	MT - SA	ER	ER	ER priv FR self-emp	ER	M* priv V* self-emp	X	Yes*
BG	DB	MT - SA	ER	ER	ER	ER	V*	Yes*	Yes*
CZ	DB	X	ER	ER	ER	ER	X	X	Yes*
DK	Flat rate + DB	FR & MT suppl.	FR & MT suppl.	V	FR	FR	Quasi M	X	Yes
DE	PS	MT - SA*	ER	ER	ER	ER	V*	X	Yes*
EE	PS	MT - SA	ER	ER	ER	ER	M*	Yes	Yes*
IE	Flat rate + DB	MT - FR & SA	FR	X	FR - MT	FR - MT	M pub V* priv	X	Yes*
EL[1]	Flat rate + DB + NDC	MT - FR	FR - ER	FR - ER	FR - ER	FR - ER	V*	X	Yes*
ES	DB	MT	ER	ER	ER	ER	V	X	Yes
FR[2]	DB + PS	MT - SA	ER	ER	ER	ER	V*	X	Yes*
HR	PS	ER	ER	ER	ER	ER	X	Yes	Yes*
IT	NDC	MT - SA	ER	ER	ER	ER	V*	X	Yes*
CY	PS	MT & ER	ER	ER	ER	ER	M* pub V* priv	X	Yes*
LV	NDC	FR - SA	ER	ER	ER	ER	X	Yes	Yes*
LT	PS	SA	ER	ER	ER	ER	X	Quasi M	Yes*
LU	DB	MT - SA*	ER	ER	ER	ER	V*	X	Yes*
HU	DB	MT - SA	ER	ER	ER	ER	V*	X	Yes*
MT	Flat rate + DB	MT - SA	FR & ER	X	FR & ER	FR & ER	V*	X	Yes*
NL	Flat rate + DB	SA	FR	X	ER	FR	M	X	Yes*
AT	DB	MT - SA	ER	ER	ER	ER	V*	X	Yes*
PL	NDC	ER	ER	ER	ER	ER	V*	Yes*	Yes*
PT	DB	MT - SA[5]	ER	ER	ER	ER	Quasi M	X	Yes*
RO	PS	SA	ER	ER	ER	ER	X	Yes	Yes
SI	DB	X	ER	ER	ER	ER	V*	X	Yes*
SK	PS	MT - SA	ER	ER	ER	ER	X	X	Yes*
FI	DB	MT	ER	ER	ER	ER	V*	X	Yes*
SE	NDC	MT	ER	ER	ER	ER	Quasi M	Yes	Yes
NO	NDC	FR	ER	X	ER	ER	M*	X	Yes*

(1) The public supplementary pension fund is NDC since 2015.
(2) Point system refers to the ARRCO and AGIRC pension schemes.
(3) Public pension expenditure include all public expenditure on pension and equivalent cash benefits granted for a long period, see Annex 6 for details on the coverage of the public pension expenditure projections.
(4) Minimum pension corresponds to minimum pension and other social allowances for older people not included elsewhere.
(5) Includes all pensions of the non-earning-related scheme such as old-age, disability and survivors' pensions and the social supplement (equal to the difference between the guaranteed minimum amount and pension benefits calculated according to the rules) granted to the earning-related pensioners.

DB: Defined benefit system
NDC: Notional defined contribution system
PS: Point system

MT - Means-tested
FR - Flat rate
ER - Earnings-related
SA - Social allowance/assistance
V - Voluntary
M - Mandatory
X - Does not exist
* Not covered in the projections
Source: European Commission, EPC.

Table II.A5.2: **Statutory retirement ages, early retirement ages (in brackets) and incentives to postpone retirement**

	Statutory retirement age (early retirement age)								Incentives**	
	MALE				FEMALE					
	2019	2030	2050	2070	2019	2030	2050	2070	Penalty	Bonus
BE	65 (63)	67 (63)	67 (63)	67 (63)	65 (63)	67 (63)	67 (63)	67 (63)		
BG	64.2 (63.2)	65 (64)	65 (64)	65 (64)	61.3 (60.3)	63.3 (62.3)	65 (64)	65 (64)	X	X
CZ	63.5 (60)	65 (60)	65 (60)	65 (60)	61.2 (58.2)	65 (60)	65 (60)	65 (60)	X	X
DK*	65.5 (63)	68 (65)	72 (69)	74.5 (71.5)	65.5 (63)	68 (65)	72 (69)	74.5 (71.5)		
DE	65.7 (63)	67 (63)	67 (63)	67 (63)	65.7 (63)	67 (63)	67 (63)	67 (63)	X	X
EE*	63.6 (60.6)	65.5 (60.5)	67.7 (62.7)	69.8 (64.8)	63.6 (60.6)	65.5 (60.5)	67.7 (62.7)	69.8 (64.8)	X	X
IE	66 (66)	68 (68)	68 (68)	68 (68)	66 (66)	68 (68)	68 (68)	68 (68)		
EL*	67 (62)	68.8 (63.8)	70.8 (65.8)	72.6 (67.6)	67 (62)	68.8 (63.8)	70.8 (65.8)	72.6 (67.6)	X	
ES	65.7 (63.7)	67 (65)	67 (65)	67 (65)	65.7 (63.7)	67 (65)	67 (65)	67 (65)	X	X
FR	66.8 (61.8)	67 (62)	67 (62)	67 (62)	66.8 (61.8)	67 (62)	67 (62)	67 (62)	X	X
HR	65 (60)	65 (60)	65 (60)	65 (60)	62.3 (57.3)	65 (60)	65 (60)	65 (60)	X	X
IT*	67 (64)	67.7 (64.7)	69.3 (66.3)	71 (68)	67 (64)	67.7 (64.7)	69.3 (66.3)	71 (68)		
CY*	65 (65)	66.5 (66.5)	68.3 (68.3)	69.9 (69.9)	65 (65)	66.5 (66.5)	68.3 (68.3)	69.9 (69.9)	X	X
LV	63.5 (61.5)	65 (63)	65 (63)	65 (63)	63.5 (61.5)	65 (63)	65 (63)	65 (63)		
LT	63.8 (58.8)	65 (60)	65 (60)	65 (60)	62.7 (57.7)	65 (60)	65 (60)	65 (60)	X	X
LU	65 (57)	65 (57)	65 (57)	65 (57)	65 (57)	65 (57)	65 (57)	65 (57)		
HU	64 (64.3)	65 (65)	65 (65)	65 (65)	64 (64.3)	65 (65)	65 (65)	65 (65)		X
MT	62.9 (61)	65 (61)	65 (61)	65 (61)	62.9 (61)	65 (61)	65 (61)	65 (61)		X
NL*	66.3 (66.3)	67.3 (67.3)	68.5 (68.5)	69.8 (69.8)	66.3 (66.3)	67.3 (67.3)	68.5 (68.5)	69.8 (69.8)		
AT	65 (60)	65 (60)	65 (60)	65 (60)	60 (58)	63.5 (60)	65 (60)	65 (60)	X	X
PL	65 (65)	65 (65)	65 (65)	65 (65)	60 (60)	60 (60)	60 (60)	60 (60)		
PT*	66.4 (60)	67 (60)	68.3 (60)	69.3 (60)	66.4 (60)	67 (60)	68.3 (60)	69.3 (60)	X	X
RO	65 (60)	65 (60)	65 (60)	65 (60)	61.2 (56.2)	63 (58)	63 (58)	63 (58)	X	
SI	65 (60)	65 (60)	65 (60)	65 (60)	64.5 (60)	65 (60)	65 (60)	65 (60)	X	X
SK	62.5 (60.5)	64 (62)	64 (62)	64 (62)	62.5 (60.5)	64 (62)	64 (62)	64 (62)	X	X
FI*	63.5 (61)	65.1 (62.3)	66.5 (63.7)	67.7 (64.8)	63.5 (61)	65.1 (62.3)	66.5 (63.7)	67.7 (64.8)	X	X
SE	67 (61)	67 (62)	67 (62)	67 (62)	67 (61)	67 (62)	67 (62)	67 (62)		
NO	67 (62)	67 (62)	67 (62)	67 (62)	67 (62)	67 (62)	67 (62)	67 (62)		

BG - The latest pension reform included a provision to link retirement ages to life expectancy as from 2037. This provision has not been implemented, though.
CZ - Statutory retirement age depends on the number of children. Values for women with two children are reported.
DK – Increase in the retirement age is subject to a Parliamentary decision.
IT - Retirement is allowed with at least 20 years of contribution and a minimum pension amount of 1.5 times the old-age allowance in 2012. In bracket the minimum age for early retirement under the NDC system is reported (a minimum pension amount of 2.8 times the old-age allowance is required in addition to the minimum of 20 years of contribution). Early retirement is also allowed regardless of age, with a contribution requirement of 43.1 years in 2019, indexed to changes in life expectancy (43.4 in 2030, 45.1 in 2050 and 46.8 in 2070). Workers who reach the age of 62 with a minimum contribution requirement of 38 years (so-called Quota 100) may retire earlier in the period 2019-2021.
PT - Since 2015, early retirement is possible from the age of 60 with 40 contributory years. For each year the contributory career exceeds 40 years, the statutory retirement age is reduced by 4 months. The pension benefit is reduced by 0.5% for each month of anticipation to the statutory retirement age (penalty).
SE - Retirement age flexible from age of 61 without an upper limit. Under the Employment Protection Act, an employee is entitled to stay in employment until the age of 67.
*Countries where the statutory retirement age is legislated to increase in line with life expectancy. Reported retirement ages are calculated on the basis of life expectancy expectation in the Eurostat population projections.
**Actuarial equivalence is not considered as a penalty/bonus.
Source: European Commission, EPC.

Table II.A5.3: **Key indexation and valorisation parameters of pension systems (old-age pensions)**

	Pensionable earnings reference	General valorisation variable(s)	General indexation variable(s)
BE	Full career	Prices	Prices and living standard
BG	Full career	Wages	Prices and wages
CZ	Full career	Wages	Prices and wages
DK	Years of residence	Not applicable	Wages
DE	Full career	Wages	Wages plus sustainability factor
EE	Full career	Prices and social taxes	Prices and social taxes
IE	Flat rate	Not applicable	No fixed rule
EL	Full career	Prices and wages	Prices and GDP (max 100% prices)
ES	Last 25 years	Prices	Index for pension revaluation
FR	25 best years (CNAVTS)	Prices	Prices
HR	Full career	Prices and wages	Prices and wages
IT	Full career	GDP	Prices
CY	Full career	Wages	Prices and wages
LV	Full career	Contribution wage sum index	Prices and wage sum
LT	Full career	Wage sum	Wage sum
LU	Full career	Prices and wages	Prices and wages
HU	Full career	Wages	Prices
MT	10 best of last 41 years	Cost of living	Prices and wages
NL	Years of residence	Not applicable	Wages
AT	Full career	Wages	Prices
PL	Full career	NDC 1st: Wages, NDC 2nd: GDP	Prices and wages
PT	Full career up to a limit of 40 years	Prices	Prices and GDP
RO	Full career	Prices and wages	Prices and wages
SI	Best consecutive 24 years	Wages	Prices and wages
SK	Full career	Wages	Prices
FI	Full career	Prices and wages	Prices and wages
SE	Full career	Wages	Wages
NO	Full career	Wages	Wages

BG - Pensionable earnings reference is full career back to 2000.
CZ - Pensionable earnings reference is full career back to 1986.
IE - A price and wage indexation rule has been assumed in the projections.
EL - Pensionable earnings reference is full career, taking into account wages/income from 2002 onwards.
ES - Pensionable earnings reference is last 25 years as of 2022. The IPR is established annually at a level consistent with a balanced budget of the Social Security system over the medium run. Depending on the balance of the system, the indexation will be less than price (budget deficit) or price + 0.5% (budget balance). It has been suspended since 2018 and is expected to remain suspended during the 2021 fiscal year.
FR - The pensionable earnings reference is full career in AGIRC (Association générale des institutions de retraite des cadres) and ARRCO (Association pour le régime de retraite complémentaire des salariés); CNAVTS: Caisse nationale de l'assurance vieillesse des travailleurs salariés. Valorisation rule and indexation of 1% in both AGIRC and ARRCO.
LT - Pensionable earnings reference is full career back to 1994. Pensions are indexed to the seven-year average of the wage sum growth over the current, previous three and next three years. The index is applied in case of a balanced budget of the Pension Social Security System in two consecutive years and contingent on positive GDP or wage sum growth.
LU - Indexation rule is wages if sufficient financial resources are available, otherwise only cost of living indexation.
HU - Pensionable earnings reference is full career back to 1988.
MT - Pensionable earnings reference rule applies to people born as of 1969.
PT - Pensionable earnings reference is full career as of 2002. Price and wage valorisation rule applies to earnings registered between 2002 and 2011.
SK - Pensionable earnings reference is full career back to 1984.
SE - Indexation rule is wage growth minus 1.6 pps.
NO - Indexation rule is wage growth minus 0.75 pps.
Source: European Commission, EPC.

Table II.A5.4: **Automatic balancing mechanisms, sustainability factors and links to life expectancy in pension systems**

	Automatic balancing mechanism	Sustainability factor (benefit linked to life expectancy)(6)	Retirement age linked to life expectancy
CY			X
DE	X		
DK(1)			X
FR(2)		X	
FI		X	X
EL(3)			X
ES	X	X	
EE			X
IT		X	X
LT	X		
LV		X	
MT(4)			X
NL(5)			X
PL		X	
PT(5)		X	X
SE	X	X	

(1) Subject to Parliamentary decision.
(2) Pension benefits evolve in line with life expectancy through the 'proratisation' coefficient; it has been legislated until 2035.
(3) An automatic balancing mechanism is applied in the auxiliary pension system.
(4) Subject to Parliamentary decision. The Government is obliged to provide Parliament, at least every five years, with recommendations to keep a stable proportion between the contribution period and life expectancy at retirement.
(5) Only two thirds of the increase in life expectancy is reflected in the retirement age.
(6) In NDC systems, the benefit is linked to changes in life expectancy through the annuity factor.
Source: European Commission, EPC.

Table II.A5.5: **Contribution rates to the public pension system**

	Contribution rate: employer	Contribution rate: employee	State contributions		Contribution rate: self-employed
			Contribution rate	Other provisions	
BE	24.92% (for all Social Security schemes)	13.07% (for all Social Security schemes)	-	Social security spending is also funded by State subsidies (17.7% of total revenue in 2019) and alternative funding (15.7% of total revenue), mainly VAT revenues.	In 2020, 20.5% for revenues up to 60428 EUR and 14.16% for revenues between 60428 EUR and 89051 EUR.
BG	8.22% when born after 1959; 11.02% when born before 1960	6.58% when born after 1959; 8.78% when born before 1960	-	State commitment for covering the deficit on an annual basis.	born before 1960: 19.8% of declared covered earnings in the preceding year; born after 1959: 14.8% of declared covered earnings
CZ	21.5%	6.5%	-	Balance of pension system is part of general governement budget	28%
DK	-	-	-	-	-
DE	9.3%	9.3%	-	State subsidies with annual indexation. 'Sustainability fund' fluctuates between 20% and 150% of monthly pension expenditures. The contribution rate is set so that this requirement is met.	18.6%
EE	20% (if not participating to 2nd pillar); 16% (if participating to 2nd pillar)	-	-	-	20%
IE	Varies	Varies	-	Social Insurance Fund and Social Assistance Fund (to finance other, non-pension social benefits). Shortfalls are met by the Exchequer.	4% of covered income
EL	Main pensions 13.33%; auxiliary pensions 3%	Main pensions 6.67%; auxiliary pensions 3%	-	National budget/other sources	Contributions are based on insurance classes. Corresponding insurable base is derived taking into account contribution rate of 20%
ES	Private sector: 23.6%	Private sector: 4.7%	-	Pension Reserve Fund. If needed, annual funding gaps are covered through central government transfers.	28.3%
FR	Private sector (CNAV): 10.45% up to the Social Security Ceiling (SSC)	Private sector (CNAV): 7.3% up to the social security ceiling (SSC). Reduced contribution rates are applied to some specific groups (artists, journalists and part-time medical workers)		Pensions Reserve Fund and Old-age solidarity fund	17.75% up to the SSC.
HR	4.86% to 17.58% for employees in arduous and hazardous occupations	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)	-	Government is committed to cover deficits.	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)
IT	23.81%	9.19%	-	Residual funding by the State (pension expenditure exceeding contributions)	24%
CY	8.3%	8.3%	4.9%	Reserve fund	15.6% of insurable income
LV	Total contribution rate for old-age pension capital (employer and employee): 20% (if no participant of 2nd tier) or 16% (if participant of 2nd tier), with 4% contribution to the 2nd tier	-	-	-	Contribution rate for old-age pension capital: 20% (if no participant of 2nd tier) or 16% (if participant of 2nd tier) with 4% contribution to the 2nd tier
LT	0.0%	8.72%	-	State provides funds from the national budget to cover the general pension part of public pension scheme	8.72% - based on 50% of declared earnings
LU	8%	8%	8%	Buffer fund of at least 1.5 times the amount of annual pension expenditure	16%
HU	15.5% in 2018, 13.0% in 2019, 11.8% in 2020 (part of social contribution tax payed into Pension Insurance Fund)	10%	-	-	10% of declared monthly earnings and 11.8% of declared monthly earnings in the form of a social contribution tax
MT	10%	10%	10%	-	15% of the annual income, subject to the same ceiling as for employees
NL	-	17.9%	-	Government supplements shortfall between expenditure and funds raised by the 17.9% tax levy	17.9%
AT	12.55%	10.25%	For farmers, self employed and liberal professions, the difference with the standard contribution rate of 22.8% is borne by federal transfers	Federal budget covers the deficits in public pension schemes	17% for farmers, 18.5% for self-employed and 20% for liberal professions
PL	9.76%	9.76%	-	Demographic Reserve Fund	19.52%
PT	23.75%	11%	-	Social Security Trust Fund	Employee: 21.4% or 25.2%; employer: 10%, if economic dependence is higher than 80%, or 7%
RO	Between 0% and 8%: 0% (normal working conditions); 4% (difficult working conditions) and 8% (special working conditions)	25%	-	State provides funds from the national budget to cover the public pension system deficit.	10.5% or 26.3%
SI	8.85%	15.5%	-	State provides funds from the national budget and other sources to cover shortfalls.	24.35%
SK	14% of gross wage if one does not participate in the 2nd pillar; otherwise 4.75% is sent to the second pillar in 2019 (rising to 6 % by 2024)	4 % of gross wage	-	Government makes contributions for people insured by the state (e.g. maternity leave) and covers special benefits (e.g. Christmas bonus). Otherwise, social security system deficits are covered by state transfers.	18% if only covered in the 1st pillar; otherwise 4.75% is sent to the second pillar in 2019 (rising to 6% by 2024)
FI	17.35% for private sector; 21.17% for local government (in 2019)	6.75% (18-52y and +63y); 8.25% (53-62y)	17.1% for State pensions	National and guarantee pensions are fully funded by the State. Part of farmers', self-employed persons' and seafarers' pension are funded by the State. 25% of private sector pension are prefunded.	24.1% (18-52y and +63y); 25.6% (53-62y)
SE	10.21% (including Premium Pension)	7% (including Premium Pension)	Employer contribution' for social insurance	Buffer funds	17.21%
NO	PAYG system without earmarked tax going to pensions.	PAYG system without earmarked tax going to pensions	PAYG system without earmarked tax going to pensions	State Pension Fund contributes to financing government expenditures (pension and other)	11.4%

When several schemes exist, the information refers to the main (general regime) pension scheme.
EL: Main pensions: unified rates from 2022 onwards. Auxiliary pensions: 2019-21: 3.25%.

Source: European Commission, EPC.

ANNEX 6
Coverage and specification of pension schemes

Table II.A6.1: **Pension schemes included in the projections**

	Schemes covered in the projections	Schemes <u>not</u> covered
BE	***Public pensions: old-age and early pensions*** Means-tested minimum benefits: 65+; 66+ as of 2025; 67+ as of 2030. Wage earners: earnings-related old-age (63+ and 41 career years in 2018 and 63+ and 42 career years as of 2019[(a)]), widows. Self-employed: earnings-related old-age (63+ and 41 career years in 2018 and 63+ and 42 career years as of 2019[(a)]), widows. Civil servants: earnings-related old-age (63+ and 41 career years in 2018 and 63+ and 42 career years as of 2019[(a)]), widows, disability. Unemployment with company allowance (wage earners): 62+ (as of 2015) and 40 career years (for men as of 2015 and for women as of 2024), until the age of 64 (65 as of 2025, 66 as of 2030). Unemployment with company allowance (wage earners) for companies undergoing restructuring or in difficulty (55+ in 2016; 56+ in 2017 and 2018; 58+ in 2019; 59+ in 2020; 60+ as of 2021), until the age of 64 (65 as of 2025, 66 as of 2030). ***Public pensions: disability*** Wage earners, disability pensions: -64; -65 as of 2025; -66 as of 2030. Self-employed, disability pensions: -64; -65 as of 2025; -66 as of 2030. [(a)]Some exceptions: 61 and 43 career years, 60 and 44 career years.	***Public pensions scheme*** Unemployment with company allowance only includes the part paid from unemployment benefit scheme, not the allowance paid by the employer. ***Private occupational pensions scheme*** Wage earners. Self-employed. ***Private individual pensions scheme*** Non-mandatory.
BG	***Public pensions: old-age and early pensions*** Earnings-related old-age pensions (including farmers and military officials). ***Public pensions: other*** Earnings-related disability pensions due to general disease (including farmers and military officials). Earnings-related disability pensions due to work injury and professional disease (including farmers and military officials). Earnings-related survivors' pensions according to relationship with the deceased – widows, children, parents. Pensions not related to employment – social pensions, special merits pensions, pensions by Decree.	***Supplementary mandatory pension schemes*** Supplementary life-long old-age pensions - Universal Pension Funds (UPF). Early retirement pensions for a limited period of time for people working in hazardous conditions - Professional Pension Funds (PPF). ***Supplementary voluntary pension schemes – individual private and occupational pensions.*** ***Teachers' Pension Fund.***

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Table (continued)

CZ	***Public pensions: old-age and early pensions*** Earnings-related old-age pensions (all sectors except armed forces, all ages). Early pensions with permanent reductions (all sectors except armed forces, all ages). ***Public pensions: other*** Disability pensions (all three types of disability, all sectors except armed forces, all ages). Widows and widowers pensions (all ages). Orphans pensions (all ages).	***Individual private schemes*** Voluntary fully funded scheme.
DK	***Public pensions: old-age and early pensions*** Public flat-rate old-age pensions and means-tested supplements, all citizens 65+. Civil servants old-age pensions 65+, central and local government. Voluntary early retirement schemes, all wage earners. ***Public pensions: other*** Disability pensions, -64. ***Occupational pensions*** Labour market pensions. Individual, private pensions. Labour market supplementary pensions, ATP. Employees' capital fund (LD).	
DE	***Public pensions: old-age and early pensions*** Earnings-related old-age, widows and disability schemes, all ages. General scheme and civil servants. Early pensions for long-time workers. Early pensions for severely handicapped. ***Public pensions: other*** (covered above; not shown separately)	Means-tested minimum benefits to elderly (social assistance); 0.1% of GDP in 2019. Farmers pensions; 0.08% of GDP in 2019. ***Occupational pensions*** Annual contributions. Pension expenditure of 1.2% of GDP in 2019. *Individual funded and state subsidised private pension (Riester-Rente)*, schemes at a building stage, only contributions to the schemes.

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Table (continued)

EE	***Public pensions: old-age and early pensions*** Minimum flat-rate pensions, all citizens. Earnings-related old-age pensions; length-of-service component to 60+ for women and 63+ for men in 2007, 65+ for both sexes as of 2026, all sectors (Pension Insurance Fund). Early pensions (possible to retire 3 years before the statutory retirement age), all sectors. ***Public pensions: other*** Disability and widows' pensions, all ages, all sectors (Pension Insurance Fund). ***Private mandatory pensions*** Mandatory funded pensions, mandatory for people born as of 1983.	
IE	***Public pensions: old-age and early pensions*** Minimum flat-rate old-age non-contributory pensions, 66+ (also includes widow(er)s non-contributory pensions, deserted wives, 66+), all sectors. Carers, 66+, all sectors. Flat-rate contributory 66+, private sector, self-employed and some civil servants. Widow(er)s contributory pensions, 66+, all sectors. Carers and deserted wives (scheme winded down), 66+, private sector, self-employed and some civil servants. ***Public pensions: others*** Widow(er)s non-contributory pensions, 65-, all sectors. Blind people, carers, 65-, all sectors. Disability pensions, 65-, and invalidity pensions 65-, private sector, self-employed, some civil servants. Carers, contributory, 65-, private sector, self-employed, some civil servants. Widow(ers) contributory pension, 65-, all sectors. ***Public sector (occupational) pensions*** Pensions, lump sums and spouses, civil service, defence, police, education, health and local authorities, non-commercial state bodies.	***Occupational pensions*** Private sector schemes and public sector commercial bodies.

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Table (continued)

EL	***Public pensions: old-age and early pensions*** Main pension: Private sector (employees, self-employed and farmers) and public sector: national pension (flat-rate) and (earnings-related) proportionate amount on the basis of their total period of insurance for all insured (statutory retirement age 67+) (including transitional period for old system regarding age thresholds and farmers). Means-tested flat rate pensions of uninsured individuals 67+. Auxiliary pensions: NDC system (including transitional period for old DB system). Disability pensions, 15-67y. Survivor pensions, all ages. Early pensions 62+, transition period. ***Public pensions: other*** EKAS (Pensioners Social Solidarity Fund - up to 2019).	Welfare benefits Occupational and private pension schemes.
ES	***Public pensions: old-age and early pensions*** Earnings-related old-age and early retirement pensions for private sector employees, the self-employed, regional and local and central government and the military. Means-tested minimum pension supplements (contributory). Means-tested minimum pension scheme (non-contributory). War pensions. ***Public pensions: other*** Disability (-64) and survivors' pensions (all ages) for private sector employees, self-employed, regional, local and central government and the military. Means-tested minimum pension supplements (contributory). Means-tested minimum pension scheme (non-contributory). ***Private pensions*** Private (supplementary and voluntary) pension schemes: occupational and individual.	

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Table (continued)

FR	***Public pensions scheme - earnings-related*** Earnings-related private sector pensions scheme for private sector wage-earners and non-civil servants public sector workers (CNAV). Earnings-related complementary pension scheme for private wage-earners (Agirc, for executives, and Arrco, for all workers). Earnings-related agricultural sector pension scheme (MSA). Earnings-related public sector pension schemes (CNRACL, for civil servants in local administrations or hospitals, and SRE, for civil servants in state administration and military). Earnings-related public sector complementary pension schemes (Ircantec, for non-civil servants public sector workers). Earnings-related basic pension scheme for licensed workers (RSI, for professions such as craftsmen, tradesmen...). Earnings-related pension scheme for law professions (CNAVPL, CNBF specifically for lawyers). Earnings-related pension schemes for other specific professions (railwayman, etc.). ***Non-earning-related pensions*** General 'old-age solidarity fund' scheme (FSV). ***Disability (earnings-related and non-earnings-related)*** pension benefits covered by the health insurance scheme.	***Public pensions scheme - earnings-related*** Earnings-related public sector complementary pension schemes (RAFP, for all civil servants): < 0.02% of GDP in 2015. Earnings-related complementary pension scheme for licensed workers (RCI, for professions such as craftsmen, tradesmen...): 0.1% of GDP in 2015. ***Occupational and other private pension schemes*** (PERP, PERCO, PERE, PREFON): <0.3% of GDP in 2015.
HR	***Public pension scheme*** Old-age and early retirement pensions. Disability pensions. Survivors' pensions. Minimum pensions (no means-tested). Pensions of people who could be granted benefits from PAYG public pension scheme under more favourable conditions (e.g. military officers, police officers and authosized officials, war veterans from the Homeland War). ***Mandatory fully funded defined-contribution (DC) scheme based on individual savings accounts*** Mandatory for all people born as of 1962 and for people born between 1953 and 1962 who voluntarily joined the private second pillar scheme.	***Voluntary fully funded pension scheme DC or DB*** have not been covered in the pensions projections.

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Table (continued)

IT	***Public pension system - Public pensions and social assistance benefits*** Old-age and early retirement pensions. Disability pensions. Survivors' pensions. Old-age allowances and social assistance additional lump sums (State budget).	***Occupational pensions*** They are not included in the definition of the 'Public pension system' (used for the analysis of the sustainability of public finances) insofar as: i) they are never mandatory; ii) they provide a pension supplement that corresponds to a minor fraction of the pension guaranteed by the public pension system and never replace it. No risk is taken by the State on investment returns.
CY	***Public pensions: old-age and early pensions*** General Social Insurance Scheme (GSIS) covering the following pension benefits: early and old-age, invalidity, Government Employees Pension Scheme (GEPS) covering old-age, widows' and disability pensions. Social pension scheme and special allowances to pensioners.	***Occupational pensions*** DB pension schemes for semi-state and private sector employees. DC provident funds for private sector employees.
LV	***Public pensions: old-age and early pensions*** Old-age minimum pension, 63+ (65+ as of 2025). Earnings-related old-age DB pensions, granted before 1996. Earnings-related old-age NDC pensions, 63+ (65+ as of 2025), granted as of 1996 (included early retirement). Service pensions (early pensions), selected professions, public sector (during the transition period). Disability pensions, granted before 1996 and not transformed to old-age pensions. Survivor's pensions (for widows during the transition period). ***Public pensions: other*** Disability pensions -63 (-65 as of 2025). Survivors' pensions -24. ***Private mandatory pensions*** Individual funded old-age, mandatory for people born after 1971. ***Social pension*** public benefit, insurance record <15 years (<20 years from 2025), paid from the state basic budget.	***Voluntary private funded pension scheme*** ***Specific public sector service pensions schemes*** (paid from state basic budget).

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Table (continued)

LT	***Public pensions: old-age and early pensions*** Social assistance pensions, women 62.7+, men 63.8+ (65+ as of 2026); (State budget). Earnings-related old-age pensions, women 62.7+, men 63.8+ (65+ as of 2026), all sectors (Social Insurance scheme). Early retirement pensions (possible to retire 5 years before the statutory retirement age), all sectors (Social Insurance scheme). ***Public pensions: disability pensions*** Social assistance disability pensions (State budget). Earnings-related disability pensions, all sectors (Social Insurance scheme). ***Public pensions: survivors' pensions*** Social assistance survivors' pensions (State budget). Survivors' pensions, all sectors (Social Insurance scheme). ***Public pensions: other*** Special public service (state) pensions for selected professions (scientists, judges) (State budget); state pensions of the first and second degree of the Republic of Lithuania (State budget); state pensions of deprived persons (State budget) women 62.7+, men 63.8+ (65+ as of 2026). Officials and military personnel pensions (for service, disability and survivors), public sector (State budget); length of service pensions, compensation for extraordinary working conditions (Social Insurance scheme). Pension supplement to small social insurance old-age and disability pensions – top-up to the ceiling of the basket of minimum consumption needs; depends on contribution period and the total amount of pension benefits received by the pensioner. ***Private mandatory pensions*** Individual funded old-age pension, quasy-mandatory, all sectors.	
LU	***Public pensions: old-age and early pensions*** Earnings-related old-age, early retirement, disability pensions (65+), private sector & self-employed (general pension scheme). Earnings-related old-age, early retirement, disability pensions (65+), public sector (special pension scheme), state budget. ***Public pensions: other*** Disability (-64 years) and survivors' pensions, all sectors	Voluntary private pension schemes (occupational and individual), social assistance (REVIS)

(Continued on the next page)

Table (continued)

HU	***Public pensions: old-age and early pensions*** Social allowances close to minimum pensions to people above retirement age. Earnings-related old-age and anticipatory old-age pensions, all sectors. Survivors pensions, above retirement age, all sectors. Disability pensions, above retirement age, all sectors. ***Public pensions: other*** Disability pensions, below retirement age, all sectors. Survivors pensions, below retirement age, all sectors. Pension-like regular social allowances, below retirement age. ***Private mandatory pensions*** Individual funded pensions. People who entered the labour market before 2010 and chose to remain in the scheme, can have some entitlements.	Handicap support, political compensation allowances ***Voluntary private pension schemes (occupational and individual)***
MT	***Public pensions: old-age and early pensions*** Two-thirds pension scheme (incorporating two-thirds retirement pension, national minimum pension, increased national minimum pension, and decreased national minimum pension), 63y in 2019, 64y in 2023 and 65y in 2027. ***Public pensions: other*** Pensions other than those listed above, notably disability and survivors' pensions and some pensions, including Treasury Pensions (a DB pension scheme open to Public Officers who joined the Public Service prior to 15/01/1979 and that is closed to new members) and increased retirement pension, which will be phased out over a transition period, to specific groups of pensioners. Public pensions: disability: decreased national invalidity pension, national minimum invalidity pension Public pensions: survivors: early survivorship pension, national minimum widows' pension, survivors' pension Non-contributory old-age pension	***Private pension schemes (occupational and individual)***
NL	***Public pensions: old-age and early pensions*** Public flat-rate old-age pensions, 65+, all citizens (AOW). Widows' pensions, women 55+, all sectors (ANW). ***Public pensions: other*** Disability benefits, all sectors (WAO; being phased out), WIA, WaJong). ***Occupational pensions*** Occupational old-age pensions, 65+, all sectors.	***Individual private pensions***

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Table (continued)

AT	***Public pensions: old-age and early pensions*** Earnings-related regular old-age pensions: **Private sector (including blue and white-collar workers, self-employed and farmers):** female 60y, male 65y (female retirement age will be gradually raised to 65 years in 2024-2033). **Public sector:** female 65y, male 65y. Earnings-related early retirement pensions (private sector): **Corridor pension scheme ('Korridorpension'):** female 62y, male 62y (for women this gets relevant only by 2028); required number of insurance years is 40; 5.1% deduction per year before the regular retirement age (for people born as of 1955). **Early old-age pension for long-term contributors ('Hacklerregelung'):** female 57y (born as of 1959), male 62y (born as of 1954); retirement age for women will be gradually raised to 62; required number of contribution years for men is 45, the required contribution years for women will be gradually raised from 42 to 45; 4.2% deduction per year before the regular retirement age (for men born as of 1954 and women at the age of 62 born as of 1966). **Heavy worker regulation ('Schwerarbeitspension'):** female 60y, male 60y (for women this gets relevant only by 2024); required number of insurance years is 45, at least 10 years of 'hard labour' within 20 years before retirement; 1.8% deduction per year before the regular retirement age (for people born as of 1955). **Early old-age pension for long-term contributors in combination with heavy worker regulation ('Hackler-Schwerarbeit'):** female 55y (born 1959-1963), male 60y (born 1954-1958); required number of insurance years is 40 for women, 45 for men; 1.8% deduction per year before the regular retirement age. In general, there are no deductions after 45 contribution years. ***Public pensions: other*** **Survivors' pensions (widow, widower and orphans):** all sectors. **Invalidity and occupational disability pensions:** only in case of permanent disability; the temporary invalidity pension was replaced by medical and job-related rehabilitation and was completely abolished for people born as of 1964 (therefore, the temporary invalidity pension will fade out); all sectors.	***Private occupational and individual pensions.*** **Minimum guarantee pensions:** no legal minimum pension exists; if individual pension claims are lower than legally defined thresholds, the gap will be closed by federal budget contributions to guarantee a minimum income for pensioners (equalising allowance; 'Ausgleichszulage'); all sectors. **Prisoner of war compensation**

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Table (continued)

PL	***Public pensions: old-age and early pensions*** Earnings-related DB old-age, women 60+, men 65+, disability, widows, people born before 1949, private and public sector, self-employed (ZUS, Social Insurance Institution). Earnings-related NDC old-age, women 60+, men 65+, private and public sector, self-employed (ZUS). Earnings-related NDC bridging-pensions (employment in special conditions or character) women 55+, men 60+, expiring scheme. Earnings-related DB old-age, disability and widows' pensions, all ages, farmers (KRUS, Farmers social insurance scheme). Armed forces old-age pensions (State budget). ***Public pensions: other*** Disability and survivors' pensions, -54y, private and public sector, self-employed (ZUS). ***Private quasi mandatory pensions*** DC funded old-age pensions. Includes supplements to ensure minimum pensions.	***Private individual pensions*** Private individual (non-mandatory) pension schemes (including the remaining part of the former mandatory FDC pillar). Private (non-mandatory) occupational pension schemes.
PT	***Public pensions*** Social Security System - Contributory Welfare System (private sector employees and self-employed, public employees since 2006 and special pensions): old-age, disability and survivors' pensions. Includes supplements to ensure minimum pension value; - Social Solidarity protection System (non-contributory and means-tested): old-age, disability and survivors' pensions; - RESSAA (special social security scheme for agricultural workers): old-age, disability and survivors' pensions. CGA (Pension scheme of civil servants hired until 2005): old-age and early pensions, disability and survivors' pensions. Includes supplements to ensure minimum pensions values and special pensions. Non-contributory CGA pensions are reported under 'other pensions' in the questionnaire. Solidarity supplement for the elderly (non-contributory means-tested scheme designed to help pensioners and low incomes). ***Private occupational pensions*** Banking sector DB schemes and other DB schemes and DC schemes financed by pension funds.	***Private individual pensions:*** Individual (non-mandatory) private pension schemes.

