Occasional Paper Series

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The macroeconomic and fiscal impact of population ageing

Contents

Abstract

The euro area, like many other advanced economies, has entered an era of drastic demographic change. Without appropriate policy responses, population ageing in the euro area is posing formidable challenges for potential growth, monetary policy and public finances. This paper examines – from a central bank's perspective – the macroeconomic and fiscal effects of population ageing in the euro area and looks at the main challenges ahead in the next decades. Total population in the euro area is projected to decline as of around 2035, while the old-age dependency ratio will rise strongly in the coming 15 years, putting additional burden on pension systems. The analysis in the paper finds that the demographic changes in the euro area present a drag on potential growth, mainly through labour supply and productivity growth – similarly to developments in Japan, which is ahead of the euro area in terms of population ageing. Precautionary savings may be higher, and the natural rate of interest lower, while the effect on trend inflation and wages are not obvious. Population ageing is posing a burden on fiscal policy, through upward pressure on pension spending and adversely affecting the tax bases and the structure of public revenues. Thus, it poses significant challenges for fiscal sustainability, limits fiscal policy space and effectiveness. To safeguard against the adverse economic and fiscal consequences of population ageing, there is a need for fiscal buffers, improved quality of public finance and structural reforms.

Non-technical summary

Population in the euro area is ageing and its growth rate is expected to turn negative from 2035 onwards, with adverse macroeconomic, fiscal and financial consequences. This occasional paper sketches the main demographic trends for the euro area and examines from a central banking perspective the macroeconomic and fiscal effects of population ageing in the euro area.

The euro area, like many other advanced economies, has entered an era of drastic demographic change. Although it is a slow-moving process, the population in the euro area is ageing, and the demographic pressure is projected to increase further. Declining birth rates and rising life expectancy are causing the number of pensioners to increase relative to workers. In the next one and a half decades, this trend will be amplified as the sizeable baby boom generation enters retirement and the cohort of workers shrinks.

Total population in the euro area is expected to start declining from 2035 onwards according to Eurostat projections, while working age population growth already turned negative. The old-age dependency ratio is projected to reach almost 54% by 2070 (based on projections before the COVID-19 shock). The demographic trend in the euro area aggregate is broadly comparable to the one of Japan, which however is leading by around 15-20 years, as discussed in a dedicated box. US population challenges are much more contained due to different migration patterns and a different time profile of the baby boom phenomenon.

The demographic transition will impact the euro area in the next decades through various angles. In particular, population ageing may hold back potential output growth, primarily through a shrinking labour contribution, but may as well impact other components of potential growth. The ageing of the working force is also expected to depress investment, thus having a negative impact on capital formation. Moreover, productivity growth may slow down with the ageing of the population. Although empirically not fully conclusive, the relationship between age and productivity is thought to be hump-shaped. However, factors such as higher education levels and improving health conditions may help to widen the hump-shaped relationship between age and productivity, while structural policies and innovation may support productivity on the aggregate level.

Population ageing, together with other secular trends, is widely seen to contribute to the decline in the natural rate of interest in the euro area. The main channels are higher precautionary savings to prepare for longer periods of retirement, capital deepening due to lower labour supply, less innovation activity reflecting a shrinking share of young and prime-age workers and a higher demand for safe assets due to older people being more risk averse. Counterbalancing forces may, however, also need to be considered. Aggregate savings and capital supply may decline with the demographic transition going forward, given that the share of older citizens, who tend to divest, is rising, while the share of the working age population, who accumulate savings, is shrinking. Assuming that the relative importance of these different

channels may change for the euro area going forward, the demographic transition is expected to reinforce the existing downward trend of the natural rate of interest at least until 2030, mainly on account of a shrinking labour force. Yet, uncertainties surrounding this outlook are very high.

The link between population ageing and inflation is less established. There is strong empirical evidence that population ageing will cause relative price changes due to shifts in consumption baskets, while it is less obvious to what extent changes in the age structure may drive trend inflation. With the baby boom generation entering retirement, a possible scenario could be a stronger upward pressure on wage inflation arising from scarcer labour supply and higher wage premia.

The demographic transition may impact the structure of financial asset holdings, as older people are found to be more risk averse. Although the demand for financial assets and housing may be depressed in the long run, risks for an asset price meltdown seem contained. Together with shrinking credit demand, this may have adverse repercussions for banks' profitability and influence monetary policy transmission, namely through the wealth and credit channels.

If left unaddressed, population ageing will pose a burden on public finances in the euro area, given the relatively strong role of publicly financed pension and health care systems. Debt sustainability challenges might arise from mounting ageing-related public spending, which will be particularly a concern in high debt countries. In addition, an ageing euro area economy may be confronted with eroding tax bases, mainly reflecting a shrinking labour force, while the structure of public revenue may change as well. Furthermore, debt dynamics will crucially hinge on how the interest rate-growth differential will evolve, as population ageing will impact potential growth as well as the natural rate of interest.

In the euro area, macroeconomic stabilisation will most likely become more complicated, as population ageing may limit the available policy space and contribute to larger heterogeneity within the euro area. Monetary policy may be more often constrained at the effective lower bound for nominal interest rates, while the available fiscal space will be bound by higher ageing-related public spending costs. At the same time, automatic stabilisers may become less effective, and the quality of public finances may worsen due to cuts in public investment in an ageing society.

To safeguard against the adverse economic and fiscal consequences of population ageing, there is a need to build-up fiscal buffers during good economic times, to improve the quality of public finance and to implement growth-enhancing structural reforms. The latter should help to expand the productivity outlook, though more innovation and labour-saving technological progress, and to foster investment in human capital. In order to mitigate the adverse impact on labour supply, well-targeted structural improvements are needed, namely through labour market reforms tailored towards older workers and increasing female participation rates. Further pension reforms are needed that encourage workers to postpone their retirement. Also, euro area governments may need to think about incentives to encourage immigration of workers and how to ensure their integration into the euro area labour market.

1   Introduction

The euro area, like many other advanced economies, has entered an era of drastic demographic change. Although it is a slow-moving process, the population in the euro area is ageing, and the demographic pressure is projected to increase further. Declining birth rates and rising life expectancy are causing the number of pensioners to increase relative to workers. In the next one and a half decades, this trend will be amplified as the sizeable baby boom generation enters retirement and the cohort of workers shrinks.

In the absence of appropriate policy responses, population ageing in the euro area is posing formidable challenges for potential growth, monetary policy and public finances. Population ageing is widely found to have adverse implications for potential growth, labour supply and productivity. Of particular importance, from a central banking perspective, is the fact that population ageing, together with other secular trends, is widely seen to have exerted downward pressure on the natural rate of interest, a trend which is likely to continue until at least 2030. By increasing the risk of nominal interest rates being constrained at the effective lower bound, a low natural rate of interest would limit the ability of central banks to achieve their price stability mandate and to stabilise the economy using conventional monetary policy instruments. While this would favour a stronger role for fiscal policy in stabilising the economy, population ageing may also have adverse effects on public finances, notably by limiting the room for manoeuvre of fiscal policy. This is all the more true given that euro area countries predominantly rely on pay-as-you-go (PAYG) pension schemes and already have high public debt-to-gross domestic product (GDP) levels.

This paper examines the macroeconomic and fiscal effects of population ageing in the euro area from a central banking perspective and looks at the main challenges in the next decades. Following a brief overview of the main features of the demographic transition in the euro area, the paper analyses the impact of population ageing on labour supply, productivity and potential growth, also drawing on experiences in Japan, which are discussed in a separate box. The paper then continues by examining the relative importance of the various channels through which population ageing may affect the natural rate of interest, including through the decline in labour supply. The paper also looks at the potential impact of ageing on trend inflation, wage dynamics and asset prices, before moving on to the potential risks for long-term fiscal sustainability. It concludes by outlining the potentially adverse implications of demographics on the available policy space and its effectiveness to achieve macroeconomic stabilisation; policy options are then discussed.

2 Population ageing – recent developments and projections

While the total population in the euro area is still increasing, its growth rate is decreasing. Population growth in the euro area has been following a long-term downward trend.[1] Temporarily deviating from this trend, population growth strengthened after the start of monetary union in 1999 to reach 0.5% prior to the onset of the global financial crisis in 2007 (Chart 1). Since 2009, euro area population growth has slowed to almost 0% in 2021. Over the past twenty years, the rate of total population growth, including net migration, was positive overall in the euro area, but decreased in Spain, Ireland, Cyprus, Greece and Portugal, while it was negative in the Baltic countries. In contrast, the population grew strongly in Luxembourg, Malta and, more recently, in Slovenia.

Chart 1

Population growth in the euro area as a whole and the largest euro area countries

(annual percentage growth and percentage point contributions)
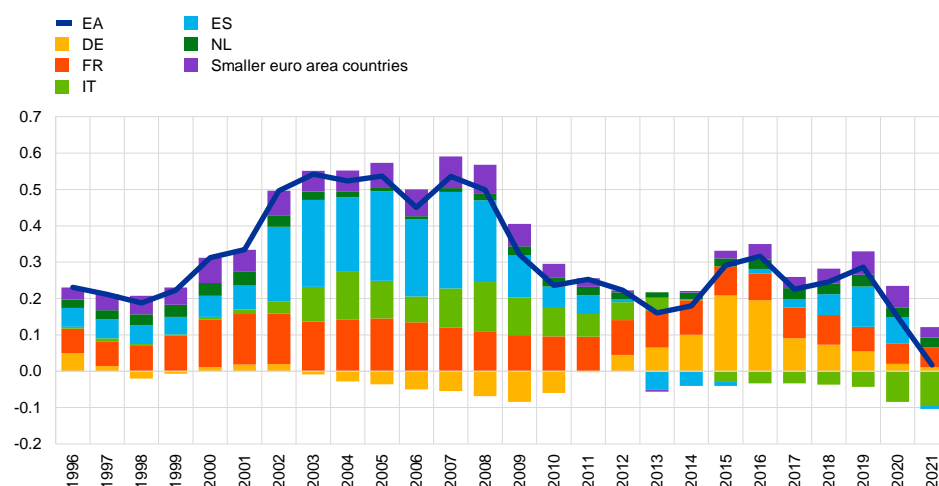
Source: European Statistical Office (Eurostat).

In the past two decades rising life expectancy has bolstered population growth, although it has not been able to fully counterbalance the negative impact of low birth rates. The gradual demographic process from high fertility and mortality to low fertility and mortality is referred to as demographic transition, and the euro area is in the final stage of this process.[2] In the euro area, the fertility rate (i.e. live births per person) has followed a long-term declining trend. Since 2000 the birth rate has been well below its recovery level, ranging between 1.2 and 1.9 across countries. At the same time, life expectancy has improved. In the euro area, life expectancy at the age

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[1] According to United Nations (UN) data, aggregate population growth in current euro area countries was the highest in the 1960s, reaching 0.9% per year.

[2] In stage 1 of the demographic transition, both fertility and mortality are high. In stage 2, mortality decreases, mainly at young ages. In stage 3, fertility and mortality (at older ages) decline. Finally, in stage 4, both fertility and mortality remain low. See Kirk (1996).

of 65 increased by about two and a half years since 2000: in 2019, a person who has reached 65 would on average live almost 21 years.[3] Notwithstanding the improved longevity, the natural change in population, i.e. the balance of births and deaths, followed a clear downward trend in most euro area countries. Since 2015 the balance of births and deaths has turned negative in the euro area as a whole, as well as in more than half of individual euro area countries.

