4

ECONOMIC CONSEQUENCES OF DEMOGRAPHIC CHANGE

Summary

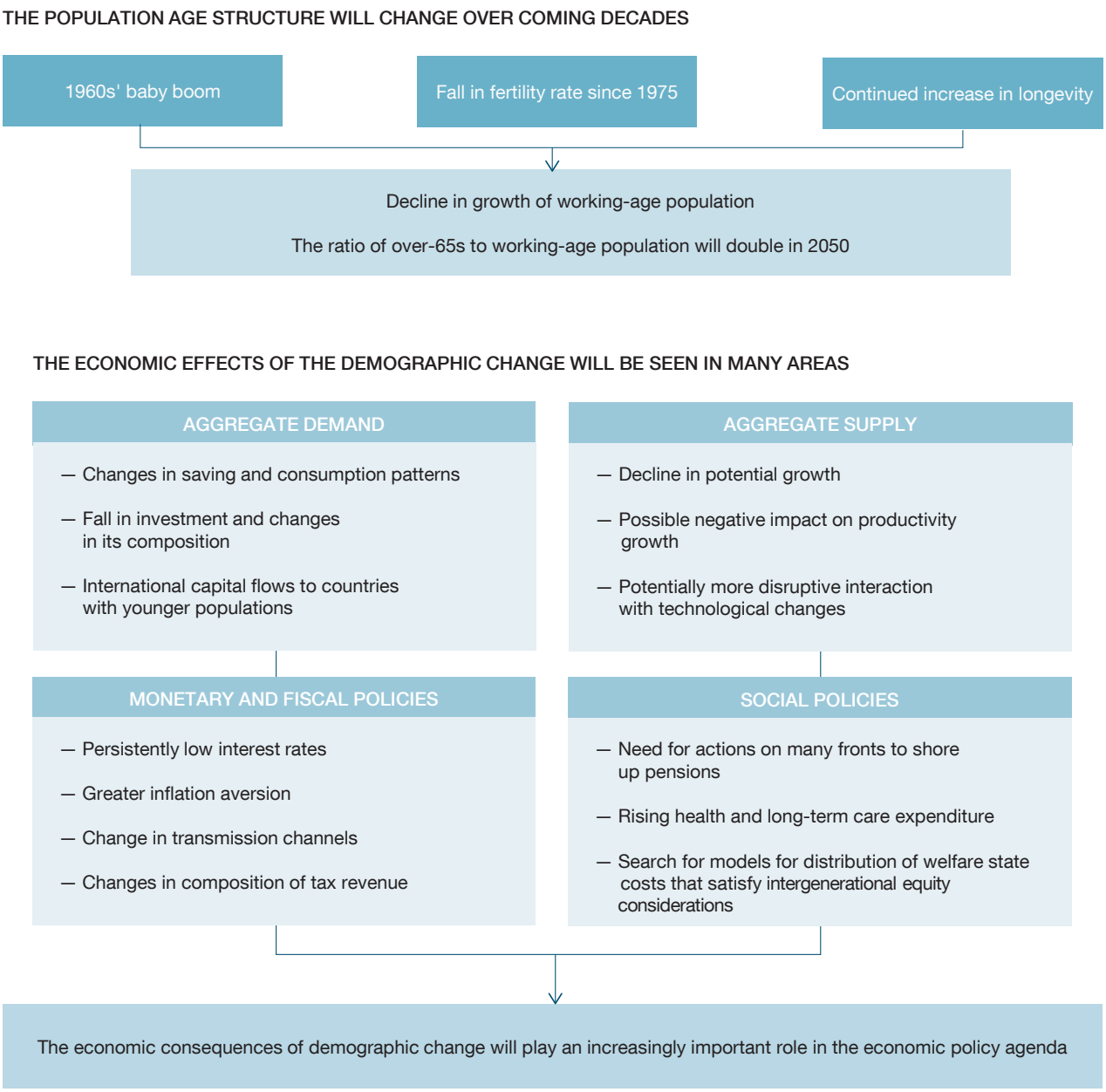
Two structural trends will shape the macroeconomic context in coming decades: demographic changes and technological advances. Three factors - the numerous population cohorts born after the Second World War that are reaching retirement age, the low fertility rate over the last four decades, and the continued increase in longevity – are driving down the proportion of the working-age population in the developed countries, and particularly in Spain. These demographic changes will accelerate in coming years, while new technological developments (partly related to them) will reshape the macroeconomic context.

Population ageing has important consequences for aggregate supply and demand in an economy, and for macroeconomic policy. There are rigorous theoretical grounds and empirical evidence to maintain that demographic changes will affect consumption (and its composition), as well as investment, employment, productivity and wage and price setting. This in turn will affect the effectiveness of monetary and fiscal policies: first, because the lower rate of growth of the working-age population makes it more likely that interest rates will remain low; and second, because both the level and composition of public expenditure and tax revenue and the transmission of fiscal impulse to economic activity depend on the population age structure.

The pension system and other social policies will have to be reoriented to meet the needs of an older population, taking into account financial sustainability and intergenerational equity considerations. A very large portion of the expenditure needs of the pension and the health and long-term care systems is directly related to the size of the elderly population. As this population cohort grows, their benefit coverage and its funding will have to be redefined. Given that this expenditure is funded mainly via intergenerational income transfers, reforms on both fronts will affect the well-being of present and future generations and must, therefore, be undertaken considering the intergenerational distribution of costs and benefits.

Figure 4.1

ECONOMIC CONSEQUENCES OF DEMOGRAPHIC CHANGES



SOURCE: Banco de España.

1 Introduction

Three demographic patterns are altering the socio-demographic fabric: the retirement of baby boomers, the decrease in fertility and the increase in longevity. Demographic developments in advanced countries show certain common factors. First, all of them benefited from the birth of a very numerous generation after the Second World War, although this happened some years later in Spain. Second, there has been a significant decrease in the fertility rate in all of them, which has been sharper in Spain than in other countries. Finally, longevity continues to rise and life expectancy in Spain is among the highest in the world. Consequently, the population projections available for Spain indicate that over the coming decades the working-age population will probably decrease, even if immigration inflows remain at high levels. Similarly, the population age composition is certainly expected to change substantially. The proportion of the population aged over 66 is expected to be 12 pp higher half-way through this century than it is at present (i.e. 29.2% compared with 17.1%, according to the INE's demographic projections).

This chapter analyses the economic consequences of these demographic changes as regards the functioning of the economy and certain key economic policies. The main objectives of this chapter are to describe and analyse the varied economic effects of the new socio-demographic fabric. Thus, the main issues addressed below are the chief determinants of the demographic shifts, how they affect macroeconomic variables (employment, inflation, output, etc.) and their implications for economic policies.

2 The demographic outlook: fertility, longevity and immigration

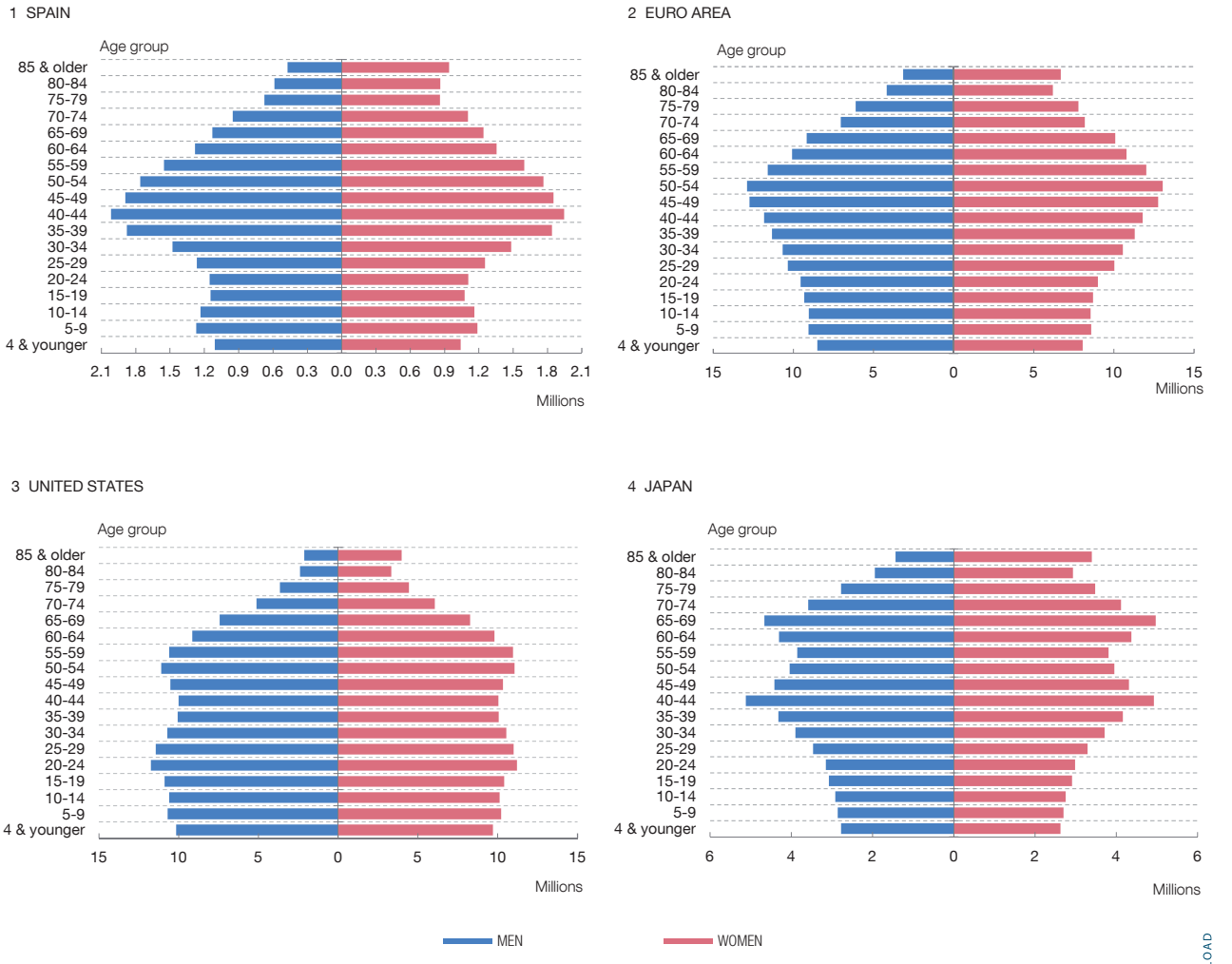
A notable widening of the middle age groups in Spain's current population pyramid is visible. In western countries, the most numerous population cohorts are currently among the 45-65 age group (see Chart 4.1). This is due to the higher fertility rates recorded after the Second World War (the baby boom), which occurred slightly later in Spain than in other countries (in 1960-1975, instead of in 1945-1965). Developments in the population aged over 66 during the coming decades are mostly determined by the relative size and time of the baby boom. In the case of Spain, these two factors will have a particularly high impact on the population age composition.

Longevity continues to rise persistently. A second contributory factor to the rapid population growth of older cohorts is the increase in longevity (see Chart 4.2). Life expectancy at birth in Spain has risen since 1975 at a rate of 2.2 years per decade (1.4 years per decade in the case of life expectancy at 65). A larger share of each

Chart 4.1

DEVELOPED COUNTRIES' POPULATION PYRAMIDS ARE WIDENING IN THE MIDDLE AGE GROUPS (a)

Moreover, as this widening is more evident in Spain than in other developed countries, the gradual increase in the older population in coming years will be more marked in the case of Spain.



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SOURCES: European Commission, UN and Banco de España.

a For Spain and the euro area, figures at 1 January 2017; for the United States and Japan, figures at 1 July 2015.