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Table (continued)

RO	***Public old-age pensions*** Women 60+/63y, men 65y, standard contribution period women 30+/35y, men 35y. No contribution period requirements for work accidents, professional disease, people with neoplasms, suffering from schizophrenia or AIDS. For ordinary diseases and accidents not related to work, a minimum contribution period is required. ***Early and partial early retirement*** 5 years before the statutory retirement age, provided the full contribution period is exceeded by at least 8 years (for early retirement) or by less than 8 (for partial early retirement, which is penalised). ***Public pensions: other*** Survivors' pensions: children and spouse. Disability pension: people who lost at least half of their capacity to work. Military, farmers, special pensions, special indemnities. Sine 2016, military pensions are paid by the State's Budget, instead of the State's Social Insurance Budget. ***Private mandatory pension*** Compulsory for eligible people under the age of 35; voluntary for age group 35-45.	***Private individual, voluntary pensions***
SI	***Public pensions: old-age and early pensions*** Old-age pension (60+ with 40 year of service; 65+ with minimum insurance period of 15 year). Early retirement (60+ with 40 year of insurance period, including purchased years). Special compulsory (occupational) pensions for workers in high-risk occupations, private and public sector. ***Public pensions: other*** Disability pensions Survivors' pensions Flat-rate pensions for farmers Pension supplements for the military personnel of the former Yugoslav army and retirees from other republics of former SFRY. Annual allowance for pensioners	National (state) pensions: excluded from Pension and Disability Act in 2012 (individuals can ask for social assistance). Mandatory collective supplementary pensions for public employees. Non-mandatory collective supplementary pensions (private sector) - based on collective agreements. Private non-mandatory individual supplementary pensions (private and public sector).

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Table (continued)

SK	***Public pensions: old-age and early pensions*** Statutory retirement is specified on cohort basis. Cohorts retiring in 2019 have a retirement age of 62 years and 139 days (born in 1956) or 62 years and 6 months (born in 1957). The retirement age will rise to 64 years in 2030, lower for mothers. Early retirement is possible two years before the statutory retirement age. ***Public pensions: other*** Disability, widow(er), orphans, minimum pension, Christmas bonus. ***Private mandatory pensions – partly covered*** Individual funded old-age pension, covers people that chose to take part in the scheme and those that had been included in the scheme when it was mandatory (prior to 2008) and did not exit during any of the openings (in 2008, 2009, 2012 and 2015). ***The special pension system of the armed forces and police.***	***Voluntary individual pension:*** funded DC scheme, introduced in 1996.
FI	***Public pensions: old-age and early pensions*** Earnings-related old-age pension, +63.5y (+65y as of 2027 and linked to life expectancy as of 2030), private sector (TyEL), self-employed (YEL), farmers (MYEL) and the public sector (JuEL, covers central government, municipal sector and church employees). Earnings-related partial early old-age pension (50% or 25%), +61y (+62y as of 2026 and 3y lower than old-age pension as of 2027). National old-age pension (National pension insurance), +65y. Early national pension, +63y for people born in 1957 or before and +64y for people born in 1958-1961. Old-age pension for long-term unemployed, +62y for people born in 1957 or before and +64y for people born in 1958-1961. ***Public pensions: other*** Guarantee pension (guaranteed minimum amount) 65+ (16-64y for disability pensioners). Disability pension, 16-64y, national pension scheme. Disability pension, 17-62y, earnings-related, all sectors. Survivors' pension, no age limit for widow(er)s, 0-18y for orphans (both earnings-related and national pension schemes). Years-of-service pension, +63y, earnings-related, all sectors.	***Occupational and voluntary individual pensions:*** collective and voluntary supplementary schemes.

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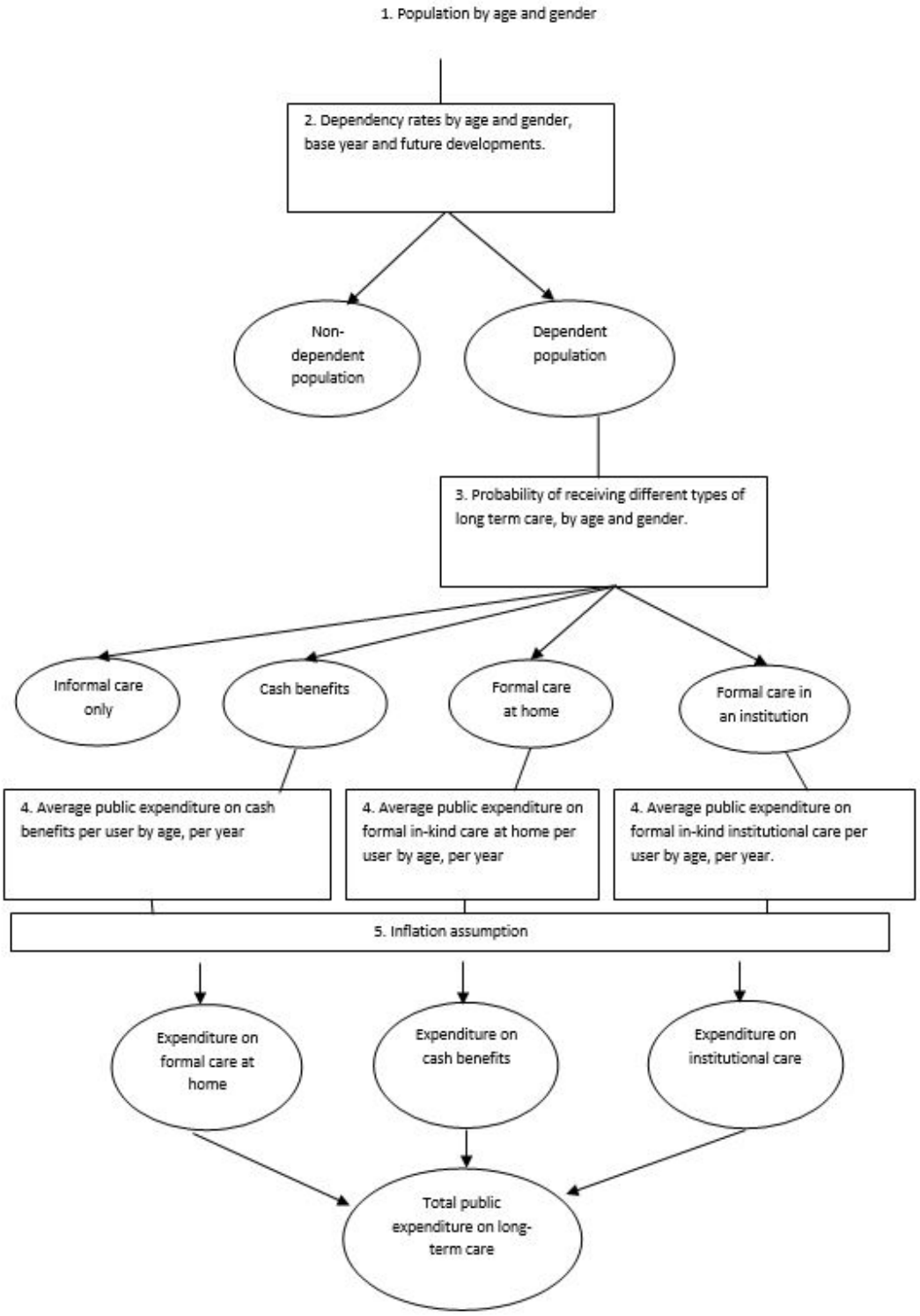
Table (continued)

SE	***Public pensions: old-age and early pensions*** Minimum pension, housing supplement for pensioners, maintenance support for the elderly (State budget), 65+. Earnings-related NDC old-age pensions, flexible age from 62 (including old transitional DB system), all sectors (Social insurance scheme). ***Public pensions: other*** Disability pensions, 19-64y. Survivors benefits, all ages (State budget). ***Occupational pensions*** Occupational (supplementary) DC and DB pensions, all sectors ***Private mandatory pensions*** Individual mandatory fully funded old-age pension, flexible age from 62, all sectors (Social insurance scheme) ***Private non-mandatory pensions*** Tax-deductible pension savings (from 2016 only deductible for self-employed).	
NO	***Public pensions: old-age and early pensions*** Earnings-related benefits. Minimum income guarantee. ***Public pensions: other*** Disability pensions. Survivors' pensions.	Central government occupational pension scheme financed by employee contributions and transfers from State budget. Supplement to public old-age pension. Local government occupational pension schemes are funded schemes. Supplement to public old-age pension. Mandatory private sector occupational schemes are funded defined contribution schemes. Supplement to public old-age pension. Private non-mandatory defined benefits (and from 2001 also defined contribution) schemes.

Source: European Commission, EPC.

ANNEX 7
Long-term care model structure

Graph II.A7.1: **Long-term care model structure**



Source: European Commission.

ANNEX 8
Sources of data to compute healthcare and long-term care

A8.1. DATA SOURCES HEALTHCARE

The data required to run long-term public expenditure projections in the field of healthcare ([114]) includes:

- per capita public expenditure on healthcare by age and sex cohorts (age/sex-specific expenditure profiles);
- sex-specific per capita public expenditure on healthcare borne by decedents and survivors broken down by the number of remaining years of life required to run the *death-related costs* scenario;
- data on planned reforms and COVID-19-related expenditure; and
- total public expenditure on healthcare.

The data collection procedure takes two steps. First, the Commission (DG ECFIN) pre-filles data on the basis of existing international databases managed by international organisations (Eurostat, OECD, AMECO). The questionnaire is then circulated to the Member States, to endorse the pre-filled figures and complement these with data from national sources if no data was available from international sources. The completed data questionnaires are used for conducting the projections.

Note that age/sex-specific per capita public expenditure on healthcare and sex-specific per capita public expenditure on healthcare borne by decedents and survivors broken down by the number of remaining years of life are not available in any common international databases. Therefore, they are provided exclusively by AWG delegates and are based on national sources and methodologies.

Computing total public expenditure on healthcare

In order to calculate **total public expenditure on healthcare**, the sum of the following two components is used:

1) Public current expenditure on healthcare – computed as the sum of all "core" healthcare System of Health Accounts 2011 (SHA 2011) functions/expenditure categories HC.1 to HC.9, excluding HC.3 (defined as "Long-Term Care (health)" in SHA 2011). More specifically, for the current public expenditure on healthcare the following SHA 2011 categories are used: Curative care (HC.1); and Rehabilitative care (HC.2); Ancillary services (HC.4); Medical goods (HC.5); Preventive care (HC.6); Governance, and health system and financing administration (HC.7); Other healthcare services not elsewhere classified (HC.9).

2) Public expenditure on gross capital formation in health from the COFOG GF07 "Health" function excluding the GF0705 "R&D Health" category. In order to smooth the volatility inherent to capital formation, the average value for the last four years is used.

SHA data by function/expenditure category and respective sub-functions is availableon Eurostat NewCronos, OECD Health Data, and WHO Data for All. Most recent data refers to 2018 on OECD Health Data and to 2017 and 2018 on Eurostat NewCronos. Eurostat reports data for all Member States and Norway, while data for five EU Member States non-OECD members (Bulgaria, Croatia, Cyprus, Malta, and Romania) is not reported on OECD Health Data.

On top of these components, COFOG data on capital formation from Eurostat NewCronos is added. Most recent data refers to year 2018.

Data used for calculating the sector-specific composite indexation

In the "***sector-specific composite indexation scenario***" the importance and evolution of various components to healthcare provision is captured. The components are: (1) inpatient care, (2) outpatient care and ancillary services, (3) pharmaceuticals and therapeutic appliances, (4)

([114]) As explained below, this definition of healthcare excludes SHA expenditure category HC.3, which is included in the long-term care expenditure category.

Table II.A8.1: **Data sources for the sector-specific indexation components**

Inpatient care (curative and rehabilitative care)	Outpatient care (curative and rehabilitative care) + Ancillary services	Medical goods (pharmaceuticals and therapeutic appliances)	Preventive care	Governance and administration	Capital formation
HC.1.1 + HC.1.2 + HC.2.1 + HC.2.2	(HC.1.3 + HC.1.4 + HC.2.3 + HC.2.4) + HC.4	HC.5	HC.6	HF.7 + HF.9	GF07 "Health" function excluding GF0705 "R&D Health"
SHA	SHA	SHA	SHA	SHA	COFOG
Eurostat or OECD	Eurostat or OECD	Eurostat or OECD	Eurostat or OECD	Eurostat or OECD	Eurostat

Source: European Commission.

preventive care, (5) governance and administration, and (6) capital investment. They broadly reflect the different sectors of the health system and correspond to the categories of the System of Health Accounts (SHA).

As shown in Table II.A8.1 the respective share in public expenditure on healthcare of each component is calculated with SHA data for the latest year available, except for the capital formation component, for which COFOG data on gross capital formation on health excluding R&D health is used.

These shares are then applied to the age-specific per capita expenditure and by so doing each age-specific per capita expenditure is divided into six sub-items of expenditure.

Next, the past evolution of public expenditure on each of those components is calculated as average annual growth rate for the past 10 years for each country. Due to current data limitations for building 10-year time series from data based on the SHA 2011 classification, data from COFOG categories in correspondence to the SHA 2011 healthcare functions are used for the calculation of the average annual expenditure growth rate for each component.

Lastly, the ratio of each of these 10-year average growth rates to the 10-year average growth rate of GDP is built. Due to high volatility in the relative growth rates for prevention, capital formation and governance and administration, these items are excluded from the indexation. Moreover, the relative growth rates of the other three components (hospitals, outpatient care and medical goods) are capped at their respective 25th and 75th percentiles.

A8.2. DATA SOURCES LONG-TERM CARE

In order to assure the best possible comparability of data, it was already agreed in the previous projections exercises to rely, to the extent possible, on:

a) common methodologies and definitions (i.e. the System of Health Accounts - SHA) agreed by international institutions (Eurostat, OECD and WHO);

b) data gathered through the joint data collection exercise (i.e. joint OECD-Eurostat-WHO questionnaire) and reported in Eurostat (Cronos) and OECD (Health Data) databases ([115]).

As in the 2018 exercise, SHA 2011 data is now available for every EU Member State in the case of variable HC.3, but only for a limited number of MS for voluntary variable HCR.1, which requires the use of the 'European System of integrated Social Protection Statistics' (ESSPROS) database to construct a proxy for this missing variable in several countries.

For the 2021 exercise, the aim is to refine the use of the data as compared to that of the 2018 and earlier rounds of projections. Nevertheless, the choice of the best option is still dependent on the availability of data in the international databases. When information is missing in the international databases, it has to be provided by each Member

([115]) See the SHA 2011 Manual (OECD, Eurostat, WHO (2011)). The manual contains guidelines for reporting health expenditure according to an international standard. It proposes a common boundary of healthcare as well as a comprehensive and detailed structure for classifying the components of total expenditure on health.

State individually. This is particularly the case for the number of recipients and the breakdown of expenditure by care setting. The detailed analysis of available data and classifications carried out ([116]) led to the following agreement. Annex 8, on sources of data, gives an overview of the combinations of data sources for the 2021 projections exercise.

The data collecting procedure covers the same steps as for healthcare (see chapter 2 on healthcare), with an equivalent questionnaire, being used to report the data required for each of health and long-term care expenditure projections.

For the Commission (DG ECFIN) to be able to calculate the proposed scenarios and run the relevant sensitivity tests, the AWG delegates provide the following information in the framework of the long-term care expenditure projections:

- total number of dependent people receiving long-term care a) in institutions b) at home and c) cash benefits, by sex and five-year cohorts;
- possible overlapping between the recipients of cash benefits and the recipients of LTC services (legal possibility + numbers);
- total number and categories of informal caregivers;
- public expenditure per user (patient) on long-term care, by sex and single age or five-year cohorts (so-called "age-related expenditure profiles");
- and public expenditure breakdown by care setting (institutional care, home care, cash benefits).

In addition, the Commission (DG ECFIN) pre-filled (according to the data availability) the following items, which the AWG delegates had to verify/confirm:

- total public spending on long-term care, disaggregated, into services of long-term nursing care (classified as HC.3 in the System of Health Accounts) and social services of long-term care (classified as HCR.1);
- a disaggregation of total public spending on long-term care into spending on institutional care, home care and long-term care-related cash benefits derived from ESSPROS and/or SHA;
- disability rates by sex and five-year cohorts (based on EU-SILC data); and
- data on planned reforms and COVID-19-related expenditure.

Public expenditure on long-term care

Data sources on long-term care are described on Table II.A8.2.

According to the System of Health Accounts classification, public expenditure on long-term care is defined as the sum of the following publicly financed items:

- services of long-term nursing care (HC.3 in SHA 2011) (which is also called "long-term healthcare", and includes both nursing care and medical care related to the cause of the dependency);
- “social services” of long-term care (HCR. 1 in SHA 2011), which represents both the "assistance services" part, relating primarily to assistance with IADL tasks.

Together these should represent the total benefits allocated to dependent people, although, as explained below, this data has to be supplemented to different degrees with ESSPROS data to fulfil the projection needs.

Long-term care (health) public expenditure

The health component of long-term care (HC.3) includes a range of services required by persons with a reduced degree of functional capacity, physical or cognitive, and who are consequently dependent on help with basic activities of daily living (ADL), such as bathing, dressing, eating, getting in and out of bed or chair, moving around and using the bathroom. The underlying physical

([116]) See the note for the attention of the Ageing Working Group of the EPC: European Commission–DG ECFIN (2020).

Table II.A8.2: **LTC public expenditure base data requirements according to availability**

I. Preferred solution: SHA, when data is available (all countries except those listed below)

LTC (health)	LTC (social)	LTC (institutional care)	LTC (home care)	LTC (cash benefits)
SHA: HC.3	**SHA**: HCR.1	**SHA**: (HC.3+HCR.1) institutional care share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**	**SHA**: (HC.3+HCR.1) home care share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**	**SHA**: (HC.3+HCR.1) cash benefits share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**

II. Alternative: When data on LTC (social) HCR.1 is not available from SHA, a proxy is constructed based on ESSPROS data (BE, BG, IE, EL, HR, IT, CY, HU, MT, AT, PL and SK)

LTC (health)	LTC (social)	LTC (institutional care)	LTC (home care)	LTC (cash benefits)
SHA: HC.3	**ESSPROS**: proxy based on cash and in-kind benefits according to Disability and Old age functions, inclunding "Accommodation", "Home help", "Periodic care allowance", and in the Disability function "Lump sum care allowance". Adjusted to reduce potential double-counting with expenditure already included within HC.3 in SHA.	**SHA**: (HC.3+HCR.1) institutional care share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**	**SHA**: (HC.3+HCR.1) home care share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**	**SHA**: (HC.3+HCR.1) cash benefits share according to **ESSPROS**, **SHA**, **ESSPROS**+**SHA** or **national data**

Source: European Commission.

or mental disability can be the consequence of chronic illness, frailty in old age, mental retardation or other limitations of mental functioning and/or cognitive capacity. It includes as well as any further medical treatment linked to the cause of disability as well as basic medical services including help with wound dressing, pain management, medication, health monitoring, prevention, rehabilitation or services of palliative care.

Finally, HC.3 also includes any cash benefits that are spent on the services detailed above. These cash benefits, however, cannot be identified in the data, since they are assigned to the category that they are spent on by the recipients.

Long-term care (social) public expenditure

LTC recipients may also need help with instrumental activities of daily living (IADL) more generally, such as help with activities of housework, meals, shopping, using the telephone

and managing one's finances. Although the need for this type of services does not stem from social causes but rather from dependency that is caused by medical conditions, old age or long-term disability, this type of care is classified in SHA as a "social" long-term care category HCR.1([117]). As in HC.3, this category also includes cash benefit expenditure, although the data is not currently populated. A further shortcoming of this data is that the SHA classification does not currently include expenditure on those LTC recipients that need help with IADL, but not with ADL.

As in the case of healthcare, the SHA figures on public expenditure on long-term care are available in two separate databases: EUROSTAT database available at NewCronos website and a parallel OECD database "OECD Health Data". SHA data on HC.3 is available for all Member States. Data on HCR.1 is currently available for 15 Member States and Norway. For those not reporting HCR.1, a proxy is calculated on the basis of the following ESSPROS data categories, adjusted in order to reduce the likelihood of double-counting between HC.3 and the ESSPROS proxy:

In-kind benefits in ESSPROS:

(a) "Disability" function – "Accommodation" (institutional care), and "Home help/assistance in carrying out daily tasks" (home care)

(b) "Old age" function – "Accommodation" (institutional care) and "Home help/assistance in carrying daily tasks" (home care).

Benefits in cash in ESSPROS:

a) "Disability" function – "Periodic care allowance", "Lump sum care allowance"; and

b) "Old age" function – "Periodic care allowance".

These proxies are then validated on the basis of national expertise in order to eliminate any possible double counting or under-counting in this area.

([117]) Unfortunately, the SHA classification does not currently include expenditure on those LTC recipients that need help with IADL, but not with ADL.

Public expenditure by care setting

The long-term care model projects public expenditure separately by care setting. This requires the identification of public expenditure on institutional care, home care, and cash benefits.

Public expenditure on cash benefits

Public spending on cash benefits include social programmes offering care allowances. Care allowances were introduced in a number of countries in order to allow households for more choice over care decisions, and to support care provided at home or in institutions. They are mainly addressed to persons with long-term care needs who live in their own homes, but can also include people who receive care in an institution. However, the design of these programmes varies widely across countries, which reduces the comparability between them. Illustrating this variety of systems, it is noteworthy that cash benefits can be included just as well in the HC.3 as in the HCR.1 category.

At least three types of cash-benefit programmes and/or consumer-choice programmes can be distinguished:

- personal budgets and consumer-directed employment of care assistants;
- payments to the person needing care who can spend it as she/he likes, but has to acquire sufficient care; and
- payments to informal caregivers.

As in the 2018 exercise, SHA 2011 data is now available for every EU Member State in the case of variable HC.3, but only for a limited number of Member States for the variable HCR.1, which requires the use of ESSPROS database to construct a proxy for this missing variable in several countries. However, in the variable HC.3 it is not possible to identify cash benefits, as they are assigned to either home or institutional care according to what they are spent on. In HCR.1, it would in principle be possible to identify cash benefits, but this sub-category is not currently populated for any country. SHA data can therefore be used to calculate the breakdown by care setting

only for those countries where there are no cash benefits or where there is no alternative data.

In contrast, LTC-related cash benefits as a % of GDP are available for the same year as of SHA joint questionnaire data (or for the latest year available) within two ESSPROS functions: disability and old age. Both periodic and lump-sum parts of care allowances in the disability function, as well as periodic care allowance in the old-age function, are compared to the total LTC expenditure in ESSPROS in order to calculate the breakdown by care setting.

This represents a pragmatic approach of using available data to estimate this split of LTC expenditure. These proportions are then validated taking into account national data on the expenditure breakdowns and institutional set-up.

Home care and institutional care public expenditure

Long-term care is provided in a variety of settings. It can be provided at home and in the community, or in various types of institutions, including nursing homes and long-stay hospitals. Mixed forms of residential care and (internally or externally provided) care services exist in the form of assisted living facilities, sheltered housing, etc., for which a wide range of national arrangements and national labels exist.

Services in institutions include services provided to people with moderate to severe functional restrictions who live permanently or for an extended period of time (usually for six months or longer) in specially designed institutions, or in a hospital-like setting where the predominant service component is long-term care, although this may frequently be combined with other services (basic medical services, help with getting meals, social activities, etc.). In these cases, eligibility is often explicitly assessed and defined by level (severity) of dependency and level of care needs.

Services at home include services provided by external home care providers, both public and private, in a person's private home on a long-lasting basis. This includes living arrangements in specially designed or adapted flats for persons who require help on a regular basis, but where this living arrangement still guarantees a high degree of autonomy and self-control over other aspects of a person's private life. Also included are services received on a day-case basis or in the form of short-term stays in institutions, for example in the form of respite care. During these stays, persons are not considered as 'institutionalised', but rather receiving temporarily services, which support their continued stay at home. They also include tele-care where the care is provided in the home of the patient through IT.

A necessary step for the purpose of the long-term projections is therefore to calculate the amount of long-term care expenditure associated with institutional care and that associated with home care. This requires some further data reclassification. For all the countries, information on HC.3 (services of long-term nursing care) is available for: HC.3.1 (In-patient long-term nursing care); HC.3.2 (day-cases of long-term nursing care); HC.3.3 (outpatient long-term care, including both regular outpatient visits and the provision of remote monitoring services for LTC patients) and HC.3.4 (long-term nursing care: home care).

According to the above definitions, HC.3.1 and HC.3.2 are types of care that are provided in the institutions or in the community facilities (in any case not at beneficiary's home), while HC.3.3 and HC.3.4 are provided at home. However, this breakdown includes not only expenditure spent on services in-kind, but also cash benefits that are spent on each of these services.

With regards to the part of HCR.1 that constitutes home care and the part which constitutes institutional care, this breakdown is not available in the classification. The System of Health Accounts methodology foresees a breakdown between in-kind benefits and cash benefits, but currently it is not populated for any country.

Therefore, the shares of home care and institutional care can be calculated in ESSPROS or, in cases where there are no cash benefits in that country, in SHA as well. These shares can then be applied to the total expenditure on LTC calculated by adding HC.3 to HCR.1 or otherwise the ESSPROS proxy.

Disability rates

Similarly to past Ageing Reports projections' exercises, disability rates are derived from EU-SILC data and more specifically data reported by the Global activity limitation indicator (GALI), on severe "Limitations in activities because of health problems [for at least the last 6 months]" ([118]). EU-SILC data, used to construct the GALI indicator, is available for all EU Member States and Norway by age-sex group and has a disability measure which allows us to identify severe (strongly limited) limitations.

This is considered an adequate measure of dependency with a high degree of data availability and comparability. Indeed, it is available for 27 EU Member States and Norway, by age-sex group for people aged 15+ ([119]). A moving average of the 5 most recent years of data available will be constructed and used for the projections, albeit excluding any data breaks.

([118]) The person's self-assessment of whether they are hampered in their daily activity by any ongoing physical or mental health problem, illness or disability. An activity is defined as: "the performance of a task or action by an individual" and thus activity limitations are defined as "the difficulties the individual experience in performing an activity". Limitations should be due to a health condition. The activity limitations are assessed against a generally accepted population standard, relative to cultural and social expectations by referring only to activities people usually do. This is a self-perceived health question and gives no restrictions by culture, age, sex or the subject's own ambition. The purpose of the instrument is to measure the presence of long-standing limitations, as the consequences of these limitations (e.g. care, dependency) are more serious. A 6 months period is often used to define chronic or long-standing diseases in surveys.

([119]) For those aged 0-14 years, either national data is used if available or the rate is assumed to equal those aged 15-19. The required age breakdowns of the EU-SILC disability rates for the Ageing Report are calculated upon request of the AWG by Eurostat.

ANNEX 9

Mathematical illustration of the healthcare scenarios

The formal illustration of the scenarios to project public expenditure on healthcare are presented in the following sections.

I. Demographic scenario

The *"demographic scenario"* estimates the effect of an ageing population on future public expenditure on healthcare. It assumes that age/sex-specific morbidity rates and the provision structure of health treatments remain constant in real terms over the whole projection period. It also assumes a gradual increase in life expectancy on the basis of underlying population projections.

To calculate future public expenditure on healthcare, the age/sex-specific per capita public expenditure profiles are multiplied by the respective age/sex population group in each projection year.

The age/sex specific public expenditure profiles, showing the average public spending on healthcare per capita for each year of age (from 0 to 100, according to data availability), are assumed to grow over time in line with GDP per capita. Therefore, the per capita cost (expenditure) in a projected year t is:

$$\begin{aligned} c^{d}_{g,a,0} &= c_{g,a,0} && t = 0 \\ c^{d}_{g,a,t} &= c^{d}_{g,a,t-1}\left(1+\Delta Ypc_t\right) && t > 0 \end{aligned} \qquad \text{II.A9.1}$$

where:

d stands for demographic scenario;

$c_{g,a,t-1}$ is the cost per capita of a person of a given sex *g* and age *a* in period *t-1*;

ΔYpc_t is GDP per capita growth rate in year *t*.

$$\Delta Ypc_t = \left(\frac{Y_t}{P_t} - \frac{Y_{t-1}}{P_{t-1}}\right) \Big/ \left(\frac{Y_{t-1}}{P_{t-1}}\right) \qquad \text{II.A9.2}$$

with Y_t *and* P_t representing GDP and total population in projection year *t*;

Hence, this "adjusted" per capita unit cost, $c^{d}_{g,a,t}$, is the cost per capita of a person of sex *g* and age *a* in year *t* of the projection period, following the adjustment to GDP per capita growth.

Next, in each year the respective unit cost is multiplied by the projected population of each age group (using the baseline population projections) to obtain the total public spending for each age/sex group:

$$S^{d}_{g,a,t} = c^{d}_{g,a,t} \quad p_{g,a,t} \qquad \text{II.A9.3}$$

where:

$S^{d}_{g,a,t}$ is public spending on healthcare for all persons of sex *g* and age *a* in year *t*.

Last, the resulting total public spending on healthcare is divided by the projected GDP in order to obtain the public healthcare expenditure as a percentage of GDP:

$$T^{d}_{t} = \frac{\sum S^{d}_{g,a,t}}{Y_t} \qquad \text{II.A9.4}$$

where:

T^{d}_{t} is the ratio of total public spending on healthcare to GDP in year *t* computed according to the pure demographic scenario.

II. High life expectancy scenario

The "*high life expectancy scenario*" is a sensitivity test to measure the impact of alternative assumptions on mortality rates. It assumes that life expectancy at birth in 2070 exceeds the projected life expectancy used in the "*demographic scenario*" by 2 years. This scenario is methodologically identical to the "*demographic scenario*", but alternative demography and GDP data are used ([120]). Therefore, the mathematical formulation used in the previous scenario still applies, except that the number of individuals in each age/sex group up to 2070 is replaced by the new population and macroeconomic assumptions.

([120]) Since GDP data also captures the life expectancy change through the impact of the latter on the labour force projections.

III. Healthy ageing scenario

The "*healthy ageing scenario*" is based on the *relative compression of morbidity* hypothesis, meaning that health status is improving in line with declines in mortality rates and increasing life expectancy. It assumes that the number of years spent in bad health during a lifetime remains constant over the whole projection period. Consequently, the morbidity rate and therefore the age/sex-specific per capita public expenditure profiles are declining with the mortality rate.

This scenario starts with calculating, for each projection year, the change in life expectancy in relation to the base year. The change in life expectancy of a person of sex g and age a in relation to the base year (say, 2019) for each year of the projections, using the Eurostat population projections 2019 ([121]) is given by:

$$\Delta LE_{g,a,t,0} = LE_{g,a,t} - \Delta LE_{g,a,0} \qquad \text{II.A9.5}$$

where:

$\Delta LE_{g,a,t,0}$ is the additional life expectancy of a person of sex g and age a in year t compared to a person of sex g and age a in the base year 2019;

$LE_{g,a,t}$ is the life expectancy of a person of sex g and age a in year t; and

$LE_{g,a,0}$ is the life expectancy of a person of sex g and age a in the base year 2019.

Then, for each year t, the projected per capita cost equals:

$$c^{ha}_{g,a,0} = c_{g,a,0} \qquad \text{t=0}$$

$$c^{ha}_{g,a,t} = c_{g,a,t-1} \cdot (1 + \Delta Ypc_t + \Delta c_{g,0,a-\Delta LE_t}) \qquad \text{t>0} \qquad \text{II.A9.6}$$

where:

ha stands for healthy ageing scenario;

$c^{ha}_{g,a,t}$ is the cost per capita assigned to a person of sex g and age a in year t of the projection period; and

$\Delta c_{g,0,a-\Delta LEt}$ is the growth rate in costs per capita due to the change in life expectancy between year 0 and projection year t.

$$\Delta c_{g,0,a-\Delta LE_t} = \frac{(c_{g,0,a-\Delta LE_{g,a,t,0}} - c_{g,0,a})}{c_{g,0,a}} \qquad \text{II.A9.7}$$

where:

$c_{g,0,a-\Delta LE_{g,a,t,0}}$ is the cost per capita assigned to a person of sex g and of age a in the base year 2019 minus the years gained in life expectancy by a person of sex g and age a between year t and year 2019, as defined in equation II.A9.5 and specified with a precision to a decimal part of a year in the base year 2019 ([122]). This is done only for those sections of the age-profile where the cost per capita is growing ([123]).

The cost per capita is further adjusted to reflect changes in income per capita over the years using the same indexation system as in the previous scenario i.e. cost per capita grows in line with GDP per capita growth.

([121]) In the *"healthy ageing scenario"* the total number of years spent in bad health during a person's lifetime is assumed to remain constant while life expectancy increases, so the morbidity rate must evolve in line with mortality rate for each age cohort. Thus, if between time t and $t+1$, total life expectancy increases by n years for a cohort of age a, healthy life expectancy for that very same age cohort must also increase by n years, as assumed by the relative *compression of morbidity hypothesis*. If healthy life expectancy increases by n years, then the health status (and consequently healthcare spending) of this cohort of age a at time $t+1$ will be the same as the health status (and healthcare spending) of cohort of age $a-n$ at time t.

([122]) Changes in life expectancy and therefore shifts in the age profile from one year to another are sometimes very small (in a range of a tenth part of a year). However, the data gathered by the Member States does not provide detailed information on costs per capita by single year of age (the most detailed item available is a 5-year average), so an additional calculation needs to be performed. To solve this problem, the intermediate values can be obtained by simple extrapolation/trend-smoothening method from the existing average figures. In this way it is possible to assign a concrete value of cost per capita to each tenth part of a year of age.

([123]) For the young and the oldest old the reference age remains the same over the whole projection period.

As before, in each year the respective unit cost is multiplied by the projected population in each age group age (using the baseline population projections) to obtain the total public spending for each age/sex group:

$$S^{ha}_{g,a,t} = c^{ha}_{g,a,t} \cdot P_{g,a,t} \qquad \text{II.A9.8}$$

where:

$S^{ha}_{g,a,t}$ is public spending on healthcare for all persons of sex *g* and age *a* in year *t*.

Next, the resulting total public spending on healthcare is divided by the projected GDP in order to obtain the public healthcare expenditure as a percentage of GDP:

$$T^{ha}_{t} = \frac{\sum S^{ha}_{g,a,t}}{Y_t} \qquad \text{II.A9.9}$$

where:

T^{ha}_{t} is the ratio of total public spending on healthcare to GDP in year *t*.

IV. Death-related costs scenario

The "*death-related costs scenario*" links per capita public expenditure on healthcare to the number of remaining years of life. It reflects empirical evidence which suggests that a large share of the total expenditure on healthcare during a person's life is concentrated in the final years of life ([124]).

In this scenario, the population of each sex-age group is divided into subgroups according to the number of remaining years of life using mortality rate as a weighting factor. In this case the groups are: those supposed to die within a year, the decedents, and those who do not, the survivors.

Each subgroup is assigned a different unit cost, being an adjustment of the "normal" unit cost with the ratio of healthcare expenditure borne by a person of a given age and sex who is in her terminal phase of life to healthcare expenditure borne by a survivor. The number of people in each subgroup is thus multiplied by its respective cost per capita to get the total spending of each subgroup. The sum of total spending borne by the two subgroups is the total spending on healthcare in a given year.

Mathematically, we have the following formulation:

We divide people of the same age and sex into the groups of survivors and those supposed to die within a year. The costs of the decedents-death related costs – are labelled with $Y^{DR}_{g,a,t}$, and the costs for the survivors – normal costs – are labelled with $Y^{NC}_{g,a,t}$, where *g*, *a* and *t* refer, respectively, to sex, age and year. With $m_{g,a,t}$ being the probability of death within a year in year t, we get:

$$\begin{aligned} Y_{g,a,t} &= Y^{NC}_{g,a,t}\left(1 - m_{g,a,t}\right) + Y^{DR}_{g,a,t}\, m_{g,a,t} \\ &= Y^{NC}_{g,a,t}\left(1 - m_{g,a,t} + k_{g,a,t}\, m_{g,a,t}\right) \end{aligned} \qquad \text{II.A9.10}$$

where: $k_{g,a,t} = Y^{DR}_{g,a,t} / Y^{NC}_{g,a,t}$ is the k-ratio. It estimates, for a given sex and age, how many times the healthcare costs of decedents exceed those of a survivor. If $k_{g,a,t}=1$, then death-related costs do not matter, while with k going toward infinity means that total healthcare costs are spent in the last life year.

If one assumes a constant k-ratio over time (*t = 0*), the healthcare costs would vary along with changes in the probabilities of death:

$$Y_{g,a,t} = Y^{NC}_{g,a,0}\left(1 - m_{g,a,t} + k_{g,a,0}\, m_{g,a,t}\right) \qquad \text{II.A9.11}$$

Taking into account that costs of survivors can be derived from the total one, according to the following equation:

$$Y^{NC}_{g,a,t} = Y^{NC}_{g,a,0} = \frac{Y_{g,a,0}}{1 - m_{g,a,0} + k_{g,a,0}\, m_{g,a,0}} \qquad \text{II.A9.12}$$

equation II.A9.10 becomes:

$$Y_{g,a,t} = Y_{g,a,0}\,\frac{1 - m_{g,a,t} + k_{g,a,0}\, m_{g,a,t}}{1 - m_{g,a,0} + k_{g,a,0}\, m_{g,a,0}} \qquad \text{II.A9.13}$$

([124]) For an overview of empirical studies, see Raitano (2006).