Strong net migration inflows have prevented an even sharper decline in population growth in the euro area. The euro area as a whole has been a net migration recipient for the past two decades, although net migration and its impact on population growth has been heterogeneous across countries and years. In several euro area countries, episodes of strong population growth were linked to periods of strong net immigration. Spain experienced one of the largest immigration waves in Europe before the global financial crisis, and saw its total population increase by about 10% between 2000 and 2010.[4] Other examples of where there were noticeable net migration inflows were Germany, Austria, Malta and Luxembourg. This was mainly owing to immigration for the purposes of work[5], but partly also due to refugee migration. In contrast, the Baltic countries, Portugal and Greece experienced net migration outflows.[6]

Changes in the age composition of the euro area population have led to an increase in the old age dependency ratio. The combination of low birth rates and rising longevity means that the population pyramid of the euro area has increasingly resembled a rectangle instead of a triangle. The shares of the younger cohorts and working-age persons in the population (i.e. those aged between 15 and 64 years)[7] have declined, while the share of the older-age cohorts has increased (Table 1). In the last one and a half decades the growth rate of the working age population has been below that of the total population (Chart 2), while the size of the prime age working population (i.e. those aged between 25 and 54) has started to decline. As a result, not only has the median age of the total population increased, but so has the old age dependency ratio (i.e. the number of people aged 65 and above relative to the working-age population) risen from 24% in 2000 to 32.7% in 2020 (Table 1).

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[3] According to Eurostat data, life expectancy is lower for men, but has increased more strongly than life expectancy for women.

[4] See Romero (2015) and Hierro (2016). However, following the global financial crisis, Spain suffered from the fact that many former immigrants left the country, which eventually resulted in negative population growth (Izquierdo et al., 2016).

[5] Following the enlargement of the EU in 2004 the original Members States were able to temporarily ban migration flows deriving from new Member States. In 2011 Germany and Austria opened their labour markets to the countries that joined the EU in 2004 and in 2014 for those that joined in 2007.

[6] For Greece see, for example, Lazaretou (2016).

[7] In this paper, we have defined the working age population as the population aged between 15 and 64. The upper limit of 64 years is close to the currently observed effective pension age in the euro area. For labour market variables (for example, the unemployment rate), the upper age limit used is usually 74.

Chart 2

Euro area population trends and projections

(left-hand scale: indices, 2020 = 100; right-hand scale: old age dependency ratio as percentages of the 15-64 age group)

- Working age population
- Total population
- Old age dependency ratio (right-hand scale)
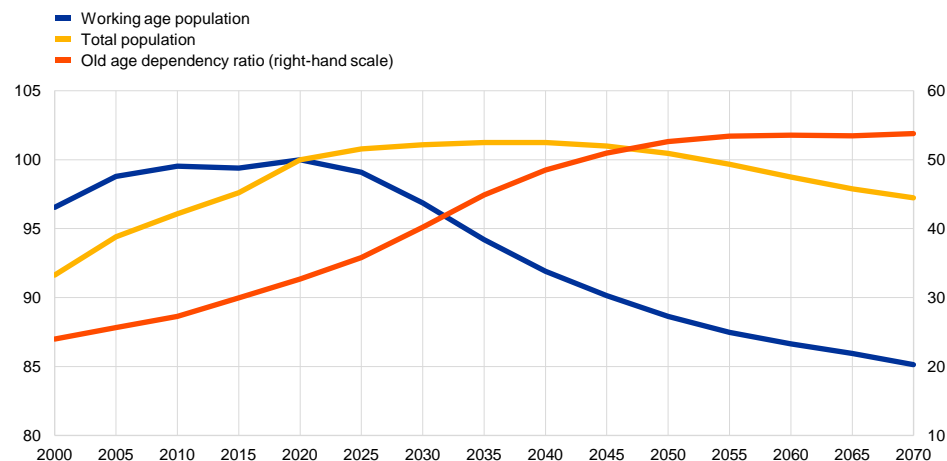
Sources: Eurostat (European Union Labour Force Survey or EU-LFS), Eurostat population projections (EUROPOP) and own calculations.
Notes: Working-age population is defined as the population aged 15-64. The old age dependency ratio is defined as the ratio of those above 65 years to working-age population.

Table 1

Euro area demographic structure

(percentages of the total population; OADR as percentages)

Age group		2000	2010	2020*	2030*	2050*	2070*
Below WAP	**-15**	16.3	15.5	15.0	13.9	13.6	13.7
WAP	**15-64**	67.5	66.4	64.1	61.4	58.2	56.1
- Young	**15-24**	12.5	11.3	10.7	10.7	10.0	10.0
	25-34	15.0	13.1	11.9	11.3	11.4	10.9
- Prime age	**35-44**	15.3	15.1	13.2	12.3	11.7	11.3
	45-54	13.4	14.7	14.6	13.1	12.3	11.7
- Older	**55-64**	11.4	12.2	13.7	14.0	12.7	12.2
Above WAP	**65-74**	9.5	9.6	10.6	12.4	13.0	11.6
	75+	6.7	8.5	10.3	12.3	15.2	18.6
OADR		**24.0**	**27.3**	**32.7**	**40.2**	**48.5**	**53.8**

Sources: Eurostat and EUROPOP.
Notes: OADR stands for old age dependency ratio. WAP stands for working age population.
* Projections by EUROPOP.

The demographic transition is amplified by the ageing of the large cohort of baby boomers. During the 1950s and 1960s several euro area countries experienced a sharp rise in the fertility rate, which led to a sizeable cohort of the so-called baby boomer generation. This phenomenon was particularly pronounced in Austria, Belgium, France, Finland, Germany and the Netherlands, while it was not so prevalent in Italy and Spain[8]. The baby boomer generation has now aged, with most today belonging to the cohort of older workers. They will retire in the next 15 years, even accounting for rising pension ages, thereby boosting the number of pensioners and exacerbating the impact of rising longevity.

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[8] See Sánchez-Barricarte (2018).

Looking ahead the total population of the euro area is projected to shrink from around 2035. With regard to the population growth rate, Eurostat projects that it will decline until 2035 and turn negative thereafter. By 2070 the total population in the euro area is expected to be 3.5% lower than in 2020. The overall trend masks very different cross-country profiles given that the population is projected to increase strongly in Cyprus (+25%), Luxembourg (+27%), Ireland (+32%), and Malta (+41%) until 2070 (Chart 3).[9] Population projections by the United Nations are more pessimistic, projecting a decline of 10% over the same period for the euro area. However, these long-term population projections must be interpreted with caution due to many uncertainties, including those relating to the underlying assumptions and frequent revisions of the methodology.

Chart 3

Projected changes in the total and working-age populations by 2070

(indices, 2020 = 100)
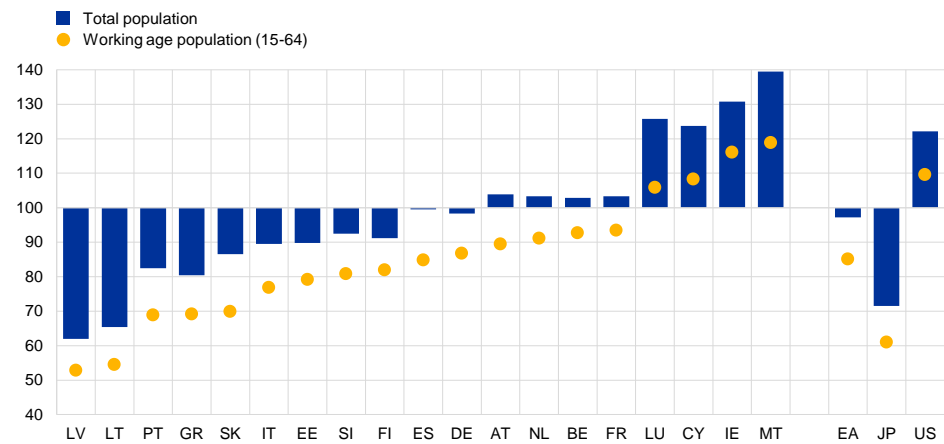
Sources: Eurostat, baseline projections, UN.

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[9] For the underlying assumptions, see the latest Eurostat population projections (EUROPOP2019) and the 2021 Ageing Report (European Commission, 2021).

Chart 4
Current and projected old age dependency ratio

(annual percentage growth and percentage point contributions)

- 🟩 Old-age dependency ratio, baseline projections 2070
- 🟡 2019
- 🔴 2070
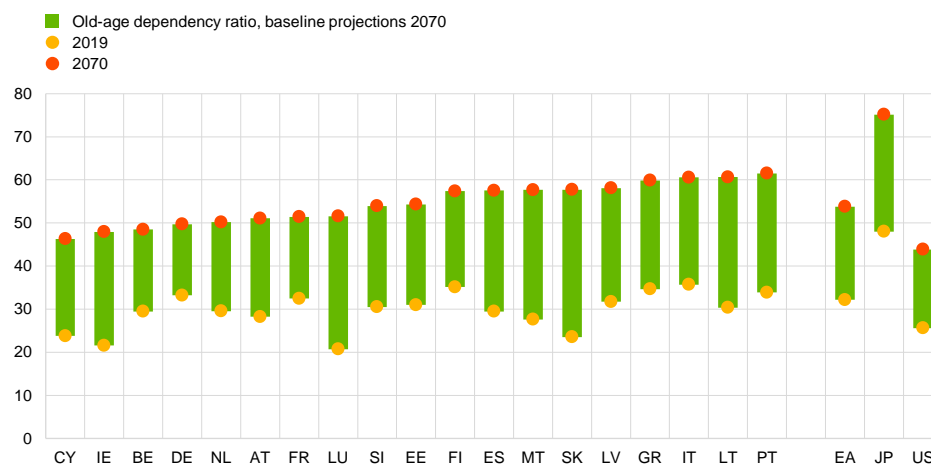
Sources: Eurostat, UN and ECB calculations.
Notes: The chart shows the projected increase in the old age dependency ratio from 2019 (yellow dots) to 2070 (red dots) across euro area countries. The ratio is the number of people aged 65 and older as a percentage of the prime age population (i.e. people aged between 15 and 64 years).

The old age dependency ratio will rise strongly in the coming 15 years, placing an additional burden on pension systems. According to Eurostat, the working-age population is expected to shrink looking ahead, while the number of pensioners will rise strongly given that the baby boomer generation will be mostly retired by around 2035. The old age dependency ratio is projected to increase in the euro area by more than 20 percentage points, reaching almost 54% in 2070 (Chart 4).[10] This will put a burden on pay-as-you-go (PAYG) pension systems given that by 2070 there will be just two workers to finance one pensioner as compared with the current three. The countries facing the highest old age dependency ratio in 2070 will be Portugal, Italy and Lithuania, while the ratio will be lowest in Cyprus and Ireland.