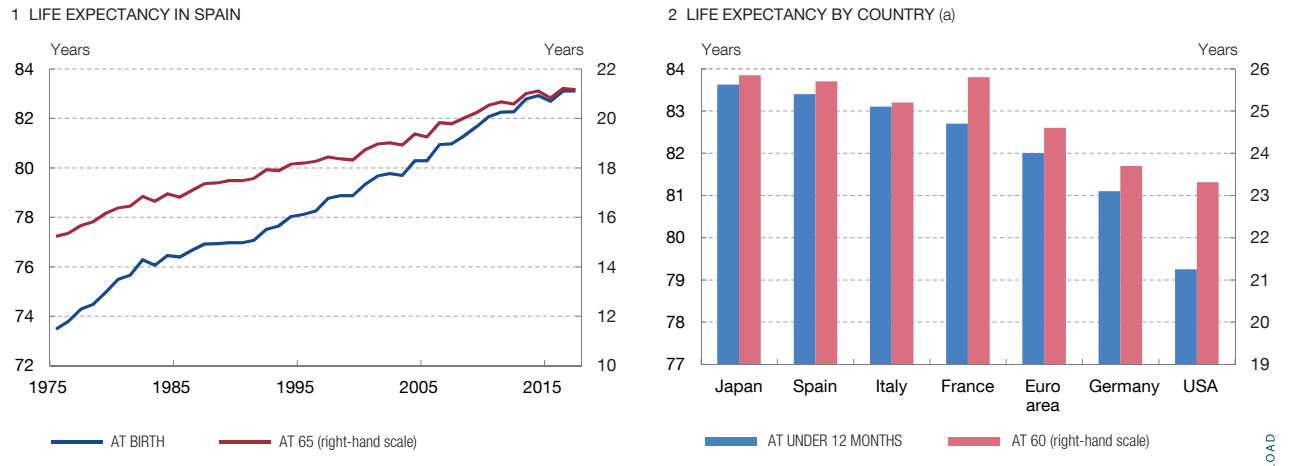
generation lives into old age, and survival rates of older cohorts are increasingly higher. At the same time, as a result of technological advances in the health system and health-related behaviour patterns, longevity may continue to increase, at least at rates similar to those observed in the past. If this is the case, the proportion of older population cohorts could increase to a greater degree than has been envisaged in demographic projections currently available.[1]

1 For longevity and health of older people by socio-demographic group, see Bohacek, Bueren, Crespo, Mira and Pijoan-Mas (2018).

Chart 4.2

SPAIN IS ONE OF THE WORLD LEADERS IN LONGEVITY

The continuing increase in longevity is one of the causes of population ageing. In Spain, life expectancy at birth and at 65 is above the European average, and shows no sign of levelling off. There is a gradual increase in the percentage of each generation that reaches old age. In addition, the numbers of years they survive in old age continues to rise.



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SOURCES: European Commission, UN and INE.

a Figures for 2017, except for the United States and Japan where the figures are for 2015.

Lower fertility rates will trigger a decrease in the working-age population. Since the baby boom, fertility rates in advanced countries have decreased notably (see Chart 4.3). The fall in the number of children per woman of child-bearing age in Spain has been more pronounced than in other countries (from 2.8 in the mid-1970s to around 1.3 in 2017) and the fertility rate continues to be especially low, despite the contribution from the immigrant population (which initially has higher fertility rates than the population in Spain). As a result, the child population and the population cohort at the first stage of their working lives are small relative to the middle age population.

Immigration has helped to increase the size of the working-age population. The robust immigration recorded in the period 1995-2008 decreased during the crisis when there was also a rise in the numbers of residents who migrated abroad. At present, net inward migration amounts to 0.4% of the population in Spain (see Chart 4.4). Although there is a high degree of uncertainty over how this inward migration may develop in future, the most probable scenario, according to the most commonly used models, is population growth due to migratory flows of approximately 200,000 individuals per year over the next three decades.[2] The immigrant population is younger than the population in Spain and, therefore, these arrivals increase the

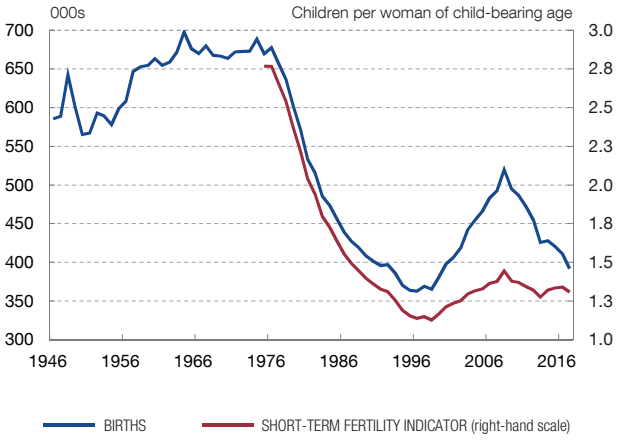
2 See, for example, Fernández-Huertas Moraga and López-Molina (2018).

Chart 4.3

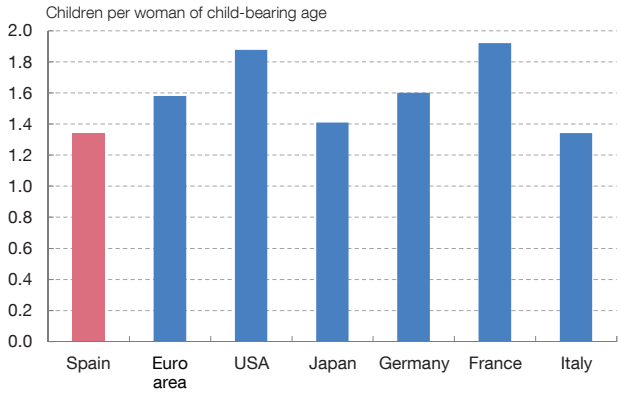
THE FERTILITY RATE IN SPAIN, WHICH IS AMONG THE LOWEST IN THE WORLD, WILL REDUCE THE SIZE OF THE WORKING-AGE POPULATION

The fall in the fertility rate has been very pronounced in Spain, more so than in the other developed countries. In consequence, the child and young population is small compared to the middle age population.

1 FERTILITY RATE IN SPAIN



2 TOTAL FERTILITY RATE BY COUNTRY (a)



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SOURCES: European Commission, UN and INE.

a Figures for 2016, except for the United States and Japan where the figures are for the period 2010-15.

proportion of younger population. However, this effect will last only to the extent that immigrant flows increase in future.

Work-life balance policies and policies to boost birth rates may contribute to achieving more balanced demographics. Over a longer time horizon the fertility rate needs to increase in order to achieve a more balanced population breakdown by age. However, in coming years, even if the fertility rate were to rise significantly, the number of births would remain low since the current cohort of women of child-bearing age is small. Only if it were to rise very strongly, quickly and permanently would it be possible, over a broader horizon, for first the number of births and then, two decades later, the cohort of young adults of working age to increase significantly. Consequently, measures are urgently needed to bolster pro-work/life balance and pro-natalist policies that, while ensuring effective equality between sexes, prompt a significant and permanent rise in the birth rate[3] as soon as possible.

The population projections show that over coming decades there will be a highly significant increase in the proportion of the population over 66.

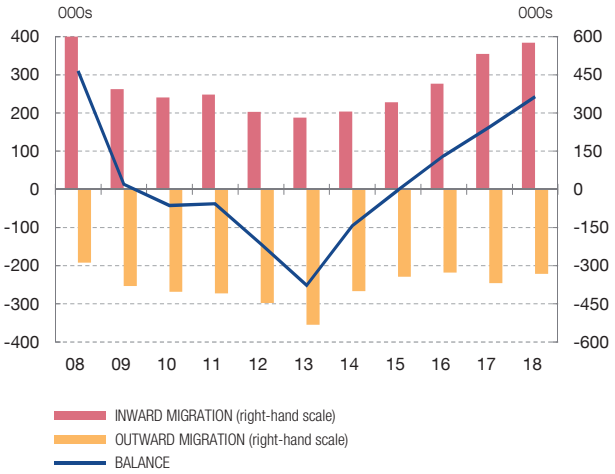
3 Which are the most effective measures for accomplishing this objective is a matter that has not been resolved by economic literature. In this field, there are examples of measures which seem to produce the opposite results to those intended (see, for example, Farré and González (2018)).

Chart 4.4

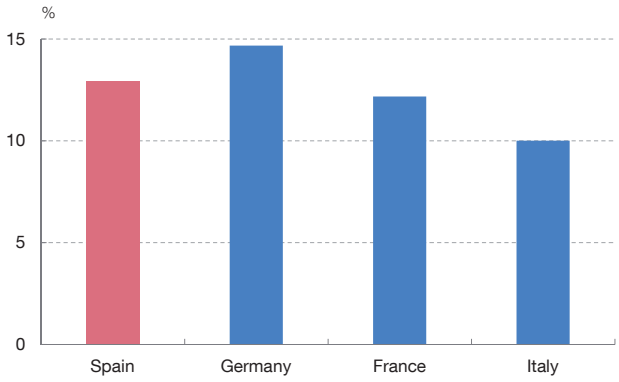
INWARD MIGRATION CAN ONLY OFFSET DEMOGRAPHIC AGEING IN THE SHORT TERM

Immigration could mitigate demographic ageing, at least in part, by increasing the size of the working-age population, as it did in the decade before the crisis. But beyond the short term this effect will fade, and the impact will be to further increase the older population.

1 EXTERNAL MIGRATION BALANCE IN SPAIN



2 PERCENTAGE OF FOREIGN-BORN POPULATION, BY COUNTRY, IN 2017



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SOURCES: European Commission, INE and Banco de España.

Despite uncertainty about developments in demographic variables (especially migratory flows), it seems inevitable that there will be a strong increase in the proportion of the population over 66 (the greater the rise in longevity, the higher it will be). As Box 4.1 shows, even despite the considerable differences in the fertility and immigration rate assumptions underlying the population projections of several bodies, the ratio of the population aged over 66 to the population aged 16-66 will rise significantly over the next three decades to at least double current values (up from 25.6% at present to 51.3% in 2050, according to the INE's demographic projections, and up to similar levels according to the other projections).

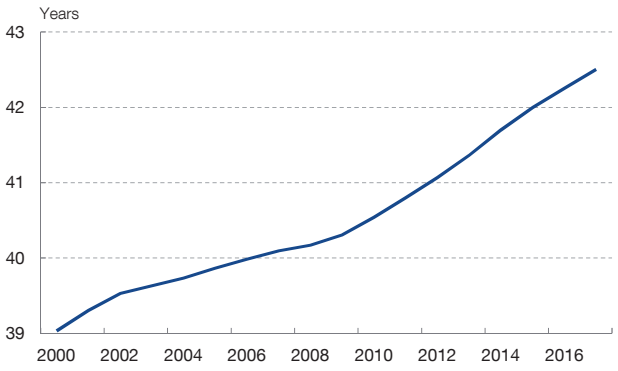
The average age of the population in Spain and of the median voter will continue to climb. Aside from its direct economic consequences, the change in the population age structure is also significant for many economic policy decisions. As a knock-on effect of this change, the average age of the population in Spain will increase by at least five years (from 43 to 48) between 2018 and 2050 (see Chart 4.5). If historical patterns of electoral participation by age group remain constant (higher participation of older people), public support for policies financed by income transfers to older people could rise, to the detriment of other policies which reduce the – currently already high – weight of the debt burden on future generations.

Chart 4.5

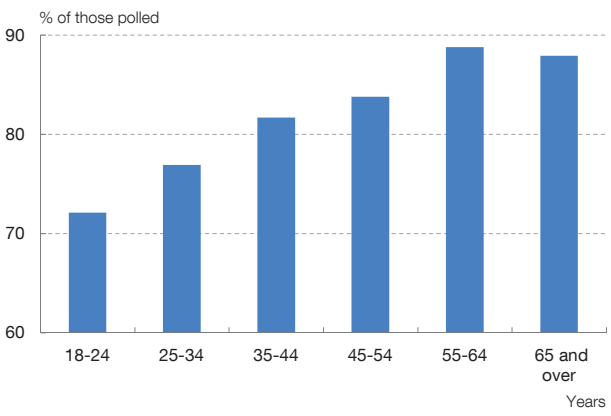
THERE IS A CLEAR POSITIVE RELATIONSHIP BETWEEN AGE AND ELECTORAL PARTICIPATION, INTERRUPTED ONLY AMONG THOSE WHO ARE 65 AND OVER

The spread between median voter age and the median age of the population will possibly widen, increasing public support for measures funded by intergenerational income transfers to the older population.

1 AVERAGE AGE IN SPAIN



2 ELECTORAL PARTICIPATION, BY AGE (a)



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SOURCE: Centro de Investigaciones Sociológicas (CIS) and Banco de España.

a Percentages by age group of persons indicating, in the post-electoral poll conducted by the CIS, that they had voted in the general election held on 26 June 2016.

3 Population ageing and aggregate supply and demand

The size of the working-age population and the population age composition play a fundamental role in developments in the economy's aggregate supply and demand. This section highlights the main mechanisms whereby demographic variables influence consumption, saving, investment, employment, productivity and price and wage setting. They all have important implications for the implementation of economic stabilisation policies and social programmes.