Equation II.A9.13 shows how the age-sex specific healthcare cost profile evolves, keeping the k-ratio unchanged with respect to the base year.

However, as shown by Aprile (2013), the empirical evidence strongly suggests a changing *k-ratio* as a function of changes in life expectancy.

As stated in the above mentioned paper, the following potential function approximates well the empirical observations:

$$k = 1 + \mathit{1}\ \ LE^{\ f} \qquad \text{II.A9.14}$$

according to which *k* is positively correlated with life expectancy and is 1 when life expectancy is nil ([125]). Then, assuming the constant coefficients of the function over time, one may derive the relation between the *k-ratio* and age conditional on life expectancy as follows:

$$k_{g,a,t} = k_{g,a,0}\ \frac{f\ (g,a,t,LE_t)}{f\ (g,a,0,LE_0)} \qquad \text{II.A9.15}$$

where $k_{g,a,0}$ is the value of *k-ratio* in the base year at the age *a*, and *f(g,a,t,LE)* is the fitted function.

As can be seen, *k-ratio* is projected according to a cohort approach, starting from the base-year value at the age a being positively correlated with changes in life expectancy. If no change occurs in life expectancy, the age profile of *k-ratio* is the same as in the base year.

Combining equations II.A9.13 and II.A9.15, the age profile of healthcare costs is projected according to the following equation:

$$Y_{g,a,t} = Y_{g,a,0}\ \frac{1 + m_{g,a,t}\ \ k_{g,a,0}\ \frac{f\ (g,a,t,LE_t)}{f\ (g,a,0,LE_0)} - m_{g,a,t}}{1 + m_{g,a,0}\ \ k_{g,a,0} - m_{g,a,0}} \qquad \text{II.A9.16}$$

As previously, the age-sex specific costs are adjusted to the GDP per capita growth and summed up over the entire population for each respective year to arrive at total costs.

V. Income elasticity scenario

The *"income elasticity scenario"* captures the effect of changes in national income on demand for healthcare goods and services. More specifically, this scenario shows the effect of an income elasticity of demand higher than 1, i.e. ε = 1.1, on the evolution of public expenditure on healthcare. It assumes that economic growth and process of real convergence between countries over the long run will drive elasticity down towards common unity level, by 2070 ([126]).

The methodology used to project healthcare spending is the same as for the "*demographic scenario*", except in the way per capita public expenditure on healthcare is evolving over the projection period. Income elasticity is taken into account by replacing equation II.A9.1 by the following equation II.A9.17, so that the per capita cost of a person of sex *g* and age *a* in year *t* of the projection period, $c^{ie}_{g,a,t}$, is adjusted to the GDP per capita growth with an elasticity that goes from 1.1 to 1 in 2070:

$$\begin{aligned} c^{ie}_{g,a,0} &= c_{g,a,0} && t = 0 \\ c^{ie}_{g,a,t} &= c^{ie}_{g,a,t-1}\ \ (1 + \Delta Ypc_t\ \ e_t) && t > 0 \end{aligned} \qquad \text{II.A9.17}$$

where:

ie stands for "*income elasticity*" scenario;

$c^{ie}_{g,a,t-1}$ is the cost per capita of a person of sex *g* and age *a* in year *t-1* in scenario *"income elasticity"*;

ΔYpc_t is GDP per capita growth rate in year *t*;

ε_t is income elasticity of demand, assumed to converge from ε_{2019} to ε_{2070} in 2070 according to the following equation:

$$\varepsilon_t = \varepsilon_{2019} - (t - 2019) \cdot \frac{\varepsilon_{2019} - \varepsilon_{2070}}{2070 - 2019} \qquad \text{II.A9.18}$$

([125]) With this function the death-related cost profile is also smoothened, thereby decreasing spurious volatility especially in young age cohorts.

([126]) This is also a common technical assumption in many long-run projection models, to avoid "explosive" path of some of the variables used in the exercise.

In the specific case where the income elasticity of demand converges from 1.1 in 2019 to 1 in 2070, the value will be the following:

$$\varepsilon_t = 1.1 - (t - 2019) \cdot \frac{0.1}{51} \qquad \text{II.A9.19}$$

The other steps of the projections are the same as in equations II.A9.3 and II.A9.4.

VI. EU27 cost convergence scenario

The "*EU27 cost convergence scenario*" captures the possible effect of an upward convergence in real living standards on healthcare spending, resulting from a convergence of citizens' expectations towards a similar basket of (health) goods. It considers the convergence by 2070 of all countries that, in the base year, are below the EU27 average in terms of percent of GDP per capita health expenditure to that average.

To project public spending on healthcare, we build on the methodology used for the "*demographic scenario*". Indeed, for those countries whose age/sex per capita public expenditure as a share of GDP per capita (relative per capita spending) is equal to or above the EU27 average (relative per capita spending), equations II.A9.1 to II.A9.4 from the demographic scenario to project public spending on healthcare are used.

For those countries whose age/sex per capita public expenditure as a share of GDP per capita is below the EU27 average in the baseline year of 2019, we assume a different evolution path for this variable. We assume it evolves over the projection period so as to reach the EU27 average in 2070. The real convergence to EU27 average is assumed to follow the following path, based on an adjustment of equation II.A9.1 of the demographic scenario:

$$\begin{aligned} c^{cc}_{g,a,0,i} &= c_{g,a,0,i} && t = 0 \\ c^{cc}_{g,a,t,i} &= c^{cc}_{g,a,t-1,i} \left(1 + \Delta Ypc_{t,i} + m_{g,a,i}\right) && t > 0 \end{aligned} \qquad \text{II.A9.20}$$

where:

cc stands for cost convergence;

$C^{CC}_{g,a,t,i}$ is cost per capita of a person of sex g and age a in year t of the projection period, in country i, adjusted to the GDP per capita growth and a catch-up effect if country i is below the EU27 average;

$\Delta Ypc_{t,i}$ is GDP per capita rate growth in year t of country i; and

$m_{g,a,i}$ is a hypothetical rate of growth of per capita costs, which is higher than zero for those countries below the EU27 average, and equal to zero for those countries at or above the EU27 average. To close the gap, $m_{g,a,i}$ is assumed to be constant in time and equal to ([127]):

$$m_{g,a,i} = \left[\left(\frac{\bar{rc}_{g,a,EU27,2019}}{rc_{g,a,i,2019}}\right)^{\frac{1}{2070-2019}}\right] - 1 \qquad \text{II.A9.21}$$

if $\bar{rc}_{g,a,EU27,2019} \geq rc_{g,a,i,2019}$

where:

$\bar{rc}_{g,a,EU27,2019}$ is the weighted EU27 average relative cost per capita of sex g and age a calculated in the baseline year of 2019; and $rc_{g,a,i,2019}$ is the relative cost per capita of sex g and age a for country i (if below the EU27 average cost per capita) calculated in the baseline year of 2019 defined as:

$$rc_{g,a,i,2019} = \left(\frac{c_{g,a,i,2019}}{Ypc_{i,2019}}\right)$$

and

$$\bar{rc}_{g,a,EU27,2019} = \left(\frac{\bar{c}_{g,a,EU27,2019}}{\overline{Ypc}_{EU27,2019}}\right)$$

where $\bar{c}_{g,a,EU27,2019}$ is the weighted EU27 average cost per capita of sex g and age a calculated in the baseline year of 2019; and $\overline{Ypc}_{EU27,2019}$ is the average GDP per capita in the EU27 calculated in the baseline year of 2019.

([127]) Assumptions for different convergence paths according to the initial country-specific situation - comparing to the EU27 average age profile - will be explored further as soon as data is made available to calculate the new age profiles.

After country-specific per capita cost has been calculated, corresponding equations II.A9.3 and II.A9.4 are used to obtain total age/sex group expenditure and total public expenditure on healthcare in each projection year.

VII. Labour intensity scenario

The "*labour intensity scenario*" estimates the evolution of public expenditure on healthcare taking into account that healthcare is and will remain a highly labour-intensive sector. In practical terms, this scenario is similar to the "*demographic scenario*" except that unit costs are assumed to evolve in line with the evolution of GDP per hours worked. Therefore, the growth in GDP per capita is replaced by the growth in GDP per hours worked, so that equation II.A9.1 becomes:

$$\begin{aligned} c^{li}_{g,a,0} &= c_{g,a,0} && t = 0 \\ c^{li}_{g,a,t} &= c^{li}_{g,a,t-1}\left(1+\Delta Yphw_t\right) && t > 0 \end{aligned} \qquad \text{II.A9.22}$$

where:

li stands for "*labour intensity*" scenario;

$\Delta Yphw_t$ is the rate of growth of GDP per hours worked in year *t*

$$\Delta Yphw_t = \left(\frac{Y_t}{HW_t} - \frac{Y_{t-1}}{HW_{t-1}}\right) \Big/ \left(\frac{Y_{t-1}}{HW_{t-1}}\right) \qquad \text{II.A9.23}$$

where *HW* stands for total hours worked.

Corresponding equations II.A9.3 and II.A9.4 are then used to calculate total age/sex group expenditure and total public expenditure on healthcare in each projection year.

VIII. Sector-specific composite indexation scenario

The *"sector-specific composite indexation scenario"* presents the special character of the healthcare sector (high level of government regulation, investment in new technologies, high labour intensity), and uses sector-specific elements as unit costs determinants in the model.

This scenario considers that expenditure on healthcare can be disaggregated in its different components, broadly reflecting the different sectors of the health system: 1) inpatient care, 2) outpatient care and ancillary services, 3) pharmaceuticals and therapeutic appliances, 4) preventive care, 5) capital investment, and 6) other factors. The different components are treated separately and indexed in a separate/different way, creating a sort of composite indexation for "unit cost development".

In mathematical terms, the different steps of this scenario are as follows: The share of each of the six components in total public expenditure on healthcare in each year *t* of available data, up to the baseline year of 2019 is calculated as follows:

$$s_{i,t} = \frac{PE_{i,t}}{\sum_{i=1}^{6} PE_{i,t}} \qquad \text{II.A9.24}$$

where $S_{i,t}$ is the share of public expenditure on component or input *i* at each time *t* to total public expenditure on healthcare,

$PE_{i,t}$ is total public expenditure on component *i* at each time *t* and

$\sum_{i=1}^{6} PE_{i,t}$ is total public expenditure on healthcare expressed as the sum of the public expenditure on each of the six components.

The average share of the ten past observations, up to the latest available data, $\bar{s}_i$ of each component is calculated as

$$\bar{s}_i = \frac{\sum_{t=0}^{-9} s_{i,t}}{10} \qquad \text{II.A9.25}$$

These average shares are combined with the age/sex-specific per capita expenditure in 2019 so that this is the sum of the expenditure on the above six components

$$c_{g,a,0} = \sum_{i=1}^{6} \bar{s}_i \cdot c_{g,a,0} \qquad \text{II.A9.26}$$

We can define the cost per capita in each subsector as

$$c_{g,a,i,0} = \bar{s}_i \cdot c_{g,a,0} \qquad \text{II.A9.27}$$

To calculate the annual growth rate of public expenditure for each of the six components, the growth rate of public expenditure for component *i* at time *t* of available data up to the baseline year of 2019 included is:

$$\mathrm{D}PE_{i,t} = \left(\frac{PE_{i,t} - PE_{i,t-1}}{PE_{i,t-1}} \right) \qquad \text{II.A9.28}$$

and the average annual growth rate of public expenditure for component *i* for the last past 10 years where available, which is:

$$\overline{\mathrm{D}PE_i} = \frac{\sum_{t=0}^{-9} \mathrm{D}PE_{i,t}}{10} \qquad \text{II.A9.29}$$

Next, we calculate the average annual growth rate of GDP (ΔY) for the past ten years of available data as:

$$\overline{\Delta Y} = \frac{1}{10} \cdot \sum_{t=0}^{-9} \Delta Y_t \qquad \text{II.A9.30}$$

The ratio of average annual grow rate of expenditure on each component to the average annual growth rate of GDP is calculated by dividing equation II.A9.29 by equation II.A9.30.

Following these calculations the per capita cost is assumed to evolve in the following manner:

$$c^{di}_{g,a,t} = \frac{\overline{\Delta PE_i}}{\overline{\Delta Y_i}} \cdot \sum_{i=1}^{5} \left(\bar{s}_i \cdot c_{g,a,t-1} \right) \qquad \text{II.A9.31}$$

where:

di stands for decomposed indexation scenario; and

ΔY_t is the GDP rate of growth in year *t* for each country.

Each of the six ratios of growth rates (the ratio of $\overline{\mathrm{D}PE_i}$ to ΔY) converges linearly to 1 by a specified date, 2070.

Again, corresponding equations II.A9.3 and II.A9.4 are then used to calculate total age/sex group expenditure and total public expenditure on healthcare in each projection year.

IX. Non-demographic determinants scenario

The *"non-demographic determinants scenario"* shows the effect of other healthcare spending drivers next to population's ageing, such as income, technology, relative prices and institutional settings. These factors have been identified as the main drivers of healthcare expenditure growth by several econometric studies ([128]).

This scenario uses panel regression techniques to estimate country-specific non-demographic cost (NDC) of healthcare. NDC is defined as the excess of growth in real per-capita healthcare expenditure over the growth in real per-capita GDP after controlling for demographic composition effects. Alternatively, results can also be expressed in terms of "average" country specific income elasticities of healthcare expenditure.

This scenario is identical to the "*income elasticity scenario*" except that the elasticity of demand is set equal to 1.5 in the base year (rather than 1.1 in the case of the "*income elasticity scenario*"), converging in a linear manner to 1 by the end of projection horizon in 2070.

X. AWG reference scenario

The *"AWG reference scenario"* is the central scenario used when calculating the overall budgetary impact of ageing. Formally, it builds on the "*income elasticity scenario*", combining it with age/sex specific expenditure profiles intermediate between the "*demographic scenario*" and the

([128]) Maisonneuve and Martins (2013), "A projection method of public health and long-term care expenditures", OECD Economic Department WP No. 1048.

"*healthy ageing scenario*", driven by the assumption that half of the future gains in life expectancy are spent in good health.

XI. AWG risk scenario

The "*AWG risk scenario*", follows the same approach as described in the "*non-demographic determinants scenario*" in combination with the assumption that half of the future gains in life expectancy are spent in good health, an intermediate approach to the age/sex specific expenditure profiles between the "*demographic scenario*" and the "*healthy ageing scenario*".

ANNEX 10

Mathematical illustration of the long-term care scenarios

General definitions

Let us define $N_{g,a,t}$ the population of a given sex *g* and age *a* in year *t*. Following the main steps of the general methodology process presented in the chapter on long-term care, the following definitions are derived.

STEP 1: dependent/non-dependent population

The ratio of dependent (resp. non-dependent) persons in the base year *t=b* (e.g. 2019) is derived from the EU-SILC data, for each age – actually, 5-year age groups (15+) – and sex group: $d_{g,a,b}$ (resp. *1*- $d_{g,a,b}$). The average dependency rates for the last 5 years are being used, based on data availability. Therefore, the projected dependent population of a given sex *g* and age *a* in a projected year *t* is:

$$D_{g,a,t} = d_{g,a,b} \quad N_{g,a,t} \qquad \text{II.A10.1}$$

STEP 2: split into types of care

To be able to differentiate the impact of different scenarios according to the respective behaviour of the different types of care, one needs to split the projected dependent population into four groups: those receiving formal in-kind care at home, those receiving formal in-kind care in institutions, those receiving cash benefits (which is also defined as a type of formal care) and those receiving only informal care.

Therefore, one defines $DFh_{g,a,t}$, $DFi_{g,a,t}$, $DI_{g,a,t}$ the projected dependent population of a given sex *g* and age *a* in a projected year *t* receiving respectively in-kind formal care at home (*DFh*), in-kind formal care in institutions (*DFi*), cash benefits and informal care (*DI*), as follows:

$$DFh_{g,a,t} = D_{g,a,t} \quad p^{Fh}_{g,a,0} \qquad \text{II.A10.2}$$

$$DFi_{g,a,t} = D_{g,a,t} \quad p^{Fi}_{g,a,0} \qquad \text{II.A10.3}$$

$$DI_{g,a,t} = D_{g,a,t} \quad (1 - p^{Fh}_{g,a,0} - p^{Fi}_{g,a,0}) \qquad \text{II.A10.4}$$

Where $p^{Fh}_{g,a,0}$ is the probability for a dependent person of sex *g* and age *a* to receive in-kind formal care at home, in the base year *0* (e.g. 2019). Similarly, $p^{Fi}_{g,a,0}$ is the correspondent probability of being taken care of formally in institutions, while $p^{I}_{g,a,0}$ – the probability of being take care of informally – is defined as not receiving any formal care service.

STEP 3: age-sex profiles of expenditure

Average expenditure is calculated for a base year *0*, to define the long-run unit costs of services. If the data is available (through the SHA joint questionnaire and/or provided by Member States), unit costs for in-kind formal care at home and in-kind formal care in institutions are calculated separately([129]):

$$c^{Fh}_{g,a,0} = \frac{S^{Fh}_{g,a,0}}{N^{Fh}_{g,a,0}} \qquad \text{II.A10.5}$$

where: $S^{Fh}_{g,a,0}$ is public spending on in-kind formal care at home in the base year (e.g. 2019); and $N^{Fh}_{g,a,0}$ is the number of recipients of a given sex *g* and age *a* of in-kind formal care at home, for the same year.

Similarly, the unit cost per beneficiary of a given sex *g* and age *a* of in-kind formal care in institutions is:

$$c^{Fi}_{g,a,0} = \frac{S^{Fi}_{g,a,0}}{N^{Fi}_{g,a,0}} \qquad \text{II.A10.6}$$

Note that two adjustments are made to the derived unit costs. The first one applies when age profiles are not provided separately for the two types of in-kind formal care. The age profiles provided by Member States for public expenditure on in-kind formal care services are then used in order to "re-calibrate" the unit costs. In other words, the relative size of the amounts provided for each sex/age group is applied to respective "total" public expenditure aggregates of in-kind formal care at home (S^{Fh}_0) and in-kind formal care in institutions (S^{Fi}_0).

([129]) Otherwise, an average of the age-cost profiles of other EU Member States is used.

The unit costs evolve in time with the GDP growth, as will be explained in the next section of this annex (see equation II.A10.10).

STEP 4: total public expenditure on long-term care services

For a projected year *t*, public spending on both types of in-kind formal care is then computed as:

$$TS^{Fh}_{g,a,t} = c^{AFh}_{g,a,t} \quad DFh_{g,a,t} \qquad \text{II.A10.7}$$

where: $TS^{Fh}_{g,a,t}$ (resp. $TS^{Fi}_{g,a,t}$) is public spending on formal in-kind care at home (resp. in institution) for all persons of sex *g* and age *a* in year *t*.

Hence, for all age and sex groups:

$$TS^{Fh}_{t} = \sum TS^{Fh}_{g,a,t}$$

and

$$TS^{Fi}_{t} = \sum TS^{Fi}_{g,a,t} \qquad \text{II.A10.8}$$

STEP 5: total public expenditure on long-term care (services and cash)

Therefore, total public expenditure on both types of formal long-term care services are added to long-term care related cash benefit expenditure, so as to obtain TS^{LTC}_{t} for a projected year *t*:

$$TS^{LTC}_{t} = TS^{Fh}_{t} + TS^{Fi}_{t} + TS^{C}_{t} \qquad \text{II.A10.9}$$

Where TS^{C}_{t} is projected in a similar manner to expenditure on in-kind benefits([130]).

These general definitions apply to the general, "basic" model structure. In order to run more accurate scenarios, general and scenario-specific assumptions are being applied. These assumptions are illustrated in the following section.

Assumptions for the different scenarios

I. Demographic scenario

As mentioned above, the first assumption added to the general model is the following: for the time horizon of the projection exercise, the age-sex specific public expenditure profiles (showing the average public spending on long-term care per beneficiary for each year of age – or 5-year age group, from 15 to 85+ or more, according to data availability) are assumed to grow in line with income, i.e. with GDP per capita ([131]).

Therefore, the adjusted per beneficiary cost (expenditure) in a projected year *t* is:

$$\begin{aligned} c'^{F}_{g,a,0} &= c^{AF}_{g,a,0} && t = 0 \\ c'^{F}_{g,a,t} &= c'^{F}_{g,a,t-1} \quad (1 + \Delta Ypc_{t}) && t > 0 \end{aligned} \qquad \text{II.A10.10}$$

where:

$c'^{F}_{g,a,t}$ is the cost per beneficiary of a given sex *g* and age group *a* in period *t* of formal care *F – Fh* for formal in-kind care at home, *Fi* for formal in-kind care in institution;

ΔYpc_t is GDP per capita growth rate in year *t*, i.e.:

$$\Delta Ypc_{t} = \left(\frac{Y_t}{P_t} - \frac{Y_{t-1}}{P_{t-1}} \right) \Big/ \left(\frac{Y_{t-1}}{P_{t-1}} \right) \qquad \text{II.A10.11}$$

with Y_t *and* P_t representing GDP and total population in projection year *t*;

Hence, the adjusted per beneficiary cost, $c'^{F}_{g,a,t}$, is the formal in-kind care cost per beneficiary of a person of sex *g* and age *a* in year *t* of the projection period, following the adjustment to GDP per capita growth.

([130]) The projection of cash benefit expenditure is illustrated in less detail than that for in-kind benefits due to the fact that the data on recipients is less readily available and therefore the profile is in some cases assumed to be the same as that for in-kind care.

([131]) Alternative indexation assumptions in order to reflect the institutional set-up of specific EU Member States are discussed in Chapter 3 of Section II.

Equation II.A10.7 above becomes II.A10.7' as the adjusted unit cost *c'* is considered, i.e.:

$$TS^{Fh}_{g,a,t} = c'^{Fh}_{g,a,t} \quad DFh_{g,a,t} \qquad \text{II.A10.7'}$$

The same applies to formal in-kind care in institutions:

$$TS^{Fi}_{g,a,t} = c'^{Fi}_{g,a,t} \quad DFi_{g,a,t} \qquad \text{II.A10.7'b}$$

Similarly for cash benefits, total public spending becomes TS'^{C}_{t}, and an adapted equation II.A10.9 gives adjusted total public spending on long-term care, i.e.:

$$TS'^{LTC}_{t} = TS'^{Fh}_{t} + TS'^{Fi}_{t} + TS'^{C}_{t} \qquad \text{II.A10.9'}$$

II. Base case scenario

For the "*base case scenario*", the assumption on unit cost development is slightly different from the "*demographic scenario*". Indeed, it has been agreed to differentiate two kinds of unit costs. The projections will link unit cost to GDP per hours worked ([132]) for in-kind benefits (services), while unit cost of cash benefits will evolve in line with GDP per capita growth. Therefore, the age-sex specific public expenditure profiles are assumed to grow in line with:

1. GDP per capita for cash benefits;

2. GDP per hours worked for benefits in kind.

The situation is unchanged for cash benefits, i.e. TS'^{C}_{t}, whereas GDP per hours worked will be used to adjust total public spending on formal care services. Equation II.A10.10 becomes:

$$\begin{aligned} c'^{Fc}_{g,a,0} &= c^{Fc}_{g,a,0} \\ c'^{Fc}_{g,a,t} &= c'^{Fc}_{g,a,t-1} \quad (1 + \Delta Yphw_t) \end{aligned} \qquad \text{II.A10.10'}$$

where:

$\Delta Yphw_t$ is the rate of growth of GDP per hours worked in year *t*,

$$\Delta Yphw_t = \left(\frac{Y_t}{HW_t} - \frac{Y_{t-1}}{HW_{t-1}} \right) \Big/ \left(\frac{Y_{t-1}}{HW_{t-1}} \right) \qquad \text{II.A10.12}$$

where *HW* stands for total hours worked.

Corresponding equations II.A10.7 and II.A10.7'b are then used and coupled with TS'^{C}_{t} as calculated in the "*demographic scenario*" to calculate total age/sex group expenditure and total public expenditure on long term care in each projection year.

$$TS'^{LTC}_{t} = TS'^{Fh}_{t} + TS'^{Fi}_{t} + TS'^{C}_{t} \qquad \text{II.A10.9''}$$

III. High life expectancy scenario

The "*high life expectancy scenario*" presents the budgetary effects of an alternative demographic scenario, which assumes life expectancy to be higher for all ages than in the *demographic* and in the *base case* scenarios. In terms of methodology, the scenario does not differ from the "*base case scenario*", apart from the fact that the baseline demographic projections used as input data are replaced with the alternative, high life expectancy, variant (the same used to assess the sensitivity of pension spending). Therefore, the mathematical illustration of the previous scenario only changes in $N_{g,a,t}$, i.e. the number of individuals in each age/sex group up to 2070 (replaced by the new population assumptions in equation II.A10.1 and II.A10.11).

IV. Constant disability scenario

This scenario reflects an alternative assumption about trends in age-specific ADL-dependency rates. The profile of age-specific disability rates shifts in line with changes in life expectancy (disability rate in the future is equal to that of a younger - by the same number of years as the change in age-specific life expectancy - age cohort today), resulting in a gradual decrease over time in

([132]) GDP per hours worked is used, similar to the previous ageing report, to stay in line with the macroeconomic assumptions and the other parts of the projections.

disability prevalence for each age cohort, i.e. affecting the variable $D_{g,a,t}$.

In practical terms, it follows the same reasoning as for the similar healthcare "*constant health scenario*". One starts by calculating, for each projection year, the change in life expectancy in relation to the base year. For example, life expectancy for a 50-year-old man is expected to increase by, say, 4 years: from 30 years in year *t* to 34 years in year *t+20* in a specific Member State. Then, the scenario assumes that in *t+20*, in that same Member State, a 50-year-old man will have a disability prevalence of a (50-4) = 46-year old man in year *t*.

Hence, the change in life expectancy of a person of sex *g* and age *a* in relation to the base year (say, 2019) is first calculated for each year of the projections, using the Eurostat population projections ([133]):

$$\Delta LE_{g,a,t,0} = LE_{g,a,t} - LE_{g,a,0}$$

II.A10.13

where:

$\Delta LE_{g,a,t,0}$ is the additional life expectancy of a person of sex *g* and age *a* in year *t* compared to a person of sex *g* and age *a* in the base year,

$LE_{g,a,t}$ is the life expectancy of a person of sex *g* and age *a* in year *t* and

$LE_{g,a,0}$ is life expectancy of an average person of sex *g* and age *a* in the base year.

For year *t* of the projections, the "adjusted" disability prevalence for the cohort of sex *g* and age *a* is then based on equation II.A10.1 adjusted such as:

$$D'_{g,a,t} = d_{g,a-\Delta LE_{g,a,t,b}} \; N_{g,a,t} \qquad \text{II.A10.1'}$$

And the adjusted projected dependent population $D'_{g,a,t}$ will therefore replace former $D_{g,a,t}$ in the subsequent equations II.A10.2 to II.A10.4 and then II.A10.10' and II.A10.9', to follow the subsequent steps of the "*base case scenario*".

V. Scenario assessing the effect of a shift from informal to formal care

Building on the "*base case scenario*", this policy-change scenario is a sensitivity test that examines the budgetary impact of a progressive shift into the formal in-kind sector of care of 1% per year of disabled elderly who have so far received only informal care. This extra shift takes place during the first ten years of the projection period, thus it sums up to about 10.5% shift from informal to formal care. This shift will not have an impact on the relative shares of home and institutional formal in-kind care. The shift will thus not be 50% of the "new" beneficiaries to move into institutional care, while the other 50% will be assumed to receive formal care at home but a shift in line with the existing shares of home and institutional care. The variables $DFh_{g,a,t}$, $DFi_{g,a,t}$, and $DI_{g,a,t}$ will be adjusted to the new assumptions.

The projected dependent population of a given sex *g* and age *a* in a projected year *t* receiving respectively formal in-kind care at home (*DFh*), formal in-kind care in institutions (*DFi*) and informal care (*DI*), calculated in equations II.A10.2 to II.A10.4, will be changed as follows. For $t \in [0+1, 0+10]$ – let us say, for the first ten years of the projection period:

$$DI'_{g,a,t} = DI_{g,a,t-1} - 0.1 \; DI_{g,a,t-1} = 0.9 \; DI_{g,a,t-1}$$
$$DFh'_{g,a,t} = DFh_{g,a,t-1} + (DFh_{g,a,t-1} / D_{g,a,t-1}) \; 0.1 \; DI_{g,a,t-1}$$
$$DFi'_{g,a,t} = DFi_{g,a,t-1} + (DFi_{g,a,t-1} / D_{g,a,t-1}) \; 0.1 \; DI_{g,a,t-1}$$

These adapted projected numbers of dependents / recipients of formal care are then injected in equations II.A10.7', II.A10.7b' and II.A10.9' to calculate the total public spending on long-term care, as it was done in the "*base case scenario*". It should be noted that cash benefit recipients are not affected by this and this population remains

([133]) In the "*constant disability scenario*" the total number of years spent with disability during a person's lifetime is assumed to remain the same while life expectancy increases. Thus, if between time *t* and *t+1*, total life expectancy increases by *n* years for a cohort of age *a*, "disability-free" life expectancy for that very same age cohort must also increase by *n* years in order for the *relative compression of morbidity* hypothesis to be valid. If "disability-free" life expectancy increases by *n* years, then the disability prevalence of this cohort of age *a* at time *t+1* will be the same as the disability prevalence of cohort of age *a-n* at time *t*.

constant for each age-sex group for the duration of the projections. For the rest of the projection period until its end in 2070 the baseline equations are used as above.

VI. Coverage convergence scenario

This policy-change scenario assumes an expansion of publicly financed formal care provision into the groups of population that have not been covered by the public in-kind programmes so far. "Formal coverage" covers any of the three types of formal long-term care: in-kind institutional care, in-kind formal home care, and cash benefits. This scenario assumes that coverage of in-kind formal care (institutional and home care) will be extended to cover a proportion of those dependent people who do not receive any type of care in the base year. The assumption is that all recipients of long-term care are dependent. It means that the equations II.A10.2 to II.A10.4 become four equations, with probabilities now changing over time, i.e. depending on *t*, but also country-specific (for a country *i*).

The scenario envisaged is a coverage convergence to the EU27 average for in-kind care. It is meant to take into account the high diversity of country-specific current in-kind care-mix between home care and institutional care. The Member States where the in-kind formal coverage rate for a specific age-range is below the EU27 average in the starting year are assumed to converge to this average by 2070. For age ranges with coverage above the EU average, this scenario is the same as the base case scenario.

The *"base case scenario"* steps are used for the countries whose formal in-kind coverage is the same or greater than the EU27 average in the base year (2019). For those countries whose in-kind formal coverage is below the EU27 average, it is assumed to converge to the EU27 average. It therefore implies that each type of in-kind formal care converges at a different pace, making up for the respective relative gaps to the EU27 average. This scenario allows a country to grow faster the relatively less-developed type of in-kind formal care.

VII. Cost convergence to EU27 average scenario

This policy-change scenario is run in parallel with the analogous scenario on healthcare expenditure projections. The "*cost convergence scenario*" is meant to capture the possible effect of a convergence in real living standards on long-term care spending. It assumes an upward convergence of the relative age-sex specific per beneficiary expenditure profiles (as percent of GDP per capita) of all countries below the corresponding EU27 average to the EU27 average. This is done for each type of formal care coverage (i.e. formal care in institutions, formal care at home, cash benefits).

To run this scenario, one builds on the methodology used for the "*base case scenario*". For those countries whose per beneficiary costs are equal to or above the EU27 average the steps illustrated above are followed.

For those countries below the EU27 average per beneficiary costs in the base year (2019) a further change in the way cost per beneficiary is evolving over the projection period is assumed, so as to reach the EU27 average of per beneficiary costs. Building on the equations II.A10.10 – for cash benefits – and II.A10.10' – for in-kind benefits – the real convergence to EU27 average is assumed to follow the adjusted equations:

$$c'^{C}_{a,0,i} = c^{C}_{a,0,i} \qquad t=0$$

$$c'^{C}_{a,t,i} = c'^{C}_{a,t-1,i} \cdot \left(1 + \Delta Ypc_{t,i} + m_{a,i}\right) \qquad t>0 \qquad \text{II.A10.10}$$

$$c''^{F}_{a,0,i} = c^{AF}_{a,0,i} \qquad t=0$$

$$c''^{F}_{a,t,i} = c''^{F}_{a,t-1,i} \cdot \left(1 + \Delta Yphw_{t,i} + n_{a,i}\right) \qquad t>0 \qquad \text{II.A10.10}$$

where:

$c''^{F}_{a,t,i}$ is the country *i*-specific cost of in-kind benefits per beneficiary of a given age *a* in period *t* – *Fh* for formal care at home, *Fi* for formal care in institution – adjusted to the GDP per hours worked

growth and a catch-up effect if country *i* is below the EU27 average;

$c'^{C}_{a,t,i}$ is the country *i*-specific cost of cash benefits per beneficiary of a given age a in period t – adjusted to GDP per capita growth and a catch-up effect if country i is below the EU27 average;

$\Delta Ypc_{t,i}$ is the GDP per capita rate growth rate in year t, for country *i*;

$\Delta Yphw_{t,i}$ is GDP per hours worked growth rate in year *t*, for country *i*, and

$m_{a,i}$ and $n_{a,i}$ are hypothetical rates of growth of per beneficiary costs. They are higher than zero for countries whose per beneficiary costs are below the EU27 average, and equal to zero for those countries whose per beneficiary costs are equal or above the EU27 average. To close the gap, $m_{a,i}$ is assumed to be constant in time and equal to ([134]):

$$m_{a,i} = \left[\left(\frac{\bar{rc}_{a,EU27,2019}}{rc_{a,i,2019}}\right)^{\frac{1}{2070-2019}}\right] - 1 \qquad \text{II.A10.14}$$

if $\bar{rc}_{a,EU27,2019} \geq rc_{a,i,2019}$

where:

$\bar{rc}_{a,EU27,2019}$ is the weighted EU27 average relative cost per beneficiary of age *a* calculated in the base year of 2019 and

$\bar{rc}_{a,i,2019}$ is the relative cost per beneficiary of age *a* for country *i* calculated in the base year of 2019 defined as:

$$rc_{a,i,2019} = \left(\frac{c''_{a,i,2019}}{Yphw_{a,i,2019}}\right)$$

and

$$\bar{rc}_{a,EU27,2019} = \left(\frac{\bar{c}_{a,EU27,2019}}{\overline{Yphw}_{a,EU27,2019}}\right)$$

where:

$\bar{c}_{a,EU27,2019}$ is the weighted EU27 average cost per beneficiary of age *a* calculated in the base year (2019); and

$\overline{Yphw}_{a,EU27,2019}$ is the average GDP per hours worked in the EU27 calculated in the base year (2019).

The same type of reasoning can be run with the corresponding equations for cash benefits, adjusted to GDP per capita growth instead of GDP per hours worked growth.

Then after country-specific per beneficiary cost has been calculated, subsequent corresponding equations are used to obtain total age-sex group expenditure and then total public expenditure on long-term care in each projection year, as in equation II.A10.9".

VIII. Cost and coverage convergence scenario

This policy-change scenario combines the two previous scenarios, the "*coverage convergence scenario*" and the "*cost convergence scenario*" to the EU 27 average. For countries with cost and coverage above the EU average, this scenario is the same as the "*base case scenario*".

IX. AWG reference scenario

The "*AWG reference scenario*" combines the assumptions of the "*base case scenario*" and the "*constant disability scenario*". It assumes that half of the projected longevity gains up to the end of the projection period will be spent in good health and free of disability/dependency. Accordingly, age-specific disability rates shift along the age profile by half of the projected increase in life expectancy. Furthermore, the unit costs are linked to GDP per hour worked in case of LTC services and to GDP per capita in case of cash benefits

([134]) Assumptions for different convergence paths according to the initial country-specific situation - comparing to the EU27-average age profile - could be explored further when data is made available.

(subject to the relevant exceptions in order to reflect country-specific assumptions).

For Member States in the highest quartile of LTC expenditure as a proportion of GDP in the base year, income elasticity of LTC expenditure is assumed to remain 1 over the projection period. For the rest, income elasticity is assumed to start at 1.1 in the base year of 2019, falling to 1 by the end of the projection period.

X. AWG risk scenario

The "*AWG risk scenario*" keeps the assumption that half of the future gains in life expectancy are spent without care-demanding disability, as in the "*AWG reference scenario*". In addition, it combines this scenario with the "*cost and coverage convergence scenario*" by assuming convergence upwards of unit costs to the EU-average as well as coverage convergence upwards to the EU-average.