Net migration inflows to the euro area will be key to at least partially counterbalancing the impact of ageing in the coming decades. Migration projections are particularly prone to uncertainty. The reasons underlying migration are complex. As such, its magnitude, length and impact on fertility and mortality is very difficult to project. Eurostat has published several population projection scenarios to account, among other things, for the uncertainty of future migration flows. Under the scenario assuming no migration, the total population would be 20% lower by 2070 compared with the baseline, while under a high migration scenario (with net immigration 33% higher than in the baseline scenario), population growth would

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[10] However, the old age dependency ratio is only a rough proxy for the effective old age dependency ratio given that it does not account for the actual statutory retirement age, which might differ from the 65-year old threshold, nor for any incentives for earlier or later retirement. An alternative measure of the demographic transition is the rising median age in the euro area: between 1982, the first year in which data became available, and 2019, the median age in the euro area increased from 33.6 years to 44.3 years.

remain positive until 2050.[11] The coronavirus (COVID-19) pandemic has resulted in downward risks for net immigration to the euro area.[12] In addition, the pandemic is affecting mortality and possibly birth rates, the impact being as yet uncertain but pointing overall to some downside risks for total population projections.[13] At the same time, the Russian invasion of Ukraine has triggered massive refugee migration flows, including to the euro area, which may help increasing euro area population, at least if the refugees decide to stay.

Population ageing in the euro area is more pronounced than in the United States, but less severe than in Japan. Japan stands out as the country with the most severe demographic challenge. As explained in Box 1, the working age population in Japan has been on a declining path since the late-1990s. In contrast, in the United States, population growth is expected to increase further, albeit at a slowing rate; although the population is ageing, the dynamics are less pronounced (Charts 3 and 4). These regional differences can be partly explained by differences in immigration, which was very low in Japan, but high in the United States.[14] Moreover, in contrast to Japan, the United States experienced a strong post-war baby boom, similar to that in Europe.

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[11] These projections are based on assumptions about the magnitude of immigration, as well as its impact on fertility and mortality. Better integration of migrant workers, which seems to be imperfect, may support their stay in the longer term and thus have a greater impact on population and other variables. Even if this were the case, the fertility and mortality rates of migrants might adjust, and thus, immigration would probably only postpone population ageing to some degree. Finally, some of the recent source countries for immigration to the euro area are themselves facing serious demographic problems and have lower migration potential, which may also add to the downside risks for immigration.

[12] The pandemic is affecting immigration through several channels. While for some essential (sometimes low-skilled) occupations the share of immigrant workers is high, pointing to a continuing demand for these workers, other factors point to lower immigration. First, foreign workers may be present in some sectors that are being strongly hit by the pandemic, but many of those sectors have few options for working from home (hotels, restaurants) and a higher share of precarious contracts and self-employment, making them more vulnerable. Second, difficulties with cross-border movement in general and, potentially, greater use of home working may also hold back migration, with a heterogenous impact across skill levels. Data on recent immigration patterns is scarce, and measurement issues are also likely to be present. According to current Eurostat estimates, in 2020 the population of foreign nationals declined in Belgium, Italy, Portugal, Greece, Estonia, Latvia and Cyprus, while it increased in other countries. See also Bodnár and O'Brien (2021).

[13] Fertility plans may have declined following the outbreak of the pandemic, which may be related to the lower income earned, particularly among those with a lower level of education and higher levels of uncertainty (see Luppi et al., 2020; The Financial Times, 2021). In Germany, by contrast, some recovery in birth rates was observed at the beginning of 2022. It is still too early, however, to judge the longer-term impact of the pandemic on birth rates.

[14] See He (2016).

3 Macroeconomic, financial and fiscal consequences of population ageing

3.1 Downward pressure on labour supply, productivity and potential growth

The demographic changes in the euro area are acting as a drag on labour supply. Both components of labour supply, i.e. the working age population and the labour force participation rate, are affected by population ageing. First, the share of the older working age cohort, i.e. those between the ages of 55 and 64, has been gradually increasing (Table 1). The labour force participation rate tends to follow an inverse U shape, and the participation rate of older workers is usually considerably lower compared with the prime age (25-54) cohort. The rising share of the older working age cohort is therefore dragging down the (trend) labour force participation rate. Second, as discussed above, working age population growth is declining and will turn negative – as in Japan (see Box 1) – dragging down the euro area labour supply.

Until recently, improvements in the labour force participation rate had been able to counterbalance the adverse impact of ageing on labour supply. Despite population ageing, most euro area countries have experienced an increase in labour supply since the early 2000s, which can be largely explained by improvements in the labour force participation rate. The steepest rise in the labour force participation rate was among older workers in the euro area (Chart 5), following a pronounced decline before the turn of the millennium (see Bodnár and Nerlich, 2020). This rise, together with the higher labour force participation rate for women of all ages, more than counterbalanced the negative impact stemming from the changing age composition of the labour force.
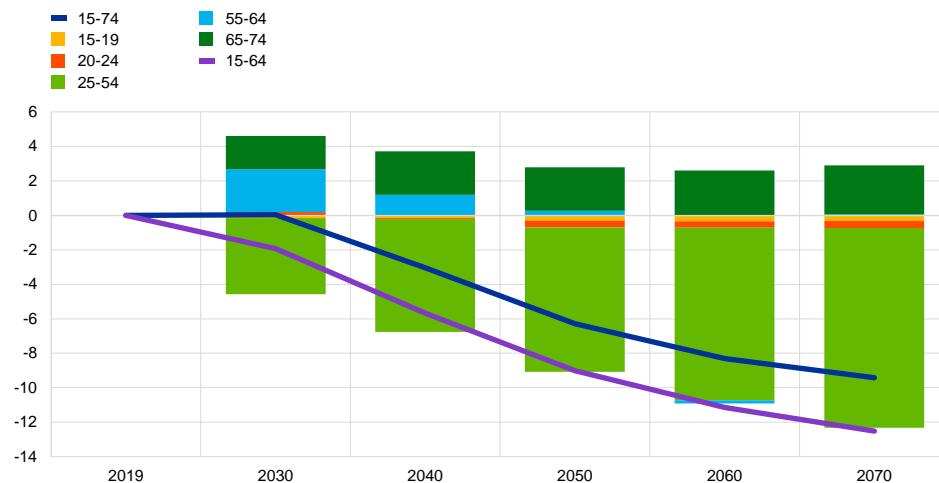
Chart 5

Labour force participation rates by age and gender in the euro area

(active as percentages of the population in the respective age cohort)
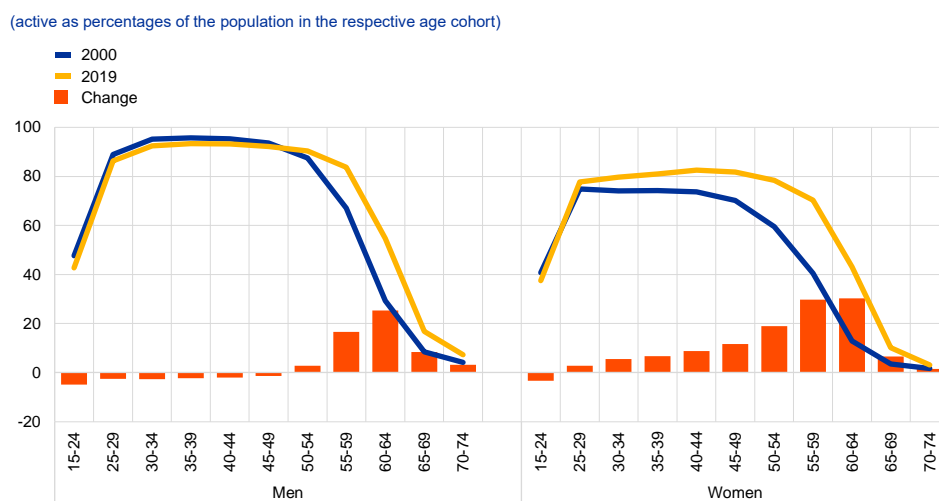
Sources: Eurostat and ECB calculations.

Chart 6

Labour force projections

(percentage point changes compared with 2019)

- 15-74
- 15-19
- 20-24
- 25-54
- 55-64
- 65-74
- 15-64

Sources: Eurostat (2021), "The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070)", Institutional Paper, No 148, European Commission, May and ECB calculations.

While the strong rise in the participation rate of older workers since 2000 seems to have been driven largely by pension reforms, further improvements may be limited. Many factors that raise the participation rate of older workers have improved in the last decades. Better health conditions, a rising life expectancy and higher educational levels – mainly among women – reflect long-term trends that had already started well before the turn of the twenty-first century. As such, those factors, although they are likely to have contributed to the rise in participation, cannot fully explain the particularly sharp rebound in the participation rate of older workers since 2000. This sharp rebound may, in fact, have been supported by more recent policy changes, such as pension reforms, which incentivised older workers to remain in the labour market for longer by postponing retirement. In concrete terms, statutory and early retirement ages were increased, eligibility criteria were tightened, and the generosity of retirement schemes was reduced (Bodnár and Nerlich, 2020) (Chart 7). Pension reforms are expected to be a powerful tool in offsetting the adverse impact of ageing on potential growth.[15] Looking ahead, however, a further substantial rise in the labour force participation rate of older workers is unlikely unless further pension reforms were to be adopted. In some countries, it was even decided to partly reverse earlier reforms, thereby triggering adverse macroeconomic and fiscal consequences.[16] In addition, the labour market impact of the COVID-19 shock may have put older people's attachment to the labour market at risk given that it may be more difficult for them to return to the labour market after a period of inactivity than it would be for younger

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[15] See also Carta and de Philippis (2021) and d'Amuri et al. (2021) on the impact of pension reforms on the participation rate in Italy.

[16] On the macroeconomic and fiscal consequences of pension reform reversals, see Baksa, Munkacsi and Nerlich (2020).

workers.[17] Against this background, labour force participation and labour supply are expected to decline (Chart 6).

The ageing of the labour force may suggest at first sight that productivity would be affected negatively. Assuming a hump-shaped relationship between age and productivity, the rising share of older cohorts in the labour force would drag productivity growth down. The positive impact of experience gained along a person's career may, with age, be gradually overtaken by the moderation of physical and cognitive abilities, less frequent on-the-job training and fewer incentives to keep up with technological advances. While there seems to be evidence in the literature of declining physical abilities (Ours, 2010) and innovativeness with age, the picture is less straightforward in terms of overall cognitive abilities. Some studies at micro level (Feyrer, 2008; Maestas et al., 2016) and macro level (Aiyar et al., 2016; Poplawski-Ribeiro, 2020) find that ageing has a negative impact on productivity. In contrast, Stoeldraijer and Ours (2010) find little evidence for such a link, while Börsch-Supan and Weiss (2016) find no evidence of declining productivity among teams with older members until the age of 60 is reached. Burtless (2013), in turn, finds that ageing has a positive impact on productivity in the United States. The relationship between age and productivity may also be sector or task-specific (Skirrbekk, 2004).