3.1 Effects on consumption, saving and investment: savings rate and financial position over the life cycle

Consumption and saving patterns and the composition of wealth vary over the life cycle. Future income expectations, which for obvious reasons vary over the life cycle, have a decisive impact on households' consumption, saving and investment decisions. Thus, on average, young adults tend to borrow, since the longer the remainder of their working life, the higher their expected income flow. By contrast, older people usually have positive net worth which they consume during retirement, to a greater or lesser degree, depending on whether they prefer to pass on their wealth to their heirs.

Real estate assets make up a high proportion of the wealth of Spanish households. A key characteristic of the financial position of Spanish households is the high proportion of real estate assets, especially in households where the reference person is older. In Spain 83.1% of households own their main residence (compared with 66.2% in the euro area) and ownership rates for households with an older reference person increase to 87.5% (for 55-64 year olds), 90.3% (for 65-74 year olds) and 88.7% (for those aged 75 and over), whereas in the euro area these rates stand at 70.5%, 71.9% and 68%,[4] respectively. In households with an older reference person, the median net wealth is similar to the median value of their main residence.[5]

However, the proportion of saving for retirement is not particularly large. Spain ranks eighth in terms of households with voluntary pension funds (24.5% compared with the euro area average of 30%),[6] with a slightly higher volume than countries such as Italy, Portugal, Austria or Finland, but below the euro area average, among the twenty European countries for which there is comparable information.[7] In addition, the growth of individual and occupational pension schemes and funds seems to have slowed recently.[8] Nevertheless, as described in Box 4.2, in order to assess the extent to which Spanish households' asset portfolios may vary in the future, it must be considered that the saving patterns and composition of asset portfolios of the new generations may differ from those of past generations.

The retired population's disposable income mainly depends on public pensions and its consumption expenditure is particularly sensitive to this source of income. The high proportion of illiquid assets in the wealth of older households means that, in many cases, their disposable income essentially depends on the revenue obtained through transfers from the public pension system. The relationship between pension amount and consumption can be estimated on the basis of a series of legislative changes in public pensions adopted in Spain between 1979 and 1997. It can be concluded from this estimate that changes in pensioners' disposable income translate into similar variations in their consumption expenditure, especially in the case of spending on durable goods by retirees in the higher wealth bracket and of spending on non-durable goods and food by those at the lower end of the income distribution.[9] It should also be noted that, in Spain, retirees' disposable income quite frequently acts as insurance to cover the economic needs of younger generation family members who are unemployed or experiencing job insecurity.

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4 Data from the Household Finance and Consumption Survey, second wave, April 2017.

5 Median wealth is the level at which half of households are below that level and half are above.

6 See the Household Finance and Consumption Survey.

7 This comparison refers to the median amount accumulated in voluntary pension funds multiplied by the probability of having a pension fund divided by the median income.

8 See Fuentes (2016).

9 See Párraga Rodríguez (2019).

Intergenerational transfers of wealth through bequests have a high value in Spain. According to data of the OECD,[10] around 35% of Spanish households receive bequests with a median value of approximately €115,000. While the proportion of households receiving bequests in Spain does not vary much over the household income distribution, the median value of bequests is approximately four times higher in the top quintile of this distribution than in the bottom quintile. Nevertheless, bequests represent a similar percentage of household net wealth in the two groups of households (around 30% in the bottom quintile, compared with approximately 25% in the top quintile).

In short, population ageing will trigger substantial changes in households' savings patterns and wealth portfolios. For the life cycle reasons described above, the greater the proportion of older population, the higher the average propensity to consume and the lower the savings rate. Thus, merely on account of a "composition effect", population ageing would mean a lower savings rate in the long term, although during the transition towards an older society aggregate saving will tend to increase due to the expectation of higher future consumption needs. However, future cohorts will not necessarily repeat the consumer and savings patterns of previous generations, and the uncertainty over how long they will live as well as the benefits they will receive during retirement may prompt the older population to reduce its savings rate to a lesser degree than did previous generations. Also, following a period of a very sharp drop in fertility and a high level of uncertainty about the amount of their pension income and their longevity, households may possibly show less propensity to transfer their wealth in the form of bequests. If this were the case, their demand for financial instruments that could extract life-long income flows from their illiquid assets during retirement could increase.

Investment in capital goods and in housing also depends on growth of the working-age population and income expectations. There are several reasons why growth in investment in capital goods and housing may decline relative to previous periods:

— First, lower growth of the employed population and more moderate expectations for consumption growth prompt a reduction in the structural factors driving investment.[11]

— Second, technological changes linked to new information technologies, communication and automation are more conducive to investment in

10 See Balestra and Tonkin (2018).

11 The factors driving investment demand and its recent performance in the Spanish economy were analysed in Chapter 3 of the Banco de España's *2017 Annual Report*.

intangible capital than in capital goods. This means that human capital is more important (than physical capital), which generally requires lower funds for investment.[12]

— Third, the relative price of investment goods shows a secular declining trend which may become even stronger with the new technological developments arising from robotics and artificial intelligence, given that these developments rely essentially on algorithms and programming codes which are easy to replicate at a low cost. Thus, even if investment projects were to increase, the expenditure needed to undertake them could decrease.

— Lastly, growth in residential investment will be weaker on account of lower household formation, which is associated with a small young population relative to a large housing stock with a high proportion of newly built homes.[13]

Population ageing occurs at different rates across countries and, consequently, the balance between savings and investment will be achieved through changes in international capital flows. International capital flows respond to differences in yields and investment opportunities across countries. Countries where the return on capital and the productivity growth rate are higher will tend to receive more capital flows. Consequently, there will be capital outflows from and current account surpluses in countries where the population is ageing more quickly which, in principle, will be those experiencing faster and sharper decreases in the return on capital and in productivity. This may aggravate external imbalances, which will require greater international coordination for the implementation of economic stabilisation policies.[14]

3.2 Potential growth, labour market and productivity: new technological changes and the importance of professional skills at all ages

Demographic changes impact the potential growth of the economy through several channels. Lower growth of the working-age population results in lower employment growth, provided that the participation rate does not increase and the unemployment rate does not decrease. At constant employment rates, working-age population growth plus productivity growth determines the potential growth of the

12 See Döttling and Perotti (2017) and Haskel and Westlake (2018).

13 See Matea and Sánchez (2015).

14 See Barany, Coeurdacier and Guibaud (2018).

economy. However, participation and unemployment rates also vary over the life cycle and, therefore, a change in the population age composition would affect the aggregate employment rate. In principle, since that rate is lowest at the beginning and at the end of individuals' working lives, with the ageing of the population the employment rate increases first and then decreases, as the more numerous population cohorts come close to retirement. There are also reasons to think that the population age composition determines the professional skills of persons in employment as well as innovation and business activity and, therefore, productivity growth. Thus, the available evidence suggests that with a working-age population in which older workers make up a higher proportion, the skills for performing physical and numerical tasks and those related to new technologies decrease to a greater degree, whereas other skills (for example planning skills or those requiring more experience) may increase. Similarly, innovation and business initiative are lower in older populations, which tends to dampen productivity growth.[15]

There are very pronounced differences between participation and employment rates by age. Over the latest cycle of the Spanish economy, participation and employment rates have increased significantly for all age groups, except for the younger ones (the participation rate for those aged 16 to 30 and the employment rate for those aged 16 to 40). Nevertheless, the differences in these rates by age group remain very high, especially in the transition from working life to retirement (see Chart 4.6). For example, the employment rate is around 15 pp higher in the 40-44 age group than in the 55-59 age group, and 20 pp higher in the 55-59 age group than in the 60-64 cohort. Consequently, as the working-age population ages, there is downward pressure on the aggregate employment rate. Insofar as individuals' working lives should be lengthened to attune them to higher longevity, the employment rates of the older population will need to increase.

Over the life cycle professional and working skills vary, with consequences for labour productivity. The available evidence in a broad sample of countries on cognitive skills and those needed to use new technologies confirms that fewer older workers have such skills (see Chart 4.7).[16] This is due to two factors: human capital depreciation, which increases with age, and cohort effects whereby previous generations of workers built up less human capital than current generations. Nevertheless, as human capital depreciation is lower and human capital accumulation is higher than in the past, future population ageing would not necessarily mean that there would be fewer workers available with the cognitive skills needed by the labour market. Similarly, evidence exists that such cognitive skills are also built up through work experience and that their use in jobs changes over the life cycle.[17] Thus,

15 See Aksoy, Basso, Smith and Grasl (2019) and Liang, Wang and Lazear (2018).

16 See, for example, Desjardins and Warnke (2012) and Barrett and Riddell (2016).

17 See Jimeno, Lacuesta, Martínez-Matute and Villanueva (2016).

Chart 4.6

LABOUR-MARKET PARTICIPATION AND EMPLOYMENT RATES IN SPAIN ARE LOWER AMONG THE OLDER POPULATION

As the more numerous cohorts reach close-to-retirement ages, employment rates will decline if there is no improvement in job opportunities for elderly workers.

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SOURCE: INE.

a As a proportion of the total population in each age bracket.

employment policies which reduce excessive labour turnover caused, for example, by a high proportion of temporary contracts (especially at young and intermediate ages) may help mitigate the slowdown in the growth of human capital linked with ageing.

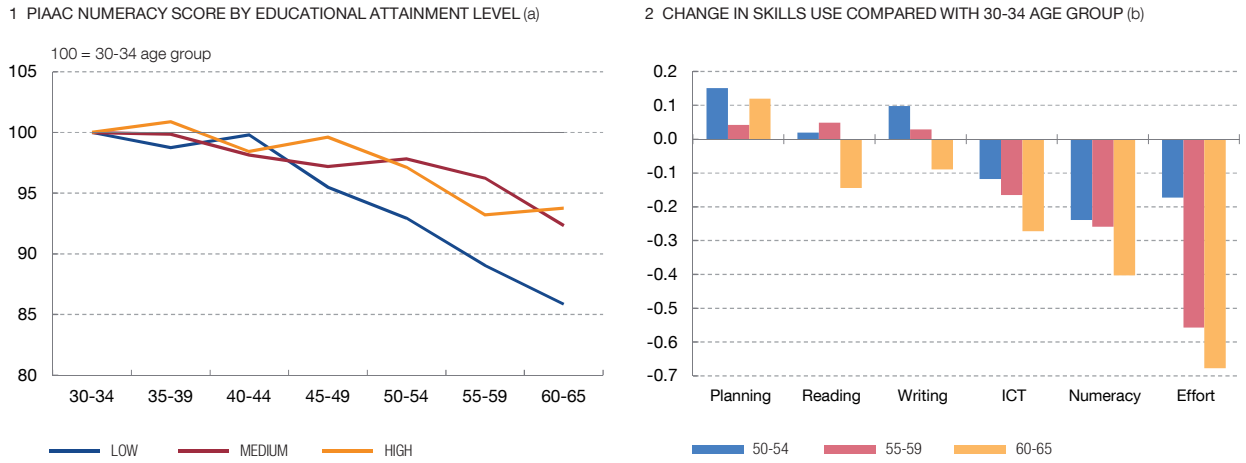
Conversely, other skills, such as those needed for planning, are used to a greater degree at more advanced ages. Work experience promotes the development of organisational and planning skills to a greater degree. Therefore, it is likely that workers who are close to retirement are relatively more qualified to continue their working lives in jobs with more demand for such skills. Generally, recent developments in the occupational distribution of employment show a higher proportion of numerical and ICT skills. However, in Spain, there is a more notable presence of older workers in occupations and sectors with a higher proportion of physical tasks – for example, construction, transport, and accommodation and food service activities – than in the rest of the euro area (see Chart 4.8).

A smaller working-age population provides incentives for automation, whereas ageing of the working-age population does not promote technological innovation. Technological changes have three immediate effects: higher productivity (due to the introduction of more efficient production processes); the displacement of workers who lose their jobs (due to the mechanisation of certain tasks); and the return of workers who rejoin the labour market in new jobs generated by technological

Chart 4.7

COGNITIVE SKILLS AND HOW THEY ARE USED CHANGE OVER THE LIFE CYCLE

Older workers have fewer of the cognitive skills needed to use new technologies. This is because they have built up less human capital than subsequent generations and also because human capital depreciation increases with age.



SOURCE: OECD (PIAAC, 2013).

a Low educational attainment level = lower secondary education or less; medium educational attainment level = upper secondary education; high educational attainment level = university education or more.

b The bars denote the estimated coefficients of an indicator for each of the age groups (50-54, 55-59 and 60-65) of a regression that includes other control variables. Skills use at work is the dependent variable. The regression includes sex, educational attainment level and dummy variables: for economic sector, occupation and each age group.