ANNEX 11

Organisational structure of secondary education

Three different organisational models can be distinguished: i) a single structure; ii) a compulsory integrated secondary education corresponding to a 'common core'; and iii) distinct types of education. In some new Member States (the Czech Republic, Latvia, Lithuania, Hungary and Slovakia), combinations of these three models coexist. ([135])

In all countries where the single structure is the only type (Denmark, Estonia, Portugal, Slovenia, Finland, Sweden, Iceland, Norway and Bulgaria), the end of secondary education coincides with the end of compulsory education, except in Bulgaria where compulsory education ends one year later.

In almost half of all European countries, all pupils follow the same general curriculum "common core" during lower secondary education. In seven of these countries, the end of lower secondary education coincides with the end of full-time compulsory education.

In Belgium, France, Ireland, Italy, Hungary, Austria, Slovakia and Bulgaria, the end of full-time compulsory education does not coincide with the end of lower secondary education. Instead, one or more final years of compulsory education are part of upper secondary education. Thus, pupils in these countries - with the exception of Ireland - have to choose between general, technical or vocational education of one or two years (or four in Hungary) before the end of full-time compulsory education.

In the French and German-speaking Belgian Communities, Germany, Latvia, Lithuania, Luxembourg, the Netherlands and Austria, pupils may select or be streamed into different types of provision or school from the beginning or before the end of lower secondary education. Even though pupils in Germany attend different schools, they follow entirely compatible curricula for the first two years so that selection of an appropriate study branch can be deferred. In the Netherlands, pupils follow a common core curriculum usually for the first two years at VMBO and three years at HAVO and VWO. While its level varies depending on the type of school concerned, it specifies minimum skills that should be acquired by all pupils.

([135]) Source: Key data on education in Europe 2005, European Commission, Eurydice, Eurostat, 2005.

ANNEX 12
Sources of data for education expenditure

Data sources and information

As in the previous projection exercise, Eurostat is the main provider of data, mainly through the UOE data collection ([136]). As a rule, expenditure data given by the average of the two last available years, generally 2015 and 2016 (or more recent data if available), are chosen. This is then uprated until the base year using COFOG data ([137]). For those countries where data are missing for the base period, AWG delegates could be asked to provide them to the Commission.

Specifically, by country, year, and ISCED groupings (1, 2, 3-4, 5-8), the following information from the UOE dataset will be used:

- Total number of students by single age;
- Number of working students by single age;
- Number of teachers and non-teaching staff;
- Total expenditure in staff compensation ([138]);
- Other current (excluding staff compensation) and capital expenditure;
- Share of transfers over total public education expenditure ([139]);
- Share of publicly funded education.

Furthermore, and to secure full consistency of the long-term budgetary exercise, the common AWG macroeconomic assumptions for the following variables are used:

- Total population per single age;
- Labour force per single age;
- GDP per worker;
- GDP.

([136]) The objective of the UNESCO-UIS/OECD/EUROSTAT (UOE) data collection on education statistics is to provide internationally comparable data on key aspects of education systems, specifically on the participation and completion of education programmes, as well as the cost and type of resources dedicated to education (http://www.oecd.org/dataoecd/32/53/33712760.pdf).

([137]) If data for 2018 is not available, the latest available public expenditure data as a share of GDP are used.

([138]) Current expenditure on staff compensation is obtained by deducting expenditure designated for capital, ancillary services, and R&D from direct expenditure on educational institutions (UOE, 2019).

([139]) From the OECD, Education at a Glance.

ANNEX 13

Estimating the education enrolment rate

Starting with the labour market identity:

$$E_{i,t} + U_{i,t} + I_{i,t} \equiv P_{i,t} \quad (1)$$

where $E_{i,t}$, $U_{i,t}$, $I_{i,t}$ and $P_{i,t}$ are respectively employment, unemployment, inactive and the population for age cohort *i* in period *t*.

After adding and subtracting the number of full-time students ($SF_{i,t}$), and of part-time students ($SP_{i,t}$):

$$SF_{i,t} + SP_{i,t} - SP_{i,t} + E_{i,t} + U_{i,t} + I_{i,t} - SF_{i,t} \equiv P_{i,t} \quad (2)$$

Let us use the definition of total students $ST_{i,t} \equiv SF_{i,t} + SP_{i,t}$, labour force $LF_{i,t} \equiv E_{i,t} + U_{i,t}$, and inactive minus full-time students $I^*_{i,t} \equiv I_{i,t} - SF_{i,t}$:

$$ST_{i,t} - SP_{i,t} + LF + I^*_{i,t} \equiv P_{i,t} \quad (3)$$

Dividing equation (1) by the population ($P_{i,t}$), and defining

$$a_{i,t} \equiv \frac{SP_{i,t}}{SF_{i,t} + SP_{i,t}} = \frac{SP_{i,t}}{ST_{i,t}}$$

as the fraction of part-time students in the total number of students, the following identity is obtained:

$$\frac{ST_{i,t}}{P_{i,t}} - \frac{SP_{i,t}}{ST_{i,t}} * \frac{ST_{i,t}}{P_{i,t}} + \frac{LF_{i,t}}{P_{i,t}} + \frac{I^*_{i,t}}{P_{i,t}} \equiv 1 \quad (4)$$

Equation 4 can be rearranged as:

$$e_{i,t} = \frac{1 - p_{i,t} - i^*_{i,t}}{1 - a_{i,t}} \quad (5)$$

where the enrolment rate for total students is;

$$e_{i,t} \equiv \frac{ST_{i,t}}{P_{i,t}}$$

and the participation rate is;

$$p_{i,t} \equiv \frac{LF_{i,t}}{P_{i,t}}$$

$$i^*_{i,t} \equiv \frac{I^*_{i,t}}{P_{i,t}}$$

is the fraction of inactive minus full-time students over the population.

In equation 5, enrolment rates are inversely related to the participation and the (adjusted) inactivity rates.

In most EU Member States, the LFS MAINSTAT variable can be used to assess the distribution of inactivity by age, distinguishing between schooling and other forms of inactivity ([140]).

Assume that the ratio between full-time students and the total inactive ($\overline{\kappa}_{i,b}$) is constant over time at the value observed in the base period (*b*):

$$\frac{SF_{i,t}}{I_{i,t}} = \frac{SF_{i,b}}{I_{i,b}} = \overline{\kappa}_{i,b}$$
$$\Rightarrow \frac{I^*_{i,t}}{P_{i,t}} = \left(1 - \overline{\kappa}_{i,b}\right) * \frac{I_{i,t}}{P_{i,t}} \Rightarrow i^*_{i,t} - i^*_{i,b} = \left(1 - \overline{\kappa}_{i,b}\right) * \left(i_{i,t} - i_{i,b}\right) \quad (6)$$

Where:

$\overline{\kappa}_{i,b} \leq 1$;

$i_{i,t} \equiv \frac{I_{i,t}}{P_{i,t}}$,

$i^*_{i,t} \equiv \frac{I^*_{i,t}}{P_{i,t}}$

are the inactivity and the adjusted inactivity rates, respectively. A bar over a variable indicates that it is constant (i.e. time invariant).

Enrolment rates are projected by expressing equation 5 in terms of differences to the base period, substituting equation 6, and using the identity $\left(p_{i,t} - p_{i,b}\right) + \left(i_{i,t} - i_{i,b}\right) \equiv 0$:

$$e_{i,t} - e_{i,b} = -\frac{\overline{\kappa}_{i,b}}{1 - \overline{\alpha}_{i,b}} * \left(p_{i,t} - p_{i,b}\right) \quad (7)$$

([140]) However, the MAINSTAT variable, which describes the main labour market status, is an optional one.

where $\overline{\kappa}_{i,b} = \frac{SF_{i,b}}{I_{i,b}}$; $\overline{\alpha}_{i,b} \equiv \frac{SP_{i,b}}{SF_{i,b}+SP_{i,b}} = \frac{SP_{i,b}}{ST_{i,b}}$,

and $0 \leq \overline{\kappa}_{i,b}, \overline{\alpha}_{i,b} \leq 1$

A value for $\overline{\kappa}_{i,b}$ lower than one means that changes in the labour force do not necessary reduce one by one enrolment rates, because some people coming from inactivity were not involved in education activities.

Part III

Statistical Annex

1. BELGIUM

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.58	1.59	1.62	1.64	1.66	1.68
Life expectancy at birth							
males	6.5	79.8	81.2	82.6	83.9	85.2	86.3
females	6.0	84.3	85.7	87.0	88.2	89.3	90.3
Life expectancy at 65							
males	4.7	18.9	19.9	20.9	21.8	22.7	23.6
females	4.6	22.2	23.2	24.2	25.1	26.0	26.8
Net migration (thousand)	-24.5	45.0	20.5	19.2	19.8	20.4	20.5
Net migration as % of population	-0.2	0.4	0.2	0.2	0.2	0.2	0.2
Population (million)	0.4	11.5	11.8	11.9	11.9	11.9	11.8
Young population (0-14) as % of total population	-2.9	22.4	21.1	20.1	20.1	19.9	19.5
Prime-age population (25-54) as % of total population	-4.7	39.5	37.5	37.1	36.1	35.7	34.8
Working-age population (20-64) as % of total population	-6.1	58.6	56.2	54.7	53.5	52.8	52.5
Elderly population (65 and over) as % of total population	8.9	19.0	22.8	25.2	26.4	27.4	28.0
Very elderly population (80 and over) as % of total population	6.0	5.7	6.7	8.6	10.3	10.9	11.7
Very elderly population (80 and over) as % of elderly population	11.9	29.8	29.3	34.2	39.1	39.7	41.7
Very elderly population (80 and over) as % of working age population	12.5	9.7	11.9	15.7	19.2	20.6	22.2
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	1.5	0.9	1.3	1.3	1.4	1.4
Employment (growth rate)	0.0	1.0	0.2	-0.2	-0.2	-0.1	-0.1
Labour input: hours worked (growth rate)	0.0	1.1	0.2	-0.2	-0.2	-0.1	-0.1
Labour productivity per hour (growth rate)	1.2	0.4	0.7	1.5	1.5	1.5	1.5
TFP (growth rate)	0.8	0.1	0.5	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.4	0.3	0.2	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.2	1.0	0.7	1.2	1.3	1.5	1.4
Potential GDP per worker (growth rate)	1.2	0.5	0.7	1.6	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-513	6,723	6,611	6,515	6,386	6,261	6,210
Population growth (working-age: 20-64)	-0.3	0.2	-0.2	-0.1	-0.2	-0.1	-0.1
Labour force 20-64 (thousands)	-312	5,011	5,047	4,967	4,850	4,748	4,699
Participation rate (20-64)	1.1	74.5	76.4	76.2	76.0	75.8	75.7
Participation rate (20-74)	0.2	64.2	65.0	65.0	64.8	64.3	64.4
youngest (20-24)	3.0	49.7	52.4	53.0	52.7	52.6	52.8
prime-age (25-54)	-1.5	84.8	83.8	83.4	83.3	83.2	83.3
older (55-64)	9.4	54.6	65.9	65.0	64.3	64.0	64.0
very old (65-74)	6.5	4.3	10.5	11.0	10.9	10.7	10.8
Participation rate (20-64) - FEMALES	2.0	70.0	72.7	72.6	72.2	72.1	71.9
Participation rate (20-74) - FEMALES	1.3	59.7	61.6	61.8	61.4	60.8	61.0
youngest (20-24)	4.1	46.9	50.7	51.2	50.9	50.8	51.0
prime-age (25-54)	-1.4	80.3	79.7	79.1	79.0	78.9	78.9
older (55-64)	12.0	49.2	62.5	62.7	61.4	61.1	61.2
very old (65-74)	7.5	2.9	9.7	10.5	10.6	10.2	10.3
Participation rate (20-64) - MALES	0.3	79.1	79.9	79.8	79.7	79.5	79.3
Participation rate (20-74) - MALES	-1.0	68.7	68.5	68.3	68.2	67.7	67.8
youngest (20-24)	2.0	52.5	54.1	54.7	54.4	54.3	54.5
prime-age (25-54)	-1.7	89.3	87.8	87.7	87.6	87.5	87.6
older (55-64)	6.8	60.1	69.1	67.4	67.1	67.0	66.9
very old (65-74)	5.4	5.9	11.3	11.4	11.3	11.2	11.3
Average effective exit age (TOTAL) (1)	0.9	63.4	64.3	64.3	64.3	64.3	64.3
Men	1.0	63.3	64.3	64.3	64.3	64.3	64.3
Women	0.8	63.5	64.3	64.3	64.3	64.3	64.3
Employment rate (20-64)	0.3	70.6	71.6	71.5	71.2	71.1	70.9
Employment rate (20-74)	-0.4	60.9	61.1	61.0	60.9	60.3	60.4
Unemployment rate (20-64)	1.0	5.2	6.2	6.2	6.2	6.2	6.2
Unemployment rate (20-74)	0.9	5.2	6.1	6.1	6.1	6.1	6.1
Employment (20-64) (in millions)	-0.3	4.7	4.7	4.7	4.5	4.5	4.4
Employment (20-74) (in millions)	-0.3	4.8	4.9	4.8	4.7	4.6	4.5
share of youngest (20-24)	0.2	6%	7%	6%	6%	6%	6%
share of prime-age (25-54)	-5.1	76%	72%	72%	72%	72%	71%
share of older (55-64)	2.9	17%	19%	18%	19%	18%	19%
share of very old (65-74)	2.0	1%	3%	3%	3%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.8	22.5	22.4	21.9	22.6	22.1	23.3
Old-age dependency ratio 20-64 (3)	20.8	32.5	40.5	46.0	49.2	51.8	53.3
Total dependency ratio (4)	19.8	70.8	78.0	82.6	86.7	89.5	90.5
Total economic dependency ratio (5)	21.1	139.3	141.4	147.9	154.4	158.3	160.4
Economic old-age dependency ratio (20-64) (6)	27.0	45.0	53.6	61.2	65.9	69.7	71.9
Economic old-age dependency ratio (20-74) (7)	25.2	44.5	52.0	59.4	64.0	67.5	69.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

2. BULGARIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.58	1.65	1.68	1.70	1.71	1.71
Life expectancy at birth							
males	11.4	71.5	74.3	76.7	79.0	81.0	82.9
females	8.9	78.8	80.9	82.8	84.6	86.2	87.7
Life expectancy at 65							
males	7.2	14.2	15.9	17.4	18.8	20.1	21.4
females	6.6	18.1	19.6	20.9	22.3	23.5	24.7
Net migration (thousand)	13.9	-3.9	0.8	3.1	5.5	7.7	10.0
Net migration as % of population	0.3	-0.1	0.0	0.1	0.1	0.1	0.2
Population (million)	-1.9	7.0	6.4	6.0	5.6	5.3	5.0
Young population (0-14) as % of total population	-0.6	18.9	18.7	17.8	18.2	18.3	18.2
Prime-age population (25-54) as % of total population	-8.5	41.6	37.2	34.3	32.5	33.3	33.1
Working-age population (20-64) as % of total population	-8.8	59.6	57.0	54.7	51.0	49.2	50.8
Elderly population (65 and over) as % of total population	9.4	21.5	24.3	27.5	30.8	32.5	30.9
Very elderly population (80 and over) as % of total population	9.1	4.9	6.6	8.3	9.7	12.4	14.0
Very elderly population (80 and over) as % of elderly population	22.7	22.6	27.3	30.3	31.5	38.1	45.2
Very elderly population (80 and over) as % of working age population	19.4	8.1	11.7	15.2	19.1	25.2	27.5
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	2.2	1.2	1.2	1.0	1.3	1.2
Employment (growth rate)	-0.9	0.2	-1.3	-1.1	-1.2	-0.5	-0.4
Labour input: hours worked (growth rate)	-0.9	0.2	-1.3	-1.1	-1.2	-0.5	-0.4
Labour productivity per hour (growth rate)	2.1	1.9	2.5	2.3	2.2	1.8	1.5
TFP (growth rate)	1.3	1.3	1.3	1.5	1.4	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.8	0.7	1.1	0.8	0.8	0.6	0.5
Potential GDP per capita (growth rate)	1.9	2.9	1.9	1.9	1.6	1.9	1.7
Potential GDP per worker (growth rate)	2.1	2.0	2.5	2.3	2.2	1.9	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,600	4,159	3,660	3,282	2,874	2,613	2,559
Population growth (working-age: 20-64)	1.1	-1.4	-0.8	-1.4	-1.3	-0.3	-0.3
Labour force 20-64 (thousands)	-1,280	3,264	2,830	2,516	2,214	2,042	1,984
Participation rate (20-64)	-0.9	78.5	77.3	76.7	77.0	78.1	77.5
Participation rate (20-74)	-0.2	66.7	66.1	64.3	63.3	64.5	66.5
youngest (20-24)	0.2	44.2	43.8	44.5	44.4	44.2	44.4
prime-age (25-54)	0.6	85.8	86.2	86.1	86.5	86.6	86.4
older (55-64)	0.6	67.1	66.5	66.5	65.8	67.8	67.7
very old (65-74)	4.9	11.0	14.9	15.3	15.4	14.9	15.9
Participation rate (20-64) - FEMALES	-1.1	73.7	72.5	71.9	72.0	73.2	72.6
Participation rate (20-74) - FEMALES	1.0	60.7	60.7	59.2	58.4	59.6	61.8
youngest (20-24)	-0.1	38.0	37.3	38.0	37.9	37.7	37.9
prime-age (25-54)	-0.4	81.4	81.6	80.8	81.0	81.3	81.0
older (55-64)	2.2	62.4	62.3	63.7	62.7	64.7	64.6
very old (65-74)	6.5	7.8	12.6	12.9	13.9	13.4	14.3
Participation rate (20-64) - MALES	-0.9	83.2	82.0	81.2	81.9	82.9	82.3
Participation rate (20-74) - MALES	-1.7	72.9	71.6	69.4	68.2	69.2	71.1
youngest (20-24)	0.6	49.9	49.9	50.6	50.5	50.3	50.5
prime-age (25-54)	1.5	90.1	90.6	91.1	91.7	91.6	91.5
older (55-64)	-1.4	72.2	70.9	69.3	69.0	70.9	70.7
very old (65-74)	2.3	15.3	17.7	18.1	17.1	16.6	17.6
Average effective exit age (TOTAL) (1)	0.5	63.9	64.1	64.4	64.4	64.4	64.4
Men	0.0	64.7	64.7	64.7	64.7	64.7	64.7
Women	0.9	63.2	63.6	64.1	64.1	64.1	64.1
Employment rate (20-64)	-1.7	75.2	73.3	72.6	73.0	74.0	73.5
Employment rate (20-74)	-0.9	63.9	62.7	61.0	60.0	61.1	63.1
Unemployment rate (20-64)	1.1	4.2	5.2	5.3	5.3	5.3	5.3
Unemployment rate (20-74)	1.0	4.2	5.2	5.2	5.2	5.2	5.2
Employment (20-64) (in millions)	-1.2	3.1	2.7	2.4	2.1	1.9	1.9
Employment (20-74) (in millions)	-1.3	3.2	2.8	2.5	2.2	2.0	2.0
share of youngest (20-24)	1.3	4%	5%	5%	5%	5%	5%
share of prime-age (25-54)	-4.7	74%	70%	67%	68%	71%	69%
share of older (55-64)	1.9	19%	21%	23%	22%	18%	21%
share of very old (65-74)	1.4	3%	4%	5%	6%	5%	4%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.1	22.9	25.6	27.8	27.0	22.2	25.0
Old-age dependency ratio 20-64 (3)	24.8	36.0	42.7	50.2	60.5	66.2	60.8
Total dependency ratio (4)	29.0	67.7	75.6	82.7	96.2	103.5	96.7
Total economic dependency ratio (5)	39.6	116.6	129.8	139.3	154.0	160.8	156.1
Economic old-age dependency ratio (20-64) (6)	33.3	44.8	53.9	63.8	76.8	83.9	78.1
Economic old-age dependency ratio (20-74) (7)	31.2	43.5	51.7	60.7	72.5	79.6	74.7

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

3. CZECH REPUBLIC

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.71	1.75	1.77	1.78	1.78	1.78
Life expectancy at birth							
males	8.3	76.5	78.4	80.2	81.8	83.4	84.8
females	6.9	82.3	83.9	85.4	86.7	88.0	89.2
Life expectancy at 65							
males	6.0	16.5	17.8	19.1	20.3	21.4	22.5
females	5.7	20.0	21.3	22.5	23.6	24.7	25.7
Net migration (thousand)	-26.0	44.2	16.3	16.6	17.5	18.0	18.2
Net migration as % of population	-0.2	0.4	0.2	0.2	0.2	0.2	0.2
Population (million)	-0.5	10.7	10.8	10.6	10.5	10.4	10.2
Young population (0-14) as % of total population	-0.4	20.4	20.5	19.6	19.9	20.3	20.0
Prime-age population (25-54) as % of total population	-8.4	43.0	38.2	35.1	34.0	34.6	34.6
Working-age population (20-64) as % of total population	-7.8	59.8	57.3	55.4	51.7	50.1	52.1
Elderly population (65 and over) as % of total population	8.2	19.8	22.1	25.0	28.3	29.6	27.9
Very elderly population (80 and over) as % of total population	8.5	4.1	6.6	8.0	8.7	11.9	12.6
Very elderly population (80 and over) as % of elderly population	24.3	20.7	29.6	31.8	30.7	40.1	45.0
Very elderly population (80 and over) as % of working age population	17.3	6.8	11.4	14.4	16.8	23.7	24.1
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.6	2.6	1.9	1.3	1.3	1.7	1.5
Employment (growth rate)	-0.3	0.7	-0.3	-0.7	-0.6	0.0	0.0
Labour input: hours worked (growth rate)	-0.3	0.6	-0.3	-0.7	-0.6	0.0	0.0
Labour productivity per hour (growth rate)	2.0	2.0	2.2	2.1	1.9	1.7	1.5
TFP (growth rate)	1.3	1.5	1.5	1.3	1.3	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.7	0.5	0.8	0.7	0.7	0.6	0.5
Potential GDP per capita (growth rate)	1.7	2.2	2.0	1.5	1.4	1.9	1.7
Potential GDP per worker (growth rate)	2.0	1.9	2.2	2.1	2.0	1.7	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,075	6,386	6,168	5,882	5,444	5,212	5,312
Population growth (working-age: 20-64)	0.6	-0.5	-0.2	-1.0	-0.6	0.0	0.1
Labour force 20-64 (thousands)	-919	5,239	5,042	4,721	4,411	4,274	4,320
Participation rate (20-64)	-0.7	82.0	81.7	80.3	81.0	82.0	81.3
Participation rate (20-74)	0.1	70.2	70.6	68.0	66.6	68.4	70.3
youngest (20-24)	0.9	52.5	52.9	53.3	53.6	53.3	53.5
prime-age (25-54)	0.4	89.1	89.8	89.3	89.3	89.6	89.4
older (55-64)	2.3	68.4	71.0	69.0	69.8	70.8	70.7
very old (65-74)	1.6	10.9	10.9	13.6	11.8	11.9	12.5
Participation rate (20-64) - FEMALES	0.4	74.5	75.3	73.7	74.3	75.6	74.9
Participation rate (20-74) - FEMALES	2.2	62.4	64.2	62.0	60.7	62.8	64.6
youngest (20-24)	1.4	44.9	45.8	46.2	46.4	46.1	46.3
prime-age (25-54)	0.5	81.8	83.2	82.1	81.9	82.7	82.4
older (55-64)	5.7	60.5	65.7	64.4	65.2	66.4	66.3
very old (65-74)	3.4	8.4	9.1	12.6	10.9	11.1	11.7
Participation rate (20-64) - MALES	-1.9	89.3	87.8	86.4	87.3	88.0	87.4
Participation rate (20-74) - MALES	-2.3	77.9	76.8	73.8	72.3	73.7	75.7
youngest (20-24)	0.5	59.8	59.7	60.1	60.4	60.0	60.2
prime-age (25-54)	0.1	95.9	95.9	96.0	96.2	96.1	96.1
older (55-64)	-1.7	76.5	76.1	73.4	74.2	74.9	74.8
very old (65-74)	-0.6	13.9	12.9	14.6	12.6	12.7	13.2
Average effective exit age (TOTAL) (1)	1.4	62.4	63.8	63.8	63.8	63.8	63.8
Men	0.7	63.5	64.2	64.2	64.2	64.2	64.2
Women	2.0	61.4	63.4	63.4	63.4	63.4	63.4
Employment rate (20-64)	-1.9	80.4	78.9	77.5	78.2	79.1	78.5
Employment rate (20-74)	-0.9	68.8	68.2	65.7	64.4	66.1	67.9
Unemployment rate (20-64)	1.5	2.0	3.5	3.5	3.5	3.5	3.5
Unemployment rate (20-74)	1.5	1.9	3.4	3.4	3.4	3.4	3.4
Employment (20-64) (in millions)	-1.0	5.1	4.9	4.6	4.3	4.1	4.2
Employment (20-74) (in millions)	-1.0	5.3	5.0	4.7	4.4	4.3	4.3
share of youngest (20-24)	1.7	5%	6%	6%	6%	6%	6%
share of prime-age (25-54)	-4.9	76%	72%	68%	70%	73%	71%
share of older (55-64)	2.9	17%	20%	22%	21%	17%	20%
share of very old (65-74)	0.3	3%	2%	4%	4%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.7	20.4	23.8	26.6	24.7	20.6	23.1
Old-age dependency ratio 20-64 (3)	20.6	33.0	38.6	45.2	54.8	59.2	53.7
Total dependency ratio (4)	25.0	67.1	74.4	80.6	93.4	99.6	92.1
Total economic dependency ratio (5)	35.2	102.4	115.6	124.4	138.0	143.5	137.6
Economic old-age dependency ratio (20-64) (6)	27.0	38.4	46.4	54.4	66.2	71.1	65.3
Economic old-age dependency ratio (20-74) (7)	26.0	37.4	45.2	52.4	63.7	68.7	63.4

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

4. DENMARK

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.72	1.74	1.75	1.76	1.77	1.77
Life expectancy at birth							
males	6.6	79.5	81.0	82.4	83.7	84.9	86.1
females	6.5	83.3	84.8	86.2	87.5	88.7	89.8
Life expectancy at 65							
males	4.8	18.5	19.5	20.5	21.5	22.4	23.3
females	5.2	21.1	22.2	23.3	24.4	25.3	26.3
Net migration (thousand)	12.6	-1.6	12.4	12.5	11.3	11.0	11.0
Net migration as % of population	0.2	0.0	0.2	0.2	0.2	0.2	0.2
Population (million)	0.3	5.8	6.0	6.1	6.1	6.1	6.2
Young population (0-14) as % of total population	-1.6	22.4	21.6	21.6	21.0	20.8	20.7
Prime-age population (25-54) as % of total population	-4.3	38.8	36.6	36.4	35.4	35.0	34.6
Working-age population (20-64) as % of total population	-6.4	57.9	55.4	53.2	53.4	52.4	51.6
Elderly population (65 and over) as % of total population	8.0	19.7	22.9	25.2	25.6	26.8	27.7
Very elderly population (80 and over) as % of total population	6.3	4.6	7.2	8.3	9.9	10.6	10.9
Very elderly population (80 and over) as % of elderly population	15.9	23.4	31.5	32.9	38.9	39.5	39.3
Very elderly population (80 and over) as % of working age population	13.2	8.0	13.1	15.6	18.6	20.2	21.1
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.7	2.3	1.5	1.6	1.7	1.6	1.6
Employment (growth rate)	0.2	0.9	0.3	0.1	0.2	0.0	0.0
Labour input: hours worked (growth rate)	0.2	0.4	0.3	0.1	0.2	0.1	0.0
Labour productivity per hour (growth rate)	1.5	1.8	1.2	1.5	1.5	1.5	1.5
TFP (growth rate)	1.0	1.2	0.9	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.7	0.4	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.6	2.0	1.3	1.5	1.7	1.6	1.5
Potential GDP per worker (growth rate)	1.5	1.4	1.2	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-191	3,364	3,310	3,223	3,257	3,207	3,174
Population growth (working-age: 20-64)	-0.1	0.0	-0.3	-0.2	0.1	-0.3	-0.1
Labour force 20-64 (thousands)	-113	2,768	2,716	2,666	2,704	2,677	2,655
Participation rate (20-64)	1.4	82.3	82.0	82.7	83.0	83.5	83.7
Participation rate (20-74)	4.2	71.4	71.2	71.8	73.9	74.6	75.5
youngest (20-24)	2.4	72.3	74.7	74.7	74.7	74.7	74.7
prime-age (25-54)	-0.7	86.5	85.9	85.7	85.7	85.7	85.7
older (55-64)	7.3	74.4	74.4	77.0	79.2	80.9	81.7
very old (65-74)	23.9	14.6	18.1	22.6	27.4	34.4	38.4
Participation rate (20-64) - FEMALES	1.1	78.7	78.0	78.8	79.1	79.6	79.8
Participation rate (20-74) - FEMALES	4.8	66.8	67.1	67.8	69.9	70.6	71.6
youngest (20-24)	2.0	70.7	72.8	72.8	72.8	72.8	72.8
prime-age (25-54)	-1.3	82.8	81.7	81.4	81.4	81.4	81.5
older (55-64)	7.8	70.2	70.0	73.2	75.2	77.1	78.0
very old (65-74)	27.6	7.4	15.0	20.0	24.0	30.3	35.0
Participation rate (20-64) - MALES	1.7	85.8	86.0	86.6	86.8	87.3	87.5
Participation rate (20-74) - MALES	3.5	75.9	75.4	75.8	77.9	78.5	79.4
youngest (20-24)	2.7	73.9	76.5	76.5	76.5	76.5	76.5
prime-age (25-54)	-0.2	90.1	90.0	89.9	89.9	89.9	89.9
older (55-64)	6.6	78.7	78.7	80.7	83.0	84.5	85.3
very old (65-74)	19.7	22.2	21.3	25.4	30.9	38.5	41.9
Average effective exit age (TOTAL) (1)	4.8	64.5	65.8	66.9	67.8	68.7	69.3
Men	4.5	65.0	66.1	67.2	68.0	69.0	69.5
Women	5.1	64.1	65.5	66.7	67.6	68.5	69.2
Employment rate (20-64)	2.5	78.4	79.3	80.0	80.3	80.7	80.9
Employment rate (20-74)	5.1	68.1	69.0	69.6	71.6	72.3	73.2
Unemployment rate (20-64)	-1.4	4.7	3.3	3.3	3.3	3.3	3.3
Unemployment rate (20-74)	-1.5	4.6	3.2	3.1	3.1	3.1	3.1
Employment (20-64) (in millions)	-0.1	2.6	2.6	2.6	2.6	2.6	2.6
Employment (20-74) (in millions)	0.1	2.7	2.7	2.7	2.8	2.8	2.8
share of youngest (20-24)	-1.0	9%	9%	9%	9%	8%	8%
share of prime-age (25-54)	-5.8	68%	66%	67%	64%	63%	62%
share of older (55-64)	0.9	19%	20%	19%	21%	20%	20%
share of very old (65-74)	5.9	3%	4%	6%	6%	9%	9%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.9	21.6	23.3	21.1	23.0	22.7	22.4
Old-age dependency ratio 20-64 (3)	19.7	34.1	41.4	47.4	47.9	51.2	53.8
Total dependency ratio (4)	21.3	72.7	80.4	88.0	87.3	90.9	94.0
Total economic dependency ratio (5)	4.6	112.7	117.4	121.2	118.7	116.3	117.3
Economic old-age dependency ratio (20-64) (6)	16.1	39.9	47.5	52.9	53.0	53.9	56.0
Economic old-age dependency ratio (20-74) (7)	12.3	38.5	45.5	49.8	49.7	49.3	50.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

5. GERMANY

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.53	1.57	1.60	1.63	1.65	1.67
Life expectancy at birth							
males	6.9	79.1	80.6	82.1	83.5	84.8	86.0
females	6.2	83.7	85.1	86.4	87.7	88.9	89.9
Life expectancy at 65							
males	5.0	18.4	19.5	20.5	21.5	22.5	23.4
females	5.0	21.4	22.5	23.6	24.6	25.5	26.4
Net migration (thousand)	-63.2	277.4	248.2	240.7	227.0	221.4	214.2
Net migration as % of population	-0.1	0.3	0.3	0.3	0.3	0.3	0.3
Population (million)	-1.4	83.1	83.4	83.2	82.6	81.8	81.7
Young population (0-14) as % of total population	1.1	18.4	19.1	18.8	18.8	19.5	19.5
Prime-age population (25-54) as % of total population	-4.6	39.6	36.6	35.8	35.2	35.2	35.1
Working-age population (20-64) as % of total population	-7.8	59.9	55.2	53.4	53.1	52.2	52.1
Elderly population (65 and over) as % of total population	6.8	21.7	25.6	27.9	28.1	28.3	28.4
Very elderly population (80 and over) as % of total population	5.3	6.7	7.4	9.2	11.9	11.1	11.9
Very elderly population (80 and over) as % of elderly population	11.3	30.8	28.9	33.0	42.4	39.2	42.0
Very elderly population (80 and over) as % of working age population	11.8	11.1	13.4	17.2	22.4	21.3	22.9
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	1.2	0.7	1.4	1.3	1.4	1.6
Employment (growth rate)	-0.2	0.6	-0.7	-0.1	-0.2	-0.1	0.0
Labour input: hours worked (growth rate)	-0.2	0.5	-0.7	-0.1	-0.2	-0.1	0.0
Labour productivity per hour (growth rate)	1.4	0.8	1.4	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	0.5	0.9	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.2	0.5	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.3	1.0	0.7	1.5	1.4	1.5	1.5
Potential GDP per worker (growth rate)	1.4	0.6	1.4	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-7,230	49,766	46,080	44,388	43,883	42,675	42,536
Population growth (working-age: 20-64)	0.2	-0.1	-1.0	0.1	-0.2	-0.1	0.1
Labour force 20-64 (thousands)	-5,590	41,389	38,428	37,294	36,807	35,902	35,800
Participation rate (20-64)	1.0	83.2	83.4	84.0	83.9	84.1	84.2
Participation rate (20-74)	-0.5	73.1	70.7	71.4	72.6	71.9	72.6
youngest (20-24)	0.2	71.1	71.3	71.3	71.3	71.3	71.3
prime-age (25-54)	0.8	88.0	88.6	88.8	88.8	88.9	88.8
older (55-64)	1.4	74.6	73.9	75.7	75.3	75.6	76.0
very old (65-74)	4.6	13.9	18.3	17.1	19.0	18.3	18.5
Participation rate (20-64) - FEMALES	2.8	78.6	79.9	81.0	81.0	81.3	81.4
Participation rate (20-74) - FEMALES	1.7	68.1	66.8	68.0	69.3	68.8	69.8
youngest (20-24)	0.5	68.3	68.8	68.9	68.9	68.8	68.8
prime-age (25-54)	2.3	83.3	84.8	85.4	85.4	85.5	85.5
older (55-64)	4.9	70.0	70.9	73.9	73.9	74.4	74.9
very old (65-74)	6.0	10.5	15.9	14.8	16.9	16.3	16.5
Participation rate (20-64) - MALES	-0.8	87.6	86.8	86.9	86.7	86.9	86.8
Participation rate (20-74) - MALES	-2.6	78.0	74.5	74.9	75.8	74.9	75.4
youngest (20-24)	0.0	73.6	73.6	73.6	73.6	73.6	73.6
prime-age (25-54)	-0.5	92.6	92.2	92.0	92.1	92.2	92.1
older (55-64)	-2.2	79.4	77.0	77.7	76.8	76.9	77.2
very old (65-74)	3.0	17.6	20.9	19.6	21.3	20.5	20.6
Average effective exit age (TOTAL) (1)	0.9	64.6	65.5	65.5	65.5	65.5	65.5
Men	1.0	64.7	65.7	65.7	65.7	65.7	65.7
Women	0.7	64.5	65.3	65.3	65.3	65.3	65.3
Employment rate (20-64)	0.2	80.6	80.0	80.6	80.4	80.7	80.7
Employment rate (20-74)	-1.1	70.9	67.9	68.6	69.7	69.1	69.7
Unemployment rate (20-64)	1.0	3.1	4.0	4.1	4.1	4.1	4.1
Unemployment rate (20-74)	0.9	3.1	3.9	4.0	4.0	4.0	4.0
Employment (20-64) (in millions)	-5.8	40.1	36.9	35.8	35.3	34.4	34.3
Employment (20-74) (in millions)	-5.3	41.3	38.9	37.5	37.0	36.2	36.0
share of youngest (20-24)	0.7	8%	7%	8%	8%	8%	8%
share of prime-age (25-54)	-0.2	68%	67%	68%	67%	68%	68%
share of older (55-64)	-2.2	22%	21%	19%	20%	19%	19%
share of very old (65-74)	1.8	3%	5%	5%	5%	5%	5%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	-2.3	24.6	24.5	22.5	23.7	22.5	22.3
Old-age dependency ratio 20-64 (3)	18.5	36.1	46.4	52.2	52.8	54.3	54.6
Total dependency ratio (4)	25.2	66.9	81.1	87.4	88.3	91.7	92.1
Total economic dependency ratio (5)	25.6	101.3	114.6	121.7	123.1	126.0	127.0
Economic old-age dependency ratio (20-64) (6)	20.8	41.9	52.4	59.8	60.7	62.1	62.7
Economic old-age dependency ratio (20-74) (7)	19.1	40.8	49.7	57.1	57.8	59.1	59.9