There are several counterbalancing factors that may help to dampen a negative impact of ageing on productivity. First, the educational level of the older population has been rising considerably, so the current older cohorts are likely to be more productive than the older cohorts in the past. Second, the age at which abilities start decreasing is likely to have increased owing to longevity and longer healthy years of life. Third, even if there is a decline in productivity at the level of the individual, this may not translate to lower productivity at firm level. Firms may support productivity, for example by providing age-specific equipment to older workers (Göbel and Zwick, 2013) or by fostering age diversified teams (Hammermann et al., 2019). Fourth, structural policies may further support longer and more productive working lives. In this regard, the following measures have been found to be effective: support for firms to hire and retrain older employees, increasing the market competition of firms, strengthening investment and innovation incentives for older workers, and introducing training and health-related policies to increase the employability of workers (OECD, 2019 and 2020; and IMF, 2019). Fifth, innovation may provide a response to the challenges created by ageing and support productivity growth.[18] Finally, as the sizeable cohort of baby boomers enters retirement, some of the adverse compositional changes for overall productivity are likely to reverse, given that the average age of the labour force will decrease.[19]

Overall, population ageing is expected to have a dampening impact on potential growth. Euro area potential growth has already been slowed down by the lower

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[17] Although not the focus of this document, there is evidence that the labour force participation rate for younger workers has declined in the past decade. This partially reflects that more people stay in education for a longer period, which may imply that they potentially stay active for longer as they are better educated.

[18] Acemoglu and Restrepo (2017) document the fact that countries experiencing more rapid ageing are those that have been at the forefront of the adoption of industrial robots.

[19] Migration may also have an impact on productivity growth: in emigration countries, brain drain may hold down productivity growth, while in destination countries, immigration may support productivity growth.

labour contribution. According to the European Commission, the labour contribution to potential growth is expected to decline close to zero in the euro area as a whole (Chart 8) and in several euro area countries. It is assumed that the expected decline in the working-age population will not be significantly counterbalanced by migration and a further rise in the labour force participation rate. Instead, the total factor productivity (TFP) contribution is projected to rise and to be the main driver of potential growth over the medium term. Finally, the capital contribution will moderate somewhat over the medium term, reflecting the fact that ageing populations invest less and that this is not counterbalanced by rising automation. As shown in Box 1, in Japan, TFP growth and the capital contribution has slowed down recently and has not counterbalanced the negative impact of ageing. Overall, population ageing is expected to keep potential output growth in the euro area as a whole and in most Members States lower than that seen before the global financial crisis in 2007. The growth of potential output per capita is also projected to be lower than at the beginning of the century, both in the euro area as a whole and in its largest member countries (Chart 9).

Chart 7

Statutory retirement age for men and women

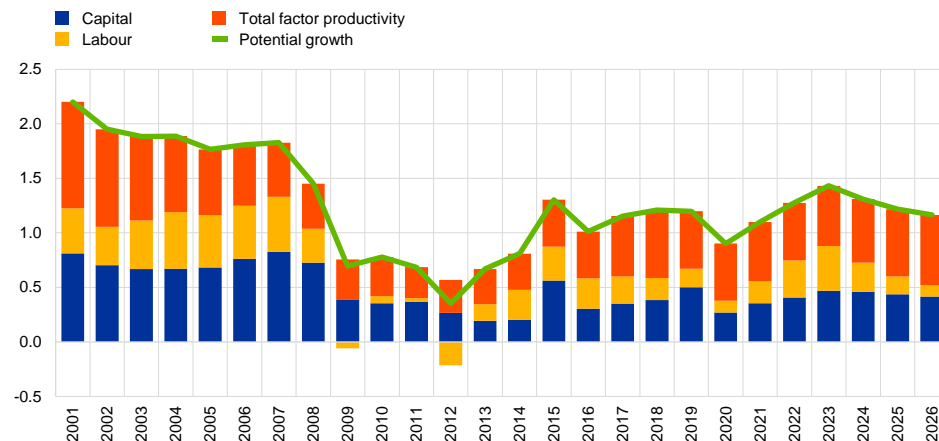(age in years, for 2000, 2010 and 2019)

- 2000
- 2010
- 2019

a) Men

b) Women
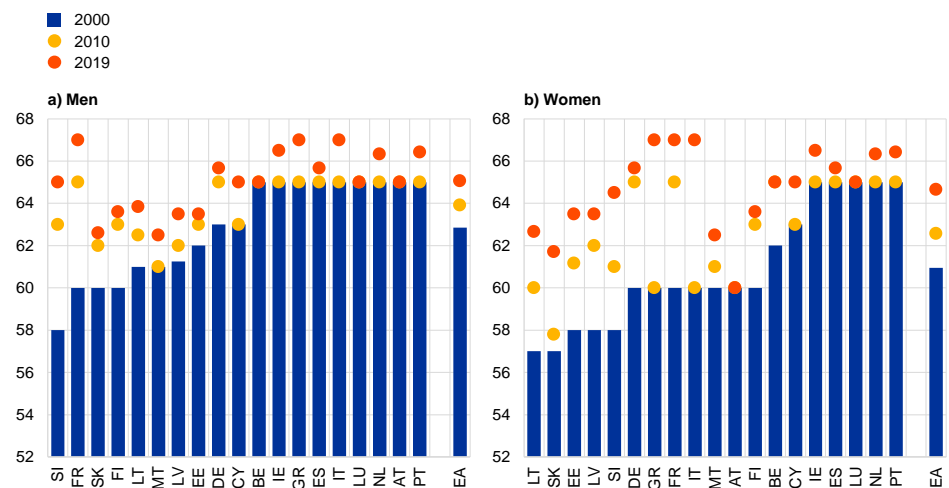
Sources: National sources and ECB calculations.

Chart 8

Euro area potential output growth projections

(percentages and percentage points)

- Capital
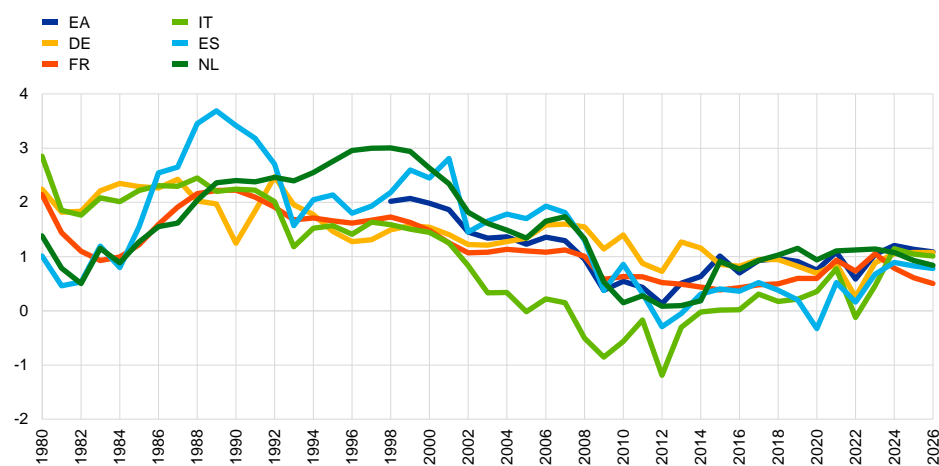- Labour
- Total factor productivity
- Potential growth

Source: European Commission, 2022 Spring Forecast, EPC Working Group on Output Gaps.

Chart 9

Projections for potential output per capita growth in the euro area as a whole and in the largest euro area countries

(year-on-year growth rates)

- EA
- DE
- FR
- IT
- ES
- NL

Source: European Commission, 2022 Spring Forecast, EPC Working Group on Output Gaps.

3.2 Demographic transition impacting the natural rate of interest

The demographic transition is an important, yet slow-moving, factor that has contributed to the decline in the natural rate of interest. Estimates for the euro area point to a decline in the natural rate of interest, i.e. the real rate of interest consistent with the economy operating at its potential and with price stability. It has fallen from over 2% at the beginning of Economic and Monetary Union (EMU) in 1999 to levels below zero prior to the COVID-19 pandemic (Brand, Bielecki and Penalver,

2018). While substantial, this decline is only half of what has been projected for Japan since the 1990s (see Box 1). Population ageing, together with other secular trends, is widely seen as having contributed to the decline in the natural rate of interest.[20] Looking ahead, population ageing, and in particular the projected decline in the labour force in the euro area, is expected to reinforce the existing downward trend of the natural rate of interest until at least 2030 (Chart 10). A low level of the natural rate of interest poses tough challenges for monetary policy given that it increases the risk of nominal interest rates being constrained by the effective lower bound and thereby limits room for manoeuvre to stabilise the economy.[21]

The literature has identified several channels through which the demographic transition may impact the natural rate of interest, although not all point in the same direction.[22] First, if labour supply declines as a result of lower birth rates and older workers leaving the labour market, as explained in section 3.1., this increases the capital-labour ratio and lowers the marginal product of capital. This capital deepening depresses the natural rate of interest.[23] Second, as the share of young and prime age workers shrinks, this may depress innovation, capital-building and productivity, thereby resulting in a lower natural rate of interest.[24] Third, rising life expectancy suggests that workers wish to increase their precautionary savings relative to consumption with a view to preparing for a longer period in retirement. These higher savings relative to investment are expected to put downward pressure on the natural rate of interest. Fourth, as population ageing is associated with a higher degree of risk aversion, this may redirect overall portfolio allocation towards a higher demand for safe assets, which in turn will bring down the natural rate of interest.[25] All these channels are expected to have a dampening effect on the natural rate of interest. Counterbalancing forces may, however, also need to be considered. Aggregate savings and capital supply may decline with the demographic transition going forward, given that the share of older citizens, who tend to divest, is rising, while the share of the working age population, who accumulate savings, is shrinking. This cohort-size effect may result, in lower total savings, thereby, all other things being equal, pushing up the natural rate of interest.[26]

There is broad consensus that demographics explain part of the recent decline in the natural rate of interest, while uncertainty relates to the size and relative importance of the various channels. Estimates aimed at quantifying the impact of

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[20] See Brand, Bielecki and Penalver (2018); Carvalho, Ferreo and Nechio (2016); Rachel and Summers (2019); and Papetti (2019).

[21] Laubach and Williams (2016).

[22] For an overview of the channels, see Brand, Bielecki and Penalver (2018); Krueger and Ludwig (2007); Carvalho, Ferrero and Nechio (2016); Ferreira and Shousha (2020); and Rachel and Summers (2020).

[23] See Gagnon, Johannsen and Lopez-Salido (2016). In an open economy setting, domestic capital deepening and downward pressure on interest rates in ageing societies could be mitigated by capital outflows to countries with a younger population and higher potential growth.

[24] Aksoy et al. (2019).

[25] See Ferreira and Shousha (2020). Based on two household panel datasets for the Netherlands and Germany, Dohmen et al. (2017) find strong evidence that the willingness of individuals to take financial risks decreases over the life cycle. However, the higher demand for safe assets due to ageing might be partly counterbalanced by a more aggressive search for yields by insurance companies and pension funds to allow for reasonable returns. This, in turn, might entail financial stability risks.

[26] This argument has been also put forward by Goodhart and Pradhan (2020), referring in particular to China's future demographic challenges, which are expected to result in a high proportion of dissavers, thereby reversing the current high proportion of savers.

demographics on the natural rate of interest in the euro area point to a decline of around 1 percentage point since the 1980s. Looking ahead, the natural rate of interest may decline by another 0.5 percentage points by 2030, notwithstanding a wide range of estimates.[27] Views diverge on the relative importance of the various channels at play. Chart 10 shows the model-predicted natural rate of interest for the euro area decomposed by the contribution of the various channels taken into account: while the decline in the natural rate of interest is currently mainly driven by savers exceeding dissavers (Chart 10, blue bars), the model predicts that the decline in the labour force, while already having a dampening impact, will soon become the main driving force (yellow bars).[28] However, uncertainties are very high in terms of both the estimated decline in the natural rate of interest and the relative importance of the channels.