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developments. The relative magnitude of these three effects and how and which groups of workers are affected depends on the nature of the technological changes. Typically, these changes are most beneficial for workers with high educational attainment levels and, consequently, displaced workers rejoin the labour market in new jobs by means of investment in education and training that provides them with the occupational skills favoured by technological progress. However, the development of robotics and artificial intelligence may lead to more disruptive technological developments, insofar as they displace occupational skills across the board. The effects of these changes essentially hinge on the demographic setting in which they take place. Box 4.3 estimates this interplay, showing that demographic changes encourage, to a greater or lesser degree, automation and technological innovation and, therefore, determine productivity growth. The findings suggest that, although population ageing fosters robotisation and, therefore, generates productivity gains, the reduction in the labour force and population ageing delay technological innovation and, consequently, in the long term, potential growth may also decline. The box also presents empirical evidence which shows that, in recent decades, population ageing in advanced countries has generally been associated with lower potential growth, which has been partly offset, in several countries, by raising the retirement age.

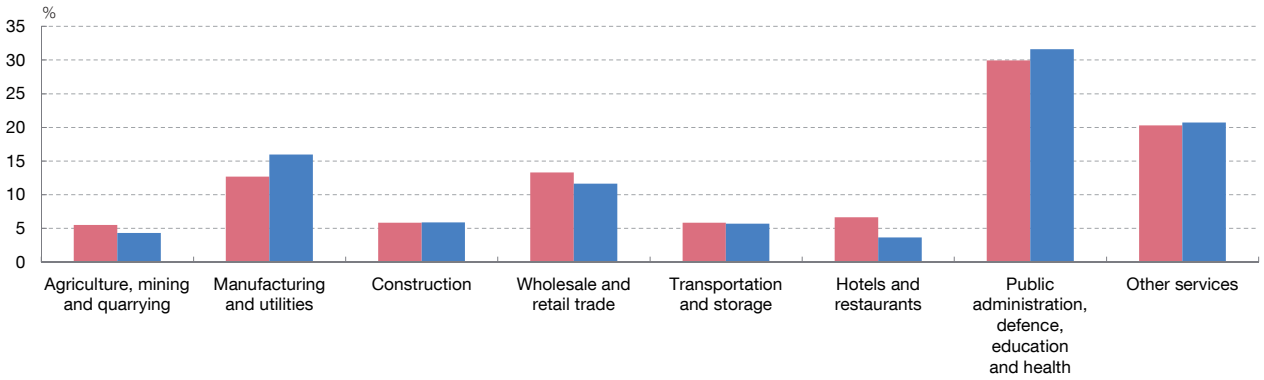
In this scenario, education and occupational skills policies become crucial. Given the technological developments on the horizon, it is vital to develop education and

Chart 4.8

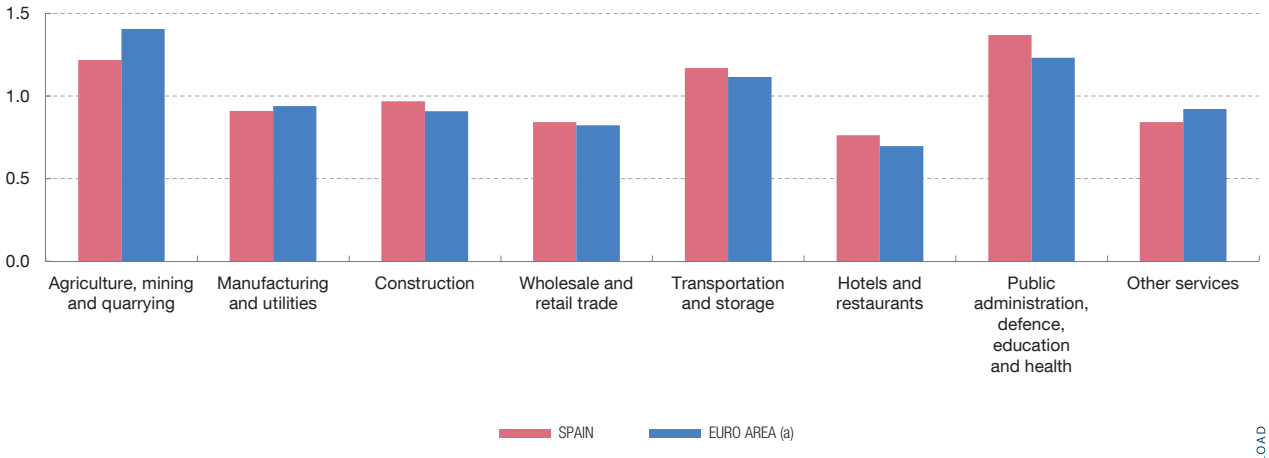
SPAIN HAS A HIGH PERCENTAGE OF ELDERLY WORKERS IN SECTORS INVOLVING HIGH USE OF PHYSICAL CAPABILITIES

Given that work experience improves organisation and planning capabilities, workers of close-to-retirement age should be more present in sectors requiring the use of these skills. However, the proportion of workers aged 55-64 in jobs in sectors mainly requiring physical attributes – construction, transport, and hotels and restaurants – is higher in Spain than in the euro area countries on average.

1 SECTORAL DISTRIBUTION OF EMPLOYMENT OF WORKERS AGED 55-64



2 PROPORTION OF WORKERS AGED 55-64/WORKERS AGED 15-64 RATIO, BY SECTOR



SOURCE: Eurostat Labour Force Survey.

a The euro area includes Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.

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occupational skills policies, both to ensure that workers can acquire the skills needed to complement new technologies and to foster innovation and the creation of new jobs. Among the needs to be taken into account in the development of these policies, three seem particularly important: i) the ability to interact with robots and to understand the algorithms underpinning new technological developments (thus focusing on education in science, technology, engineering and mathematics (STEM)); ii) encouraging versatility and exploitation of the possibilities that new technologies offer for self-employment; and iii) focus on the skills needed to pursue R&D activities. In addition, since the available evidence shows that work experience also helps people acquire some of

these skills, even in the case of workers with lower educational attainment levels, job stability needs to be encouraged so as to facilitate human capital accumulation.[18]

Moreover, increased longevity should prompt a rebalancing between the duration of working life and retirement, raising the age at which workers finally retire. Accordingly, labour market measures are needed that will encourage older workers to continue working and make it easier for them to switch between jobs rather than to take retirement. Economic incentives to replace these older workers with younger ones often entail a considerable cost for the pension system and are not especially conducive to creating work opportunities for the younger population. Alternatively, it may be better to develop active labour market policies that will help improve occupational skills throughout the life cycle, especially after a period in which expenditure on such policies has been cut and has become less efficient.[19]

4 Demographic changes and economic stabilisation policies

Demographic changes shape the cyclical behaviour of the economy and the effects of stabilisation policies. Economic fluctuations are the result of shocks that are transmitted according to the structural characteristics of the economy and the economic policy response (especially the monetary stabilisation and fiscal policy response). In general, shock transmission mechanisms and the effectiveness of stabilisation policies are both affected by demographic factors.

4.1 Monetary policy: low interest and inflation rates

Demographic change affects two basic pillars of monetary policy: the natural rate of interest and the determinants of inflation. The role played by the natural rate of interest in monetary policy strategies has been examined in detail in Chapter 3 of this report and its main determinants – including demographic factors – have been identified. Yet this is not the only transmission channel through which demographic change shapes the implementation and effects of monetary policy.

Changes in the relative demand for goods and services and in the labour market can curb inflationary pressure. The consumption basket of young adults includes a higher proportion of expenditure on durable goods and services than that

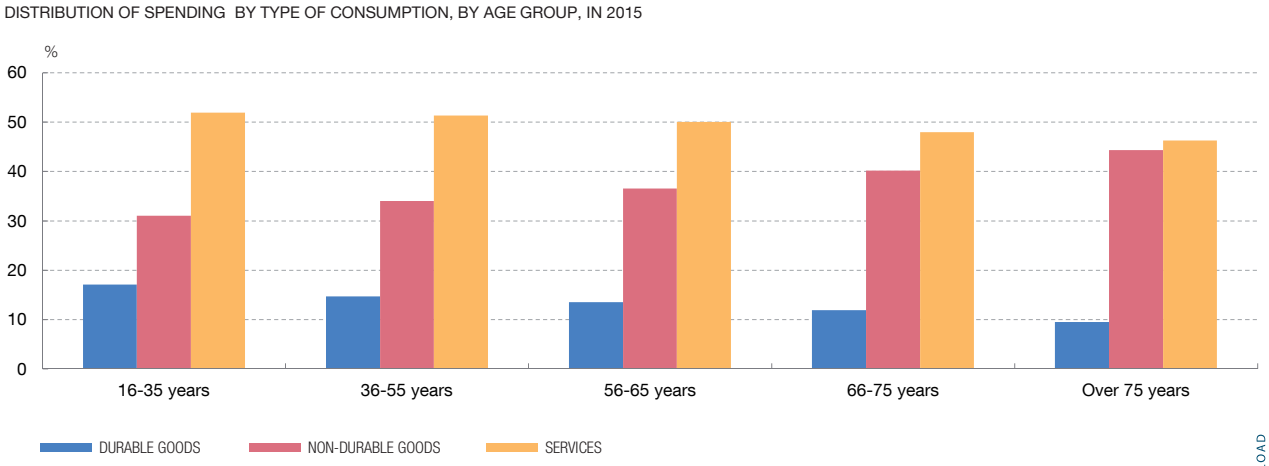
18 See Börsch-Supan and Weiss (2016) and Jimeno, Lacuesta, Martínez-Matute and Villanueva (2016).

19 Other measures (such as, for example, subsidies for employing older workers, which entail high costs) would not appear to achieve the aim of increasing the employment rate among the older population (see Font, Izquierdo and Puente (2017)).

Chart 4.9

THE COMPOSITION OF CONSUMPTION SPENDING BY TYPE OF GOOD VARIES THROUGHOUT THE LIFE CYCLE

Population ageing will change consumption patterns. Non-durable goods and non-market services consumption, which are generally characterised by lower relative prices than the other segments, will increase.



SOURCE: INE Household Expenditure Survey.

of the older age groups, whose consumption basket includes higher expenditure on non-durable goods and lower expenditure on services, as many of the services they consume are non-market services (see Chart 4.9). More detailed studies of these consumption patterns conclude that population ageing will prompt changes in the relative demand for goods and services. If that is the case, and this higher demand is concentrated on goods and services with lower price growth, population ageing would put a certain degree of downward pressure on inflation.[20] Moreover, these consumption patterns would give rise to changes in the sectoral and occupational composition of employment, increasing the share of employment both in low and highly-skilled occupations and reducing it in medium-skilled occupations, as this is the skills pattern required to produce the goods and services in growing demand. Accordingly, demographics could also accelerate the trend towards the polarisation of employment that has been observed since the early 1990s and is usually attributed to technological advances resulting from the automation of routine tasks.[21]

Population ageing tends to increase inflation aversion and reduce wage growth. There are three ways by which the demographic changes described may give rise to lower pressure on inflation:

20 See Aguiar and Hurst (2013) and Luengo-Prado and Sevilla (2013). Chapter 2 of this report analyses other causes of persistently low inflation.

21 See Sebastián (2018).

— First, as older people have accumulated more wealth, and are therefore generally net creditors, they are more averse to inflation, and for this reason monetary policies that are more counter-inflationary act in their favour.[22]

— Second, the employment changes described in the previous paragraph may also give rise to lower wage pressure, as employment growth will be higher among lower paid skills.

— Third, over the life cycle, wage growth is generally very fast at the start of a person's working life, and then quite steady towards the end. In consequence, it will tend to lessen as the share of the employed population approaching retirement age increases.

However, the empirical evidence on the effects of demographic change on the inflation rate is not yet conclusive. The importance of the role played by the three factors listed above in reducing trend inflation, and of the role of other mechanisms through which demographic change affects the economy, is being estimated and assessed, with data that are as yet initial and incomplete and do not envisage the scale of population ageing up to the end of the century. Accordingly, it is difficult to forecast the extent to which these mechanisms may ultimately pose an additional challenge and a significant constraint on the effectiveness of expansionary monetary policies. But they should, however, be taken into account in macroeconomic analysis and monitoring of developed countries.