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

6. ESTONIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.51	1.59	1.66	1.68	1.69	1.70
Life expectancy at birth							
males	9.4	74.9	76.7	78.9	80.8	82.6	84.3
females	6.5	83.4	84.7	86.1	87.5	88.7	89.9
Life expectancy at 65							
males	6.1	16.5	17.6	18.9	20.2	21.4	22.6
females	5.0	21.5	22.4	23.5	24.6	25.6	26.5
Net migration (thousand)	-4.0	6.6	1.8	1.9	2.2	2.4	2.6
Net migration as % of population	-0.3	0.5	0.1	0.1	0.2	0.2	0.2
Population (million)	-0.1	1.3	1.3	1.3	1.3	1.2	1.2
Young population (0-14) as % of total population	-2.8	21.1	19.8	18.3	18.8	18.7	18.2
Prime-age population (25-54) as % of total population	-7.6	41.1	38.3	36.7	34.3	34.2	33.5
Working-age population (20-64) as % of total population	-7.7	59.0	56.9	56.0	52.8	50.3	51.3
Elderly population (65 and over) as % of total population	10.5	19.9	23.3	25.8	28.4	30.9	30.5
Very elderly population (80 and over) as % of total population	8.1	5.7	6.8	8.8	10.0	11.6	13.9
Very elderly population (80 and over) as % of elderly population	16.7	28.8	29.4	34.3	35.3	37.4	45.6
Very elderly population (80 and over) as % of working age population	17.3	9.7	12.0	15.8	19.0	23.0	27.0
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.9	3.9	2.5	1.6	1.3	1.4	1.5
Employment (growth rate)	-0.3	1.0	-0.5	-0.3	-0.5	-0.3	0.0
Labour input: hours worked (growth rate)	-0.3	0.3	-0.6	-0.3	-0.5	-0.3	0.0
Labour productivity per hour (growth rate)	2.2	3.5	3.0	1.9	1.8	1.7	1.5
TFP (growth rate)	1.4	2.1	1.9	1.2	1.2	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.8	1.5	1.2	0.7	0.6	0.6	0.5
Potential GDP per capita (growth rate)	2.1	3.5	2.7	1.8	1.5	1.7	1.8
Potential GDP per worker (growth rate)	2.1	2.9	3.0	1.9	1.8	1.7	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-171	783	744	717	662	616	612
Population growth (working-age: 20-64)	0.0	-0.2	-0.1	-0.6	-0.9	-0.2	-0.2
Labour force 20-64 (thousands)	-118	657	632	616	576	541	538
Participation rate (20-64)	4.1	83.8	84.9	86.0	86.9	87.8	88.0
Participation rate (20-74)	4.2	75.5	73.9	75.1	75.4	76.3	79.7
youngest (20-24)	2.0	72.3	73.8	74.4	74.2	74.0	74.3
prime-age (25-54)	2.4	87.8	89.4	89.8	90.2	90.2	90.2
older (55-64)	11.9	75.7	76.7	80.5	83.0	86.5	87.6
very old (65-74)	12.7	28.1	20.3	23.6	28.4	32.9	40.9
Participation rate (20-64) - FEMALES	4.3	80.3	81.3	82.3	83.3	84.5	84.6
Participation rate (20-74) - FEMALES	5.7	71.0	69.5	70.9	71.7	73.3	76.7
youngest (20-24)	1.4	67.8	68.7	69.3	69.2	69.0	69.2
prime-age (25-54)	3.5	82.7	85.6	85.7	86.2	86.5	86.3
older (55-64)	8.9	77.6	74.8	78.5	81.0	85.3	86.5
very old (65-74)	12.6	27.5	20.5	22.0	26.5	31.6	40.1
Participation rate (20-64) - MALES	3.8	87.4	88.4	89.4	90.2	90.9	91.1
Participation rate (20-74) - MALES	2.4	80.2	78.4	79.1	78.9	79.2	82.6
youngest (20-24)	2.5	76.6	78.7	79.3	79.1	78.9	79.1
prime-age (25-54)	1.4	92.5	93.0	93.5	94.0	93.8	93.9
older (55-64)	15.1	73.6	78.6	82.3	84.7	87.5	88.7
very old (65-74)	12.5	29.2	20.0	25.4	30.4	34.1	41.7
Average effective exit age (TOTAL) (1)	4.3	65.1	66.0	66.8	67.8	68.7	69.4
Men	4.2	65.2	66.1	67.0	67.9	68.8	69.4
Women	4.4	65.0	65.9	66.7	67.6	68.7	69.3
Employment rate (20-64)	2.3	80.2	79.7	80.6	81.5	82.4	82.5
Employment rate (20-74)	2.7	72.3	69.5	70.5	70.9	71.8	75.0
Unemployment rate (20-64)	1.8	4.4	6.1	6.2	6.2	6.2	6.2
Unemployment rate (20-74)	1.7	4.3	6.0	6.1	6.0	5.9	6.0
Employment (20-64) (in millions)	-0.1	0.6	0.6	0.6	0.5	0.5	0.5
Employment (20-74) (in millions)	-0.1	0.7	0.6	0.6	0.6	0.6	0.6
share of youngest (20-24)	0.7	6%	8%	7%	6%	7%	7%
share of prime-age (25-54)	-7.9	69%	68%	65%	63%	64%	61%
share of older (55-64)	3.7	19%	19%	22%	23%	20%	23%
share of very old (65-74)	3.5	6%	5%	6%	8%	9%	9%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.7	22.2	22.5	24.5	26.3	22.1	24.9
Old-age dependency ratio 20-64 (3)	25.6	33.8	40.9	46.1	53.8	61.5	59.4
Total dependency ratio (4)	25.4	69.5	75.6	78.7	89.4	98.7	94.9
Total economic dependency ratio (5)	15.1	99.3	109.7	109.1	114.8	118.9	114.5
Economic old-age dependency ratio (20-64) (6)	25.5	35.9	46.1	50.9	57.5	64.1	61.4
Economic old-age dependency ratio (20-74) (7)	21.9	33.9	43.9	48.1	53.1	58.2	55.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

7. IRELAND

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.0	1.78	1.80	1.80	1.80	1.80	1.81
Life expectancy at birth							
males	5.7	81.1	82.1	83.4	84.6	85.7	86.8
females	5.6	84.8	85.8	87.1	88.3	89.4	90.4
Life expectancy at 65							
males	4.2	19.6	20.3	21.2	22.1	23.0	23.8
females	4.6	22.1	22.9	23.9	24.9	25.8	26.7
Net migration (thousand)	-22.2	32.7	19.3	16.1	14.4	12.1	10.5
Net migration as % of population	-0.5	0.7	0.3	0.3	0.2	0.2	0.2
Population (million)	1.6	4.9	5.5	5.9	6.2	6.4	6.5
Young population (0-14) as % of total population	-6.3	26.9	23.6	22.2	22.0	21.2	20.6
Prime-age population (25-54) as % of total population	-7.4	41.8	40.0	37.8	36.4	35.3	34.3
Working-age population (20-64) as % of total population	-6.9	58.8	58.6	56.6	53.3	52.6	51.9
Elderly population (65 and over) as % of total population	13.2	14.3	17.8	21.2	24.8	26.3	27.5
Very elderly population (80 and over) as % of total population	8.1	3.4	4.9	6.4	8.1	10.3	11.5
Very elderly population (80 and over) as % of elderly population	18.1	23.8	27.4	30.5	32.7	39.2	41.9
Very elderly population (80 and over) as % of working age population	16.4	5.8	8.3	11.4	15.2	19.6	22.2
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.8	5.6	1.5	1.8	1.6	1.7	1.5
Employment (growth rate)	0.3	2.1	0.4	0.2	0.1	0.1	-0.1
Labour input: hours worked (growth rate)	0.3	2.1	0.4	0.2	0.1	0.1	0.0
Labour productivity per hour (growth rate)	1.5	3.4	1.1	1.5	1.5	1.5	1.5
TFP (growth rate)	1.1	1.6	0.9	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	1.8	0.3	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.3	4.1	0.7	1.1	1.2	1.5	1.4
Potential GDP per worker (growth rate)	1.5	3.5	1.1	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	471	2,904	3,241	3,353	3,315	3,366	3,374
Population growth (working-age: 20-64)	-1.4	1.4	0.8	0.0	0.0	0.2	-0.1
Labour force 20-64 (thousands)	448	2,287	2,593	2,705	2,692	2,734	2,735
Participation rate (20-64)	2.3	78.8	80.0	80.7	81.2	81.2	81.1
Participation rate (20-74)	-0.1	71.1	72.1	71.7	70.7	71.5	71.0
youngest (20-24)	0.6	72.3	72.6	73.0	72.8	72.8	72.9
prime-age (25-54)	2.6	83.5	85.1	85.8	86.1	86.1	86.1
older (55-64)	6.3	64.1	67.2	69.4	69.5	70.5	70.4
very old (65-74)	7.4	16.7	22.4	23.9	23.7	23.7	24.1
Participation rate (20-64) - FEMALES	3.8	72.1	74.7	75.6	75.9	76.1	75.9
Participation rate (20-74) - FEMALES	1.8	64.5	66.9	67.0	65.9	66.7	66.2
youngest (20-24)	0.6	69.6	69.9	70.4	70.2	70.1	70.2
prime-age (25-54)	3.3	76.7	79.1	79.6	80.1	80.1	80.1
older (55-64)	10.9	55.9	62.4	66.3	65.5	67.0	66.8
very old (65-74)	12.1	10.0	19.0	21.5	21.9	21.4	22.0
Participation rate (20-64) - MALES	0.8	85.5	85.5	86.0	86.6	86.5	86.3
Participation rate (20-74) - MALES	-2.0	77.9	77.4	76.6	75.8	76.5	76.0
youngest (20-24)	0.6	74.9	75.2	75.6	75.4	75.4	75.5
prime-age (25-54)	1.8	90.6	91.4	92.2	92.4	92.3	92.3
older (55-64)	1.6	72.5	72.1	72.7	73.8	74.3	74.2
very old (65-74)	2.7	23.6	26.0	26.3	25.6	26.2	26.4
Average effective exit age (TOTAL) (1)	1.1	65.0	66.0	66.0	66.0	66.0	66.0
Men	0.6	65.5	66.0	66.0	66.0	66.0	66.0
Women	1.5	64.5	66.1	66.1	66.1	66.1	66.1
Employment rate (20-64)	0.7	75.1	74.6	75.3	76.0	76.0	75.9
Employment rate (20-74)	-1.3	67.9	67.3	67.1	66.4	67.2	66.7
Unemployment rate (20-64)	1.8	4.6	6.8	6.7	6.4	6.4	6.4
Unemployment rate (20-74)	1.6	4.5	6.6	6.4	6.1	6.1	6.1
Employment (20-64) (in millions)	0.4	2.2	2.4	2.5	2.5	2.6	2.6
Employment (20-74) (in millions)	0.5	2.2	2.5	2.7	2.7	2.7	2.7
share of youngest (20-24)	-0.6	9%	9%	8%	8%	8%	8%
share of prime-age (25-54)	-7.1	73%	70%	67%	68%	67%	66%
share of older (55-64)	4.4	15%	17%	19%	17%	19%	19%
share of very old (65-74)	3.3	3%	4%	5%	6%	6%	6%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	4.8	18.6	20.5	23.2	21.5	22.3	23.4
Old-age dependency ratio 20-64 (3)	28.7	24.2	30.3	37.4	46.5	50.0	53.0
Total dependency ratio (4)	22.7	70.0	70.5	76.7	87.8	90.3	92.6
Total economic dependency ratio (5)	18.5	119.5	118.4	121.7	131.3	135.6	138.0
Economic old-age dependency ratio (20-64) (6)	33.8	29.1	35.8	43.7	54.3	59.4	63.0
Economic old-age dependency ratio (20-74) (7)	30.8	28.3	34.2	41.3	50.9	56.0	59.0

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

8. GREECE

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.34	1.39	1.43	1.47	1.50	1.54
Life expectancy at birth							
males	7.4	79.0	80.8	82.4	83.8	85.2	86.4
females	6.0	84.3	85.7	86.9	88.1	89.3	90.3
Life expectancy at 65							
males	5.1	18.8	20.0	21.1	22.1	23.0	23.9
females	4.9	21.8	22.9	23.9	24.9	25.8	26.7
Net migration (thousand)	12.3	13.7	11.6	16.0	20.7	23.8	26.0
Net migration as % of population	0.2	0.1	0.1	0.2	0.2	0.3	0.3
Population (million)	-2.1	10.7	10.3	9.9	9.5	9.0	8.6
Young population (0-14) as % of total population	-2.5	19.4	17.5	16.3	16.7	16.8	16.9
Prime-age population (25-54) as % of total population	-7.4	40.2	36.2	33.8	33.4	33.1	32.9
Working-age population (20-64) as % of total population	-8.1	58.4	56.5	53.0	49.5	49.8	50.3
Elderly population (65 and over) as % of total population	10.6	22.2	26.0	30.6	33.8	33.5	32.8
Very elderly population (80 and over) as % of total population	8.1	7.2	8.4	10.4	13.1	15.4	15.2
Very elderly population (80 and over) as % of elderly population	14.1	32.3	32.1	34.1	38.7	45.9	46.4
Very elderly population (80 and over) as % of working age population	18.0	12.2	14.8	19.7	26.4	30.9	30.3
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	-0.4	0.7	1.7	1.6	1.5	1.3
Employment (growth rate)	-0.3	-0.6	-0.1	-0.4	-0.5	-0.3	-0.3
Labour input: hours worked (growth rate)	-0.3	-0.6	-0.1	-0.4	-0.5	-0.3	-0.2
Labour productivity per hour (growth rate)	1.5	0.2	0.9	2.2	2.0	1.8	1.5
TFP (growth rate)	1.0	0.3	0.7	1.4	1.3	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.4	-0.1	0.2	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	1.6	-0.2	1.1	2.1	2.0	2.1	1.7
Potential GDP per worker (growth rate)	1.5	0.2	0.9	2.2	2.0	1.8	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,939	6,259	5,810	5,245	4,697	4,486	4,320
Population growth (working-age: 20-64)	0.2	-0.6	-0.7	-1.1	-0.7	-0.3	-0.4
Labour force 20-64 (thousands)	-1,070	4,622	4,496	4,170	3,843	3,683	3,552
Participation rate (20-64)	8.4	73.8	77.4	79.5	81.8	82.1	82.2
Participation rate (20-74)	7.9	63.5	65.1	65.8	67.5	70.6	71.4
youngest (20-24)	3.5	42.4	45.4	46.1	45.7	45.7	45.8
prime-age (25-54)	2.8	85.4	87.0	88.0	88.4	88.2	88.2
older (55-64)	30.4	50.4	65.8	71.2	77.2	79.8	80.8
very old (65-74)	17.7	8.0	10.1	14.8	16.9	21.7	25.7
Participation rate (20-64) - FEMALES	13.3	65.4	71.6	75.2	78.1	78.5	78.7
Participation rate (20-74) - FEMALES	12.6	55.5	59.0	60.9	63.4	67.0	68.1
youngest (20-24)	1.5	40.8	41.7	42.6	42.2	42.1	42.3
prime-age (25-54)	7.0	77.8	82.0	84.3	84.9	84.8	84.8
older (55-64)	39.2	38.0	57.9	65.9	72.9	76.2	77.3
very old (65-74)	19.4	5.2	8.0	12.8	15.8	20.5	24.6
Participation rate (20-64) - MALES	3.0	82.5	83.1	83.6	85.3	85.3	85.5
Participation rate (20-74) - MALES	2.5	71.8	71.4	70.7	71.5	74.0	74.3
youngest (20-24)	5.3	43.8	48.7	49.3	49.0	48.9	49.1
prime-age (25-54)	-1.9	93.3	91.8	91.5	91.5	91.3	91.4
older (55-64)	19.7	64.5	74.6	76.7	81.4	83.2	84.1
very old (65-74)	15.4	11.3	12.7	17.1	18.0	22.9	26.7
Average effective exit age (TOTAL) (1)	4.7	62.9	64.8	65.8	66.6	67.1	67.6
Men	4.6	63.0	64.8	65.8	66.6	67.1	67.6
Women	4.8	62.9	64.8	65.8	66.6	67.1	67.6
Employment rate (20-64)	15.6	60.9	68.0	71.9	76.0	76.4	76.5
Employment rate (20-74)	14.1	52.5	57.3	59.6	62.9	65.9	66.5
Unemployment rate (20-64)	-10.5	17.5	12.1	9.6	7.1	6.9	6.9
Unemployment rate (20-74)	-10.6	17.3	12.0	9.4	6.9	6.8	6.7
Employment (20-64) (in millions)	-0.5	3.8	4.0	3.8	3.6	3.4	3.3
Employment (20-74) (in millions)	-0.3	3.9	4.1	4.0	3.8	3.6	3.6
share of youngest (20-24)	0.7	4%	5%	5%	5%	5%	5%
share of prime-age (25-54)	-13.1	78%	70%	67%	69%	67%	65%
share of older (55-64)	7.4	16%	22%	23%	21%	22%	23%
share of very old (65-74)	5.0	2%	3%	5%	6%	6%	7%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.6	22.3	26.0	26.7	23.2	23.7	24.9
Old-age dependency ratio 20-64 (3)	27.3	37.9	46.1	57.8	68.2	67.3	65.2
Total dependency ratio (4)	27.6	71.1	77.0	88.6	101.8	100.9	98.7
Total economic dependency ratio (5)	-33.5	174.7	152.5	149.2	150.5	147.3	141.2
Economic old-age dependency ratio (20-64) (6)	17.5	59.8	64.4	74.8	83.5	81.5	77.2
Economic old-age dependency ratio (20-74) (7)	13.3	58.5	62.5	71.1	78.8	76.6	71.7

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

9. SPAIN

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.27	1.33	1.37	1.41	1.45	1.49
Life expectancy at birth							
males	5.9	81.2	82.4	83.7	84.9	86.0	87.1
females	4.6	86.8	87.7	88.7	89.7	90.6	91.4
Life expectancy at 65							
males	4.2	19.9	20.7	21.6	22.5	23.3	24.1
females	3.8	23.9	24.6	25.5	26.2	27.0	27.7
Net migration (thousand)	-269.6	438.5	185.4	178.2	178.7	175.7	169.0
Net migration as % of population	-0.6	0.9	0.4	0.4	0.4	0.4	0.4
Population (million)	-0.1	47.1	48.8	49.4	49.3	48.3	47.0
Young population (0-14) as % of total population	-2.9	19.7	17.2	16.3	16.7	16.7	16.8
Prime-age population (25-54) as % of total population	-9.3	42.8	37.8	35.2	34.4	33.9	33.5
Working-age population (20-64) as % of total population	-9.6	60.8	58.7	54.3	50.6	50.8	51.2
Elderly population (65 and over) as % of total population	12.5	19.5	24.0	29.4	32.7	32.5	32.0
Very elderly population (80 and over) as % of total population	8.5	6.1	7.3	9.4	12.4	15.1	14.6
Very elderly population (80 and over) as % of elderly population	14.4	31.2	30.5	32.1	38.0	46.3	45.6
Very elderly population (80 and over) as % of working age population	18.5	10.0	12.5	17.3	24.6	29.7	28.5
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.4	1.7	1.6	1.4	1.4	1.5	1.3
Employment (growth rate)	0.0	1.2	0.4	-0.3	-0.3	-0.1	-0.3
Labour input: hours worked (growth rate)	0.0	1.1	0.4	-0.3	-0.3	-0.1	-0.3
Labour productivity per hour (growth rate)	1.5	0.6	1.1	1.8	1.7	1.6	1.5
TFP (growth rate)	1.0	0.5	0.8	1.2	1.1	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.1	0.4	0.6	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.4	1.0	1.4	1.4	1.5	1.8	1.5
Potential GDP per worker (growth rate)	1.5	0.5	1.1	1.8	1.7	1.6	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-4,574	28,662	28,646	26,846	24,943	24,538	24,088
Population growth (working-age: 20-64)	-0.9	0.5	-0.3	-1.0	-0.4	-0.1	-0.3
Labour force 20-64 (thousands)	-2,934	22,639	23,389	22,059	20,517	20,115	19,705
Participation rate (20-64)	2.8	79.0	81.7	82.2	82.3	82.0	81.8
Participation rate (20-74)	1.7	68.6	70.5	69.4	68.8	70.6	70.3
youngest (20-24)	0.7	55.5	56.0	56.6	56.1	56.0	56.2
prime-age (25-54)	-0.1	87.0	87.4	87.0	87.0	86.9	86.9
older (55-64)	16.6	61.7	77.1	79.0	78.5	78.5	78.3
very old (65-74)	16.7	4.5	17.5	20.2	19.0	20.1	21.2
Participation rate (20-64) - FEMALES	5.1	73.8	78.3	79.3	79.3	79.0	78.9
Participation rate (20-74) - FEMALES	4.0	63.5	67.1	66.6	66.0	67.7	67.5
youngest (20-24)	0.5	52.1	52.4	52.9	52.4	52.4	52.5
prime-age (25-54)	0.9	82.3	83.9	83.4	83.3	83.2	83.2
older (55-64)	22.8	54.5	73.9	78.2	77.8	77.5	77.3
very old (65-74)	17.2	3.5	16.2	19.4	18.8	19.8	20.7
Participation rate (20-64) - MALES	0.6	84.2	85.1	85.0	85.3	85.0	84.8
Participation rate (20-74) - MALES	-0.6	73.8	74.1	72.2	71.7	73.5	73.2
youngest (20-24)	0.9	58.8	59.5	60.0	59.6	59.5	59.7
prime-age (25-54)	-1.1	91.7	90.9	90.7	90.7	90.6	90.6
older (55-64)	10.1	69.1	80.4	79.8	79.3	79.6	79.3
very old (65-74)	16.1	5.5	18.9	21.1	19.2	20.5	21.6
Average effective exit age (TOTAL) (1)	2.7	63.8	66.3	66.3	66.4	66.4	66.4
Men	2.8	63.4	66.0	66.1	66.1	66.1	66.2
Women	2.6	64.1	66.5	66.6	66.6	66.6	66.7
Employment rate (20-64)	8.2	68.1	70.4	73.7	76.5	76.4	76.2
Employment rate (20-74)	6.5	59.2	61.1	62.5	64.2	65.9	65.7
Unemployment rate (20-64)	-7.0	13.8	13.8	10.3	7.0	6.8	6.8
Unemployment rate (20-74)	-7.1	13.7	13.5	10.0	6.8	6.6	6.6
Employment (20-64) (in millions)	-1.2	19.5	20.2	19.8	19.1	18.7	18.4
Employment (20-74) (in millions)	-0.2	19.7	21.1	21.1	20.3	19.8	19.5
share of youngest (20-24)	1.1	5%	5%	5%	5%	6%	6%
share of prime-age (25-54)	-11.9	78%	66%	65%	68%	67%	66%
share of older (55-64)	5.9	17%	24%	24%	21%	22%	23%
share of very old (65-74)	4.9	1%	5%	6%	6%	5%	6%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	3.5	21.6	25.9	26.4	23.1	23.6	25.1
Old-age dependency ratio 20-64 (3)	30.5	32.1	40.9	54.0	64.7	64.1	62.5
Total dependency ratio (4)	30.9	64.4	70.3	84.0	97.7	96.9	95.3
Total economic dependency ratio (5)	1.9	139.1	130.7	133.8	142.8	143.7	141.1
Economic old-age dependency ratio (20-64) (6)	29.5	46.1	53.0	66.2	77.9	77.9	75.6
Economic old-age dependency ratio (20-74) (7)	25.5	45.6	50.5	61.9	73.1	73.7	71.1

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

10. FRANCE

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.0	1.85	1.84	1.84	1.84	1.84	1.84
Life expectancy at birth							
males	6.6	80.1	81.6	83.0	84.3	85.6	86.7
females	5.1	86.3	87.4	88.6	89.6	90.6	91.4
Life expectancy at 65							
males	4.2	20.0	20.9	21.8	22.6	23.5	24.2
females	3.8	24.1	24.9	25.7	26.5	27.2	27.9
Net migration (thousand)	42.1	38.1	68.3	73.9	75.2	74.6	80.2
Net migration as % of population	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Population (million)	2.3	67.1	68.8	69.8	70.0	69.7	69.4
Young population (0-14) as % of total population	-3.3	24.1	22.3	21.6	21.5	21.1	20.8
Prime-age population (25-54) as % of total population	-4.2	37.5	35.1	34.6	34.0	33.8	33.3
Working-age population (20-64) as % of total population	-5.1	55.6	53.6	51.7	50.7	50.6	50.5
Elderly population (65 and over) as % of total population	8.4	20.3	24.1	26.8	27.8	28.3	28.7
Very elderly population (80 and over) as % of total population	6.5	6.2	7.7	9.9	11.2	11.9	12.6
Very elderly population (80 and over) as % of elderly population	13.5	30.3	32.1	36.8	40.5	42.2	43.9
Very elderly population (80 and over) as % of working age population	13.9	11.1	14.4	19.1	22.2	23.6	25.0
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	1.1	1.0	1.6	1.5	1.5	1.4
Employment (growth rate)	0.1	0.5	0.2	0.1	-0.1	0.0	-0.1
Labour input: hours worked (growth rate)	0.1	0.4	0.2	0.1	-0.1	0.0	-0.1
Labour productivity per hour (growth rate)	1.3	0.7	0.8	1.5	1.5	1.5	1.5
TFP (growth rate)	0.8	0.3	0.5	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.4	0.3	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.3	0.9	0.8	1.5	1.5	1.6	1.4
Potential GDP per worker (growth rate)	1.3	0.6	0.8	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-2,276	37,327	36,906	36,102	35,511	35,255	35,051
Population growth (working-age: 20-64)	0.1	-0.2	-0.1	-0.1	-0.2	0.1	-0.1
Labour force 20-64 (thousands)	-1,103	29,127	29,076	28,789	28,417	28,246	28,024
Participation rate (20-64)	1.9	78.0	78.8	79.7	80.0	80.1	80.0
Participation rate (20-74)	2.0	66.2	66.5	67.2	68.2	68.3	68.2
youngest (20-24)	1.0	62.6	63.4	63.5	63.5	63.5	63.6
prime-age (25-54)	-0.3	87.4	87.1	87.0	87.2	87.1	87.2
older (55-64)	10.1	56.9	62.9	65.8	66.4	67.3	67.0
very old (65-74)	9.0	5.5	9.1	11.8	14.4	14.0	14.6
Participation rate (20-64) - FEMALES	3.1	74.1	75.5	76.9	77.3	77.5	77.3
Participation rate (20-74) - FEMALES	3.3	62.3	63.2	64.5	65.5	65.6	65.6
youngest (20-24)	1.5	58.1	59.4	59.6	59.5	59.5	59.6
prime-age (25-54)	1.4	83.1	83.8	84.3	84.6	84.6	84.6
older (55-64)	10.2	54.6	59.7	62.9	63.9	65.1	64.8
very old (65-74)	9.7	4.3	8.1	11.2	13.7	13.3	14.0
Participation rate (20-64) - MALES	0.6	82.1	82.2	82.8	82.8	82.8	82.7
Participation rate (20-74) - MALES	0.6	70.3	70.0	70.1	71.1	71.0	70.9
youngest (20-24)	0.6	67.0	67.3	67.4	67.4	67.4	67.6
prime-age (25-54)	-2.0	91.9	90.5	89.9	89.8	89.8	89.8
older (55-64)	10.1	59.3	66.2	68.9	69.2	69.6	69.4
very old (65-74)	8.2	6.9	10.3	12.6	15.2	14.7	15.2
Average effective exit age (TOTAL) (1)	2.2	62.3	63.5	64.3	64.5	64.5	64.5
Men	2.4	62.3	63.6	64.5	64.7	64.7	64.7
Women	2.1	62.2	63.3	64.1	64.3	64.3	64.3
Employment rate (20-64)	2.9	71.6	72.4	73.8	74.6	74.7	74.5
Employment rate (20-74)	2.9	60.8	61.2	62.3	63.7	63.8	63.7
Unemployment rate (20-64)	-1.5	8.2	8.1	7.4	6.8	6.8	6.8
Unemployment rate (20-74)	-1.6	8.2	8.0	7.3	6.6	6.6	6.6
Employment (20-64) (in millions)	-0.6	26.7	26.7	26.6	26.5	26.3	26.1
Employment (20-74) (in millions)	0.1	27.1	27.4	27.6	27.6	27.4	27.2
share of youngest (20-24)	0.3	7%	8%	7%	7%	7%	7%
share of prime-age (25-54)	-5.5	75%	71%	71%	71%	70%	69%
share of older (55-64)	2.7	17%	19%	18%	18%	18%	19%
share of very old (65-74)	2.6	1%	3%	3%	4%	4%	4%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.9	22.6	23.6	22.8	22.7	22.6	23.5
Old-age dependency ratio 20-64 (3)	20.4	36.5	44.9	51.7	54.8	55.9	56.9
Total dependency ratio (4)	18.3	79.8	86.5	93.4	97.1	97.6	98.1
Total economic dependency ratio (5)	7.6	147.4	151.0	153.2	153.8	154.4	155.1
Economic old-age dependency ratio (20-64) (6)	22.6	49.4	59.3	66.5	69.2	70.8	72.0
Economic old-age dependency ratio (20-74) (7)	20.5	48.7	57.8	64.2	66.4	68.1	69.2

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

11. CROATIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.43	1.48	1.51	1.54	1.56	1.59
Life expectancy at birth							
males	9.0	75.3	77.3	79.3	81.1	82.7	84.3
females	7.2	81.6	83.2	84.7	86.2	87.5	88.8
Life expectancy at 65							
males	6.3	15.8	17.2	18.5	19.7	20.9	22.1
females	5.9	19.4	20.7	21.9	23.1	24.2	25.3
Net migration (thousand)	9.8	-3.8	-1.2	0.8	2.6	4.4	6.0
Net migration as % of population	0.3	-0.1	0.0	0.0	0.1	0.1	0.2
Population (million)	-1.0	4.1	3.8	3.6	3.4	3.2	3.0
Young population (0-14) as % of total population	-2.7	19.3	18.0	17.1	16.9	16.7	16.7
Prime-age population (25-54) as % of total population	-6.3	39.4	38.0	36.1	34.9	33.8	33.1
Working-age population (20-64) as % of total population	-9.2	59.8	56.7	55.2	52.9	51.6	50.6
Elderly population (65 and over) as % of total population	11.9	20.8	25.3	27.8	30.3	31.7	32.7
Very elderly population (80 and over) as % of total population	8.1	5.4	6.5	9.2	10.7	12.0	13.5
Very elderly population (80 and over) as % of elderly population	15.4	26.0	25.7	33.1	35.4	37.9	41.4
Very elderly population (80 and over) as % of working age population	17.7	9.0	11.4	16.7	20.2	23.3	26.7
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.1	1.8	0.7	1.5	1.2	1.0	0.9
Employment (growth rate)	-0.7	0.7	-0.7	-0.8	-0.9	-0.8	-0.6
Labour input: hours worked (growth rate)	-0.7	0.7	-0.7	-0.8	-0.9	-0.8	-0.6
Labour productivity per hour (growth rate)	1.8	1.0	1.4	2.3	2.2	1.9	1.5
TFP (growth rate)	1.1	0.3	0.7	1.5	1.4	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.7	0.7	0.7	0.8	0.8	0.7	0.5
Potential GDP per capita (growth rate)	1.7	2.4	0.9	1.8	2.1	2.0	1.8
Potential GDP per worker (growth rate)	1.9	1.0	1.0	2.0	2.4	2.3	1.9
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-900	2,433	2,165	1,986	1,788	1,643	1,533
Population growth (working-age: 20-64)	0.5	-1.0	-0.9	-0.9	-1.0	-0.8	-0.6
Labour force 20-64 (thousands)	-593	1,737	1,601	1,479	1,335	1,223	1,143
Participation rate (20-64)	3.2	71.4	73.9	74.5	74.6	74.4	74.6
Participation rate (20-74)	0.2	60.8	61.1	61.9	61.0	61.0	61.0
youngest (20-24)	3.1	52.4	55.3	55.5	55.5	55.5	55.5
prime-age (25-54)	1.4	83.6	84.8	85.0	85.0	85.0	85.0
older (55-64)	8.6	45.8	50.3	54.2	54.2	53.8	54.5
very old (65-74)	3.1	5.0	6.6	7.8	8.4	8.3	8.1
Participation rate (20-64) - FEMALES	4.5	66.1	69.4	70.2	70.6	70.5	70.6
Participation rate (20-74) - FEMALES	2.3	55.2	56.2	57.5	57.0	57.5	57.6
youngest (20-24)	2.7	44.4	46.8	47.0	47.1	47.0	47.1
prime-age (25-54)	1.5	80.3	81.4	81.6	81.8	81.7	81.8
older (55-64)	12.8	37.6	45.5	49.8	49.8	49.8	50.4
very old (65-74)	4.0	3.8	5.8	7.3	8.0	7.9	7.8
Participation rate (20-64) - MALES	1.7	76.6	78.2	78.4	78.4	78.1	78.3
Participation rate (20-74) - MALES	-2.2	66.4	66.0	66.2	64.7	64.3	64.3
youngest (20-24)	3.5	59.9	63.3	63.4	63.4	63.4	63.4
prime-age (25-54)	1.3	86.8	88.1	88.1	88.0	88.0	88.1
older (55-64)	3.6	54.8	55.1	58.4	58.3	57.6	58.4
very old (65-74)	2.0	6.4	7.6	8.4	8.9	8.8	8.4
Average effective exit age (TOTAL) (1)	0.9	62.0	62.7	63.0	63.0	63.0	63.0
Men	0.6	62.7	62.9	63.2	63.2	63.2	63.2
Women	1.3	61.4	62.4	62.7	62.7	62.7	62.7
Employment rate (20-64)	2.8	66.8	68.2	69.1	69.6	69.5	69.6
Employment rate (20-74)	0.1	57.0	56.5	57.6	57.0	57.0	57.1
Unemployment rate (20-64)	0.3	6.4	7.7	7.2	6.7	6.7	6.7
Unemployment rate (20-74)	0.2	6.3	7.5	7.1	6.5	6.5	6.5
Employment (20-64) (in millions)	-0.6	1.6	1.5	1.4	1.2	1.1	1.1
Employment (20-74) (in millions)	-0.6	1.6	1.5	1.4	1.3	1.2	1.1
share of youngest (20-24)	-0.5	7%	6%	6%	6%	6%	6%
share of prime-age (25-54)	-3.7	76%	75%	73%	73%	73%	72%
share of older (55-64)	2.7	16%	16%	19%	18%	18%	19%
share of very old (65-74)	1.5	1%	2%	3%	3%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	1.0	24.3	23.6	25.5	25.2	25.2	25.3
Old-age dependency ratio 20-64 (3)	29.8	34.8	44.5	50.4	57.2	61.5	64.6
Total dependency ratio (4)	30.4	67.1	76.3	81.3	89.1	94.0	97.5
Total economic dependency ratio (5)	28.9	146.6	152.6	155.9	163.4	170.9	175.6
Economic old-age dependency ratio (20-64) (6)	39.1	50.6	63.0	70.3	79.0	85.5	89.8
Economic old-age dependency ratio (20-74) (7)	37.3	49.9	61.6	68.6	76.7	83.0	87.2