Chart 10

Illustration of demographic drivers of the natural rate of interest

(percentage point deviation and contributions)
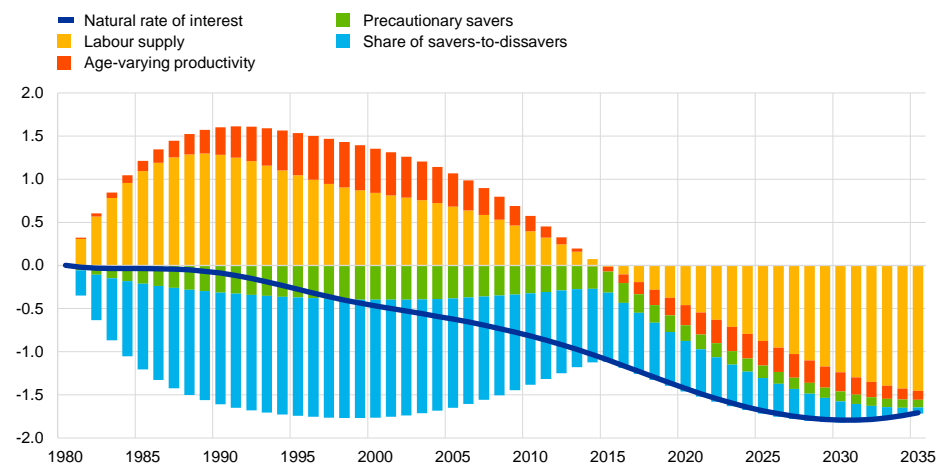
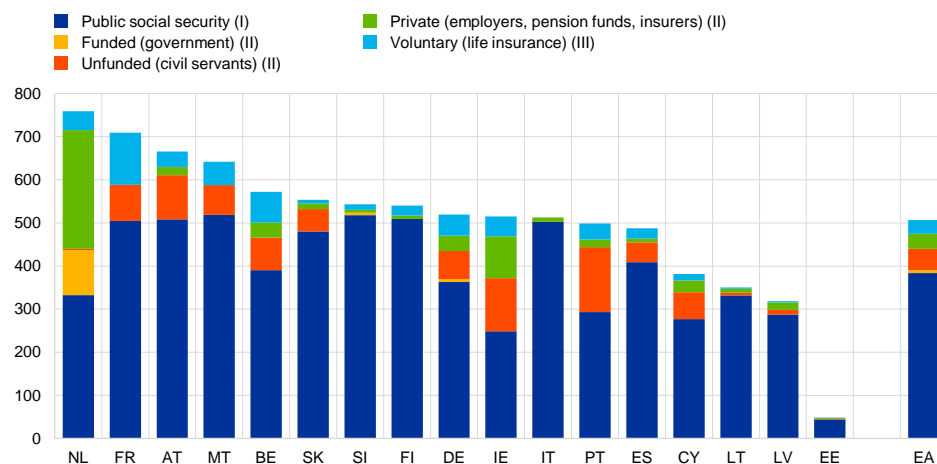Sources: Brand, Bielecki and Penalver (2018), based on Papetti (2019).
Notes: The natural rate of interest is expressed as percentage point deviation from the initial steady state. The demographic drivers of the natural rate of interest are in this chart decomposed into the contributions from the labour supply (yellow), the age-varying labour productivity (red), the precautionary savers (green) and the share of the savers-to-dissavers (blue).

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[27] See the estimates summarised in Brand, Bielecki and Penalver (2018).

[28] See Brand, Bielecki and Penalver (2018), based on Papetti (2019). The channel working through safe assets is not reflected in the model-predicted contributions shown in Chart 10.

Chart 11

Household pension wealth in euro area countries in 2015

(percentages of households' gross disposable income)

- Public social security (I)
- Funded (government) (II)
- Unfunded (civil servants) (II)
- Private (employers, pension funds, insurers) (II)
- Voluntary (life insurance) (III)

Sources: ECB, Eurostat and ECB calculations.
Notes: The most recent data available on accrued-to-date pension entitlements are for 2015. No data are available for Greece and Luxembourg. Pension entitlements are decomposed into the three pillars (state-run, contributory occupational and private) and are differentiated between funded and unfunded entitlements. The euro area average is unweighted.

The relative importance of the driving forces depends, among other things, on the prevailing structural features of the economy and may change over time.
Structural features, such as flexible labour markets and stable financial conditions, determine the labour force participation rate, the productivity of older workers, and the savings and investment decisions of households. Precautionary savings decisions are strongly influenced by whether there are sound and sustainable pension schemes in place.[29] In the euro area, on average three-quarters of the accrued-to-date pension entitlements come from public social security systems (first pillar), while, with the exception of the Netherlands and to some extent Ireland, privately funded pension schemes play only a limited role (Chart 11).[30] Generally, a high share of unfunded public systems makes pension benefits less vulnerable to a low interest rate environment. However, the mounting demographic headwinds and the fact that pension scheme generosity has recently been curtailed in several euro area countries, thereby raising questions about pension adequacy in the long run, are likely to lead to more precautionary savings going forward. More importantly, structural reforms, specifically those aimed at increasing the retirement age, have been found to limit the downward trend of the natural rate of interest, namely through its positive impact on the labour force.[31]

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[29] A counterexample is China, which has aged rapidly without a proper intergenerational insurance scheme in place. This has resulted in a "savings glut" and a shortage of safe assets (Goodhart and Pradhan, 2020).

[30] See Rodríguez-Vives (2020).

[31] See Papetti (2019).

Box 1

Population ageing in Japan and the related macroeconomic challenges

Prepared by Ana Lima and Alexander Al-Haschimi

Japan increasingly faces a formidable demographic challenge. Like many of its global peers, Japan has been confronted with population ageing and, more recently, a shrinking population. But the rapid pace and earlier onset of these demographic headwinds, which have become pivotal to its economic outcomes and policy decisions, place Japan at the forefront of tackling the related challenges. This box reviews the demographic trends in Japan and their far-reaching implications for the Japanese economy and macroeconomic policies.

Demographic headwinds are building at a rapid pace in Japan, with direct implications for the country's labour supply. According to data from the United Nations (UN), Japan's working age population (aged 15 to 64) has been falling since the mid-1990s and is projected to decline by more than a quarter in the next 40 years (Chart A). At the same time, the UN estimates that Japan's old age dependency ratio (the share of citizens above the age of 65 relative to the working age population) has risen significantly to about 48% in 2020. These developments reflect a declining trend in Japanese fertility rates (from 1.5 in the mid-1990s to 1.4 in 2020), and an increase in life expectancy at birth, which rose to 84.4 in 2020 from about 79 at the start of the 1990s. Notwithstanding a reduction in the working age population, recent labour market reforms have succeeded in raising employment since 2013, particularly among female and older workers, offsetting the impact of the demographic headwinds, although progress has been partly reversed by the pandemic (OECD, 2021). However, despite recent increases, immigration inflows have remained limited overall, with foreign workers accounting for about 2.5% of the workforce in Japan.

Chart A

Demographic trends in Japan

(left-hand scale: millions; right-hand scale: percentages)
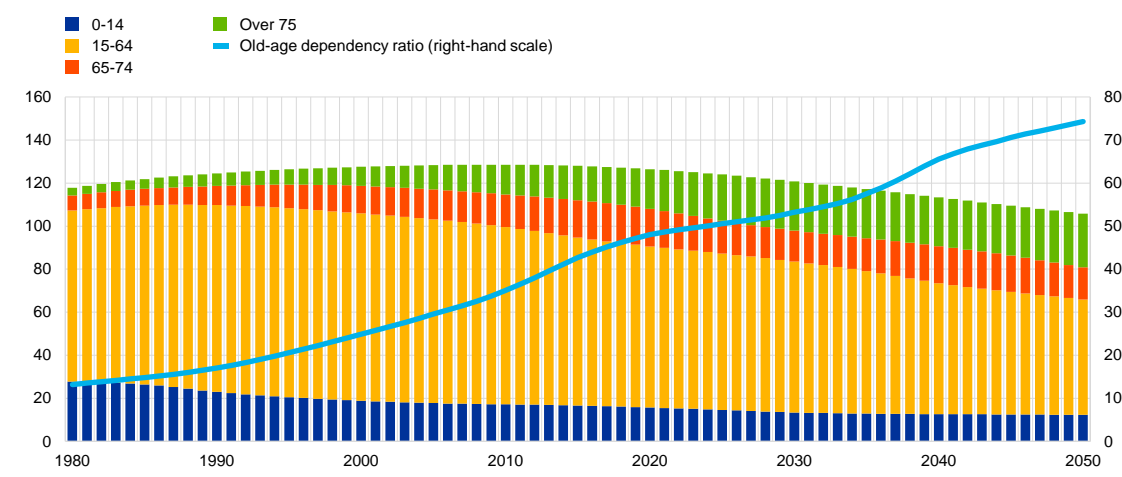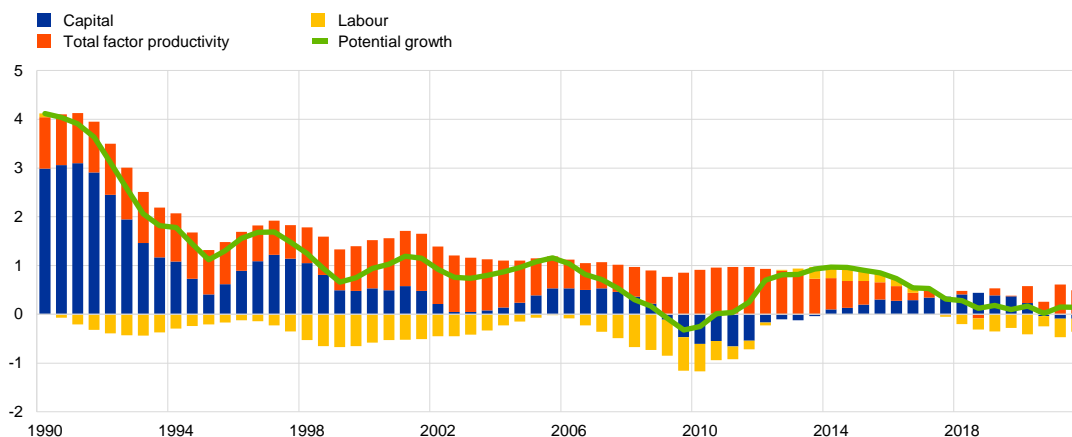

Source: UN world population prospects, 2019 revision, via Haver Analytics.
Note: Estimates and projections are presented for five-year periods; data for calendar years are interpolated.

Chart B

Potential growth estimates

(semi-annual; percentage points)

■ Capital   ■ Labour
■ Total factor productivity   ─ Potential growth

Source: Bank of Japan via Haver Analytics.
Note: The last observations are for 2021Q4.