4.2 Fiscal policy: some constraints on its revenue-raising powers and transmission mechanisms

In terms of stabilising economic fluctuations, population ageing affects both fiscal policy resources and its revenue-raising capacity. Public revenue and expenditure and their impact on economic activity all depend on population growth and age structure. As income sources and consumption patterns change over the life cycle, the different tax treatment of different kinds of income and consumption expenditure will affect tax revenue. The same is true of how funds associated with the automatic stabilisers (unemployment and other benefits) are obtained and used. Lastly, public revenue and expenditure programmes have different effects on aggregate demand, according to the marginal propensity to consume and labour supply elasticity of the persons receiving the income stimuli associated with those programmes.[23]

22 See Bullard, Garriga and Walker (2012).

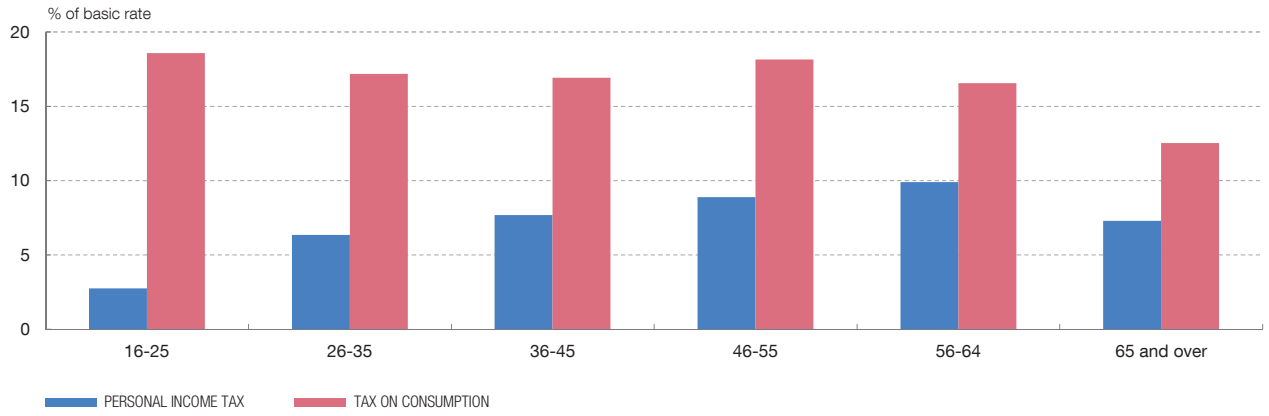
23 See Anderson, Inoue and Rossi (2016) and Ferraro and Fiori (2018).

Chart 4.10

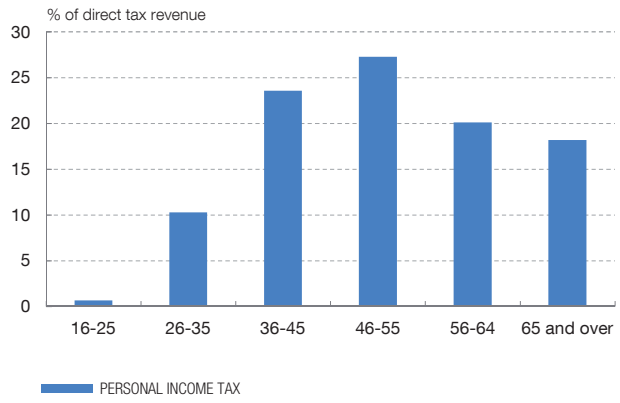
TAX REVENUE AND THE COMPOSITION THEREOF DEPEND ON DEMOGRAPHIC FACTORS

Population ageing will reduce tax revenue from both income and capital, and also from consumption.

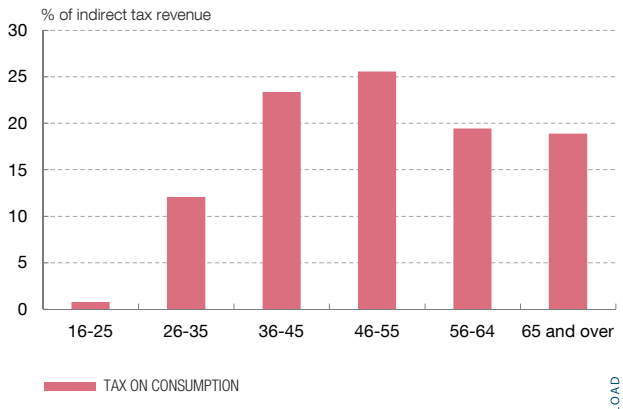
1 AVERAGE EFFECTIVE TAX RATES BY AGE GROUP



2 DISTRIBUTION OF DIRECT TAX REVENUE, BY AGE GROUP



3 DISTRIBUTION OF INDIRECT TAX REVENUE, BY AGE GROUP



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SOURCE: Banco de España.

The volume and composition of tax revenue depend on demographic factors. One trend associated with population ageing, and which also has roots in technological advances, is the decline in wages as a proportion of national income. As a result, revenue from social security contributions declines, as does the contribution from the progressive element of personal income tax, as older taxpayers pay tax at effectively lower rates (see Chart 4.10).[24] In addition, the fact that people accumulate wealth as they age (documented in section 3.1 above) also dilutes this contribution, since implicit tax rates on investment income are lower than those on labour income,

24 On the composition of tax revenue in Spain, see López-Rodríguez and García Ciria (2018).

although the end impact depends on the composition of that wealth (financial or real estate assets). Indirect tax revenue depends on the composition of consumption. Since the older population consumes more goods and services that are taxed at lower effective rates (for example, more healthcare services and fewer goods subject to excise duties such as alcohol, tobacco, fuel, etc.), population ageing will push down indirect tax revenue. This could present an added difficulty for further fiscal consolidation for countries with structural budget deficits and/or high debt ratios.

How effective fiscal policy is in accommodating economic shocks depends on the revenue and expenditure programmes in place; these programmes affect different age groups differently. How much GDP grows as a result of variations in public revenue and expenditure (the so-called "fiscal multipliers") determines how effective fiscal policy is in stabilising economic activity. The size of these multipliers depends on numerous factors: the fiscal instrument in question, the stage of the economic cycle and the level of public debt, among others.[25] The way in which these programmes are passed through to households' spending power (through labour income or via transfers), and the differences between marginal propensity to consume and labour supply elasticities by age group, are also fundamental to determine their macroeconomic impact. In this respect, there are some empirical findings and theoretical reasons to support the view that fiscal multipliers associated with certain public investment and consumption programmes may diminish in the future (see Box 4.4).

5 Consequences of demographic change on social policies

Population ageing demands reform of the public pension, health and long-term care systems. As a result of the growth in the retired population, if benefits per capita remain constant, transfers through the public pension system will increase. Moreover, as indicated earlier, the lower the working-age population as a proportion of the total population, the lower, in relative terms, the revenue from social security contributions that are used to fund contributory social benefits. In addition, as the population ages, the demand for public health and long-term care services increases. This section highlights the main effects of population ageing on the public pension system and on public expenditure on public health and long-term care services.

5.1 Public pension system: financial sustainability and sufficiency

The Spanish public pension system comprises contributory and non-contributory pension benefits funded by social security contributions and

25 See Hernández de Cos and Moral-Benito (2013).

general taxes. The public pension benefit system in Spain covers a set of contingencies relating to ageing (retirement), death (widow(er)s, orphans, family members) and illness (permanent disability). It is split into two types of benefits: one that is contributory and compulsory; and the other, in the form of assistance, which is secondary to the first and designed to meet the needs of those who are not entitled to contributory pension benefits and whose income and wealth are below certain thresholds. Contributory pension benefits are calculated on the basis of a person's working life (contribution years and bases), according to defined-benefit criteria, and are funded by (a portion of the) social security contributions. There are also minimum contributory pension benefits (with minimum pension top-ups funded through general taxes) and maximum contributory pension benefits, set on a discretionary basis each year in the State Budget Law. In Spain, voluntary private pension funds and schemes are very limited.[26]

Pension expenditure is determined by demographic, employment, economic and institutional factors. Pension expenditure, expressed as a percentage of GDP, depends positively on the ratio of the population receiving benefits to the working-age population or dependency ratio (the demographic factor), negatively on the employment rate, which is the ratio of employed population to working-age population (the employment factor), and positively on the share of wages in GDP (the economic factor), and on the benefit ratio, which is the ratio of average pensions to average wages (the institutional factor). This relationship may be expressed as follows:

Pension expenditure/GDP = Dependency ratio * Share of wages in GDP * Benefit ratio/Employment rate

In recent decades, the demographic factor and the increase in the benefit ratio have contributed most to the growth in expenditure on contributory pension benefits (see Chart 4.11.1). In 2018, this expenditure amounted to 10% of GDP, with a dependency ratio of 29.8% (defined as the ratio of population over 64 to the population aged 16 to 64), an employment rate of 58.5% (referring to the population aged 16 to 64 who are employed), a share of wages in GDP of 47.3%, and a benefit ratio of 41.5%. Expenditure on non-contributory pension benefits amounted to around 1% of GDP.

Revenue from social security contributions depends on the effective rate of contributions and on the share of wages in GDP. Revenue from social security contributions, expressed in terms of GDP (see Chart 4.11.2) is determined by multiplying the share of wages in GDP by the effective tax rate of social security contributions. The latter is the result of the statutory rates set (23.6% of the contribution

26 Table 4.1 sums up the main characteristics of the public retirement pension system in Spain. For more details, see Hernández de Cos, Jimeno and Ramos (2017).

Table 4.1

CHARACTERISTICS OF DIFFERENT COUNTRIES' PENSION SYSTEMS

	Public pensions expenditure (a) 2016	Statutory retirement age (b) 2016	Actual retirement age (b) 2017	Dependency ratio (c) 2016	Replacement ratio (d) 2016	Accrual rate (e) 2016	Type of pension system (f)
Belgium	12.1	65.0	61.8	38.2	41.8	1.4	Defined benefit
Bulgaria	9.6	63.8	63.8	46.8	31.2	1.1	Defined benefit
Czech Republic	8.2	63.1	63.5	41.7	39.9	1.4	Defined benefit
Denmark	10.0	65.0	65.2	36.4	41.7	—	Defined benefit
Germany	10.1	65.5	64.6	41.7	42.0	—	Points system
Estonia	8.1	63.0	65.2	48.9	33.1	0.5	Defined benefit
Ireland	5.0	65.4	65.0	30.3	26.8	—	Flat-rate benefit
Greece	17.3	67.0	62.3	37.9	77.0	1.9	Flat-rate benefit
Spain	12.2	65.3	63.4	31.0	57.7	2.3	Defined benefit
France	15.0	66.3	61.9	46.4	50.5	1.5	Defined benefit
Croatia	10.6	65.0	62.4	44.8	31.6	1.0	Points system
Italy	15.6	66.6	63.9	38.6	58.9	1.9	Notional accounts
Cyprus	10.2	65.0	64.5	26.0	62.9	1.3	Defined benefit (points)
Latvia	7.4	62.8	61.7	44.7	24.0	1.0	Notional accounts
Lithuania	6.9	63.3	63.6	47.9	31.4	0.5	Points system
Luxembourg	9.0	65.0	60.4	47.3	51.8	1.8	Defined benefit
Hungary	9.7	63.1	62.5	38.6	40.4	2.4	Defined benefit
Malta	8.0	62.0	62.5	29.6	49.2		Flat-rate benefit
Netherlands	7.3	65.5	65.4	36.3	35.7		Flat-rate benefit
Austria	13.8	65.0	64.0	40.5	50.5	1.3	Defined benefit
Poland	11.2	65.0	64.0	35.4	48.5	1.0	Notional accounts
Portugal	13.5	66.2	64.8	40.4	57.5	2.1	Defined benefit
Romania	8.0	64.8	64.0	39.0	35.5	—	Points system
Slovenia	10.9	65.0	60.9	44.9	31.8	1.5	Defined benefit
Slovakia	8.6	62.0	61.9	35.9	46.6	1.2	Points system
Finland	13.4	66.0	63.9	41.8	53.5	1.6	Defined benefit
Sweden	8.2	67.0	65.9	40.2	38.6	0.9	Notional accounts
United Kingdom	7.7	65.4	65.0	31.2	27.8	—	Flat-rate benefit
Norway	10.7	67.0	65.9	35.3	50.6	0.9	Notional accounts

SOURCE: European Commission (2018).