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

12. ITALY

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.31	1.37	1.41	1.45	1.48	1.52
Life expectancy at birth							
males	5.7	81.3	82.6	83.8	84.9	86.0	87.0
females	5.2	85.7	86.9	88.0	89.0	90.0	90.9
Life expectancy at 65							
males	4.3	19.6	20.5	21.4	22.3	23.1	23.9
females	4.3	22.9	23.8	24.7	25.6	26.4	27.2
Net migration (thousand)	71.8	134.7	224.0	217.2	214.3	210.5	206.6
Net migration as % of population	0.2	0.2	0.4	0.4	0.4	0.4	0.4
Population (million)	-6.4	60.3	59.9	59.3	58.0	55.9	53.9
Young population (0-14) as % of total population	-2.1	17.9	15.9	15.4	15.6	15.6	15.8
Prime-age population (25-54) as % of total population	-7.1	40.3	35.8	34.9	34.1	33.6	33.1
Working-age population (20-64) as % of total population	-8.3	59.1	56.8	52.4	50.7	51.0	50.8
Elderly population (65 and over) as % of total population	10.4	23.0	27.3	32.2	33.7	33.4	33.3
Very elderly population (80 and over) as % of total population	7.2	7.3	8.8	10.5	13.8	15.3	14.5
Very elderly population (80 and over) as % of elderly population	11.8	31.7	32.2	32.6	41.0	45.8	43.5
Very elderly population (80 and over) as % of working age population	16.2	12.3	15.5	20.0	27.3	30.0	28.5
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.0	0.6	0.3	1.1	1.5	1.4	1.3
Employment (growth rate)	-0.2	0.7	-0.4	-0.6	-0.2	-0.2	-0.2
Labour input: hours worked (growth rate)	-0.2	0.6	-0.4	-0.6	-0.2	-0.2	-0.2
Labour productivity per hour (growth rate)	1.3	0.0	0.7	1.7	1.7	1.6	1.5
TFP (growth rate)	0.8	0.1	0.4	1.1	1.1	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.4	-0.2	0.2	0.6	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.3	0.7	0.4	1.3	1.8	1.8	1.6
Potential GDP per worker (growth rate)	1.3	-0.1	0.7	1.7	1.7	1.6	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-8,285	35,660	34,053	31,117	29,402	28,495	27,375
Population growth (working-age: 20-64)	-0.1	-0.4	-0.7	-1.0	-0.4	-0.3	-0.5
Labour force 20-64 (thousands)	-4,649	25,139	24,795	23,051	21,912	21,226	20,490
Participation rate (20-64)	4.4	70.5	72.8	74.1	74.5	74.5	74.9
Participation rate (20-74)	5.6	60.7	62.5	62.2	64.3	65.8	66.3
youngest (20-24)	0.6	44.7	45.3	45.5	45.3	45.3	45.4
prime-age (25-54)	0.3	78.2	78.3	78.4	78.7	78.5	78.5
older (55-64)	18.4	57.5	69.4	72.2	73.3	74.4	75.9
very old (65-74)	23.5	9.1	18.8	21.0	24.1	29.5	32.6
Participation rate (20-64) - FEMALES	6.8	60.5	64.6	66.3	66.9	67.1	67.3
Participation rate (20-74) - FEMALES	8.6	51.3	54.9	55.3	57.5	59.2	59.9
youngest (20-24)	0.6	38.5	39.0	39.2	39.0	39.0	39.1
prime-age (25-54)	2.1	67.8	69.3	69.7	70.1	70.0	69.9
older (55-64)	23.3	47.0	62.3	66.3	67.8	69.3	70.2
very old (65-74)	25.8	5.7	16.5	20.1	23.1	28.0	31.5
Participation rate (20-64) - MALES	1.3	80.6	80.8	81.5	81.6	81.4	81.9
Participation rate (20-74) - MALES	2.0	70.3	70.0	68.9	70.9	72.0	72.3
youngest (20-24)	0.7	50.4	51.0	51.2	51.0	51.0	51.1
prime-age (25-54)	-2.1	88.5	86.8	86.4	86.5	86.3	86.4
older (55-64)	12.6	68.7	76.9	78.5	78.7	79.1	81.3
very old (65-74)	20.9	12.9	21.2	22.1	25.1	31.0	33.7
Average effective exit age (TOTAL) (1)	3.4	65.5	66.4	67.0	67.6	68.3	68.9
Men	3.2	65.2	66.0	66.4	67.0	67.8	68.5
Women	3.5	65.8	66.9	67.6	68.2	68.8	69.3
Employment rate (20-64)	6.2	63.6	66.3	68.2	69.4	69.4	69.8
Employment rate (20-74)	7.3	54.8	57.1	57.6	60.1	61.6	62.1
Unemployment rate (20-64)	-3.1	9.8	8.9	7.9	6.9	6.8	6.8
Unemployment rate (20-74)	-3.4	9.7	8.6	7.5	6.5	6.3	6.3
Employment (20-64) (in millions)	-3.6	22.7	22.6	21.2	20.4	19.8	19.1
Employment (20-74) (in millions)	-1.9	23.3	24.1	23.1	22.2	21.8	21.3
share of youngest (20-24)	0.0	4%	4%	4%	4%	4%	4%
share of prime-age (25-54)	-12.6	74%	63%	64%	65%	63%	61%
share of older (55-64)	4.7	20%	26%	23%	23%	24%	24%
share of very old (65-74)	7.9	3%	6%	8%	8%	9%	10%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.4	23.5	27.9	25.1	24.1	25.1	25.8
Old-age dependency ratio 20-64 (3)	26.7	38.9	48.0	61.4	66.5	65.5	65.6
Total dependency ratio (4)	27.6	69.2	76.0	90.7	97.4	96.1	96.8
Total economic dependency ratio (5)	-6.7	159.3	149.1	157.1	161.7	156.7	152.6
Economic old-age dependency ratio (20-64) (6)	23.7	58.5	65.8	81.0	87.0	84.2	82.2
Economic old-age dependency ratio (20-74) (7)	16.7	56.9	61.7	74.5	80.1	76.5	73.6

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

13. CYPRUS

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.33	1.38	1.42	1.46	1.49	1.53
Life expectancy at birth							
males	5.8	80.8	82.1	83.3	84.5	85.6	86.6
females	5.1	85.1	86.1	87.2	88.3	89.3	90.2
Life expectancy at 65							
males	4.3	19.2	20.1	21.0	21.9	22.7	23.5
females	4.3	22.1	22.9	23.8	24.7	25.6	26.4
Net migration (thousand)	-5.5	7.8	3.4	3.0	2.7	2.4	2.3
Net migration as % of population	-0.7	0.9	0.4	0.3	0.3	0.2	0.2
Population (million)	0.2	0.9	1.0	1.0	1.0	1.1	1.1
Young population (0-14) as % of total population	-2.3	21.6	21.0	20.6	19.8	19.5	19.4
Prime-age population (25-54) as % of total population	-6.5	43.2	43.0	41.7	39.4	38.0	36.7
Working-age population (20-64) as % of total population	-8.6	62.1	59.4	58.5	57.8	55.4	53.5
Elderly population (65 and over) as % of total population	10.9	16.2	19.6	20.9	22.4	25.1	27.1
Very elderly population (80 and over) as % of total population	6.8	3.7	5.5	7.2	8.0	8.6	10.5
Very elderly population (80 and over) as % of elderly population	15.8	22.9	28.2	34.5	35.8	34.4	38.7
Very elderly population (80 and over) as % of working age population	13.7	6.0	9.3	12.3	13.9	15.6	19.6
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.9	1.9	1.7	2.4	2.1	1.6	1.5
Employment (growth rate)	0.4	1.6	0.9	0.5	0.3	-0.1	0.0
Labour input: hours worked (growth rate)	0.4	1.4	0.9	0.5	0.3	-0.1	0.0
Labour productivity per hour (growth rate)	1.5	0.5	0.8	1.9	1.8	1.7	1.5
TFP (growth rate)	0.9	0.0	0.4	1.2	1.2	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.6	0.5	0.4	0.7	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.4	0.6	1.0	2.0	1.8	1.4	1.3
Potential GDP per worker (growth rate)	1.4	0.3	0.8	1.9	1.8	1.7	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	40	548	574	594	606	596	588
Population growth (working-age: 20-64)	-1.3	1.2	0.4	0.4	0.0	-0.2	-0.1
Labour force 20-64 (thousands)	62	443	480	501	513	509	505
Participation rate (20-64)	4.9	80.9	83.7	84.4	84.6	85.4	85.9
Participation rate (20-74)	3.2	72.1	73.6	75.2	75.1	74.6	75.4
youngest (20-24)	4.4	62.5	66.8	67.0	67.0	67.0	66.9
prime-age (25-54)	2.2	88.3	89.7	90.1	90.3	90.4	90.5
older (55-64)	14.8	65.3	68.6	72.0	75.0	77.7	80.1
very old (65-74)	11.1	13.8	13.5	17.2	21.1	23.4	24.9
Participation rate (20-64) - FEMALES	6.6	75.7	79.7	80.6	80.9	81.6	82.2
Participation rate (20-74) - FEMALES	4.7	66.5	69.9	71.6	71.3	70.5	71.2
youngest (20-24)	2.5	64.0	66.4	66.6	66.6	66.6	66.5
prime-age (25-54)	3.3	83.5	85.8	86.4	86.6	86.7	86.7
older (55-64)	21.3	53.9	61.0	65.5	69.6	72.4	75.2
very old (65-74)	14.0	6.9	10.6	14.7	17.8	19.6	20.9
Participation rate (20-64) - MALES	3.3	86.5	88.1	88.6	88.8	89.4	89.8
Participation rate (20-74) - MALES	1.9	78.1	77.5	79.1	79.3	79.3	79.9
youngest (20-24)	6.5	60.8	67.3	67.4	67.4	67.3	67.3
prime-age (25-54)	1.2	93.3	94.0	94.2	94.4	94.5	94.5
older (55-64)	8.8	77.0	76.6	79.3	81.6	83.9	85.8
very old (65-74)	8.3	21.4	16.4	19.8	24.8	28.0	29.7
Average effective exit age (TOTAL) (1)	3.4	63.9	64.7	65.5	66.2	66.8	67.3
Men	3.3	64.4	65.3	66.1	66.7	67.3	67.7
Women	3.4	63.4	64.2	65.1	65.8	66.3	66.8
Employment rate (20-64)	5.0	75.1	76.8	78.1	78.9	79.6	80.1
Employment rate (20-74)	3.5	67.0	67.7	69.7	70.2	69.8	70.5
Unemployment rate (20-64)	-0.5	7.2	8.2	7.5	6.8	6.7	6.7
Unemployment rate (20-74)	-0.6	7.1	8.0	7.3	6.5	6.4	6.4
Employment (20-64) (in millions)	0.1	0.4	0.4	0.5	0.5	0.5	0.5
Employment (20-74) (in millions)	0.1	0.4	0.5	0.5	0.5	0.5	0.5
share of youngest (20-24)	-1.2	8%	7%	7%	7%	7%	7%
share of prime-age (25-54)	-6.0	74%	76%	74%	70%	69%	68%
share of older (55-64)	3.9	15%	14%	16%	18%	19%	19%
share of very old (65-74)	3.3	3%	3%	3%	4%	6%	6%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.4	18.9	17.3	19.0	21.6	21.4	21.3
Old-age dependency ratio 20-64 (3)	24.6	26.2	33.0	35.6	38.8	45.3	50.7
Total dependency ratio (4)	26.0	61.0	68.4	70.9	73.0	80.5	86.9
Total economic dependency ratio (5)	10.8	108.6	112.9	111.7	109.5	113.7	119.4
Economic old-age dependency ratio (20-64) (6)	24.8	32.0	40.0	42.2	44.4	50.8	56.9
Economic old-age dependency ratio (20-74) (7)	22.3	31.2	38.9	40.8	42.4	47.9	53.5

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

14. LATVIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.58	1.64	1.67	1.69	1.70	1.71
Life expectancy at birth							
males	12.0	70.6	73.3	75.9	78.4	80.6	82.6
females	8.3	80.2	82.1	83.9	85.6	87.1	88.5
Life expectancy at 65							
males	7.2	14.5	16.0	17.6	19.0	20.4	21.7
females	6.1	19.4	20.7	22.0	23.3	24.4	25.5
Net migration (thousand)	4.7	-3.9	-7.3	-4.7	-2.3	-0.6	0.7
Net migration as % of population	0.3	-0.2	-0.4	-0.3	-0.2	0.0	0.1
Population (million)	-0.7	1.9	1.7	1.5	1.4	1.3	1.2
Young population (0-14) as % of total population	-2.3	20.6	20.1	18.1	18.3	18.6	18.3
Prime-age population (25-54) as % of total population	-7.8	40.4	35.8	33.7	31.8	32.6	32.6
Working-age population (20-64) as % of total population	-9.0	59.0	54.8	53.2	50.3	48.0	50.0
Elderly population (65 and over) as % of total population	11.4	20.4	25.0	28.7	31.3	33.4	31.8
Very elderly population (80 and over) as % of total population	9.2	5.7	7.0	9.4	11.5	12.9	14.9
Very elderly population (80 and over) as % of elderly population	19.0	28.0	27.8	32.9	36.7	38.6	47.0
Very elderly population (80 and over) as % of working age population	20.2	9.7	12.7	17.7	22.9	26.8	29.9
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	2.7	1.9	1.0	0.6	1.0	1.1
Employment (growth rate)	-1.1	-0.1	-1.2	-1.2	-1.5	-0.8	-0.4
Labour input: hours worked (growth rate)	-1.1	-0.6	-1.2	-1.2	-1.4	-0.8	-0.4
Labour productivity per hour (growth rate)	2.3	3.3	3.1	2.2	2.0	1.8	1.5
TFP (growth rate)	1.4	1.9	1.9	1.4	1.3	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.9	1.4	1.2	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	2.2	3.4	3.1	2.0	1.5	1.9	1.8
Potential GDP per worker (growth rate)	2.3	2.8	3.2	2.2	2.0	1.8	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-540	1,129	934	814	699	610	589
Population growth (working-age: 20-64)	1.0	-1.4	-1.6	-1.4	-1.7	-0.6	-0.4
Labour force 20-64 (thousands)	-448	936	766	667	575	510	489
Participation rate (20-64)	0.1	82.9	82.0	82.0	82.2	83.6	83.0
Participation rate (20-74)	-2.9	73.6	68.8	68.4	67.6	67.7	70.7
youngest (20-24)	3.8	66.2	69.6	70.4	70.0	69.7	69.9
prime-age (25-54)	1.7	88.4	89.1	89.5	90.4	90.2	90.1
older (55-64)	-3.1	72.5	68.3	68.8	67.5	69.4	69.4
very old (65-74)	-7.1	20.7	13.8	13.7	13.7	12.5	13.6
Participation rate (20-64) - FEMALES	0.9	80.4	79.7	79.8	80.3	81.9	81.2
Participation rate (20-74) - FEMALES	-0.4	69.7	65.4	65.4	65.4	66.0	69.3
youngest (20-24)	4.4	61.4	65.6	66.2	65.9	65.6	65.8
prime-age (25-54)	3.1	85.5	86.9	87.9	88.8	88.7	88.6
older (55-64)	-3.9	72.2	67.5	66.4	66.0	68.3	68.2
very old (65-74)	-4.0	19.3	15.1	15.0	14.9	14.1	15.3
Participation rate (20-64) - MALES	-0.9	85.6	84.3	84.2	84.0	85.1	84.7
Participation rate (20-74) - MALES	-6.0	78.0	72.4	71.5	69.8	69.3	72.0
youngest (20-24)	3.2	70.6	73.5	74.2	73.9	73.5	73.8
prime-age (25-54)	0.3	91.3	91.2	91.0	91.9	91.6	91.6
older (55-64)	-2.3	73.0	69.1	71.2	68.9	70.5	70.6
very old (65-74)	-11.0	22.8	12.0	11.9	12.3	10.8	11.8
Average effective exit age (TOTAL) (1)	0.9	63.5	64.5	64.5	64.5	64.5	64.5
Men	1.1	63.2	64.3	64.3	64.3	64.3	64.3
Women	0.8	63.8	64.6	64.6	64.6	64.6	64.6
Employment rate (20-64)	-0.2	77.6	74.7	75.5	76.6	77.9	77.4
Employment rate (20-74)	-3.0	69.0	62.8	63.2	63.1	63.2	66.0
Unemployment rate (20-64)	0.4	6.4	8.9	7.9	6.9	6.8	6.8
Unemployment rate (20-74)	0.4	6.2	8.7	7.7	6.7	6.6	6.7
Employment (20-64) (in millions)	-0.4	0.9	0.7	0.6	0.5	0.5	0.5
Employment (20-74) (in millions)	-0.4	0.9	0.7	0.6	0.6	0.5	0.5
share of youngest (20-24)	2.3	6%	7%	8%	7%	8%	8%
share of prime-age (25-54)	-1.3	70%	69%	67%	67%	71%	69%
share of older (55-64)	-0.1	20%	20%	21%	22%	18%	20%
share of very old (65-74)	-0.8	4%	4%	4%	5%	4%	4%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.6	24.0	25.0	26.1	27.6	22.1	24.6
Old-age dependency ratio 20-64 (3)	29.0	34.6	45.7	53.8	62.3	69.5	63.6
Total dependency ratio (4)	30.7	69.5	82.3	87.9	98.7	108.2	100.2
Total economic dependency ratio (5)	40.7	108.8	133.9	138.2	147.8	155.8	149.5
Economic old-age dependency ratio (20-64) (6)	38.5	39.9	56.7	66.8	76.5	84.6	78.4
Economic old-age dependency ratio (20-74) (7)	37.5	38.1	54.3	64.0	73.1	80.9	75.6

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

15. LITHUANIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.61	1.63	1.65	1.67	1.69	1.70
Life expectancy at birth							
males	11.6	71.3	73.8	76.4	78.8	80.9	82.9
females	7.7	81.1	82.8	84.4	86.0	87.4	88.8
Life expectancy at 65							
males	6.9	15.0	16.4	17.9	19.3	20.6	21.9
females	5.7	20.0	21.2	22.4	23.5	24.6	25.7
Net migration (thousand)	-7.4	10.1	-9.5	-5.2	-1.9	0.7	2.6
Net migration as % of population	-0.2	0.4	-0.4	-0.2	-0.1	0.0	0.1
Population (million)	-1.0	2.8	2.6	2.3	2.1	2.0	1.8
Young population (0-14) as % of total population	-2.6	19.9	19.6	17.5	17.1	17.5	17.3
Prime-age population (25-54) as % of total population	-7.0	39.9	36.3	34.5	32.6	32.7	32.8
Working-age population (20-64) as % of total population	-10.4	60.2	55.3	52.9	51.3	49.0	49.8
Elderly population (65 and over) as % of total population	13.0	19.8	25.1	29.6	31.6	33.5	32.9
Very elderly population (80 and over) as % of total population	8.5	5.8	6.7	9.4	12.3	13.1	14.3
Very elderly population (80 and over) as % of elderly population	14.1	29.4	26.6	31.9	39.0	39.2	43.5
Very elderly population (80 and over) as % of working age population	19.0	9.7	12.1	17.8	24.0	26.8	28.7
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	3.8	1.4	1.0	0.7	0.8	1.1
Employment (growth rate)	-1.0	1.4	-1.7	-1.1	-1.3	-0.9	-0.4
Labour input: hours worked (growth rate)	-1.0	1.3	-1.7	-1.1	-1.3	-0.9	-0.4
Labour productivity per hour (growth rate)	2.2	2.4	3.0	2.1	2.0	1.8	1.5
TFP (growth rate)	1.3	1.1	1.8	1.4	1.3	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.9	1.3	1.3	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	2.1	4.0	2.4	1.9	1.6	1.6	1.7
Potential GDP per worker (growth rate)	2.2	2.4	3.1	2.2	2.0	1.8	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-776	1,683	1,417	1,232	1,092	956	907
Population growth (working-age: 20-64)	0.0	-0.3	-1.6	-1.2	-1.4	-0.9	-0.3
Labour force 20-64 (thousands)	-624	1,407	1,196	1,052	935	825	783
Participation rate (20-64)	2.8	83.6	84.4	85.4	85.6	86.3	86.4
Participation rate (20-74)	-2.4	74.2	69.5	69.9	70.6	69.4	71.8
youngest (20-24)	2.6	63.1	64.6	65.8	65.9	65.5	65.7
prime-age (25-54)	3.7	90.1	92.6	93.3	93.8	93.9	93.8
older (55-64)	0.7	73.8	70.2	72.4	73.1	73.4	74.5
very old (65-74)	-6.7	17.5	9.9	10.4	11.1	10.9	10.7
Participation rate (20-64) - FEMALES	2.6	82.1	82.7	83.6	83.8	84.6	84.7
Participation rate (20-74) - FEMALES	-1.1	71.0	65.3	66.1	67.7	67.1	69.8
youngest (20-24)	2.0	60.1	60.9	62.2	62.3	61.8	62.0
prime-age (25-54)	3.1	89.0	90.9	91.6	92.0	92.2	92.1
older (55-64)	1.0	72.7	70.6	71.6	72.0	72.4	73.7
very old (65-74)	-6.6	15.4	7.8	8.8	9.0	8.9	8.8
Participation rate (20-64) - MALES	2.7	85.2	86.1	87.0	87.2	87.9	87.9
Participation rate (20-74) - MALES	-4.2	77.8	73.9	73.6	73.2	71.5	73.6
youngest (20-24)	3.2	65.8	68.1	69.2	69.2	68.9	69.0
prime-age (25-54)	4.1	91.3	94.1	94.8	95.4	95.5	95.4
older (55-64)	0.1	75.1	69.6	73.2	74.0	74.2	75.2
very old (65-74)	-8.3	20.8	12.9	12.4	13.2	12.8	12.5
Average effective exit age (TOTAL) (1)	1.4	62.7	64.1	64.1	64.1	64.1	64.1
Men	1.0	63.4	64.4	64.4	64.4	64.4	64.4
Women	1.6	62.1	63.8	63.8	63.8	63.8	63.8
Employment rate (20-64)	2.2	78.3	78.5	79.4	79.7	80.4	80.4
Employment rate (20-74)	-2.6	69.6	64.8	65.2	65.8	64.8	67.0
Unemployment rate (20-64)	0.5	6.4	7.0	7.0	6.9	6.9	6.9
Unemployment rate (20-74)	0.5	6.2	6.9	6.8	6.7	6.7	6.7
Employment (20-64) (in millions)	-0.6	1.3	1.1	1.0	0.9	0.8	0.7
Employment (20-74) (in millions)	-0.6	1.4	1.1	1.0	0.9	0.8	0.8
share of youngest (20-24)	0.2	6%	6%	7%	6%	6%	7%
share of prime-age (25-54)	0.6	69%	70%	69%	68%	70%	70%
share of older (55-64)	-0.3	21%	21%	20%	23%	20%	20%
share of very old (65-74)	-0.5	4%	3%	3%	3%	4%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.0	24.5	25.8	25.0	27.7	24.2	24.5
Old-age dependency ratio 20-64 (3)	33.1	32.9	45.4	55.9	61.5	68.4	66.0
Total dependency ratio (4)	34.8	66.0	80.9	89.1	94.8	104.2	100.8
Total economic dependency ratio (5)	37.4	104.6	123.6	130.3	136.3	144.5	142.0
Economic old-age dependency ratio (20-64) (6)	40.5	38.4	54.8	67.0	73.7	81.2	78.9
Economic old-age dependency ratio (20-74) (7)	39.4	37.0	53.1	64.8	71.2	78.1	76.5

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

16. LUXEMBOURG

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.34	1.40	1.46	1.49	1.53	1.56
Life expectancy at birth							
males	6.3	80.3	81.7	83.1	84.4	85.5	86.6
females	5.8	85.0	86.3	87.5	88.7	89.8	90.8
Life expectancy at 65							
males	4.6	19.1	20.1	21.1	22.0	22.9	23.7
females	4.6	22.5	23.5	24.5	25.4	26.3	27.1
Net migration (thousand)	-7.7	10.2	4.2	3.5	3.0	2.7	2.5
Net migration as % of population	-1.3	1.6	0.6	0.5	0.4	0.3	0.3
Population (million)	0.2	0.6	0.7	0.7	0.8	0.8	0.8
Young population (0-14) as % of total population	-3.9	21.4	19.8	18.5	17.9	17.7	17.5
Prime-age population (25-54) as % of total population	-10.4	45.8	43.2	40.6	37.8	36.5	35.4
Working-age population (20-64) as % of total population	-11.3	64.2	61.9	59.2	56.4	53.8	52.9
Elderly population (65 and over) as % of total population	15.2	14.5	18.3	22.4	25.7	28.5	29.7
Very elderly population (80 and over) as % of total population	8.3	4.0	4.8	6.5	9.0	10.6	12.3
Very elderly population (80 and over) as % of elderly population	14.0	27.5	26.2	29.2	34.9	37.2	41.5
Very elderly population (80 and over) as % of working age population	17.1	6.2	7.7	11.0	15.9	19.7	23.3
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.8	2.1	1.8	2.1	1.7	1.6	1.3
Employment (growth rate)	0.7	2.9	1.1	0.6	0.1	0.0	-0.2
Labour input: hours worked (growth rate)	0.7	2.9	1.1	0.5	0.1	0.0	-0.2
Labour productivity per hour (growth rate)	1.1	-0.8	0.7	1.5	1.5	1.5	1.5
TFP (growth rate)	0.7	-0.7	0.5	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.4	-0.2	0.3	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.3	0.1	1.0	1.6	1.4	1.5	1.3
Potential GDP per worker (growth rate)	1.1	-0.9	0.7	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	18	398	431	438	435	422	416
Population growth (working-age: 20-64)	-2.2	2.1	0.3	0.1	-0.2	-0.2	-0.1
Labour force 20-64 (thousands)	17	305	335	342	337	328	323
Participation rate (20-64)	0.8	76.8	77.7	78.1	77.5	77.9	77.5
Participation rate (20-74)	-4.5	68.7	67.4	66.2	64.8	64.0	64.2
youngest (20-24)	2.6	51.9	54.4	54.6	54.6	54.4	54.5
prime-age (25-54)	3.7	88.5	91.3	91.9	92.3	92.3	92.2
older (55-64)	0.0	45.2	42.9	45.1	44.9	45.0	45.2
very old (65-74)	1.0	2.9	4.1	3.8	3.9	3.9	3.9
Participation rate (20-64) - FEMALES	4.8	71.8	75.7	76.8	76.4	77.0	76.6
Participation rate (20-74) - FEMALES	-0.6	63.9	65.4	65.0	63.6	62.9	63.3
youngest (20-24)	4.2	46.5	50.6	50.9	50.8	50.7	50.7
prime-age (25-54)	7.9	84.0	90.1	91.3	91.9	91.9	91.8
older (55-64)	5.2	38.4	37.9	42.8	43.1	43.4	43.6
very old (65-74)	1.7	1.7	3.2	3.1	3.5	3.5	3.5
Participation rate (20-64) - MALES	-3.1	81.5	79.6	79.3	78.5	78.8	78.4
Participation rate (20-74) - MALES	-8.2	73.4	69.3	67.3	65.9	65.0	65.1
youngest (20-24)	1.1	56.9	57.9	58.2	58.1	57.9	58.0
prime-age (25-54)	-0.3	92.9	92.5	92.5	92.7	92.6	92.6
older (55-64)	-4.9	51.6	47.5	47.3	46.7	46.6	46.7
very old (65-74)	0.2	4.1	5.0	4.4	4.4	4.3	4.3
Average effective exit age (TOTAL) (1)	0.0	60.2	60.2	60.2	60.2	60.2	60.2
Men	0.0	60.4	60.4	60.4	60.4	60.4	60.4
Women	0.0	60.1	60.1	60.1	60.1	60.1	60.1
Employment rate (20-64)	1.4	72.7	74.2	74.6	74.0	74.4	74.1
Employment rate (20-74)	-3.7	65.1	64.3	63.2	61.9	61.1	61.4
Unemployment rate (20-64)	-0.8	5.3	4.5	4.5	4.5	4.5	4.5
Unemployment rate (20-74)	-0.8	5.3	4.5	4.5	4.5	4.5	4.5
Employment (20-64) (in millions)	0.0	0.3	0.3	0.3	0.3	0.3	0.3
Employment (20-74) (in millions)	0.0	0.3	0.3	0.3	0.3	0.3	0.3
share of youngest (20-24)	-0.1	6%	6%	5%	5%	6%	6%
share of prime-age (25-54)	-3.2	82%	82%	80%	79%	80%	79%
share of older (55-64)	2.6	11%	12%	13%	14%	13%	14%
share of very old (65-74)	0.7	0%	1%	1%	1%	1%	1%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	4.9	19.1	21.4	22.6	24.3	23.3	24.0
Old-age dependency ratio 20-64 (3)	33.6	22.6	29.6	37.8	45.5	52.8	56.1
Total dependency ratio (4)	33.4	55.9	61.5	69.0	77.2	85.7	89.2
Total economic dependency ratio (5)	39.2	113.4	115.8	124.6	136.8	146.7	152.6
Economic old-age dependency ratio (20-64) (6)	44.1	30.6	38.9	49.7	60.3	69.8	74.6
Economic old-age dependency ratio (20-74) (7)	43.4	30.4	38.6	49.2	59.7	69.0	73.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

17. HUNGARY

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.51	1.61	1.67	1.69	1.69	1.70
Life expectancy at birth							
males	10.7	72.9	75.4	77.7	79.8	81.8	83.6
females	8.7	79.8	81.8	83.7	85.4	87.0	88.5
Life expectancy at 65							
males	7.1	14.8	16.4	17.9	19.3	20.6	21.9
females	6.7	18.7	20.2	21.6	23.0	24.2	25.4
Net migration (thousand)	-12.8	36.3	23.5	23.3	23.2	23.3	23.5
Net migration as % of population	-0.1	0.4	0.2	0.2	0.3	0.3	0.3
Population (million)	-0.9	9.8	9.6	9.4	9.3	9.1	8.9
Young population (0-14) as % of total population	-0.9	19.6	19.2	18.8	18.7	18.7	18.7
Prime-age population (25-54) as % of total population	-8.0	42.4	39.7	36.6	35.1	34.6	34.4
Working-age population (20-64) as % of total population	-9.2	60.8	59.2	56.6	53.5	51.8	51.7
Elderly population (65 and over) as % of total population	10.0	19.6	21.7	24.6	27.8	29.5	29.6
Very elderly population (80 and over) as % of total population	7.7	4.5	5.9	7.8	8.6	11.6	12.2
Very elderly population (80 and over) as % of elderly population	18.3	22.7	27.3	31.8	30.8	39.3	41.0
Very elderly population (80 and over) as % of working age population	16.2	7.3	10.0	13.8	16.0	22.4	23.5
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.8	3.9	2.4	1.4	1.6	1.4	1.3
Employment (growth rate)	-0.2	1.1	0.1	-0.9	-0.5	-0.4	-0.2
Labour input: hours worked (growth rate)	-0.3	0.9	0.1	-0.8	-0.5	-0.4	-0.2
Labour productivity per hour (growth rate)	2.1	2.9	2.3	2.3	2.1	1.8	1.5
TFP (growth rate)	1.3	1.2	1.5	1.5	1.4	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.7	1.7	0.8	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	2.0	3.9	2.6	1.6	1.8	1.6	1.5
Potential GDP per worker (growth rate)	2.0	2.7	2.3	2.3	2.1	1.8	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,337	5,944	5,687	5,336	4,953	4,715	4,607
Population growth (working-age: 20-64)	0.6	-0.8	-0.2	-1.2	-0.4	-0.5	-0.2
Labour force 20-64 (thousands)	-705	4,634	4,813	4,523	4,224	4,023	3,928
Participation rate (20-64)	7.3	77.9	84.6	84.8	85.3	85.3	85.3
Participation rate (20-74)	4.9	66.8	73.2	71.6	70.3	71.1	71.7
youngest (20-24)	3.0	54.4	57.5	57.5	57.4	57.3	57.4
prime-age (25-54)	2.9	87.1	89.4	90.0	90.0	90.0	90.0
older (55-64)	25.5	58.2	81.5	81.7	83.5	83.6	83.7
very old (65-74)	4.5	7.1	9.6	12.6	10.6	11.8	11.5
Participation rate (20-64) - FEMALES	10.1	70.0	79.3	79.4	80.1	80.2	80.1
Participation rate (20-74) - FEMALES	8.5	58.4	67.1	66.0	65.0	66.2	67.0
youngest (20-24)	3.4	46.4	50.0	49.9	49.9	49.8	49.8
prime-age (25-54)	4.0	80.5	83.7	84.4	84.5	84.6	84.5
older (55-64)	33.2	47.4	78.5	77.8	80.2	80.5	80.6
very old (65-74)	5.2	5.1	8.1	11.2	9.2	10.5	10.3
Participation rate (20-64) - MALES	4.2	85.9	89.8	89.8	90.1	90.2	90.1
Participation rate (20-74) - MALES	0.6	75.6	79.4	77.2	75.5	75.7	76.2
youngest (20-24)	2.7	61.8	64.6	64.5	64.5	64.4	64.5
prime-age (25-54)	1.7	93.4	94.9	95.1	95.2	95.2	95.2
older (55-64)	15.9	70.7	84.7	85.6	86.6	86.5	86.6
very old (65-74)	3.0	9.8	11.6	14.3	12.0	13.1	12.8
Average effective exit age (TOTAL) (1)	2.3	62.8	65.1	65.1	65.1	65.1	65.1
Men	2.1	63.2	65.3	65.3	65.3	65.3	65.3
Women	2.5	62.4	64.8	64.8	64.8	64.8	64.8
Employment rate (20-64)	6.5	75.4	81.2	81.4	81.9	82.0	81.9
Employment rate (20-74)	4.3	64.6	70.3	68.8	67.6	68.3	68.9
Unemployment rate (20-64)	0.7	3.3	4.0	4.0	3.9	3.9	3.9
Unemployment rate (20-74)	0.6	3.3	4.0	3.9	3.9	3.9	3.9
Employment (20-64) (in millions)	-0.7	4.5	4.6	4.3	4.1	3.9	3.8
Employment (20-74) (in millions)	-0.7	4.6	4.7	4.5	4.2	4.0	3.9
share of youngest (20-24)	0.0	6%	6%	6%	6%	6%	6%
share of prime-age (25-54)	-8.4	77%	70%	67%	67%	68%	68%
share of older (55-64)	7.1	16%	23%	24%	24%	22%	23%
share of very old (65-74)	1.3	2%	2%	3%	3%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.5	21.0	23.7	25.8	24.8	23.4	23.6
Old-age dependency ratio 20-64 (3)	25.1	32.2	36.6	43.5	52.0	57.0	57.4
Total dependency ratio (4)	29.2	64.4	69.0	76.8	87.0	93.2	93.6
Total economic dependency ratio (5)	14.8	114.4	103.8	110.0	121.3	127.9	129.2
Economic old-age dependency ratio (20-64) (6)	25.9	41.0	42.9	50.0	60.2	66.1	66.9
Economic old-age dependency ratio (20-74) (7)	24.5	40.3	42.1	48.4	58.4	63.9	64.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

18. MALTA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.3	1.14	1.26	1.34	1.39	1.44	1.47
Life expectancy at birth							
males	6.3	80.5	82.0	83.3	84.6	85.7	86.8
females	6.1	84.5	85.9	87.2	88.4	89.5	90.6
Life expectancy at 65							
males	4.3	19.6	20.5	21.4	22.3	23.1	23.9
females	4.6	22.4	23.4	24.4	25.3	26.2	27.0
Net migration (thousand)	-9.0	12.8	6.0	5.3	4.7	4.2	3.8
Net migration as % of population	-2.0	2.6	1.0	0.8	0.7	0.6	0.5
Population (million)	0.2	0.5	0.6	0.6	0.7	0.7	0.7
Young population (0-14) as % of total population	-2.6	18.1	17.8	16.4	15.7	15.7	15.6
Prime-age population (25-54) as % of total population	-9.5	44.4	45.5	42.6	38.4	36.3	34.9
Working-age population (20-64) as % of total population	-11.1	63.1	61.2	61.3	58.7	53.9	52.0
Elderly population (65 and over) as % of total population	13.7	18.7	21.0	22.3	25.6	30.4	32.4
Very elderly population (80 and over) as % of total population	9.0	4.3	6.4	7.9	8.4	10.1	13.2
Very elderly population (80 and over) as % of elderly population	18.0	22.7	30.7	35.6	32.8	33.3	40.7
Very elderly population (80 and over) as % of working age population	18.7	6.8	10.5	12.9	14.3	18.8	25.4
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	2.2	4.5	3.9	2.1	1.3	1.2	1.4
Employment (growth rate)	0.5	3.7	1.8	0.5	-0.3	-0.3	-0.1
Labour input: hours worked (growth rate)	0.4	2.8	1.7	0.4	-0.3	-0.3	-0.1
Labour productivity per hour (growth rate)	1.8	1.7	2.1	1.7	1.6	1.6	1.5
TFP (growth rate)	1.2	1.3	1.5	1.1	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.6	0.4	0.7	0.6	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.5	1.2	2.9	1.5	0.9	0.9	1.3
Potential GDP per worker (growth rate)	1.7	0.8	2.1	1.7	1.6	1.6	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	52	316	362	390	393	374	368
Population growth (working-age: 20-64)	-3.8	3.7	0.9	0.4	-0.2	-0.4	-0.1
Labour force 20-64 (thousands)	65	251	311	336	336	321	316
Participation rate (20-64)	6.4	79.7	85.9	86.2	85.6	85.8	86.0
Participation rate (20-74)	2.0	68.8	74.3	75.2	72.0	69.4	70.8
youngest (20-24)	1.5	77.7	79.2	79.4	79.4	79.3	79.2
prime-age (25-54)	5.4	87.5	91.6	92.7	93.0	93.0	93.0
older (55-64)	16.8	52.3	65.1	68.1	69.1	68.1	69.2
very old (65-74)	-1.0	8.7	5.7	8.1	8.2	8.0	7.7
Participation rate (20-64) - FEMALES	13.0	68.8	79.1	81.1	81.1	81.5	81.8
Participation rate (20-74) - FEMALES	8.8	58.4	67.6	70.2	67.8	65.5	67.2
youngest (20-24)	0.3	77.3	77.4	77.8	77.8	77.6	77.6
prime-age (25-54)	11.8	77.1	85.5	88.3	88.9	88.9	88.9
older (55-64)	27.1	36.4	54.2	60.1	62.9	62.4	63.5
very old (65-74)	1.2	5.2	3.7	6.3	6.7	6.7	6.4
Participation rate (20-64) - MALES	0.2	89.4	91.5	90.4	89.3	89.4	89.6
Participation rate (20-74) - MALES	-4.6	78.4	80.2	79.4	75.6	72.6	73.8
youngest (20-24)	2.6	78.0	80.7	80.9	80.8	80.7	80.7
prime-age (25-54)	-0.3	96.7	96.6	96.3	96.4	96.5	96.4
older (55-64)	6.0	67.8	74.7	74.9	74.2	72.7	73.8
very old (65-74)	-3.7	12.4	7.7	9.7	9.6	9.1	8.7
Average effective exit age (TOTAL) (1)	0.9	62.4	63.3	63.3	63.3	63.3	63.3
Men	1.1	62.8	63.9	63.9	63.9	63.9	63.9
Women	0.8	61.9	62.7	62.7	62.7	62.7	62.7
Employment rate (20-64)	5.5	77.3	82.5	82.8	82.3	82.5	82.7
Employment rate (20-74)	1.3	66.8	71.5	72.3	69.3	66.8	68.2
Unemployment rate (20-64)	0.8	3.0	3.9	3.9	3.9	3.8	3.8
Unemployment rate (20-74)	0.8	2.9	3.8	3.8	3.8	3.8	3.8
Employment (20-64) (in millions)	0.1	0.2	0.3	0.3	0.3	0.3	0.3
Employment (20-74) (in millions)	0.1	0.2	0.3	0.3	0.3	0.3	0.3
share of youngest (20-24)	-2.0	9%	7%	7%	7%	7%	7%
share of prime-age (25-54)	-4.7	76%	79%	74%	70%	71%	71%
share of older (55-64)	6.5	13%	14%	18%	21%	19%	19%
share of very old (65-74)	0.2	2%	1%	2%	2%	3%	2%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	4.6	19.6	18.0	22.2	26.6	24.4	24.2
Old-age dependency ratio 20-64 (3)	32.7	29.7	34.4	36.4	43.5	56.5	62.4
Total dependency ratio (4)	33.9	58.5	63.4	63.3	70.3	85.7	92.3
Total economic dependency ratio (5)	26.5	101.0	95.7	94.0	102.8	119.4	127.5
Economic old-age dependency ratio (20-64) (6)	36.8	36.4	40.4	42.4	50.8	65.9	73.2
Economic old-age dependency ratio (20-74) (7)	35.9	35.7	40.0	41.7	49.8	64.2	71.6