Population ageing and a shrinking working-age population have likely weighed on productivity and potential growth in Japan. As fewer people enter the workforce, and as older workers tend to have lower participation rates, labour resources become more limited, exerting downward pressure on potential output through the labour component (Nerlich and Schroth, 2018). Available potential output estimates from the Bank of Japan (BoJ) point to a persistent negative contribution from labour (Chart B). Since 2013 this has been partly offset by rising labour participation by women and older workers, which has more recently again reversed.[32] In addition to lower labour inputs, an ageing and declining population may also lead to lower productivity. Using prefectural data, Liu and Westelius (2016) find evidence that changes in the age distribution of workers had a significant negative impact on the level of total factor productivity (TFP) between the early 1990s and 2007.[33] Moreover, an ageing population is likely to generate an increase in demand for services such as health care, which triggers a sectoral shift in economic activity towards the more labour-intensive and less productive service sector (Hong and Schneider, 2020). Overall, the impact of ageing on economic growth can be significant. Using a growth accounting framework, the IMF (2017) estimated that demographic trends will reduce average real GDP growth in Japan by about 1 percentage point per year over the period 2020-2050.[34]

Adverse demographic factors may also negatively affect the natural rate of interest owing to lower potential growth, thereby constraining the role of monetary policy in supporting the economy. While the natural rate cannot be observed and its estimation is subject to a large degree of uncertainty, estimates based on various methodologies point to a significant decline in Japan's natural rate since the 1990s (Sudo et al., 2018). Estimates of the natural rate were in the range of

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[32]   In this respect, the Japanese traditional labour market model – based on life-time employment, a seniority-based wage and promotion system, and a mandatory retirement age – is held to potentially be creating disincentives for female and senior labour participation, as well as labour mobility (OECD, 2019).

[33]   In more detail, they estimate that the ageing Japanese workforce could have reduced annual TFP growth by as much as 0.7-0.9 percentage points between 1990 and 2007, implying that a workforce with fewer mid-age workers (particularly those aged 40-49, who have been found to be more productive) is characterised by lower productivity.

[34]   The IMF assumed constant TFP growth, labour participation rates and capital to effective labour ratios. It then estimated long-term output using a production function approach.

4-5% in 1990, but they have declined to around 0% by 2017, with some measurements even suggesting a negative rate. While changes in neutral technology and, to a lesser extent, the functioning of financial intermediation following the banking crisis are likely to explain a large part of the decline in the natural rate, Han (2019) estimates that demographic changes have had a significant (and gradually increasing) negative impact on Japan's natural rate of interest in recent years (about -0.3 percentage points on average since the global financial crisis). Moreover, as demographic headwinds are projected to worsen further, the negative demographic impact on the natural rate may increase under current policies, further limiting the role of monetary policy in supporting the economy.[35]

Ageing has also placed added pressure on public finances and posed growing challenges for fiscal policy management. Following almost three decades of consecutive budget deficits, gross government debt more than doubled to over 250% of GDP in 2020 according to IMF data (Chart C). But while fiscal spending was initially focused on providing stimulus to support aggregate demand in the cyclical downturn of the 1990s, the advent of ageing and depopulation has led to a reorientation of expenditures towards higher age-related spending, amid a declining tax base. The OECD estimates that public social spending increased from about 11% of GDP at the start of the 1990s to about 22% of GDP in 2018, of which about 80% could be attributed to pensions, health care and long-term care. Under current demographic headwinds, these trends are likely to worsen, making it increasingly difficult to meet social security-related obligations and contain spending. With an ageing society, fiscal stimulus is also likely to become less effective in boosting demand given that public spending is increasingly aimed at age-related spending.

Chart C

Fiscal developments

(percentages of GDP)
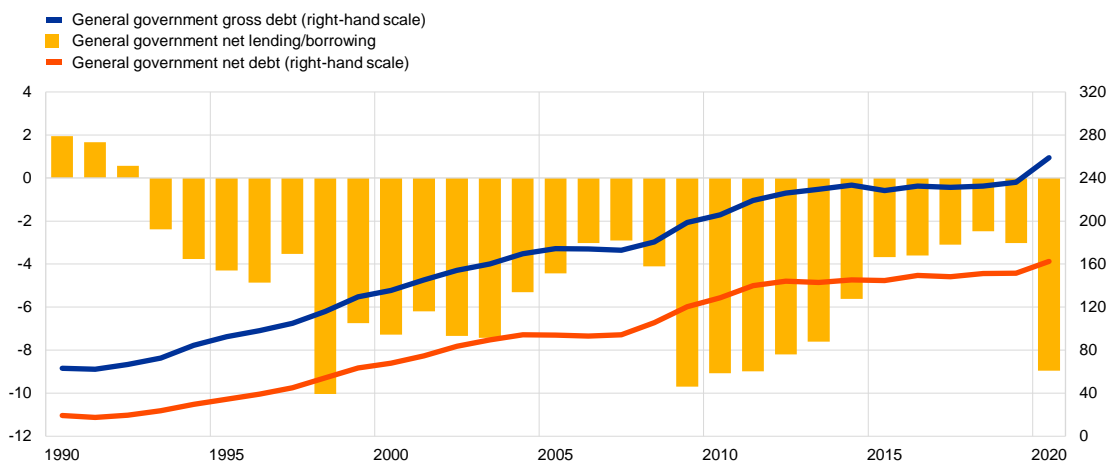
Source: IMF World Economic Outlook, April 2022, via Haver Analytics.
Note: The latest observations are for fiscal year 2020.

Faced with a lower natural rate of interest and increased fiscal strains, analysis of the Japanese experience suggests that structural reforms may be key to tackling the challenges

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[35] Demographic headwinds are also believed to have raised challenges for the financial system, and hence for macroprudential policy (see, for example, Gelos and Muñoz, 2017). For instance, they add downward pressure to the profits of financial institutions (namely banks and insurance companies) through lower growth and interest rates, which has, to a certain extent, encouraged risk-taking among financial institutions.

presented by ageing. Higher labour force participation by women and the elderly has recently offset, at least in part, the decline in the prime age population. However, given that pressures on the labour market are likely to continue under current demographic trends, additional efforts to mitigate its effects may be needed. These include initiatives to further remove obstacles and disincentives that hamper an increase in labour supply, particularly of female and older workers. Furthermore, after a period of weakness, business investment has picked up recently (before the start of the pandemic), driven, to a certain extent, by investment aimed at increasing efficiency through the use of labour-saving technologies. Automation, artificial intelligence and robotics might also form a crucial part of the country's response to ageing. Against this background, and in view of the limited policy space, labour, product market and corporate reforms might be essential to increase productivity and growth, together with regulatory and fiscal reforms (including pension reform), in order to offset the impacts of ageing. The IMF suggests that making headway on the implementation of structural reforms could offset as much as 60% of the demographically-driven slowdown in real GDP growth (IMF, 2020).

3.3 Trend inflation, wage dynamics and structural changes

Population ageing will cause relative price changes due to shifts in consumption baskets. There is strong empirical evidence that the consumption patterns of older people differ from those of younger cohorts. On average, older cohorts spend more in relative terms on services, namely health care and long-term care, and on housing costs for utilities and maintenance, and less on transport, durable goods and clothing than younger cohorts.[36] Furthermore, the goods and services consumed by older cohorts are, to a large extent, price-regulated, making them more price-inelastic to higher demand. These sectoral changes may have a dampening effect, although small, on the price level[37] and may also have consequences for economic activity and employment across sectors.

Changes in the population age structure may be a driver of trend inflation. There is empirical evidence for the underlying demographic structure playing an important role in inflation, although the literature is not entirely conclusive.[38] The link between demographic structure and (low-frequency) inflation is found to be U shaped: a relative larger share of young and old aged dependents is likely to have an inflationary impact, while a relative larger share of working age population is seen to be disinflationary.[39] The line of reasoning is that (young and old) dependents consume, but do not contribute to the production process, while population ageing may cause a shortage in

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[36] For the age-specific breakdown in the euro area, see Box 2 entitled "Nerlich, C. and Schroth, J.(2018), "The economic impact of population ageing and pension reforms", *Economic Bulletin,* Issue 1, ECB, Frankfurt am Main. For the United States, Lee (2016) presents changes in the cross-sectional consumption age profile over the past 50 years. Overall consumption as a share of labour income has tilted towards older cohorts over time, with a rising share of public health care and long-term care.

[37] See Lis et al. (2020).

[38] See Juselius and Takats (2016) and (Mojon and Ragot (2019), while Bobeica et al. (2017) do not find a strong relationship.

[39] See Juselius and Takats (2016). For a panel of 22 countries over the period 1955-2010, they find that the age-structure effect has lowered inflationary pressures by around 5 percentage points in the past 40 years, notwithstanding large cross-country differences. Looking ahead the rising share of the elderly population will increase inflationary pressures on average by 3 percentage points until 2050.

labour supply thereby depressing potential output, as discussed above.[40] If population ageing is dominated by low birth rates and a declining share of young while labour supply is stable or even rising, as experienced in the euro area over the past two decades, the impact tends to be disinflationary. By contrast, once the labour force starts to shrink and the share of old age dependents to total population rises more strongly, the disinflationary effects may be partly reversed. In fact, in the euro area, with the large cohort of baby boomers due to retire around 2035, this will result in labour supply shortages and suggests, all other things being equal, that the change in the demographic structure may pose inflationary pressures thereafter.[41]

While the demographic transition has put downward pressure on wage inflation, this may reverse, at least in part, once the baby boomers have retired. There are two aspects supporting this view. First, given that the age structure influences both the wage level and its growth rate, ageing would seem to be a relevant factor for aggregate wage inflation.[42] The cohort-specific wage level tends to rise with age, while wage growth is generally faster during the early career years and tends to decrease for older workers, a pattern which can also be observed for the euro area (Chart 12).[43] Second, there is empirical evidence for an inverse relationship between cohort size and wage level, i.e. the average wage level of a certain age group tends to be lower if the age cohort and thereby the labour supply from this cohort is sizeable, while the lower wage level at the start of a career may not be fully offset over subsequent career years.[44] These two characteristics, i.e. the cohort-specific wages and the cohort size effect, are likely to play a role in the euro area going forward as the baby boomer generation enters retirement. At the current juncture, the ageing of the baby boomers means a relatively high labour supply of older workers, which may partly explain the depressed wage growth of this cohort relative to what has been observed in the past, in addition to compositional effects. Looking ahead these underlying factors are likely to turn around once the baby boomer generation has left the labour market on retirement. Labour supply will become scarcer and the wage premiums of older workers may return to levels higher than those observed in the past.

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[40] See Goodhart and Pradham (2020) and Aksoy et al. (2015).

[41] Due to its reversing impact on the inflation outlook, this phase of the demographic transition has recently been labelled the "great demographic reversal" (Goodhart and Pradhan, 2020). However, to what extent this would result in an increase in the natural rate of interest has been strongly debated in the literature (see, for example, the discussion by Auerbach in Goodhart and Pradhan (2017). The impact strongly depends on the models used and the relative importance of the various channels discussed above in section 3.2.

[42] See the Box 1 entitled "Changes in employment composition and their impact on wage growth: an example based on age groups", in Bodnar (2018), "Labour supply and employment growth", *Economic Bulletin*, Issue 1, ECB, Frankfurt am Main, 2018.