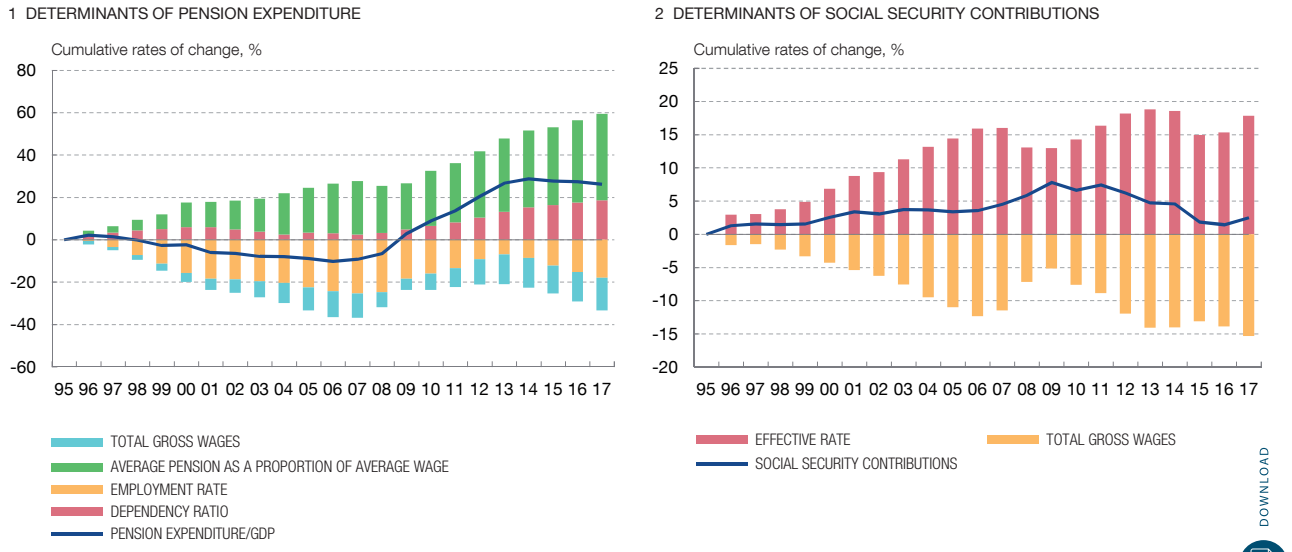
a As a percentage of GDP.
b For men. Actual retirement age is calculated as the average age at which people leave the workforce.
c Number of pensioners as a proportion of the population aged 15 to 64.
d Defined as average pension to average wage. In some countries, where the replacement ratio is comparatively low (the United Kingdom, the Netherlands, Sweden or Denmark), private pensions have much more weight than in other countries.
e Rate of accrual of pension rights (new pensions).
f Retirement pensions, main system.

base for the employer's contribution and 4.7% of the contribution base for the employee's contribution, in the case of contributions for common contingencies in the General Social Security Regime), the existence of minimum and maximum contribution bases, and wage distribution. At present, the effective rate is around 25.2%, while the contribution of general taxes to the pension system to cover the

Chart 4.11

SOCIAL SECURITY SYSTEM EXPENDITURE DEPENDS ON DEMOGRAPHIC FACTORS TO A GREATER EXTENT THAN REVENUE

In recent decades, the increase in the dependency ratio and in the average pension/average wage ratio explains the rise in pension expenditure as a proportion of GDP. On the revenue side, the share of social security contributions as a percentage of GDP has fallen slightly.



SOURCES: Social Security System and INE.

funding of minimum pensions (top-ups) amounts to 0.6% of GDP. Overall, the contributory pension benefit system currently has a deficit of 1.5% of GDP, which is being covered by the Social Security Reserve Fund and, primarily, by Treasury loans to Social Security.

Pension expenditure will increase significantly if the current determinants remain the same. According to the demographic projections discussed in section 2, the ratio of the population receiving retirement benefits (over-66s) to the working-age population (16-66 years) will double between 2020 and 2050. In consequence, maintaining in the future the current level of pension expenditure, as a proportion of GDP, in the absence of additional revenue, would demand an increase in the employment rate or a decrease in the benefit ratio. For illustration purposes, Table 4.2 shows recent pension expenditure projections drawn up by different bodies.[27] These projections confirm that if the benefit ratio were to remain at current levels, pension expenditure would increase very significantly.

27 See AIReF (2019), European Commission (2018) and De la Fuente, García Díaz and Sánchez Martín (2018). The "AIReF without reforms" scenario is built without either the 2011 reform measures or the Pension Revaluation Index introduced in the 2013 reform, but with the sustainability factor included in the 2013 reform.

Table 4.2
PENSION SYSTEM EXPENDITURE: ALTERNATIVE SCENARIOS

	2018	2048		2050	2070	2050	
Percentages	Baseline scenario	AIReF with reforms (a)	AIReF without reforms (a)	AWG (b)	AWG (b)	FEDEA with reforms (c)	FEDEA without reforms (c)
Expenditure on contributory pensions (% of GDP)	10.6	13.4	16.7	13.8	10.8	12.7	17.5
Dependency ratio (d)	29.8	51.6	51.6	61.9	46.6	68.1	68.1
Employment rate (d)	58.5	61.3	61.3	71.0	71.0	79.0	79.0
Wage share of GDP	47.3	47.3	47.3	47.3	47.3	47.3	47.3
Benefit ratio (average pension/average wage) (e)	44.0	33.7	41.9	33.5	34.8	31.1	42.9

SOURCES: AIReF, European Commission, FEDEA and Banco de España.

a AIReF (2019).
b European Commission (2018).
c De la Fuente, García Díaz and Sánchez Martín (2018).
d Relating to the population aged 16 to 64, save for the AIReF projections which refer to the population aged 16 to 66.
e Defined using compensation per employee measured in National Accounts terms and not considering an eligibility rate (i.e. including all the retirement-age population, whether or not they are receiving pension benefits, in the average pension calculation). In other projections [(for example AIReF (2019)], the benefit ratio refers to a different wage measure and is conditional on an eligibility rate that varies over time.

Adapting the public pension system to the new demographic context requires action on several fronts. Even if the employment rate were to grow significantly, in order to maintain the present benefit ratio there would have to be a huge increase in revenue from social security contributions. This suggests that to guarantee the social and financial sustainability of the pension system, action needs to be taken on several fronts, foreseeably both on the revenue and the expenditure side.

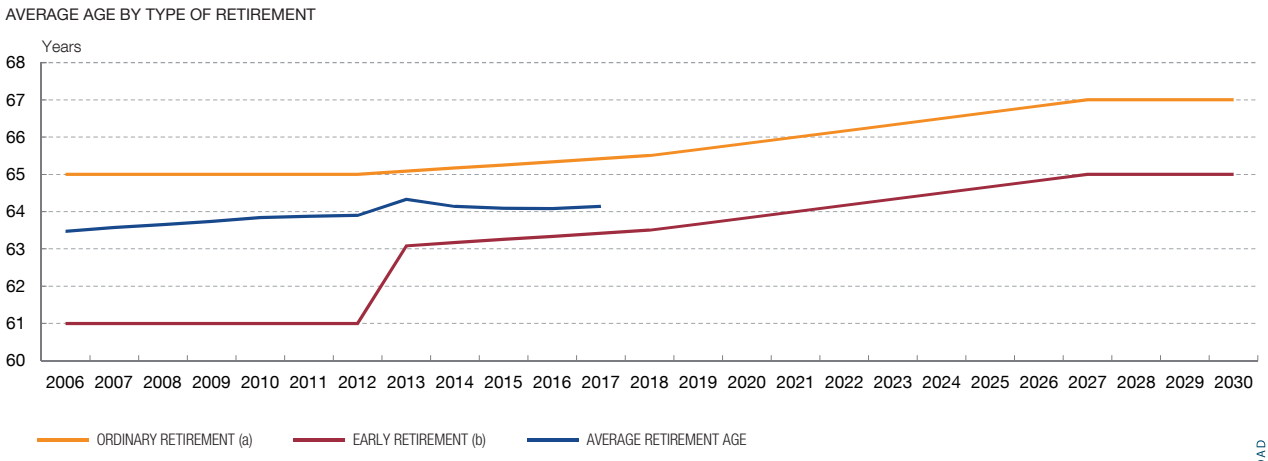
One important aspect to be reconsidered is the relationship between benefits provided by the system and pension age. The financial sustainability and sufficiency of contributory retirement pensions depend both on pension amount and retirement age. One way to satisfy both objectives – sustainability and sufficiency – is to tailor retirement age to increased longevity. In Spain the first steps to increase the retirement age were taken in 2011, and will be completed in 2027 when it will be 67 (for workers with less than 38.5 years' contributions). However, the actual retirement age is still under 65 and there is no clearly upward pattern (see Chart 4.12). Moreover, differences in working life circumstances and in the effects of different occupations on health demand a certain degree of flexibility when it comes to determining when workers should retire.

In addition, policies should be explored that reinforce the link between contributory pension benefits received and working-life contributions made, and life expectancy at the time of retirement, and that strengthen the transparency and predictability of the benefits. Without abandoning the current distribution and defined benefit system, the contributory nature of the

Chart 4.12

RETIREMENT AGE IS A SIGNIFICANT ASPECT OF THE SUSTAINABILITY OF THE PENSION SYSTEM IN SPAIN

The average retirement age is around 64, and has held more or less constant in recent years. Ordinary and early (voluntary) retirement ages will rise to 67 and 65, respectively, in 2027.



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SOURCE: Social Security System.

a When social security contributions have spanned a long working period, the ordinary retirement age holds at 65.
b Before 2013, age related to early retirement for causes not attributable to the worker.

system may be shored up by incorporating sustainability factors that adjust the pension amount to increased life expectancy and GDP growth (as is the case in Germany, or as envisaged in the sustainability factor introduced in the 2013 reform, which was recently suspended and will not be implemented until 2023). In turn, introducing transparency, drawing on notional account models in which contributions are recorded in individual accounts to which a revaluation factor is applied according to certain demographic and economic variables (as in Sweden), would help make information on accumulated pension rights more accessible. This is essential to allow workers to take the most appropriate retirement savings decisions, according to their spending needs, income and wealth, sufficiently in advance.

Growth in retirement savings may complement current public pension system benefits. The Spanish public pension system co-exists with a voluntary pillar based on funded retirement savings (pension funds and schemes). At present this pillar is only small and is fed largely by contributions resulting from personal income tax incentives.[28] In 2017, total pension fund assets in Spain amounted to 13.6% of GDP (slightly more than in Italy, France or Germany, with 10.1%, 9.8% and 6.9%, respectively), compared with the OECD average of 50.6%.[29]

28 See Fuentes (2016).

29 Average not weighted by country size. See OECD (2018).

Moreover, transforming accumulated wealth into income flows during retirement demands financial innovation, to offer products tailored to greater and more uncertain longevity. Transforming illiquid assets into income flows over long periods and at a reasonable cost, when the length of the periods is highly uncertain and against a backdrop of low interest rates, poses considerable challenges. At present, transformation of wealth into annuities via the financial markets is quite uncommon among Spanish households, which maintain high rates of ownership of their main residence after retirement (see Box 4.2). In consequence, much of Spanish households' wealth is passed down to the next generation via bequests, while the consumption of the retired population depends largely on their disposable income, most of which is obtained from public pensions.

Reform of the public pension system should guarantee, not only the financial sustainability and sufficiency of pensions, but also equitable distribution of pension costs and benefits between present and future generations. Reforms of the public pension system generally affect how pensions are distributed between individuals, according to the design and form of implementation of the reforms. In particular, the way in which the changes in the pension system are phased in will affect how the cost of the reform is distributed between generations. In this respect, delaying the necessary reform of the public pension system could contribute to this distribution having to be made in a less equitable manner and at the expense of greater uncertainty, with an adverse effect on the savings and labour supply decisions of present generations.

5.2 Population ageing, health and long-term care: funding growing expenditure and the need for efficient service provision

Expenditure on healthcare services and long-term care programmes is closely linked to population ageing. Healthcare expenditure is concentrated on the older population. Long-term care programmes are also, by their very nature, essentially focused on the older population. In consequence, an increase in the proportion of this age group will have a considerable impact on health and long-term care expenditure needs.