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

19. THE NETHERLANDS

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.58	1.60	1.62	1.64	1.66	1.68
Life expectancy at birth							
males	5.9	80.7	81.9	83.2	84.4	85.5	86.6
females	6.3	83.6	85.1	86.4	87.6	88.8	89.9
Life expectancy at 65							
males	4.5	19.0	19.9	20.9	21.8	22.7	23.5
females	4.9	21.4	22.5	23.5	24.5	25.4	26.3
Net migration (thousand)	-72.2	105.4	33.3	34.0	33.4	32.8	33.2
Net migration as % of population	-0.4	0.6	0.2	0.2	0.2	0.2	0.2
Population (million)	0.6	17.3	18.0	18.2	18.1	18.0	18.0
Young population (0-14) as % of total population	-2.2	21.8	20.4	20.3	19.9	19.6	19.7
Prime-age population (25-54) as % of total population	-4.3	39.0	37.0	36.9	35.9	35.2	34.7
Working-age population (20-64) as % of total population	-7.1	58.8	55.9	53.4	53.6	53.1	51.8
Elderly population (65 and over) as % of total population	9.2	19.3	23.7	26.3	26.4	27.3	28.6
Very elderly population (80 and over) as % of total population	6.6	4.7	6.9	8.8	10.8	10.7	11.3
Very elderly population (80 and over) as % of elderly population	15.2	24.2	29.2	33.4	40.8	39.4	39.4
Very elderly population (80 and over) as % of working age population	13.8	7.9	12.4	16.5	20.1	20.3	21.7
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	1.8	0.7	1.5	1.6	1.4	1.4
Employment (growth rate)	0.0	1.2	-0.3	-0.1	0.1	-0.1	-0.1
Labour input: hours worked (growth rate)	0.0	1.2	-0.3	-0.1	0.1	-0.1	-0.1
Labour productivity per hour (growth rate)	1.3	0.6	1.0	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	0.4	0.6	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.2	0.4	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.2	1.2	0.5	1.4	1.7	1.5	1.4
Potential GDP per worker (growth rate)	1.3	0.6	1.0	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-893	10,205	10,055	9,709	9,729	9,557	9,312
Population growth (working-age: 20-64)	-0.7	0.5	-0.4	-0.1	0.0	-0.2	-0.2
Labour force 20-64 (thousands)	-559	8,435	8,342	8,121	8,156	8,042	7,875
Participation rate (20-64)	1.9	82.6	83.0	83.7	83.8	84.1	84.6
Participation rate (20-74)	2.2	71.8	71.6	71.7	73.8	73.6	74.0
youngest (20-24)	2.8	75.7	78.5	78.5	78.5	78.5	78.5
prime-age (25-54)	0.1	87.4	87.4	87.3	87.4	87.5	87.5
older (55-64)	6.5	72.0	72.4	74.1	75.6	77.1	78.5
very old (65-74)	13.5	14.4	19.4	18.5	22.6	25.6	27.9
Participation rate (20-64) - FEMALES	4.0	77.8	79.0	80.5	81.1	81.3	81.8
Participation rate (20-74) - FEMALES	4.0	66.7	67.5	68.1	70.5	70.3	70.8
youngest (20-24)	3.1	75.3	78.3	78.4	78.3	78.4	78.4
prime-age (25-54)	1.8	83.3	84.3	84.9	85.0	85.1	85.1
older (55-64)	10.5	63.1	64.4	67.0	70.8	72.0	73.6
very old (65-74)	14.3	9.1	14.9	14.0	16.9	21.0	23.4
Participation rate (20-64) - MALES	-0.1	87.4	86.9	86.8	86.6	87.0	87.3
Participation rate (20-74) - MALES	0.4	76.9	75.8	75.3	77.2	77.0	77.3
youngest (20-24)	2.6	76.1	78.7	78.7	78.7	78.7	78.7
prime-age (25-54)	-1.6	91.5	90.4	89.7	89.8	89.9	89.9
older (55-64)	2.6	81.0	80.6	81.2	80.5	82.3	83.5
very old (65-74)	12.8	19.8	24.0	23.1	28.5	30.5	32.6
Average effective exit age (TOTAL) (1)	2.8	64.9	65.8	66.2	66.7	67.3	67.7
Men	2.7	65.8	66.6	67.0	67.6	68.1	68.5
Women	3.0	64.0	65.0	65.4	65.9	66.4	67.0
Employment rate (20-64)	0.6	80.2	79.2	79.9	80.1	80.3	80.7
Employment rate (20-74)	1.0	69.7	68.4	68.4	70.4	70.2	70.6
Unemployment rate (20-64)	1.5	3.0	4.5	4.5	4.5	4.5	4.5
Unemployment rate (20-74)	1.6	3.0	4.6	4.6	4.6	4.6	4.6
Employment (20-64) (in millions)	-0.7	8.2	8.0	7.8	7.8	7.7	7.5
Employment (20-74) (in millions)	-0.4	8.4	8.4	8.1	8.2	8.2	8.1
share of youngest (20-24)	-0.7	9%	9%	9%	9%	9%	8%
share of prime-age (25-54)	-3.3	68%	67%	69%	67%	65%	65%
share of older (55-64)	0.2	19%	19%	18%	19%	20%	20%
share of very old (65-74)	3.8	3%	5%	5%	5%	6%	7%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	-0.2	23.0	23.4	20.9	22.7	23.3	22.8
Old-age dependency ratio 20-64 (3)	22.4	32.9	42.4	49.3	49.3	51.4	55.2
Total dependency ratio (4)	23.2	69.9	78.9	87.3	86.4	88.4	93.2
Total economic dependency ratio (5)	17.3	105.3	115.1	123.6	121.4	120.1	122.7
Economic old-age dependency ratio (20-64) (6)	22.9	37.6	48.2	56.5	56.0	57.0	60.5
Economic old-age dependency ratio (20-74) (7)	19.9	36.4	45.9	53.9	53.3	53.5	56.3

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

20. AUSTRIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.45	1.49	1.52	1.55	1.57	1.60
Life expectancy at birth							
males	6.5	79.8	81.2	82.6	83.9	85.2	86.3
females	5.9	84.3	85.7	86.9	88.1	89.2	90.2
Life expectancy at 65							
males	4.8	18.8	19.8	20.8	21.8	22.7	23.6
females	4.8	21.8	22.9	23.9	24.8	25.7	26.6
Net migration (thousand)	-18.8	44.3	31.3	29.4	27.2	26.4	25.5
Net migration as % of population	-0.2	0.5	0.3	0.3	0.3	0.3	0.3
Population (million)	0.4	8.9	9.2	9.3	9.3	9.3	9.2
Young population (0-14) as % of total population	-1.0	19.4	19.3	18.5	18.2	18.5	18.4
Prime-age population (25-54) as % of total population	-6.9	41.9	38.3	37.1	35.9	35.5	35.1
Working-age population (20-64) as % of total population	-9.4	61.7	57.5	55.0	54.0	52.7	52.3
Elderly population (65 and over) as % of total population	10.3	18.9	23.2	26.5	27.8	28.9	29.3
Very elderly population (80 and over) as % of total population	7.0	5.2	6.7	8.3	11.1	11.3	12.2
Very elderly population (80 and over) as % of elderly population	14.4	27.3	29.0	31.3	40.0	39.1	41.7
Very elderly population (80 and over) as % of working age population	14.9	8.4	11.7	15.1	20.6	21.4	23.3
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	1.3	1.2	1.5	1.3	1.4	1.4
Employment (growth rate)	0.0	0.7	0.1	0.0	-0.2	-0.2	-0.1
Labour input: hours worked (growth rate)	0.0	0.6	0.1	-0.1	-0.2	-0.2	-0.1
Labour productivity per hour (growth rate)	1.4	0.7	1.1	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	0.3	0.7	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.4	0.4	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.2	0.9	1.0	1.4	1.3	1.4	1.5
Potential GDP per worker (growth rate)	1.3	0.6	1.1	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-640	5,478	5,268	5,115	5,047	4,892	4,838
Population growth (working-age: 20-64)	-0.3	0.3	-0.6	-0.1	-0.3	-0.2	-0.1
Labour force 20-64 (thousands)	-388	4,399	4,256	4,239	4,168	4,054	4,010
Participation rate (20-64)	2.6	80.3	80.8	82.9	82.6	82.9	82.9
Participation rate (20-74)	-0.7	70.6	68.1	69.3	70.0	69.3	69.9
youngest (20-24)	1.0	74.0	75.1	75.1	75.1	75.0	75.0
prime-age (25-54)	1.5	89.0	90.0	90.3	90.6	90.6	90.6
older (55-64)	7.4	56.5	57.6	64.1	63.5	63.4	63.9
very old (65-74)	3.2	7.1	9.3	9.5	10.5	10.3	10.3
Participation rate (20-64) - FEMALES	5.4	75.6	77.5	80.8	80.6	80.9	81.0
Participation rate (20-74) - FEMALES	2.1	65.6	64.4	66.6	67.5	66.9	67.7
youngest (20-24)	0.0	71.6	71.6	71.6	71.6	71.6	71.6
prime-age (25-54)	2.4	85.7	87.2	87.8	88.0	88.1	88.1
older (55-64)	17.2	47.4	53.5	64.3	63.9	64.0	64.6
very old (65-74)	3.8	4.8	6.1	7.4	8.9	8.6	8.6
Participation rate (20-64) - MALES	-0.2	84.9	84.0	84.9	84.6	84.8	84.7
Participation rate (20-74) - MALES	-3.6	75.6	72.0	72.1	72.5	71.7	72.0
youngest (20-24)	2.0	76.2	78.3	78.3	78.3	78.3	78.3
prime-age (25-54)	0.6	92.4	92.7	92.7	93.0	93.0	93.0
older (55-64)	-2.6	65.9	61.9	63.9	63.0	62.9	63.3
very old (65-74)	2.3	9.7	12.7	11.8	12.3	12.1	12.0
Average effective exit age (TOTAL) (1)	0.9	62.3	62.9	63.2	63.2	63.2	63.2
Men	0.0	63.2	63.2	63.2	63.2	63.2	63.2
Women	1.8	61.4	62.6	63.2	63.2	63.2	63.2
Employment rate (20-64)	2.7	76.8	77.5	79.5	79.2	79.5	79.5
Employment rate (20-74)	-0.5	67.5	65.4	66.5	67.2	66.5	67.1
Unemployment rate (20-64)	-0.3	4.4	4.1	4.1	4.1	4.1	4.1
Unemployment rate (20-74)	-0.3	4.3	4.0	4.0	4.0	4.0	4.0
Employment (20-64) (in millions)	-0.4	4.2	4.1	4.1	4.0	3.9	3.8
Employment (20-74) (in millions)	-0.3	4.3	4.2	4.2	4.1	4.0	4.0
share of youngest (20-24)	0.1	8%	8%	9%	8%	8%	8%
share of prime-age (25-54)	-3.1	74%	72%	72%	71%	72%	71%
share of older (55-64)	1.7	16%	17%	17%	18%	17%	17%
share of very old (65-74)	1.3	1%	2%	3%	3%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.6	22.4	24.1	22.5	23.9	22.8	23.0
Old-age dependency ratio 20-64 (3)	25.2	30.7	40.3	48.2	51.5	54.8	55.9
Total dependency ratio (4)	29.0	62.1	73.8	81.8	85.2	89.9	91.1
Total economic dependency ratio (5)	25.7	108.2	118.8	122.7	127.4	132.0	133.9
Economic old-age dependency ratio (20-64) (6)	29.0	38.5	49.5	57.9	62.2	66.0	67.5
Economic old-age dependency ratio (20-74) (7)	27.7	38.0	48.3	56.4	60.5	64.1	65.7

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

21. POLAND

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.36	1.40	1.45	1.49	1.53	1.56
Life expectancy at birth							
males	10.2	74.1	76.5	78.7	80.7	82.6	84.3
females	7.5	82.0	83.8	85.4	86.9	88.3	89.5
Life expectancy at 65							
males	6.5	16.1	17.6	18.9	20.2	21.4	22.6
females	5.7	20.5	21.8	23.0	24.2	25.2	26.2
Net migration (thousand)	69.1	3.3	25.4	37.5	47.6	60.4	72.4
Net migration as % of population	0.2	0.0	0.1	0.1	0.1	0.2	0.2
Population (million)	-7.1	38.0	37.0	35.6	34.0	32.4	30.8
Young population (0-14) as % of total population	-4.3	20.1	18.6	16.5	16.4	16.3	15.9
Prime-age population (25-54) as % of total population	-10.3	42.9	40.9	37.0	34.3	33.5	32.6
Working-age population (20-64) as % of total population	-11.8	61.9	58.6	58.1	53.3	49.8	50.1
Elderly population (65 and over) as % of total population	16.0	17.9	22.8	25.5	30.4	33.9	34.0
Very elderly population (80 and over) as % of total population	11.3	4.4	5.8	9.2	9.8	12.5	15.7
Very elderly population (80 and over) as % of elderly population	21.7	24.5	25.6	36.3	32.2	36.8	46.3
Very elderly population (80 and over) as % of working age population	24.3	7.1	9.9	15.9	18.3	25.1	31.4
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.5	3.5	2.3	1.4	0.9	1.1	1.0
Employment (growth rate)	-0.8	0.4	-0.9	-0.9	-1.2	-0.7	-0.6
Labour input: hours worked (growth rate)	-0.8	0.3	-0.9	-0.9	-1.2	-0.7	-0.6
Labour productivity per hour (growth rate)	2.3	3.2	3.2	2.2	2.1	1.8	1.5
TFP (growth rate)	1.5	1.8	2.0	1.5	1.3	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.9	1.3	1.2	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	2.0	3.5	2.7	1.8	1.3	1.5	1.5
Potential GDP per worker (growth rate)	2.3	3.1	3.2	2.3	2.1	1.8	1.6
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-8,061	23,506	21,666	20,665	18,122	16,150	15,445
Population growth (working-age: 20-64)	0.6	-1.0	-0.2	-0.8	-1.5	-0.8	-0.4
Labour force 20-64 (thousands)	-6,079	17,798	16,662	15,493	13,647	12,356	11,719
Participation rate (20-64)	0.2	75.7	76.9	75.0	75.3	76.5	75.9
Participation rate (20-74)	-1.9	65.7	66.0	64.8	61.6	62.2	63.9
youngest (20-24)	0.3	61.3	60.9	61.7	61.7	61.4	61.6
prime-age (25-54)	0.8	85.3	85.2	85.5	86.3	86.2	86.1
older (55-64)	4.0	51.1	56.3	54.8	53.6	54.6	55.1
very old (65-74)	4.1	8.5	11.9	13.3	12.8	12.3	12.6
Participation rate (20-64) - FEMALES	0.6	68.0	69.6	67.2	67.6	69.3	68.5
Participation rate (20-74) - FEMALES	-0.9	57.7	58.4	57.0	53.9	55.1	56.8
youngest (20-24)	0.9	54.3	54.4	55.2	55.2	54.9	55.2
prime-age (25-54)	1.4	79.0	79.0	79.3	80.5	80.5	80.4
older (55-64)	3.7	40.3	46.3	43.7	41.8	43.3	44.0
very old (65-74)	2.8	5.5	8.1	9.1	8.5	8.0	8.4
Participation rate (20-64) - MALES	-0.6	83.5	84.1	82.6	82.8	83.4	82.9
Participation rate (20-74) - MALES	-3.4	74.1	73.8	72.7	69.2	69.2	70.7
youngest (20-24)	-0.3	68.0	67.1	67.8	67.8	67.6	67.8
prime-age (25-54)	0.0	91.6	91.3	91.4	91.9	91.6	91.6
older (55-64)	3.0	63.0	66.8	66.3	65.4	65.7	66.1
very old (65-74)	4.6	12.3	16.5	18.1	17.6	16.8	17.0
Average effective exit age (TOTAL) (1)	0.0	62.9	62.9	62.9	62.9	62.9	62.9
Men	0.0	64.5	64.5	64.5	64.5	64.5	64.5
Women	0.0	61.3	61.3	61.3	61.3	61.3	61.3
Employment rate (20-64)	-1.2	73.3	73.1	71.2	71.5	72.7	72.1
Employment rate (20-74)	-2.9	63.6	62.8	61.6	58.6	59.2	60.8
Unemployment rate (20-64)	1.8	3.2	4.9	5.0	5.0	5.0	5.0
Unemployment rate (20-74)	1.7	3.2	4.8	4.9	4.8	4.8	4.9
Employment (20-64) (in millions)	-6.1	17.2	15.8	14.7	13.0	11.7	11.1
Employment (20-74) (in millions)	-6.0	17.6	16.3	15.3	13.6	12.3	11.6
share of youngest (20-24)	-0.1	7%	6%	7%	6%	6%	6%
share of prime-age (25-54)	-5.5	77%	75%	70%	71%	73%	71%
share of older (55-64)	3.7	15%	15%	19%	19%	16%	18%
share of very old (65-74)	1.9	2%	3%	4%	5%	5%	4%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	3.9	22.0	21.1	27.2	27.5	23.8	25.9
Old-age dependency ratio 20-64 (3)	38.8	29.0	38.9	43.9	57.0	68.2	67.8
Total dependency ratio (4)	38.0	61.5	70.6	72.2	87.7	100.9	99.5
Total economic dependency ratio (5)	49.8	116.1	126.1	133.3	150.0	163.8	165.9
Economic old-age dependency ratio (20-64) (6)	52.4	37.5	49.9	57.9	74.7	89.0	90.0
Economic old-age dependency ratio (20-74) (7)	49.7	36.8	48.4	55.9	71.1	84.9	86.4

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

22. PORTUGAL

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.43	1.47	1.51	1.53	1.56	1.59
Life expectancy at birth							
males	7.1	78.6	80.2	81.7	83.2	84.5	85.7
females	5.6	84.8	86.0	87.2	88.3	89.4	90.4
Life expectancy at 65							
males	4.8	18.4	19.4	20.4	21.4	22.3	23.2
females	4.5	22.2	23.2	24.1	25.0	25.9	26.7
Net migration (thousand)	-21.5	40.1	9.9	12.3	14.3	16.3	18.6
Net migration as % of population	-0.2	0.4	0.1	0.1	0.2	0.2	0.2
Population (million)	-1.8	10.3	10.1	9.8	9.4	8.9	8.5
Young population (0-14) as % of total population	-1.2	19.0	17.5	17.4	17.3	17.3	17.7
Prime-age population (25-54) as % of total population	-7.5	40.0	36.2	33.0	32.5	32.1	32.5
Working-age population (20-64) as % of total population	-9.8	59.0	56.1	51.8	49.0	49.3	49.2
Elderly population (65 and over) as % of total population	11.1	22.0	26.5	30.9	33.7	33.4	33.1
Very elderly population (80 and over) as % of total population	8.2	6.5	8.0	10.3	12.8	15.2	14.7
Very elderly population (80 and over) as % of elderly population	15.0	29.5	30.4	33.4	37.9	45.4	44.5
Very elderly population (80 and over) as % of working age population	19.0	11.0	14.4	19.9	26.1	30.8	30.0
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	1.8	0.7	1.2	1.3	1.4	1.2
Employment (growth rate)	-0.5	1.4	-0.7	-0.9	-0.6	-0.4	-0.4
Labour input: hours worked (growth rate)	-0.5	1.3	-0.7	-0.9	-0.6	-0.4	-0.3
Labour productivity per hour (growth rate)	1.7	0.5	1.4	2.1	2.0	1.8	1.5
TFP (growth rate)	1.1	0.8	0.9	1.4	1.3	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.6	-0.3	0.5	0.7	0.7	0.6	0.5
Potential GDP per capita (growth rate)	1.6	1.8	1.0	1.5	1.8	1.9	1.6
Potential GDP per worker (growth rate)	1.7	0.4	1.4	2.1	2.0	1.8	1.6
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,908	6,070	5,648	5,058	4,581	4,379	4,162
Population growth (working-age: 20-64)	-0.2	-0.2	-0.9	-1.3	-0.6	-0.4	-0.5
Labour force 20-64 (thousands)	-1,374	4,942	4,685	4,226	3,884	3,729	3,568
Participation rate (20-64)	4.3	81.4	83.0	83.5	84.8	85.2	85.7
Participation rate (20-74)	2.1	70.9	70.1	69.5	70.2	72.7	73.0
youngest (20-24)	0.5	58.3	58.8	58.6	58.7	58.8	58.8
prime-age (25-54)	2.1	90.3	91.7	92.2	92.3	92.3	92.4
older (55-64)	14.0	64.5	69.9	71.6	74.5	76.9	78.4
very old (65-74)	7.0	16.1	15.4	18.8	18.9	21.1	23.1
Participation rate (20-64) - FEMALES	6.3	78.3	80.7	81.8	83.5	84.0	84.5
Participation rate (20-74) - FEMALES	4.8	66.7	67.6	67.4	68.4	71.2	71.5
youngest (20-24)	0.6	55.3	55.9	55.8	55.8	55.9	55.9
prime-age (25-54)	3.9	88.0	90.5	91.5	91.8	91.8	91.9
older (55-64)	16.9	58.7	65.4	67.7	71.5	74.3	75.6
very old (65-74)	13.1	9.5	14.2	17.8	18.0	20.3	22.7
Participation rate (20-64) - MALES	2.2	84.9	85.4	85.5	86.2	86.5	87.1
Participation rate (20-74) - MALES	-0.8	75.6	73.0	72.0	72.2	74.4	74.7
youngest (20-24)	0.4	61.2	61.6	61.5	61.5	61.6	61.6
prime-age (25-54)	0.2	92.7	92.9	92.9	92.9	92.8	92.9
older (55-64)	10.6	71.0	75.2	76.1	78.0	79.9	81.7
very old (65-74)	-0.4	24.0	16.9	20.0	20.0	22.0	23.6
Average effective exit age (TOTAL) (1)	2.1	64.3	64.8	65.2	65.6	65.9	66.4
Men	2.0	64.6	65.1	65.5	65.8	66.1	66.6
Women	2.2	64.1	64.6	65.0	65.4	65.8	66.2
Employment rate (20-64)	4.2	76.2	77.8	78.3	79.5	79.9	80.4
Employment rate (20-74)	2.2	66.4	65.9	65.3	66.0	68.3	68.6
Unemployment rate (20-64)	-0.2	6.4	6.2	6.2	6.2	6.2	6.2
Unemployment rate (20-74)	-0.3	6.3	6.1	6.1	6.0	6.0	6.0
Employment (20-64) (in millions)	-1.3	4.6	4.4	4.0	3.6	3.5	3.3
Employment (20-74) (in millions)	-1.2	4.8	4.6	4.2	3.9	3.7	3.6
share of youngest (20-24)	0.1	6%	6%	5%	6%	6%	6%
share of prime-age (25-54)	-5.9	73%	69%	67%	68%	67%	67%
share of older (55-64)	3.0	18%	21%	22%	20%	21%	21%
share of very old (65-74)	2.8	4%	4%	6%	6%	6%	7%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.9	23.2	26.3	27.1	24.1	25.0	24.1
Old-age dependency ratio 20-64 (3)	30.0	37.3	47.2	59.6	68.8	67.9	67.3
Total dependency ratio (4)	33.9	69.4	78.4	93.1	104.1	103.0	103.3
Total economic dependency ratio (5)	22.2	114.0	119.4	131.7	140.9	139.3	136.2
Economic old-age dependency ratio (20-64) (6)	31.5	44.9	56.0	69.5	79.8	78.6	76.4
Economic old-age dependency ratio (20-74) (7)	28.1	43.2	53.6	65.3	74.9	74.0	71.3

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

23. ROMANIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.65	1.66	1.70	1.72	1.73	1.74
Life expectancy at birth							
males	11.6	71.9	74.7	77.2	79.5	81.6	83.5
females	9.0	79.5	81.6	83.5	85.3	87.0	88.5
Life expectancy at 65							
males	7.2	14.9	16.5	18.0	19.5	20.8	22.1
females	6.8	18.6	20.1	21.6	22.9	24.2	25.4
Net migration (thousand)	94.5	-73.5	-40.0	-20.2	-2.0	10.4	21.0
Net migration as % of population	0.5	-0.4	-0.2	-0.1	0.0	0.1	0.2
Population (million)	-5.7	19.3	17.7	16.5	15.5	14.5	13.7
Young population (0-14) as % of total population	-3.3	21.0	19.3	18.0	18.0	17.8	17.8
Prime-age population (25-54) as % of total population	-9.2	42.6	38.0	34.9	33.5	33.4	33.4
Working-age population (20-64) as % of total population	-9.5	60.2	58.8	55.1	51.3	50.0	50.7
Elderly population (65 and over) as % of total population	12.8	18.7	21.8	26.9	30.7	32.2	31.5
Very elderly population (80 and over) as % of total population	9.6	4.7	5.8	8.4	10.2	13.2	14.3
Very elderly population (80 and over) as % of elderly population	20.2	25.2	26.6	31.0	33.3	41.0	45.4
Very elderly population (80 and over) as % of working age population	20.4	7.8	9.9	15.2	19.9	26.4	28.2
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.7	4.6	2.8	1.2	1.1	1.2	1.1
Employment (growth rate)	-0.9	-0.3	-0.8	-1.1	-1.1	-0.6	-0.5
Labour input: hours worked (growth rate)	-0.9	-0.4	-0.8	-1.1	-1.1	-0.6	-0.5
Labour productivity per hour (growth rate)	2.6	4.9	3.7	2.3	2.2	1.9	1.5
TFP (growth rate)	1.6	3.1	2.3	1.5	1.4	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.9	1.9	1.3	0.8	0.8	0.7	0.5
Potential GDP per capita (growth rate)	2.4	5.3	3.6	1.9	1.7	1.9	1.6
Potential GDP per worker (growth rate)	2.6	5.0	3.7	2.3	2.2	1.9	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-4,728	11,654	10,439	9,103	7,932	7,252	6,927
Population growth (working-age: 20-64)	0.8	-1.3	-0.5	-1.5	-1.2	-0.5	-0.5
Labour force 20-64 (thousands)	-3,330	8,594	7,760	6,762	5,985	5,542	5,264
Participation rate (20-64)	2.2	73.7	74.3	74.3	75.5	76.4	76.0
Participation rate (20-74)	0.5	64.7	65.1	62.6	62.8	64.3	65.1
youngest (20-24)	1.6	48.4	49.6	49.8	49.9	49.8	49.9
prime-age (25-54)	2.7	84.1	85.7	86.4	87.0	86.9	86.8
older (55-64)	8.2	49.0	55.2	54.9	55.2	57.6	57.2
very old (65-74)	4.5	13.4	15.5	17.4	16.9	17.0	17.9
Participation rate (20-64) - FEMALES	2.5	63.3	64.1	63.6	65.0	66.2	65.8
Participation rate (20-74) - FEMALES	1.1	54.6	54.9	52.4	52.8	54.8	55.8
youngest (20-24)	1.8	38.5	39.9	40.2	40.2	40.1	40.3
prime-age (25-54)	2.4	74.6	75.6	76.2	77.1	77.1	77.0
older (55-64)	9.0	37.2	45.4	44.3	43.9	46.6	46.3
very old (65-74)	1.9	12.1	12.0	14.0	13.3	13.2	14.1
Participation rate (20-64) - MALES	1.2	83.9	84.0	84.1	84.8	85.5	85.1
Participation rate (20-74) - MALES	-1.3	74.8	75.1	72.3	72.2	73.0	73.5
youngest (20-24)	1.1	57.7	58.5	58.8	58.8	58.7	58.8
prime-age (25-54)	2.4	93.0	94.8	95.2	95.5	95.5	95.4
older (55-64)	5.2	61.9	65.3	65.7	65.8	67.6	67.1
very old (65-74)	6.6	15.1	20.0	21.4	20.9	20.9	21.6
Average effective exit age (TOTAL) (1)	0.0	63.4	63.3	63.3	63.3	63.3	63.3
Men	0.0	64.1	64.1	64.1	64.1	64.1	64.1
Women	-0.1	62.7	62.6	62.6	62.6	62.6	62.6
Employment rate (20-64)	1.7	71.0	71.1	71.0	72.2	73.1	72.7
Employment rate (20-74)	0.1	62.3	62.3	60.0	60.2	61.7	62.4
Unemployment rate (20-64)	0.7	3.7	4.4	4.4	4.4	4.3	4.4
Unemployment rate (20-74)	0.6	3.6	4.2	4.1	4.1	4.1	4.1
Employment (20-64) (in millions)	-3.2	8.3	7.4	6.5	5.7	5.3	5.0
Employment (20-74) (in millions)	-3.2	8.6	7.7	6.9	6.1	5.6	5.3
share of youngest (20-24)	0.4	5%	5%	6%	5%	5%	5%
share of prime-age (25-54)	-6.8	78%	72%	70%	71%	72%	72%
share of older (55-64)	4.3	13%	19%	19%	18%	17%	18%
share of very old (65-74)	2.1	3%	4%	6%	6%	6%	5%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	3.9	20.7	26.0	26.8	25.5	23.5	24.5
Old-age dependency ratio 20-64 (3)	31.0	31.1	37.1	48.9	59.8	64.3	62.1
Total dependency ratio (4)	31.1	66.0	70.0	81.5	94.8	99.9	97.1
Total economic dependency ratio (5)	30.4	126.2	129.8	140.2	153.7	158.1	156.6
Economic old-age dependency ratio (20-64) (6)	39.3	40.5	48.1	62.5	76.5	82.0	79.8
Economic old-age dependency ratio (20-74) (7)	36.3	39.2	46.3	58.7	71.8	77.4	75.5

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

24. SLOVENIA

Main demographic and macroeconomic assumptions

Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.55	1.59	1.62	1.65	1.67	1.68
Life expectancy at birth							
males	7.2	78.7	80.3	81.8	83.3	84.6	85.9
females	5.9	84.5	85.8	87.1	88.2	89.4	90.4
Life expectancy at 65							
males	5.1	18.1	19.2	20.3	21.3	22.3	23.2
females	4.8	22.0	23.0	24.0	25.0	25.9	26.8
Net migration (thousand)	-10.5	15.7	4.5	4.6	4.9	5.2	5.2
Net migration as % of population	-0.5	0.8	0.2	0.2	0.2	0.3	0.3
Population (million)	-0.2	2.1	2.1	2.1	2.0	2.0	1.9
Young population (0-14) as % of total population	-1.8	19.6	18.6	17.2	17.9	18.0	17.8
Prime-age population (25-54) as % of total population	-7.5	41.4	37.4	35.0	34.1	34.2	33.9
Working-age population (20-64) as % of total population	-8.6	60.4	56.7	54.9	51.3	50.7	51.8
Elderly population (65 and over) as % of total population	10.4	20.0	24.7	28.0	30.8	31.3	30.4
Very elderly population (80 and over) as % of total population	8.4	5.4	6.8	9.5	11.2	12.9	13.8
Very elderly population (80 and over) as % of elderly population	18.6	26.9	27.4	33.9	36.5	41.2	45.4
Very elderly population (80 and over) as % of working age population	17.8	8.9	11.9	17.3	21.9	25.4	26.7
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.6	2.4	2.2	1.2	1.1	1.5	1.3
Employment (growth rate)	-0.3	1.0	-0.5	-0.6	-0.6	-0.2	-0.2
Labour input: hours worked (growth rate)	-0.3	0.5	-0.5	-0.6	-0.6	-0.2	-0.2
Labour productivity per hour (growth rate)	1.9	1.8	2.7	1.8	1.7	1.6	1.5
TFP (growth rate)	1.3	1.9	1.8	1.2	1.1	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.6	-0.1	0.9	0.6	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.8	1.7	2.3	1.3	1.3	1.7	1.6
Potential GDP per worker (growth rate)	1.9	1.3	2.7	1.8	1.7	1.6	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-258	1,261	1,195	1,141	1,048	1,007	1,002
Population growth (working-age: 20-64)	0.0	-0.1	-0.4	-0.7	-0.7	-0.1	-0.1
Labour force 20-64 (thousands)	-175	1,007	986	938	871	841	832
Participation rate (20-64)	3.1	79.9	82.5	82.2	83.1	83.5	83.0
Participation rate (20-74)	1.5	68.4	68.9	68.4	67.5	69.2	69.9
youngest (20-24)	0.3	59.3	58.8	59.7	59.5	59.3	59.5
prime-age (25-54)	1.1	92.4	93.0	93.2	93.7	93.6	93.5
older (55-64)	14.3	50.3	63.6	63.7	62.9	64.1	64.6
very old (65-74)	4.8	4.6	8.0	9.5	9.3	9.1	9.4
Participation rate (20-64) - FEMALES	4.4	76.6	80.0	79.8	81.0	81.6	81.0
Participation rate (20-74) - FEMALES	3.9	64.5	65.7	65.7	65.5	67.6	68.4
youngest (20-24)	0.4	53.5	53.3	54.1	53.9	53.7	53.9
prime-age (25-54)	1.4	90.4	90.9	91.3	92.0	91.9	91.8
older (55-64)	17.6	45.6	62.0	61.8	61.0	62.8	63.2
very old (65-74)	6.4	3.0	8.0	9.4	9.1	8.9	9.4
Participation rate (20-64) - MALES	1.8	83.0	84.8	84.2	84.8	85.2	84.8
Participation rate (20-74) - MALES	-0.8	72.1	71.9	70.8	69.3	70.5	71.3
youngest (20-24)	0.3	64.4	63.9	64.8	64.7	64.4	64.7
prime-age (25-54)	0.7	94.3	94.7	94.9	95.1	95.0	95.0
older (55-64)	10.8	54.9	65.1	65.3	64.5	65.2	65.7
very old (65-74)	3.0	6.4	7.9	9.6	9.4	9.2	9.4
Average effective exit age (TOTAL) (1)	0.9	62.0	62.9	62.9	62.9	62.9	62.9
Men	0.9	62.1	63.0	63.0	63.0	63.0	63.0
Women	0.8	62.0	62.8	62.8	62.8	62.8	62.8
Employment rate (20-64)	1.9	76.4	77.9	77.5	78.4	78.8	78.3
Employment rate (20-74)	0.6	65.5	65.1	64.6	63.8	65.4	66.1
Unemployment rate (20-64)	1.3	4.4	5.6	5.7	5.7	5.6	5.7
Unemployment rate (20-74)	1.2	4.3	5.5	5.5	5.5	5.5	5.5
Employment (20-64) (in millions)	-0.2	1.0	0.9	0.9	0.8	0.8	0.8
Employment (20-74) (in millions)	-0.2	1.0	1.0	0.9	0.8	0.8	0.8
share of youngest (20-24)	0.9	6%	6%	7%	6%	7%	7%
share of prime-age (25-54)	-6.5	79%	73%	71%	73%	74%	72%
share of older (55-64)	4.1	15%	18%	20%	18%	17%	19%
share of very old (65-74)	1.5	1%	2%	3%	3%	3%	3%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	1.3	23.4	24.5	26.5	24.5	22.6	24.7
Old-age dependency ratio 20-64 (3)	25.5	33.2	43.5	51.0	59.9	61.7	58.8
Total dependency ratio (4)	27.5	65.7	76.2	82.3	94.8	97.3	93.2
Total economic dependency ratio (5)	25.9	114.5	121.3	128.7	140.9	143.6	140.4
Economic old-age dependency ratio (20-64) (6)	30.0	42.4	53.5	62.9	73.3	75.6	72.4
Economic old-age dependency ratio (20-74) (7)	28.7	41.9	52.4	61.2	71.1	73.5	70.6