[43] The lower wage growth of older workers is usually explained by their lower bargaining power and the fact that they have fewer incentives for searching for new jobs than younger workers (Mojon and Ragot, 2019). Data for the United States even show negative growth rates for older workers towards the end of their career.

[44] In the United States, changes in the age distribution of workers have accounted for 5-10 percentage points of wage change. With the ageing of baby boomers, the wage premium of older workers is likely to have depressed their wages relative to those of younger cohorts, thereby putting downward pressure on overall wages (Papadopoulos, Patria and Triest, 2017).

Chart 12

Hourly earnings by age

(left-hand scale: hourly wages in euro; right-hand scale: wage growth as percentage changes)

- Hourly wage (right-hand scale)
- Wage growth (left-hand scale)
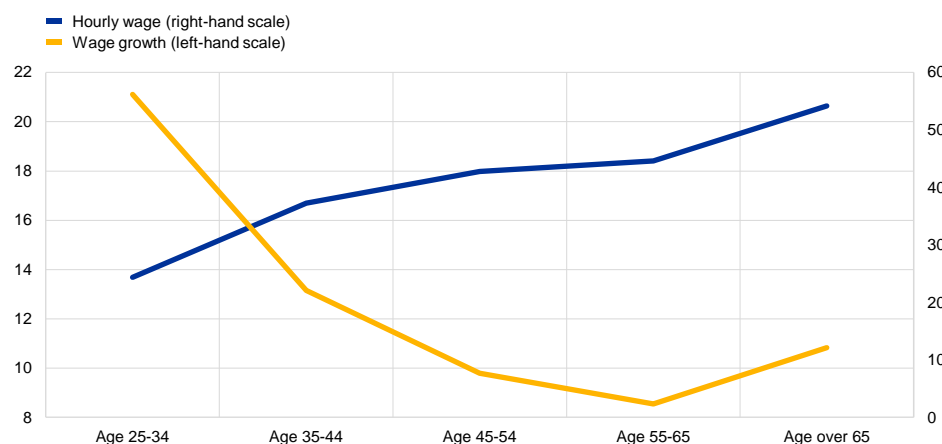
Sources: Eurostat and ECB calculations.
Notes: The chart, taken from the European Union Statistics on Income and Living Conditions (EU-SILC), shows hourly earnings for men and women in 2018 for the euro area. The data are not controlled for the cohort composition. The slight increase for the age cohort 65+ might therefore reflect a selection bias towards highly educated and high wage earners among those who work for longer.

3.4 Asset prices and housing markets

Population ageing may depress the demand for financial assets in the longer run. The life cycle theory of saving predicts that the working age cohort accumulates assets to prepare for retirement, while people may dissave once in retirement, abstracting from the underlying pension schemes. So far, demographic factors seem to have placed only limited downward pressure on asset prices. Looking ahead, once the baby boom generation has entered retirement by around 2035, downward pressure on asset prices could, in principle, become more pronounced. However, as population ageing is a fairly foreseeable, slow-moving process, it is unlikely to trigger a sudden asset price meltdown (Lee, 2016). International arbitrage may also prevent this, given that the demographic transition is not synchronised across countries and regions. Nevertheless, population ageing may weigh on the relative price of assets owing to changes in the structure of financial asset holdings. As older people are found to be more risk averse, the expectation is that they will adjust their investment portfolio decisions by favouring fixed-income investment rather than equities.[45] In turn, large portfolio shifts in household assets may affect the transmission channels for monetary policy.

Population ageing may gradually diminish the demand for credit. Credit demand usually follows a life-cycle profile with peak credit demand coinciding with young prime age workers, and demand falling to relatively low levels towards the end of the working career.[46] This may be particularly relevant for household mortgages.[47] Credit demand

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[45] See footnote 25.

[46] See Hernández de Cos (2020).

[47] In 2019 less than 6% of the single homeowners older than 65 years had a mortgage, compared to 44% for the same household type younger than 65 years.

might also shrink in case of dampened private investment and lower demand for durable consumption goods among older citizens. Systematically lower credit demand would have important implications for the intermediary role of banks and subsequently for monetary policy transmission. In addition, if lower credit demand were to come on top of already compressed bank profit margins, for example in a low interest rate environment, this might also pose challenges for financial stability.

There is currently no evidence for house prices being negatively affected by population ageing. In the euro area, house prices have increased strongly in the past two decades, thereby calling into question the argument that there would be an oversupply of housing due to the demographic change. Instead, several trends point in the opposite direction and tend to stabilise the housing market. These include a higher preference among older citizens for living in single households rather than in multigeneration homes, higher living standards in terms of space per person, and medical progress which allows the elderly to remain independently at home for longer.[48] Higher life expectancy and healthy ageing might support these factors further. However, once the total population starts to shrink from 2035 onwards, as projected for several euro area countries (Chart 3), there might be an oversupply of housing in a number of countries, placing downward pressure on house prices. Under such circumstances, the balance sheets of households and (regional) banks might be exposed to greater risks.

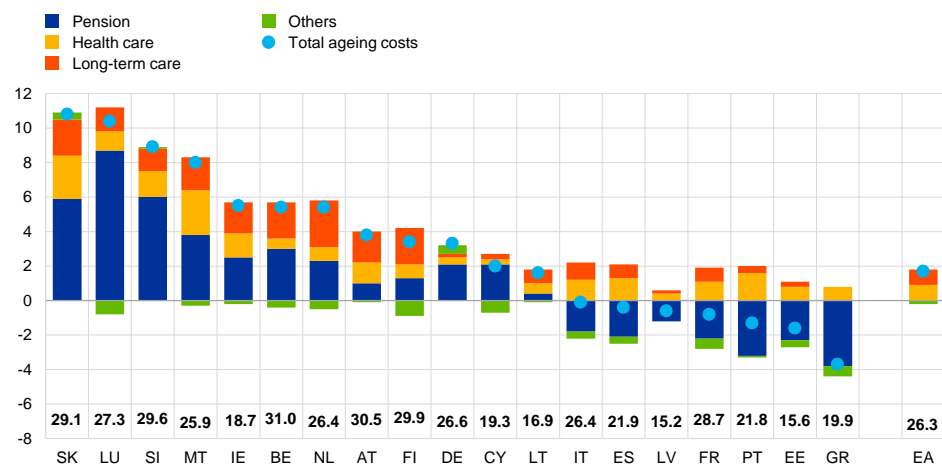## 3.5   Risks to long-term fiscal sustainability

Population ageing is placing a burden on fiscal policy. In the euro area, public spending that is sensitive to demographic ageing, such as expenditure on pensions, health care and long-term care, is high by international standards. Total ageing-related public costs in the euro area amount to more than 25% of GDP currently, similar to the figure for Japan, compared with roughly 15% of GDP in the United States. Different regional patterns reflect not only different underlying age profiles, with Japan leading by almost 15-20 years (see Box 1), but also different societal preferences, institutional settings and reform efforts. As the share of the elderly rises further, countries will be faced with additional pressure on age-related public spending unless corrective adjustments are implemented to contain such dynamics. Based on the estimates given in the 2021 Ageing Report, ageing-related expenditure is projected to rise from 24.6% of GDP in 2019 to almost 27% in 2040, reflecting the fact that the baby boomer generation will be retired by then, and will fall slightly thereafter to 26.5% of GDP in 2070 (Chart 13).

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[48]   See Börsch-Supan et al. (2019). According to Eurostat, around 70% of euro area citizens over the age of 65 were homeowners in 2019.

Chart 13

Level of ageing-related public spending in 2019 and projected changes in 2070

(percentage changes and 2019 level as percentages of GDP)

- Pension
- Health care
- Long-term care
- Others
- Total ageing costs

	SK	LU	SI	MT	IE	BE	NL	AT	FI	DE	CY	LT	IT	ES	LV	FR	PT	EE	GR		EA
	29.1	27.3	29.6	25.9	18.7	31.0	26.4	30.5	29.9	26.6	19.3	16.9	26.4	21.9	15.2	28.7	21.8	15.6	19.9		26.3

Sources: European Commission (2021 Ageing Report) and ECB calculations.
Notes: The category "Others" includes public education. The 2019 total ageing costs, expressed as a share of GDP, are shown at the bottom of the chart.

Pension spending is the largest ageing-related budgetary component in the euro area. It accounted for more than half of total public expenditure in 2019, corresponding to 12.1% of GDP. Public pension spending is projected to increase to 13.4% of GDP in 2040, before returning to around 12% of GDP in 2070. This, however, masks large cross-country differences.[49] Population ageing will exacerbate intergenerational burden-sharing, given that mandatory public (unfunded) schemes are the predominant pension system in place in the euro area (Chart 11). Without corrective pension reform measures, population ageing will result in a widening of the financing gap in most countries. Moreover, public health care and long-term care systems are also expected to weigh adversely on public finances in the coming decades, given that such systems cater disproportionately for older citizens, even with improved health status and rising economic wealth.[50]

Population ageing may adversely affect tax bases and the structure of public revenues. A shrinking labour force will partly erode the tax base for personal income taxes and social security contributions, while pension income is often not taxed at all or at a limited rate, reducing revenues due to the progressive nature of the tax systems in the euro area. Compensating for such shortfalls through higher tax rates could be expected to have adverse effects on labour supply. In principle, migration inflows may have a positive impact on the labour supply and thereby the tax base, but their overall fiscal impact is uncertain.[51] Direct tax revenues may suffer from an age-dependent shift in consumption from durable consumption goods to specific services (e.g. health care) that are often price-regulated and frequently benefit from tax exemptions or

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[49] Projections of the 2021 Ageing Report.

[50] High health care expenditure is a function of economic growth. To the extent that higher health care expenditure contributes to a better health status of the older population, this improves life expectancy and thereby indirectly affects pension expenditure.

[51] The fiscal impact of immigration depends on several factors, such as the composition of the immigrant population in terms of age, employment status, education, design of the tax and benefit system in the host country, and the business cycle (OECD, 2013).

reductions. Whether this will affect the relative size of VAT revenues will also depend on the marginal propensity to consume, which is found to be higher for the older generation. Opposite forces may be at play for capital tax revenues, reflecting the impact of ageing on national savings and interest income. On the one hand, capital tax revenues may increase as a result of rising longevity and the desire for precautionary savings. On the other hand, revenues may be dampened by a larger share of retirees who tend to dissave, as discussed above. While population ageing in the euro area may affect the overall composition of tax revenues, the extent to which revenue shortfalls would be offset by tax adjustments is highly uncertain given that the latter might trigger fierce political resistance.