Nevertheless, there are other factors, in addition to longevity, that also determine health and long-term care expenditure. First, as the healthcare system becomes more efficient, more services can be offered at less cost. Second, there is evidence, albeit not fully conclusive, linking increasing longevity to better health among the older population, so not all the increase in longevity translates into greater demand for healthcare services.[30] Moreover, demand for healthcare

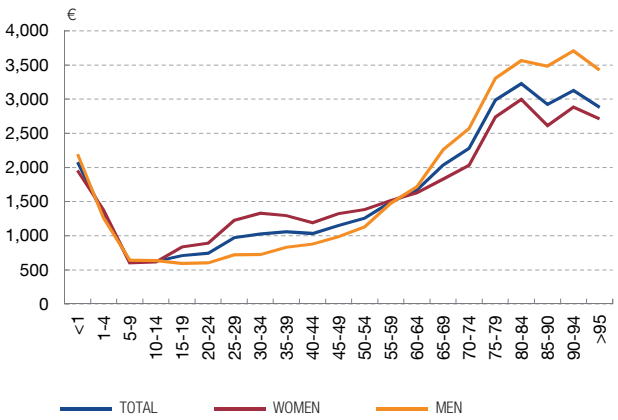
30 See Bohacek, Bueren, Crespo, Mira and Pijoan-Mas (2018).

Chart 4.13

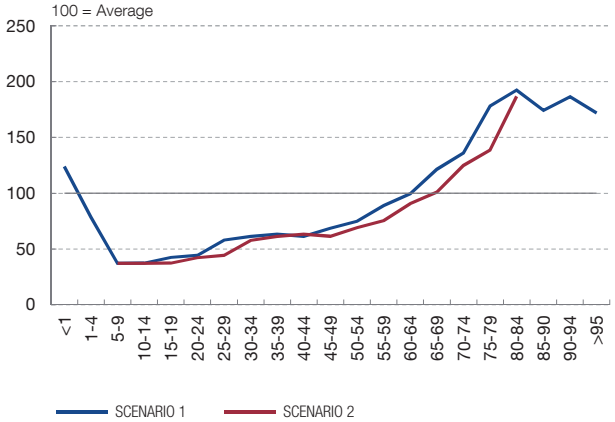
AGEING WILL INCREASE HEALTH EXPENDITURE IN SPAIN

Admittedly, the efficiency of the health system and possible improvements in the health of the elderly associated recently with increased longevity may offset the pressure of ageing on health spending. But other factors, such as the emergence of new high-cost treatments or the increased demand for health services arising from higher income, will exert upward pressure.

1 EXPENDITURE PROFILE, BY AGE AND GENDER GROUPS, IN 2016



2 ALTERNATIVE SCENARIOS FOR 2070 (a)



SOURCES: Eurostat, Ministerio de Hacienda and Banco de España.

a Scenarios based on the assumptions of the European Commission's "The 2018 Ageing Report", and relating to two alternative extreme hypotheses. In scenario 1, the expenditure profile by age remains identical to that of the baseline year (2016), which means that the assumed increase in life expectancy is not accompanied by any improvement in the level of health for each age. Conversely, in scenario 2 the increase in life expectancy corresponds in full to an improvement in health, whereby the expenditure profile shifts rightwards by the amount of this increase.

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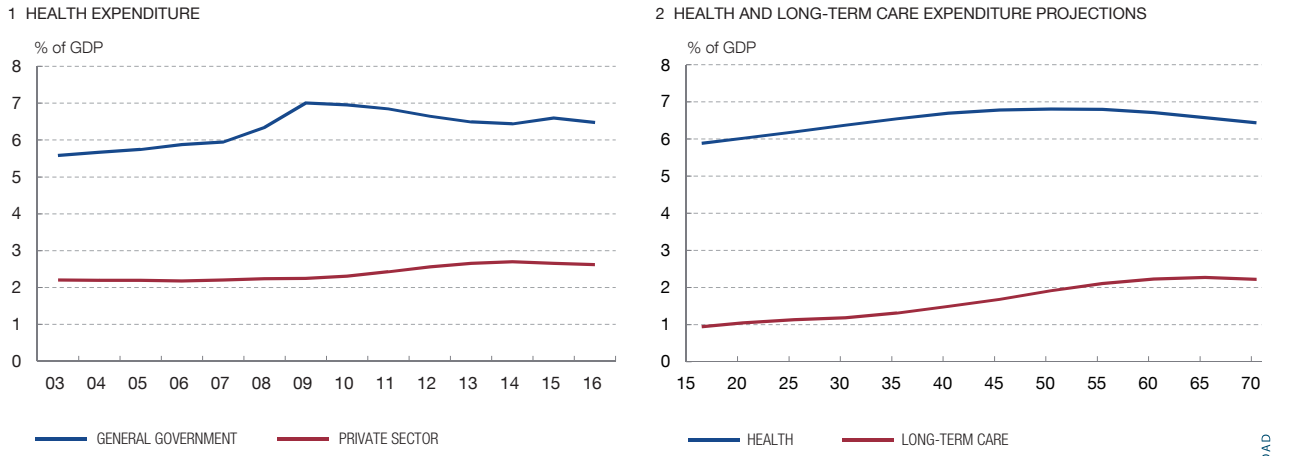
services rises as aggregate income increases and new high-cost treatments become available, so expenditure on healthcare services and long-term care is expected to increase significantly in coming decades, even taking into account possible efficiency gains in the healthcare system and improved health among the older population. Indeed, recent trends point to an increase in expenditure that cannot be fully explained by either demographic factors or higher demand for healthcare services linked to higher household income. This suggests that the impact of technology on the healthcare industry is driving up expenditure. This is a trend that may become more pronounced as population ageing intensifies, according to the extent to which increased longevity is accompanied by good health among the older population or by the need for more health and long-term care (see Chart 4.13).

Expenditure on long-term care is lower than healthcare expenditure. Long-term care is defined as a variety of activities carried out by formal or informal carers to give those who are not fully able to look after themselves the best quality of life possible. The system of health accounts includes as long-term care a total healthcare expenditure item (long-term care services) and other items not included in that category (supply of social services in kind and supply of social services in cash for the ill or disabled). In Spain, provision of the two types of

Chart 4.14

AGEING WILL ALSO EXERT UPWARD PRESSURE ON DEPENDENCY-RELATED EXPENDITURE

Dependency-related expenditure accounts in Spain for somewhat over 2% of GDP, of which almost three-quarters is provided by general government. In future, health and long-term care expenditure is projected to grow in step with population ageing.



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SOURCES: Ministerio de Sanidad, Consumo y Bienestar Social and European Commission (2018).

services combined amounts to 0.94% of GDP and is mostly public provision. However, much of the care provided to persons with a certain degree of disability is not recorded in the health accounts as it is provided on an informal basis at home.[31]

As in the case of pensions, the pressure on expenditure on health and long-term care demands an overhaul of how it is funded and of the level of care provided and the efficiency of its provision. Despite the high uncertainty surrounding expenditure projections of this kind, in view of all the factors mentioned above, it is estimated that by mid-century healthcare expenditure could rise to 6.4% and expenditure on long-term care services to 2.2% of GDP (see Chart 4.14). This last figure could be even higher if, as the result of an increase in the labour force participation rate, the informal provision of these services at home were to decrease, driving up public demand for long-term care. In consequence, it is vital not only to ensure that there is adequate funding in place for the expected increase in expenditure, but also to identify and introduce good practice in hospital and clinic management and in public procurement and the supply of pharmaceutical products on prescription.

31 See Verbakel (2017) and Braczyk and Kredler (2018).

6 Final comments

Over the course of this century, the working-age population in developed countries will level off and will decrease dramatically as a proportion of the total population. The economic and social consequences of these demographic changes will be far-reaching, affecting not only the social policies designed to protect the older population (pension benefits, health and long-term care) but also the functioning of the goods and services markets, the labour and financial markets and the macroeconomic (monetary and fiscal) policy transmission mechanisms.

One likely outcome is that the potential growth of developed countries will decelerate, on account of the lower growth in the working-age population and the possible adverse effects of the demographic changes on productivity growth, despite the new wave of technological advances based on robotics and artificial intelligence. This, together with the high build-up of global debt in recent decades, poses major challenges in several key economic dimensions, such as those relating to growth potential, the functioning of the welfare state or intergenerational wealth transfers.

It is, therefore, an essential and pressing requirement that the various economic policy instruments in place – aimed at stabilising the economy or boosting economic growth – take into account the demographic changes. Policy-makers must anticipate the consequences of these changes and implement measures to reduce their negative effects, ensuring at all times that the distribution of the associated costs is equitable from both the intra- and intergenerational standpoint.

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Box 4.1

POPULATION PROJECTIONS FOR SPAIN: COMPARISONS AND UNCERTAINTIES

In October 2018, the INE published the latest population projections for the period 2018-2068.[1] The starting point for these projections are the provisional population figures at 1 January 2018, which reflect an increase of almost 220,000 persons on the figure projected for that year in October 2016. In the new projections, the INE estimates continued growth of the total population, to a record high bordering on 50 million inhabitants in 2048, after which moderate declines are expected. The new projections represent a strong upward revision vis-à-vis the INE's estimates for 2016, with around seven million more inhabitants at the end of the projection horizon (see Chart 1). In the shorter term, the INE estimates an increase in the total population of almost 4% between 2018 and 2028, which is also well above the previously projected figures. This upward revision also applies to the working-age population (see Chart 2).

Other organisations, such as Eurostat or the Independent Authority for Fiscal Responsibility (AIReF), prepare their own population projections.[2] A comparison of these projections reveals that the INE projections are very similar to those of the AIReF in the first ten years, but then drop below them, as the projection horizon progresses. The difference in population in 2050 is of almost six million inhabitants. Compared with Eurostat, although the INE's population projections are higher over most of the projection horizon, its estimates are somewhat more pessimistic at the end of the horizon, with around 1.5 million fewer inhabitants.

These differences are mainly due to the disparities between the initial underlying assumptions (specifically, those referring to migratory flows and fertility rates, since those relating to mortality rates are very similar) (see Charts 3 to 6). As regards migration, the INE envisages net positive migratory flows over the entire projection horizon, well above the assumptions made in 2016 and in keeping with the recently observed trend in these flows, and also above those projected in the short run by the AIReF, which would be clearly below the most recently published data.[3] In contrast, in the long run, while the INE projects that migration will gradually move towards a net inflow of around 200,000 persons per year, the net migratory flows envisaged by the AIReF[4] are much higher (more than 400,000 persons in 2050). A comparison of Eurostat and INE projections shows that the differences are concentrated in the first 15 years, subsequently converging towards very similar levels.

The INE projects that fertility rates will rise very modestly, from 1.3 children per woman in 2018 to close to 1.5 children which, albeit a slight improvement, is not an abrupt change with respect to the levels observed in Spain in recent years. Both Eurostat and the AIReF make a more optimistic fertility assumption, estimating the average number of children per woman at very close to 2, assuming convergence towards the European average.

Despite the differences in the total population estimates in the various projections analysed, they all envisage gradual and substantial population ageing, which will entail an ongoing increase in the dependency ratio, which is expected to at least double between 2018 and 2050 (see Chart 7). The dependency ratios estimated by the INE and the AIReF are similar for 2050, despite the different fertility and immigration assumptions used. This is explained by the fact that the AIReF assumes a substantially older age distribution of net migration inflows than that underlying the INE projection, which offsets the increase in the working-age population as a result of higher fertility. These differences and similarities indicate that, although long-term population projections are subject to a high degree of uncertainty (in 2050, the 95% confidence bands may widen to nearly 20 pp of the median value, according to

1 The methodology used in this projection exercise assumes a continuation of current demographic trends in fertility and mortality rates and migratory flows. However, some methodological changes have been introduced with a view to obtaining reference values, in the medium and long run, for the relevant demographic parameters (birth rate, mortality rate and migratory flows), on the basis of a survey of a group of experts in demography.

2 The latest Eurostat projections, from February 2017, serve as the basis for *"The 2018 Ageing Report"*, and those of the AIReF were published on 4 October 2018.

3 Corresponding to the first half of 2018, revealing a net positive balance of 121,564.

4 According to the AIReF, its immigration forecasts are based on a gravity model developed by J. Fernández-Huertas Moraga and G. López-Molina (2018), *Predicting Spanish Emigration and Immigration,* AIReF Working Papers, which estimates bilateral migration flows for all countries in the world in the very long run.