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

25. SLOVAKIA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.56	1.59	1.61	1.63	1.65	1.67
Life expectancy at birth							
males	9.7	74.4	76.5	78.6	80.6	82.4	84.1
females	7.8	81.2	82.9	84.6	86.2	87.6	89.0
Life expectancy at 65							
males	6.5	15.6	17.0	18.4	19.7	21.0	22.1
females	6.1	19.6	20.8	22.1	23.4	24.6	25.7
Net migration (thousand)	3.9	3.4	4.5	5.0	5.4	6.3	7.4
Net migration as % of population	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Population (million)	-0.7	5.5	5.4	5.3	5.1	4.9	4.7
Young population (0-14) as % of total population	-2.5	20.6	20.2	18.4	18.1	18.3	18.1
Prime-age population (25-54) as % of total population	-11.3	44.4	40.4	35.7	33.4	33.3	33.1
Working-age population (20-64) as % of total population	-12.9	63.1	58.7	57.0	52.3	49.1	50.2
Elderly population (65 and over) as % of total population	15.4	16.3	21.1	24.6	29.6	32.6	31.7
Very elderly population (80 and over) as % of total population	11.3	3.3	5.0	7.7	9.0	12.2	14.6
Very elderly population (80 and over) as % of elderly population	25.7	20.4	23.5	31.4	30.4	37.4	46.1
Very elderly population (80 and over) as % of working age population	23.8	5.3	8.5	13.5	17.2	24.8	29.1
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	2.3	1.7	1.2	1.0	1.3	1.2
Employment (growth rate)	-0.7	0.9	-0.8	-1.0	-1.1	-0.5	-0.4
Labour input: hours worked (growth rate)	-0.7	0.4	-0.8	-1.0	-1.1	-0.5	-0.4
Labour productivity per hour (growth rate)	2.1	1.9	2.5	2.2	2.0	1.8	1.5
TFP (growth rate)	1.3	0.9	1.6	1.4	1.3	1.2	1.0
Capital deepening (contribution to labour productivity growth)	0.8	1.0	0.9	0.8	0.7	0.6	0.5
Potential GDP per capita (growth rate)	1.6	2.2	1.9	1.5	1.3	1.7	1.7
Potential GDP per worker (growth rate)	2.0	1.3	2.5	2.2	2.1	1.8	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-1,073	3,441	3,193	3,025	2,688	2,427	2,367
Population growth (working-age: 20-64)	0.5	-0.7	-0.5	-0.9	-1.3	-0.6	-0.2
Labour force 20-64 (thousands)	-875	2,683	2,484	2,273	2,025	1,863	1,809
Participation rate (20-64)	-1.6	78.0	77.8	75.1	75.3	76.8	76.4
Participation rate (20-74)	-4.4	68.2	66.1	63.2	60.0	61.3	63.8
youngest (20-24)	1.9	50.4	51.9	52.3	52.5	52.2	52.3
prime-age (25-54)	-0.4	86.6	86.1	86.0	86.1	86.4	86.2
older (55-64)	-0.9	60.5	62.4	58.5	57.6	58.3	59.6
very old (65-74)	-1.2	7.0	5.6	6.5	5.9	5.6	5.8
Participation rate (20-64) - FEMALES	-2.7	71.3	71.0	67.7	67.3	68.9	68.6
Participation rate (20-74) - FEMALES	-4.2	61.1	59.2	56.1	52.9	54.3	56.9
youngest (20-24)	2.9	37.4	39.9	40.2	40.4	40.2	40.3
prime-age (25-54)	-1.3	79.6	79.3	78.4	77.9	78.5	78.3
older (55-64)	-3.9	57.7	58.2	53.2	51.8	52.3	53.8
very old (65-74)	-1.0	5.4	4.7	5.1	4.5	4.3	4.4
Participation rate (20-64) - MALES	-0.8	84.6	84.4	82.3	83.0	84.2	83.9
Participation rate (20-74) - MALES	-4.9	75.5	72.9	70.2	67.0	68.1	70.5
youngest (20-24)	0.9	62.9	63.3	63.7	63.9	63.6	63.7
prime-age (25-54)	0.4	93.2	92.7	93.2	93.9	93.8	93.6
older (55-64)	1.7	63.5	66.7	63.9	63.2	64.1	65.3
very old (65-74)	-1.8	9.0	6.6	8.1	7.3	7.1	7.3
Average effective exit age (TOTAL) (1)	0.5	61.7	62.2	62.2	62.2	62.2	62.2
Men	0.7	62.0	62.7	62.7	62.7	62.7	62.7
Women	0.3	61.4	61.7	61.7	61.7	61.7	61.7
Employment rate (20-64)	-2.3	73.6	71.8	69.7	70.3	71.6	71.3
Employment rate (20-74)	-4.8	64.4	61.0	58.7	56.1	57.3	59.6
Unemployment rate (20-64)	1.1	5.6	7.8	7.3	6.7	6.7	6.7
Unemployment rate (20-74)	1.1	5.5	7.7	7.1	6.6	6.5	6.6
Employment (20-64) (in millions)	-0.8	2.5	2.3	2.1	1.9	1.7	1.7
Employment (20-74) (in millions)	-0.9	2.6	2.3	2.1	1.9	1.8	1.7
share of youngest (20-24)	1.0	5%	5%	6%	6%	6%	6%
share of prime-age (25-54)	-3.8	77%	76%	71%	72%	75%	73%
share of older (55-64)	2.5	16%	18%	21%	20%	17%	19%
share of very old (65-74)	0.2	1%	1%	2%	2%	2%	2%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	3.1	20.9	22.3	27.5	27.0	22.4	24.1
Old-age dependency ratio 20-64 (3)	37.2	25.9	35.9	43.1	56.5	66.3	63.1
Total dependency ratio (4)	40.6	58.5	70.3	75.4	91.1	103.6	99.1
Total economic dependency ratio (5)	62.3	112.1	133.8	146.8	165.8	178.2	174.3
Economic old-age dependency ratio (20-64) (6)	53.1	33.6	48.5	59.9	78.1	90.4	86.7
Economic old-age dependency ratio (20-74) (7)	52.1	33.1	47.8	58.8	76.3	88.5	85.2

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

26. FINLAND

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.2	1.35	1.38	1.42	1.46	1.50	1.53
Life expectancy at birth							
males	6.6	79.5	80.9	82.3	83.7	85.0	86.1
females	5.6	84.8	86.0	87.3	88.4	89.4	90.4
Life expectancy at 65							
males	4.6	18.9	19.8	20.8	21.7	22.7	23.5
females	4.5	22.3	23.3	24.2	25.1	26.0	26.8
Net migration (thousand)	-4.4	17.6	11.3	11.5	12.2	12.7	13.2
Net migration as % of population	-0.1	0.3	0.2	0.2	0.2	0.2	0.3
Population (million)	-0.5	5.5	5.5	5.4	5.3	5.1	5.0
Young population (0-14) as % of total population	-4.7	21.2	18.8	17.4	17.5	16.9	16.5
Prime-age population (25-54) as % of total population	-4.5	37.7	37.8	38.0	36.1	34.9	33.3
Working-age population (20-64) as % of total population	-5.3	56.7	55.3	55.7	54.2	52.5	51.4
Elderly population (65 and over) as % of total population	10.0	22.1	25.9	27.0	28.3	30.6	32.1
Very elderly population (80 and over) as % of total population	7.8	5.6	8.4	10.4	11.2	11.6	13.4
Very elderly population (80 and over) as % of elderly population	16.5	25.2	32.5	38.4	39.4	38.0	41.7
Very elderly population (80 and over) as % of working age population	16.2	9.8	15.2	18.6	20.6	22.1	26.1
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.2	1.2	1.3	1.4	1.2	1.2	1.2
Employment (growth rate)	-0.2	0.6	0.0	-0.2	-0.4	-0.4	-0.3
Labour input: hours worked (growth rate)	-0.3	0.3	0.0	-0.2	-0.4	-0.4	-0.3
Labour productivity per hour (growth rate)	1.5	0.8	1.3	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	0.4	0.9	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.5	0.4	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.4	1.0	1.4	1.6	1.4	1.4	1.4
Potential GDP per worker (growth rate)	1.4	0.6	1.3	1.6	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-546	3,131	3,053	3,018	2,863	2,701	2,585
Population growth (working-age: 20-64)	-0.2	-0.3	-0.1	-0.4	-0.6	-0.6	-0.5
Labour force 20-64 (thousands)	-377	2,572	2,520	2,523	2,412	2,288	2,196
Participation rate (20-64)	2.8	82.2	82.6	83.6	84.2	84.7	85.0
Participation rate (20-74)	4.0	69.2	69.8	71.9	71.8	72.0	73.2
youngest (20-24)	3.9	70.7	74.5	74.7	74.6	74.6	74.6
prime-age (25-54)	0.2	87.6	87.8	87.7	87.9	88.0	87.8
older (55-64)	9.9	71.5	69.6	74.8	77.7	79.6	81.4
very old (65-74)	13.3	11.5	11.5	13.3	16.9	20.7	24.8
Participation rate (20-64) - FEMALES	3.1	80.1	80.5	81.8	82.7	83.2	83.2
Participation rate (20-74) - FEMALES	4.9	66.2	66.9	69.3	69.6	69.9	71.1
youngest (20-24)	4.7	67.9	72.6	72.8	72.6	72.6	72.6
prime-age (25-54)	0.7	84.8	85.2	85.4	85.7	85.8	85.5
older (55-64)	9.2	72.1	70.0	74.6	78.4	80.0	81.3
very old (65-74)	13.9	8.2	8.3	10.1	13.2	17.5	22.2
Participation rate (20-64) - MALES	2.4	84.2	84.5	85.4	85.7	86.2	86.6
Participation rate (20-74) - MALES	3.0	72.2	72.7	74.4	74.0	74.0	75.3
youngest (20-24)	3.2	73.3	76.3	76.6	76.4	76.4	76.5
prime-age (25-54)	-0.3	90.3	90.4	90.0	90.1	90.0	90.0
older (55-64)	10.7	70.8	69.1	75.0	76.9	79.3	81.5
very old (65-74)	12.4	15.1	15.0	16.7	20.8	23.9	27.5
Average effective exit age (TOTAL) (1)	3.4	63.7	64.4	65.1	65.8	66.4	67.1
Men	3.5	63.9	64.7	65.4	66.1	66.7	67.4
Women	3.3	63.5	64.1	64.8	65.5	66.1	66.8
Employment rate (20-64)	2.6	77.1	77.6	78.4	79.1	79.5	79.7
Employment rate (20-74)	3.8	65.1	65.7	67.6	67.5	67.7	68.9
Unemployment rate (20-64)	0.1	6.1	6.0	6.2	6.2	6.1	6.2
Unemployment rate (20-74)	-0.1	6.0	5.9	6.1	6.0	5.9	5.9
Employment (20-64) (in millions)	-0.4	2.4	2.4	2.4	2.3	2.1	2.1
Employment (20-74) (in millions)	-0.3	2.5	2.4	2.4	2.4	2.3	2.2
share of youngest (20-24)	-0.8	8%	9%	7%	7%	7%	7%
share of prime-age (25-54)	-6.4	70%	71%	70%	67%	66%	63%
share of older (55-64)	3.6	20%	17%	20%	22%	21%	23%
share of very old (65-74)	3.7	3%	3%	3%	5%	6%	7%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.7	23.3	21.2	22.8	24.6	24.2	26.0
Old-age dependency ratio 20-64 (3)	23.6	38.9	46.8	48.4	52.3	58.2	62.5
Total dependency ratio (4)	18.3	76.4	80.7	79.6	84.6	90.5	94.7
Total economic dependency ratio (5)	6.1	121.4	125.8	121.6	122.9	125.3	127.5
Economic old-age dependency ratio (20-64) (6)	23.8	47.1	57.1	58.3	61.3	66.8	70.9
Economic old-age dependency ratio (20-74) (7)	20.4	45.6	55.4	56.4	58.5	62.8	66.0

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

27. SWEDEN

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.71	1.75	1.78	1.78	1.78	1.78
Life expectancy at birth							
males	5.4	81.4	82.5	83.7	84.8	85.8	86.8
females	5.6	84.7	85.9	87.1	88.2	89.3	90.3
Life expectancy at 65							
males	4.0	19.7	20.4	21.3	22.2	23.0	23.7
females	4.6	22.0	22.9	23.9	24.8	25.7	26.6
Net migration (thousand)	-36.4	66.7	52.1	45.5	39.8	35.1	30.3
Net migration as % of population	-0.4	0.6	0.5	0.4	0.3	0.3	0.2
Population (million)	2.8	10.3	11.1	11.7	12.3	12.7	13.1
Young population (0-14) as % of total population	-2.4	23.3	22.8	21.8	21.8	21.5	20.9
Prime-age population (25-54) as % of total population	-4.3	39.6	37.7	38.1	36.5	36.1	35.3
Working-age population (20-64) as % of total population	-4.0	56.8	55.7	55.4	54.7	52.9	52.8
Elderly population (65 and over) as % of total population	6.3	20.0	21.4	22.8	23.5	25.6	26.3
Very elderly population (80 and over) as % of total population	5.5	5.2	7.2	7.7	8.8	9.5	10.6
Very elderly population (80 and over) as % of elderly population	14.6	25.8	33.7	33.8	37.2	36.9	40.4
Very elderly population (80 and over) as % of working age population	11.0	9.1	13.0	13.9	16.0	17.9	20.1
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.8	1.8	2.2	1.9	1.7	1.7	1.7
Employment (growth rate)	0.4	1.1	1.1	0.4	0.2	0.2	0.1
Labour input: hours worked (growth rate)	0.4	0.8	1.1	0.4	0.2	0.2	0.1
Labour productivity per hour (growth rate)	1.4	1.0	1.1	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	0.5	0.8	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.5	0.3	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.3	0.8	1.6	1.4	1.3	1.4	1.4
Potential GDP per worker (growth rate)	1.3	0.7	1.0	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	1,075	5,833	6,205	6,489	6,716	6,730	6,908
Population growth (working-age: 20-64)	-0.5	0.7	0.4	0.4	0.2	0.1	0.1
Labour force 20-64 (thousands)	921	5,094	5,414	5,664	5,850	5,877	6,015
Participation rate (20-64)	-0.3	87.3	87.2	87.3	87.1	87.3	87.1
Participation rate (20-74)	-0.6	76.2	76.6	76.1	76.2	74.8	75.6
youngest (20-24)	3.6	71.5	75.1	75.2	75.2	75.2	75.2
prime-age (25-54)	0.5	91.2	91.7	91.7	91.8	91.8	91.7
older (55-64)	-2.8	81.7	79.4	78.9	78.9	78.9	78.9
very old (65-74)	-0.4	17.8	17.8	17.5	17.5	17.3	17.4
Participation rate (20-64) - FEMALES	0.4	84.8	85.0	85.2	85.1	85.4	85.1
Participation rate (20-74) - FEMALES	0.1	73.2	73.7	73.3	73.6	72.4	73.4
youngest (20-24)	5.2	68.7	73.9	74.0	74.0	74.0	74.0
prime-age (25-54)	1.3	88.7	89.7	89.9	90.0	90.1	90.0
older (55-64)	-3.3	79.1	76.1	75.3	75.7	75.8	75.9
very old (65-74)	-1.3	14.8	13.4	13.6	13.4	13.4	13.5
Participation rate (20-64) - MALES	-0.9	89.8	89.4	89.3	89.0	89.1	88.9
Participation rate (20-74) - MALES	-1.3	79.1	79.4	78.6	78.6	77.2	77.8
youngest (20-24)	2.2	74.1	76.3	76.4	76.4	76.3	76.3
prime-age (25-54)	-0.3	93.7	93.6	93.3	93.4	93.4	93.3
older (55-64)	-2.5	84.3	82.6	82.4	81.9	81.7	81.8
very old (65-74)	0.2	20.9	22.3	21.4	21.5	21.2	21.2
Average effective exit age (TOTAL) (1)	0.1	65.0	65.1	65.1	65.1	65.1	65.1
Men	0.0	65.6	65.6	65.6	65.6	65.6	65.6
Women	0.1	64.5	64.6	64.6	64.6	64.6	64.6
Employment rate (20-64)	0.8	82.1	83.1	83.2	83.0	83.2	83.0
Employment rate (20-74)	0.4	71.8	73.1	72.6	72.7	71.4	72.2
Unemployment rate (20-64)	-1.2	5.9	4.7	4.7	4.7	4.7	4.7
Unemployment rate (20-74)	-1.2	5.8	4.6	4.6	4.6	4.6	4.6
Employment (20-64) (in millions)	0.9	4.8	5.2	5.4	5.6	5.6	5.7
Employment (20-74) (in millions)	1.0	5.0	5.4	5.6	5.8	5.9	6.0
share of youngest (20-24)	1.0	7%	9%	8%	8%	8%	8%
share of prime-age (25-54)	-2.5	70%	69%	70%	68%	69%	68%
share of older (55-64)	1.4	18%	19%	18%	20%	18%	20%
share of very old (65-74)	0.0	4%	4%	4%	4%	4%	4%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	2.3	20.2	21.3	20.3	22.8	21.0	22.5
Old-age dependency ratio 20-64 (3)	14.6	35.2	38.4	41.2	43.0	48.4	49.8
Total dependency ratio (4)	13.2	76.2	79.4	80.7	82.8	89.1	89.4
Total economic dependency ratio (5)	13.1	106.2	107.9	108.9	112.1	117.5	119.3
Economic old-age dependency ratio (20-64) (6)	17.2	38.7	42.3	45.5	47.9	53.6	55.9
Economic old-age dependency ratio (20-74) (7)	16.5	37.2	40.8	43.8	46.2	51.3	53.7

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

28. NORWAY

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.53	1.55	1.58	1.60	1.62	1.65
Life expectancy at birth							
males	5.5	81.4	82.5	83.7	84.8	85.9	86.9
females	5.7	84.6	85.9	87.1	88.2	89.3	90.3
Life expectancy at 65							
males	4.1	19.7	20.5	21.4	22.2	23.0	23.8
females	4.7	21.9	22.9	23.9	24.8	25.7	26.6
Net migration (thousand)	-1.9	25.3	27.2	25.9	25.2	24.4	23.4
Net migration as % of population	-0.1	0.5	0.5	0.4	0.4	0.4	0.3
Population (million)	1.4	5.3	5.8	6.1	6.4	6.6	6.7
Young population (0-14) as % of total population	-4.3	23.4	21.3	20.4	20.0	19.5	19.2
Prime-age population (25-54) as % of total population	-5.4	40.9	39.4	39.3	37.7	36.6	35.5
Working-age population (20-64) as % of total population	-6.1	59.2	58.1	56.4	55.5	54.2	53.0
Elderly population (65 and over) as % of total population	10.4	17.4	20.6	23.3	24.5	26.3	27.8
Very elderly population (80 and over) as % of total population	6.7	4.3	6.2	7.6	9.1	10.0	10.9
Very elderly population (80 and over) as % of elderly population	14.7	24.5	30.1	32.7	37.1	37.8	39.3
Very elderly population (80 and over) as % of working age population	13.4	7.2	10.6	13.5	16.4	18.4	20.6
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.7	1.8	1.6	1.8	1.7	1.6	1.5
Employment (growth rate)	0.2	1.7	0.5	0.2	0.2	0.0	0.0
Labour input: hours worked (growth rate)	0.2	1.7	0.2	0.2	0.2	0.0	0.0
Labour productivity per hour (growth rate)	1.5	0.1	1.4	1.5	1.5	1.5	1.5
TFP (growth rate)	0.9	-0.2	1.0	1.0	1.0	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.3	0.4	0.5	0.5	0.5	0.5
Potential GDP per capita (growth rate)	1.2	1.1	1.0	1.3	1.4	1.3	1.3
Potential GDP per worker (growth rate)	1.5	0.1	1.2	1.5	1.5	1.5	1.5
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	398	3,164	3,360	3,444	3,532	3,554	3,562
Population growth (working-age: 20-64)	-0.6	0.6	0.5	0.2	0.2	0.0	0.0
Labour force 20-64 (thousands)	294	2,599	2,737	2,809	2,874	2,888	2,893
Participation rate (20-64)	-0.9	82.1	81.5	81.6	81.4	81.3	81.2
Participation rate (20-74)	-3.1	73.1	72.2	71.2	71.4	70.2	70.0
youngest (20-24)	1.6	70.7	72.2	72.4	72.3	72.3	72.3
prime-age (25-54)	0.0	86.3	86.1	86.2	86.3	86.3	86.3
older (55-64)	-3.6	73.9	71.5	70.0	70.3	70.2	70.3
very old (65-74)	-0.8	19.0	19.9	18.5	18.6	18.5	18.2
Participation rate (20-64) - FEMALES	0.3	79.1	78.9	79.3	79.5	79.5	79.4
Participation rate (20-74) - FEMALES	-2.0	69.6	69.1	68.4	69.0	67.9	67.6
youngest (20-24)	1.7	69.1	70.7	71.0	70.8	70.8	70.8
prime-age (25-54)	1.7	83.5	84.0	84.9	85.2	85.2	85.2
older (55-64)	-2.9	69.4	66.8	64.3	66.0	66.4	66.5
very old (65-74)	-1.0	14.9	15.1	14.0	13.8	14.1	13.9
Participation rate (20-64) - MALES	-2.1	85.0	83.9	83.7	83.1	82.9	82.9
Participation rate (20-74) - MALES	-4.2	76.4	75.2	73.8	73.7	72.5	72.2
youngest (20-24)	1.5	72.2	73.7	73.8	73.7	73.7	73.7
prime-age (25-54)	-1.6	89.0	88.1	87.5	87.4	87.3	87.4
older (55-64)	-4.5	78.3	76.0	75.4	74.2	73.8	73.9
very old (65-74)	-0.9	23.2	24.6	23.1	23.3	22.7	22.3
Average effective exit age (TOTAL) (1)	0.0	65.4	65.4	65.4	65.4	65.4	65.4
Men	0.0	66.0	66.0	66.0	66.0	66.0	66.0
Women	0.0	64.7	64.7	64.7	64.7	64.7	64.7
Employment rate (20-64)	-0.7	79.4	78.9	79.0	78.9	78.7	78.7
Employment rate (20-74)	-2.9	70.7	69.9	69.0	69.2	68.1	67.9
Unemployment rate (20-64)	-0.2	3.3	3.2	3.1	3.1	3.1	3.1
Unemployment rate (20-74)	-0.2	3.2	3.1	3.0	3.0	3.0	3.0
Employment (20-64) (in millions)	0.3	2.5	2.6	2.7	2.8	2.8	2.8
Employment (20-74) (in millions)	0.3	2.6	2.8	2.8	2.9	2.9	2.9
share of youngest (20-24)	-0.6	9%	9%	8%	8%	8%	8%
share of prime-age (25-54)	-2.2	70%	69%	71%	69%	68%	68%
share of older (55-64)	1.9	18%	19%	17%	19%	19%	20%
share of very old (65-74)	0.9	4%	4%	4%	4%	5%	5%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	3.2	20.0	21.7	20.5	22.5	22.7	23.3
Old-age dependency ratio 20-64 (3)	23.0	29.4	35.4	41.3	44.1	48.5	52.4
Total dependency ratio (4)	19.6	69.0	72.1	77.4	80.1	84.4	88.6
Total economic dependency ratio (5)	23.7	104.6	109.0	114.7	118.7	123.2	128.3
Economic old-age dependency ratio (20-64) (6)	28.6	33.0	40.4	47.6	51.4	56.6	61.6
Economic old-age dependency ratio (20-74) (7)	27.0	31.7	38.7	45.5	49.3	54.0	58.7

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

29. EUROPEAN UNION

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.52	1.55	1.59	1.61	1.63	1.65
Life expectancy at birth							
males	7.4	78.7	80.4	82.0	83.5	84.8	86.1
females	6.1	84.2	85.6	86.9	88.2	89.3	90.3
Life expectancy at 65							
males	5.1	18.4	19.5	20.6	21.6	22.6	23.5
females	4.8	22.0	23.0	24.1	25.1	25.9	26.8
Net migration (thousand)	-280.7	1317.5	960.0	980.8	1001.3	1020.4	1036.8
Net migration as % of population	-0.1	0.3	0.2	0.2	0.2	0.2	0.2
Population (million)	-23.2	447.2	449.1	446.6	440.8	432.0	424.0
Young population (0-14) as % of total population	-1.9	20.3	19.2	18.4	18.5	18.5	18.5
Prime-age population (25-54) as % of total population	-6.6	40.4	37.2	35.6	34.6	34.3	33.9
Working-age population (20-64) as % of total population	-8.0	59.3	56.5	53.9	52.0	51.2	51.2
Elderly population (65 and over) as % of total population	9.9	20.4	24.4	27.7	29.6	30.3	30.3
Very elderly population (80 and over) as % of total population	7.3	5.9	7.3	9.3	11.4	12.6	13.2
Very elderly population (80 and over) as % of elderly population	14.7	28.8	29.9	33.6	38.6	41.5	43.5
Very elderly population (80 and over) as % of working age population	15.8	9.9	12.9	17.3	21.9	24.6	25.7
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	1.6	1.1	1.4	1.4	1.4	1.4
Employment (growth rate)	-0.2	0.7	-0.3	-0.3	-0.3	-0.2	-0.2
Labour input: hours worked (growth rate)	-0.2	0.6	-0.3	-0.4	-0.4	-0.2	-0.2
Labour productivity per hour (growth rate)	1.6	1.0	1.4	1.8	1.8	1.7	1.6
TFP (growth rate)	1.0	0.6	0.9	1.2	1.1	1.1	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.3	0.5	0.6	0.6	0.6	0.6
Potential GDP per capita (growth rate)	1.4	1.4	1.1	1.5	1.6	1.7	1.6
Potential GDP per worker (growth rate)	1.5	0.9	1.4	1.8	1.7	1.6	1.6
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-47,860	265,024	253,521	240,781	229,065	221,135	217,163
Population growth (working-age: 20-64)	0.0	-0.2	-0.5	-0.5	-0.4	-0.2	-0.2
Labour force 20-64 (thousands)	-32,100	207,378	201,657	192,693	184,197	178,519	175,278
Participation rate (20-64)	2.5	78.2	79.5	80.0	80.4	80.7	80.7
Participation rate (20-74)	1.7	67.8	68.0	67.8	68.3	68.9	69.5
youngest (20-24)	1.7	60.3	60.9	61.8	61.9	61.8	62.0
prime-age (25-54)	0.8	85.9	86.4	86.5	86.7	86.7	86.7
older (55-64)	9.6	62.3	68.6	69.8	70.3	71.6	71.9
very old (65-74)	10.1	9.8	14.9	16.5	17.4	18.4	19.9
Participation rate (20-64) - FEMALES	4.4	72.2	74.7	75.6	76.1	76.6	76.6
Participation rate (20-74) - FEMALES	3.9	61.7	63.0	63.3	64.0	64.8	65.6
youngest (20-24)	2.2	55.8	56.6	57.6	57.9	57.7	58.0
prime-age (25-54)	2.2	80.2	81.5	81.9	82.3	82.4	82.4
older (55-64)	12.9	55.4	63.6	65.6	66.5	68.1	68.4
very old (65-74)	11.0	7.1	12.7	14.6	15.6	16.5	18.1
Participation rate (20-64) - MALES	0.5	84.2	84.3	84.4	84.6	84.7	84.7
Participation rate (20-74) - MALES	-0.7	74.0	73.1	72.4	72.6	72.9	73.4
youngest (20-24)	1.4	64.5	64.9	65.7	65.8	65.6	65.9
prime-age (25-54)	-0.7	91.6	91.1	90.8	91.0	90.9	90.9
older (55-64)	5.8	69.7	73.8	74.2	74.2	75.0	75.5
very old (65-74)	8.8	12.9	17.5	18.5	19.3	20.4	21.7
Average effective exit age (TOTAL) (1)	1.8	63.8	64.8	65.1	65.3	65.5	65.6
Men	1.8	64.0	65.0	65.3	65.5	65.7	65.8
Women	1.9	63.5	64.6	64.9	65.1	65.3	65.4
Employment rate (20-64)	3.1	73.1	74.0	75.0	75.9	76.3	76.2
Employment rate (20-74)	2.4	63.4	63.4	63.7	64.6	65.2	65.8
Unemployment rate (20-64)	-1.0	6.6	7.0	6.3	5.6	5.5	5.5
Unemployment rate (20-74)	-1.1	6.5	6.8	6.1	5.4	5.4	5.4
Employment (20-64) (in millions)	-28.2	193.7	187.6	180.6	173.9	168.6	165.6
Employment (20-74) (in millions)	-23.2	198.3	195.6	189.8	183.2	178.0	175.1
share of youngest (20-24)	0.4	6%	7%	7%	6%	7%	7%
share of prime-age (25-54)	-6.0	73%	69%	68%	68%	68%	67%
share of older (55-64)	2.5	18%	20%	20%	20%	20%	20%
share of very old (65-74)	3.1	2%	4%	5%	5%	5%	5%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	1.3	22.7	24.4	24.3	23.9	23.2	24.0
Old-age dependency ratio 20-64 (3)	24.7	34.4	43.1	51.4	56.9	59.2	59.2
Total dependency ratio (4)	26.5	68.8	77.1	85.5	92.5	95.4	95.3
Total economic dependency ratio (5)	16.6	125.5	129.6	135.3	140.6	142.7	142.2
Economic old-age dependency ratio (20-64) (6)	27.0	44.7	53.9	63.3	69.5	71.9	71.7
Economic old-age dependency ratio (20-74) (7)	24.2	43.7	51.7	60.2	66.0	68.2	67.8

LEGENDA:
*** The potential GDP and its components are used to estimate the rate of potential output growth, net of normal cyclical variations**
(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
(2) Share of older population = Population aged 55 to 64 as a % of the population aged 20-64
(3) Old-age dependency ratio = Population aged 65 and over as a % of the population aged 20-64
(4) Total dependency ratio = Population under 20 and over 64 as a % of the population aged 20-64
(5) Total economic dependency ratio = Total population less employed as a % of the employed population 20-74
(6) Economic old-age dependency ratio (20-64) = Inactive population aged 65+ as a % of the employed population 20-64
(7) Economic old-age dependency ratio (20-74) = Inactive population aged 65+ as a % of the employed population 20-74
NB: ":" = missing data

30. EURO AREA

Main demographic and macroeconomic assumptions							
Demographic projections - EUROPOP2019 (EUROSTAT)	Ch 19-70	2019	2030	2040	2050	2060	2070
Fertility rate	0.1	1.51	1.55	1.58	1.60	1.63	1.65
Life expectancy at birth							
males	6.6	79.9	81.4	82.8	84.1	85.3	86.5
females	5.6	85.0	86.3	87.5	88.6	89.7	90.6
Life expectancy at 65							
males	4.6	19.1	20.1	21.1	22.0	22.9	23.7
females	4.5	22.6	23.5	24.5	25.4	26.3	27.1
Net migration (thousand)	-405.4	1249.9	870.8	861.9	855.9	850.1	844.5
Net migration as % of population	-0.1	0.4	0.3	0.2	0.2	0.3	0.3
Population (million)	-9.2	342.4	346.6	347.0	344.2	338.2	333.1
Young population (0-14) as % of total population	-1.7	20.3	19.1	18.4	18.5	18.6	18.6
Prime-age population (25-54) as % of total population	-6.0	39.9	36.6	35.4	34.6	34.3	33.9
Working-age population (20-64) as % of total population	-7.7	58.9	56.0	53.3	51.7	51.3	51.2
Elderly population (65 and over) as % of total population	9.4	20.8	24.9	28.3	29.8	30.1	30.2
Very elderly population (80 and over) as % of total population	6.8	6.3	7.6	9.5	11.9	12.8	13.1
Very elderly population (80 and over) as % of elderly population	13.2	30.1	30.5	33.6	40.1	42.4	43.3
Very elderly population (80 and over) as % of working age population	14.9	10.6	13.5	17.9	23.1	24.9	25.5
Macroeconomic assumptions*	AVG 19-70	2019	2030	2040	2050	2060	2070
Potential GDP (growth rate)	1.3	1.4	0.9	1.4	1.4	1.4	1.4
Employment (growth rate)	-0.1	0.8	-0.2	-0.2	-0.2	-0.1	-0.1
Labour input: hours worked (growth rate)	-0.1	0.7	-0.2	-0.3	-0.2	-0.1	-0.1
Labour productivity per hour (growth rate)	1.4	0.7	1.1	1.7	1.6	1.6	1.6
TFP (growth rate)	0.9	0.5	0.7	1.1	1.1	1.0	1.0
Capital deepening (contribution to labour productivity growth)	0.5	0.2	0.4	0.6	0.6	0.6	0.5
Potential GDP per capita (growth rate)	1.3	1.1	0.9	1.5	1.5	1.6	1.5
Potential GDP per worker (growth rate)	1.4	0.6	1.1	1.7	1.6	1.6	1.6
Labour force assumptions	Ch 19-70	2019	2030	2040	2050	2060	2070
Working-age population (20-64) (in thousands)	-31,044	201,743	194,220	184,817	177,979	173,612	170,699
Population growth (working-age: 20-64)	-0.1	0.0	-0.5	-0.4	-0.3	-0.1	-0.2
Labour force 20-64 (thousands)	-20,003	158,252	154,819	148,869	143,826	140,505	138,249
Participation rate (20-64)	2.5	78.4	79.7	80.5	80.8	80.9	81.0
Participation rate (20-74)	1.9	68.0	68.0	68.1	69.0	69.5	69.9
youngest (20-24)	1.5	61.0	61.4	62.4	62.4	62.2	62.4
prime-age (25-54)	0.6	85.8	86.2	86.2	86.4	86.4	86.4
older (55-64)	10.0	63.7	69.9	72.1	72.5	73.3	73.7
very old (65-74)	11.5	9.5	15.4	16.9	18.3	19.5	21.0
Participation rate (20-64) - FEMALES	4.6	72.8	75.4	76.7	77.2	77.4	77.4
Participation rate (20-74) - FEMALES	4.2	62.3	63.5	64.3	65.3	66.0	66.5
youngest (20-24)	1.7	57.2	57.8	58.9	58.9	58.6	58.9
prime-age (25-54)	2.2	80.3	81.8	82.1	82.4	82.4	82.5
older (55-64)	13.6	57.5	65.5	69.0	69.8	70.8	71.1
very old (65-74)	12.8	6.8	13.4	15.4	17.0	18.0	19.5
Participation rate (20-64) - MALES	0.4	84.1	84.0	84.3	84.4	84.4	84.5
Participation rate (20-74) - MALES	-0.5	73.8	72.5	72.0	72.7	73.0	73.3
youngest (20-24)	1.3	64.5	64.9	65.7	65.7	65.5	65.8
prime-age (25-54)	-1.1	91.4	90.6	90.2	90.3	90.3	90.3
older (55-64)	6.1	70.2	74.4	75.3	75.2	75.8	76.3
very old (65-74)	10.0	12.5	17.6	18.5	19.8	21.1	22.4
Average effective exit age (TOTAL) (1)	2.1	63.9	65.1	65.5	65.7	65.9	66.0
Men	2.1	64.0	65.2	65.5	65.7	65.9	66.1
Women	2.1	63.9	65.1	65.4	65.7	65.8	66.0
Employment rate (20-64)	3.7	72.6	73.6	75.1	76.1	76.2	76.3
Employment rate (20-74)	3.0	63.0	62.9	63.6	65.1	65.6	66.0
Unemployment rate (20-64)	-1.7	7.5	7.7	6.8	5.9	5.8	5.8
Unemployment rate (20-74)	-1.7	7.4	7.5	6.6	5.7	5.6	5.6
Employment (20-64) (in millions)	-16.2	146.4	142.9	138.8	135.4	132.3	130.2
Employment (20-74) (in millions)	-11.6	149.8	149.4	146.2	142.8	139.9	138.2
share of youngest (20-24)	0.4	6%	7%	7%	7%	7%	7%
share of prime-age (25-54)	-5.9	73%	68%	68%	68%	68%	67%
share of older (55-64)	2.1	19%	21%	21%	20%	20%	21%
share of very old (65-74)	3.5	2%	4%	5%	5%	5%	6%
Dependency ratios	Ch 19-70	2019	2030	2040	2050	2060	2070
Share of older population (55-64) (2)	0.8	23.1	24.9	23.8	23.5	23.3	23.8
Old-age dependency ratio 20-64 (3)	23.6	35.3	44.4	53.2	57.6	58.6	58.9
Total dependency ratio (4)	25.5	69.7	78.5	87.8	93.4	94.8	95.2
Total economic dependency ratio (5)	12.5	128.6	132.0	137.4	141.0	141.8	141.1
Economic old-age dependency ratio (20-64) (6)	24.6	46.3	55.7	65.4	70.1	71.1	71.0
Economic old-age dependency ratio (20-74) (7)	21.6	45.3	53.3	62.1	66.4	67.2	66.9

LEGENDA:
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(1) Based on the calculation of the average probability of labour force entry and exit observed. The table reports the value for 2020 instead of 2019.
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NB: ":" = missing data

Part IV

Resources

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