Demographic ageing could pose significant challenges for fiscal sustainability. Overly generous pension schemes and health care systems are a threat to long-term fiscal sustainability. Euro area countries have already accrued substantial implicit pension liabilities that will continue to rise with population ageing (Chart 11).[52] If this additional ageing-related spending is left unaddressed, it may lead to very large amounts of government debt over the medium to long term. Public ageing cost pressures are expected to increase particularly strongly in the next two decades, when the large cohort of baby boomers enter retirement. In the absence of further cost-reducing reforms of the social security schemes, countries would need to cut other public expenditure or increase taxes both of which are likely to have adverse effects on potential growth. The need for swift action seems to be particularly pressing for high-debt countries such as Italy, Portugal, Belgium, Spain, France and Cyprus, which will face sharp increases in their ageing-related costs by 2040 (Chart 14, upper right-hand quadrant).[53] Illustrative long-run debt simulations for the euro area show that the impact of age-related spending on the public debt-to-GDP ratio would be over 50 percentage points by 2070 (Chart 15), compared with simulations abstracting from population ageing, in which the debt-to GDP ratio would remain broadly unchanged from today's level.[54] The difference between these simulations gives a rough indication of the costs if countries were to fail to address future increases in age-related spending through structural reforms or net migration flows.

Debt dynamics and the available fiscal space hinge on the interest rate growth differential and how it is affected by population ageing. In past years euro area countries benefited from a favourable, i.e. negative, interest rate growth differential that offered fiscal space for most countries.[55] As discussed above, population ageing is expected to contribute to a lower growth environment, while the natural rate of interest is expected to further decline in the next one and a half decades. The overall impact of ageing on public debt will largely depend on which of these two opposing

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[52] The data on accrued-to-date pension entitlements are not directly comparable with the ageing cost projections, as pension entitlements are derived ex post and only include pension entitlements already accrued by current workers and pensioners, but not future liabilities.

[53] The picture would look somewhat different if the ageing cost projections were to be shown until 2070. In fact, in some countries ageing-related pressures are projected to decline in later decades, partly due to favourable macroeconomic assumptions, while in other countries they are expected to increase even further.

[54] It is assumed that the euro area general government debt-to-GDP ratio, as presented in the European Commission's 2020 Debt Sustainability Monitor, would remain broadly unchanged.

[55] In most cases, the additional fiscal space available before 2020 was used for discretionary fiscal policy rather than a reduction in part of very high government debt-to-GDP levels.

effects dominates.[56] Ageing would certainly make it more difficult to ensure debt sustainability if the interest rate-growth rate (r-g) were to be reversed, i.e. if interest rates were to exceed real economic growth.[57] Yet, uncertainty is high.

Chart 14

Public ageing cost pressure in high-debt countries

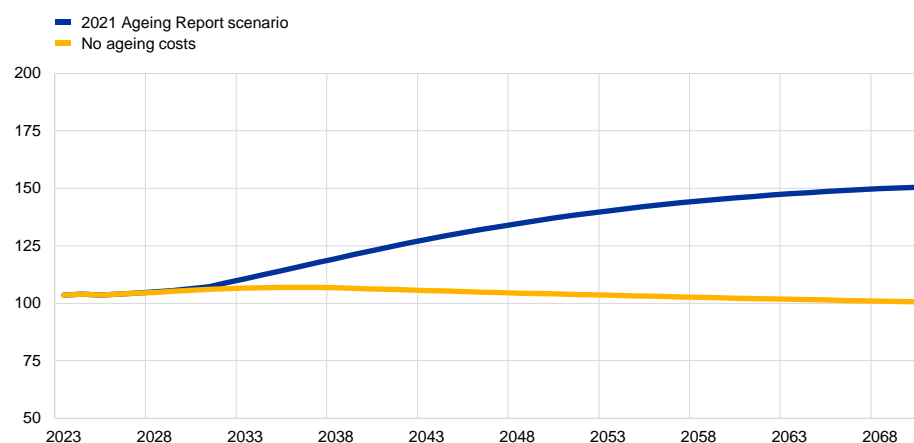(government debt-to-GDP in 2019; changes in ageing costs, 2019-40, as percentages of GDP)
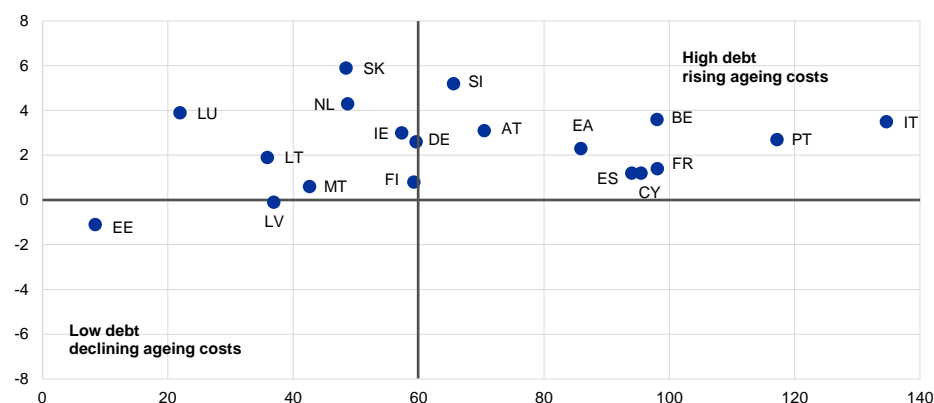
Sources: Eurostat (2021 Ageing Report) and ECB calculations.
Note: Greece is not shown in the chart given that it is an outlier with a debt ratio of 180% of GDP in 2019 and a projected decline in ageing costs of 1.8% of GDP by 2040.

Chart 15

Illustrative debt simulations

(percentages of GDP)

Source: 2020 Debt Sustainability Monitor (DSM), Eurostat (2021 Ageing Report) and ECB calculations.
Notes: Until 2031 based on the DSM as updated with the European Commission Autumn 2020 forecast; at 2032 ECB calculations based on the DSM methodology and macro-ageing-cost assumptions from Eurostat's 2021 Ageing Report.
The "no increase in ageing costs" scenario assumes, counterfactually, that ageing costs remain constant at their 2019 level throughout the simulation horizon.

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[56]   Checcherita-Westphal and Domingues Semeano (2020) find that a higher old age dependency ratio is associated with a lower r-g differential, while a decline in population growth tends to increase the differential assuming lower potential growth.

[57]   In particular, a sudden rise in interest rates relative to growth could quickly result in explosive debt dynamics, suggesting that the fiscal limit might be tighter than if based on long term trends for r-g (see Sergeyev and Mehrotra, 2020).

4 The implications for policy space and policy options

The available policy space for macroeconomic stabilisation is likely to be more limited as demographic pressure increases. As discussed above, population ageing will intensify in the coming decades and, as such, will continue to adversely affect potential growth and the natural rate of interest. Consequently, population ageing will be an important factor in monetary policy possibly being constrained more often at the effective lower bound. In line with the currently prevailing view, low nominal interest rates may make it more difficult for central banks to achieve their price stability mandate and to stabilise the economy through conventional monetary policy instruments.[58] Moreover, in an ageing society, consumers may be less responsive to changes in nominal interest rates, reflecting their shorter-term time preferences. This, in turn, could limit the effectiveness of conventional monetary policy instruments to stabilise the economy.[59] Furthermore, population ageing may weaken monetary policy transmission through structural changes to financial asset holdings and credit demand, thereby affecting the wealth and credit channels.

While these limitations would argue in favour of fiscal policy playing a stronger role in stabilising the economy, there are reasons to believe that population ageing will limit the available fiscal policy space and its effectiveness. First, as discussed above, population ageing will place a burden on public finances through higher ageing-related public spending and eroded tax bases. This trend is projected to accelerate, particularly in the next one and a half decades. By posing additional challenges for long-term fiscal sustainability, this would substantially constrain the available fiscal space, especially in countries with already high public debt levels and assuming that no counterbalancing actions were taken. Second, the effectiveness of automatic stabilisers, which have played a crucial role in diminishing macroeconomic fluctuations in the euro area countries since 2000,[60] may decline with population ageing going forward. As the working age population will shrink in absolute and relative terms in the coming years, it will diminish the leverage of unemployment benefits, short-time work schemes and progressive income taxation to stabilise the economy. However, the decline in effectiveness might be offset, at least partly, by higher ageing-related public expenditure, such as pension benefits, which might have stabilising properties during economic downturns.[61] Third, population ageing is expected to weaken the effectiveness of fiscal policy stabilisation more during recessions than during boom phases. The negative impact of an economic downturn on consumer confidence and expected investment returns is found to be stronger in an ageing society reflecting higher risk aversion.[62] Fourth, to adjust for an ageing

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[58] See, for example Laubach and Williams (2016).

[59] See the argument made by Stansbury and Summers (2020).

[60] See Bouabdallah et al. (2020).

[61] For countries with predominantly capital-based pension schemes, such as Ireland and the Netherlands, however, the income-stabilising effect of pensions may fluctuate over time.

[62] See Honda and Miyamoto (2021) and Basso and Rachedi (2020).

society, governments may decide to curtail in particular those fiscal policy activities that have a higher fiscal multiplier but long-term benefits, such as public investment in infrastructure and education.[63] This would weight negatively on potential growth.

Population ageing may even lead to higher economic volatility and increased heterogeneity in the euro area. If both monetary policy and fiscal policy were more constrained in stabilising the economy due to the demographic transition, this might result in higher economic volatility. An additional complication might arise from the fact that the dynamics of population ageing vary across countries. Thus, euro area countries might not only experience very different adverse macroeconomic and fiscal implications of ageing, but their available policy space on the fiscal side might also be constrained to very different degrees. As a result, business cycles in the euro area countries might become less synchronised with population ageing going forward, which would affect the environment in which monetary policy is taking place.

To safeguard against the adverse economic and fiscal consequences of population ageing, there is a need for fiscal buffers, better quality public finance and structural reforms. Although the demographic transition will not change any time soon, there are several policy measures available that might help to mitigate the unfavourable macroeconomic and fiscal implications of population ageing. First, in view of rising ageing-related government spending, there is a need to build-up stronger fiscal buffers during good economic times to improve the room for manoeuvre during downturns. Second, to prevent the effectiveness of fiscal policy declining with population ageing, improvements in the quality of public finance and a reprioritisation towards growth-enhancing public spending are called for. Third, there is an urgent need to implement structural reforms that help to expand productivity growth and private investment by promoting innovation, including through labour-saving technological progress[64], and by investing more strongly in human capital. Fourth, to mitigate the adverse impact of population ageing on labour supply, well-targeted pension reforms are needed to encourage older workers to remain active for longer and postpose their entry into retirement. In this regard, it will be crucial that governments avoid the temptation to reverse, even if only temporarily, those pension reforms that have already implemented given that this would give the wrong signals to an ageing society. Fifth, labour market reforms tailored towards older workers and supporting a higher participation rate, in particular of women, will be essential. Sixth, euro area governments may need to encourage migration inflows and ensure better integration of foreign workers into society. Migration might cushion the decline in working-age population due to ageing, and, if fully integrated into the labour market, help by generating fiscal income. However, immigration in itself may not be able to fully counterbalance the projected decline in population, while further measures will be needed.

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[63] In addition, this needs to be seen against the findings in the literature that fiscal multipliers are larger at the effective lower bound, as investors expect monetary policy to remain accommodative. See, for example Coenen, G. et al. (2010) and Christiano, L., Eichenbaum, M. and Rebelo, S. (2011).

[64] The adoption of labour-saving technologies might have heterogeneous effects on the workforce in the short run owing to a drop in wages and employment opportunities. The adoption of new technologies should thus be accompanied by adequate reforms and investments in human capital and retraining that would allow the benefits of such innovations to be reaped in full.

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