Box 4.1

POPULATION PROJECTIONS FOR SPAIN: COMPARISONS AND UNCERTAINTIES (cont'd)

Chart 1
TOTAL POPULATION

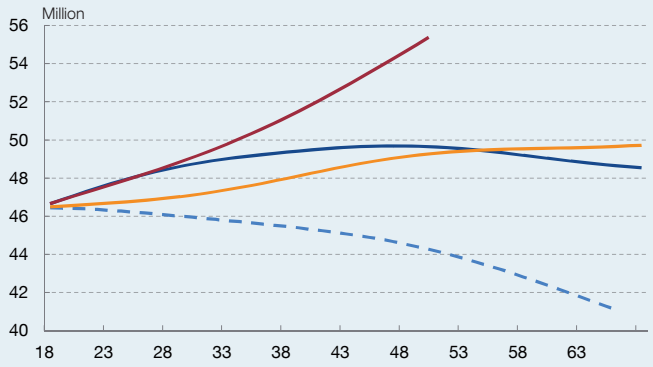


Chart 2
POPULATION AGED 16 TO 66

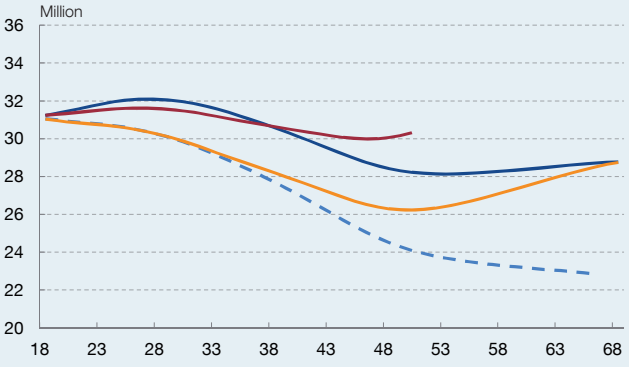


Chart 3
NET MIGRANT INFLOWS

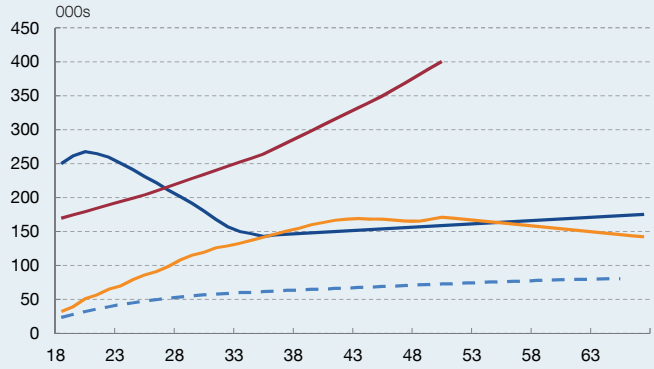


Chart 4
FERTILITY RATE

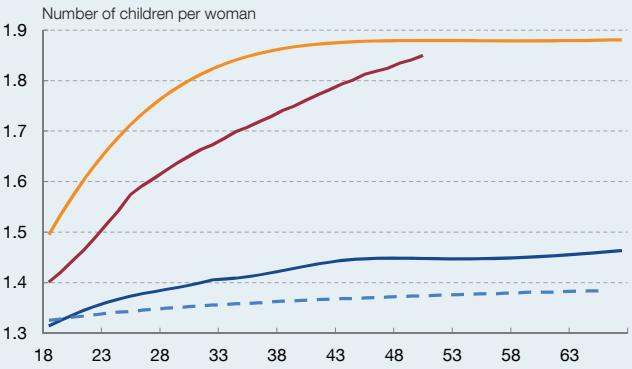


Chart 5
LIFE EXPECTANCY AT BIRTH (MEN)

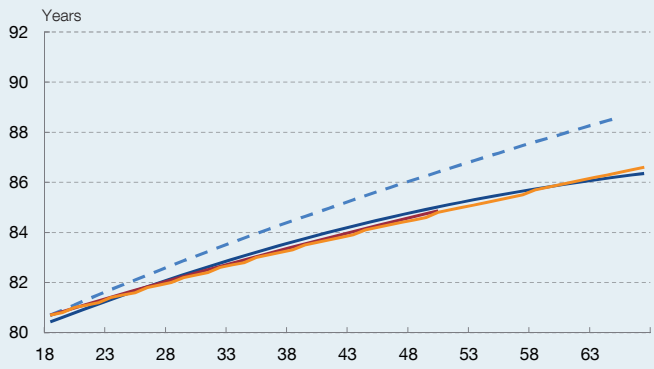
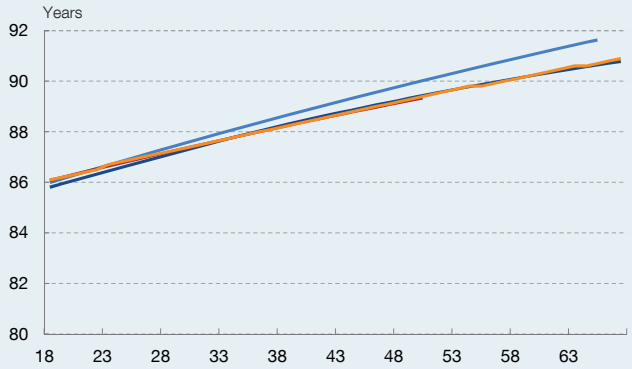


Chart 6
LIFE EXPECTANCY AT BIRTH (WOMEN)



SOURCES: Eurostat, AIReF, INE and Banco de España.

the World Population Prospects of the United Nations) (see Chart 8), the envisaged demographic trends based on a broad range of assumptions all clearly point to substantial population ageing in the medium and long run.

Chart 7
DEPENDENCY RATIO (a)

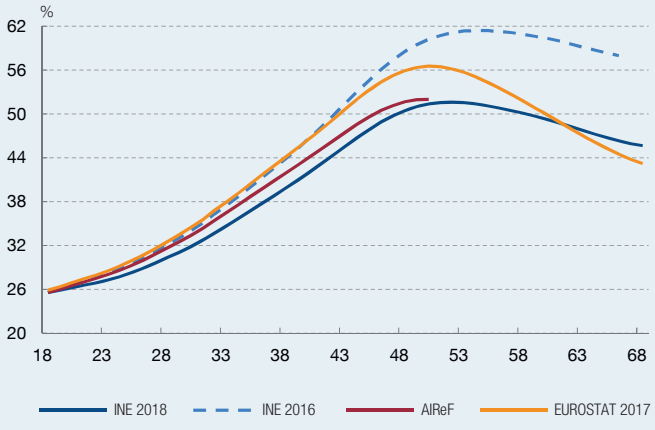
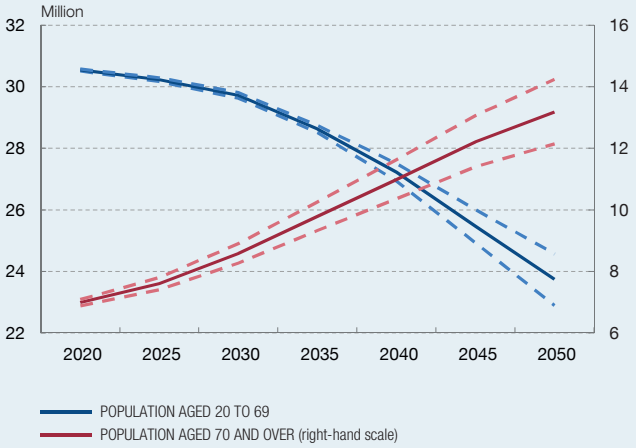


Chart 8
UNCERTAINTY ASSOCIATED WITH POPULATION PROJECTIONS (b)



SOURCES: Eurostat, AIReF, INE, UN and Banco de España.

a Defined as the ratio of the population aged over 66 to the population aged 16 to 66. The 2011 pension system reform established a gradual increase in the statutory retirement age, from 65 to 67 in 2027, at the rate of one month per year between 2013 and 2018, and of two months per year from 2018 to 2027. Given that this box contains projections beyond 2027, the dependency ratio used is consistent with that change.
b The chart depicts the median population projection for each population group. The dotted lines represent the respective 95% confidence intervals.

Box 4.2

CHANGES IN THE PORTFOLIOS OF SPANISH HOUSEHOLDS OVER THEIR LIFE CYCLE

The life-cycle theory predicts that individuals expect their income to decrease after retirement, and so they accumulate financial assets during their working lives to be able to sustain their spending in old age. According to this theory, the volume of savings would increase during a person's working life, and then decrease after retirement and, therefore, changes in the demographic breakdown of the population would entail changes in aggregate savings.

When determining whether household wealth increases during a person's working life and decreases after retirement, it is important to bear in mind that savings decisions are taken by individuals of different ages in diverse financial environments. Accordingly, the financial asset holdings of a given generation at a specific age are not necessarily those that might be expected of younger people. By way of example, it has been documented in both the United States and the euro area that, compared with other generations, those that have lived through stock market crashes have a lower propensity to own shares during their lifetime.[1] Thus, households with members of different ages may have different levels of wealth for reasons that do not only relate to the life cycle.

This box analyses the real and financial assets held by Spanish households throughout their life cycle, and groups them according to the date of birth of the reference person.[2] To this end, it uses information from the first five waves of the Spanish Survey of Household Finances, covering the period 2002-2014.[3]

The results suggest that, as predicted by the life-cycle theory, ownership of a main residence rises by 40 pp between the ages of 25 and 45; by 45, 80% of households own their main residence (see Chart 1). This age profile indicates that households are not able to purchase their home until they have saved enough for the down payment, and that the possibility of saving increases as household income rises. However, the percentage of home owners does not drop after retirement, as discussed below.

By contrast, the holding of risk-bearing financial assets does show a profile of accumulation during a person's working life and subsequent dissaving.[4] At around the age of 30, one in five households has risk-bearing financial assets, and this percentage rises throughout their working lives, up to the ages of 45-50, when approximately one in every two households owns this type of asset (see Chart 4). However, in the over-65 age group, the proportion of households owning a risk-bearing financial asset drops to one in ten, owing to the fact that people redeem their pension schemes once they retire.[5]

The amount of saving amassed in the form of a main residence basically reflects the changes in house prices between 2002 and 2014. Thus, for all the generations analysed, the median market value of the main residence rose by between €50,000 and €100,000 in the period 2002-2008 and then fell on a similar scale from 2008 to 2014 (the figures are expressed in 2014 euro). In 2014, the median market value of the main residence was €120,000 for all age groups, similar in real terms to that observed in 2002 (see Chart 2). The fact that the median value of the main residence increased and then decreased across all age groups (and that the decrease was not particularly pronounced among retirees) suggests that older households do not "dissave" by selling their main residence to move to one that has a lower value.

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1 See M. Ampudia and M. Ehrmann (2017), "Macroeconomic Experiences and Risk Taking of Euro Area Households", *European Economic Review,* 91(C), pp. 146-156, and U. Malmendier and S. Nagel (2009), "Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking?", *Quarterly Journal of Economics,* 126(1), pp. 373-416.

2 The year of birth is shown in groups of three years.

3 These results are based on C. Barceló, O. Bover, N. Guner, G. Kocharkov and E. Villanueva (2019), *Housing over the Life Cycle: Expectations, Inheritance and Policy*, Banco de España Working Paper (forthcoming).

4 This box analyses two forms of ownership of risk-bearing financial assets. The first includes ownership of shares (listed or unlisted) and of investment funds in which shares have a predominant weight (see Chart 3). The second (see Chart 4) includes, apart from the aforementioned assets, pension funds, life insurance (unit-linked and mixed) and managed accounts, excluding deposits and fixed-income securities.

5 When examining the ownership of risk-bearing financial assets including only shares and investment funds in which shares have a predominant weight, the decline following retirement is substantially lower, between 10 pp and 20 pp (compare Charts 4 and 5).

CHANGES IN THE PORTFOLIOS OF SPANISH HOUSEHOLDS OVER THEIR LIFE CYCLE (cont'd)

Chart 1
DISTRIBUTION OF HOUSEHOLDS THAT OWN THEIR MAIN RESIDENCE, BY AGE OF HOUSEHOLD REFERENCE PERSON

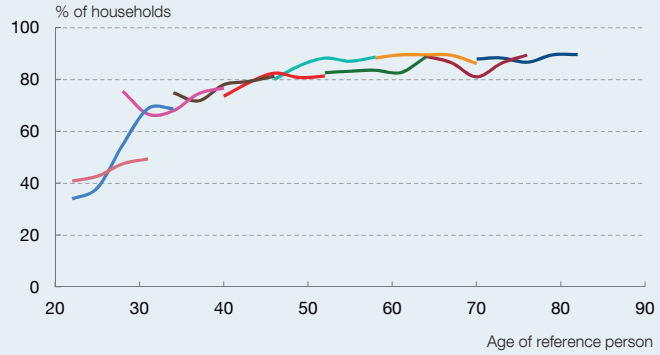


Chart 2
MEDIAN REAL VALUE OF MAIN RESIDENCE OWNED BY HOUSEHOLDS, BY AGE OF HOUSEHOLD REFERENCE PERSON (a)

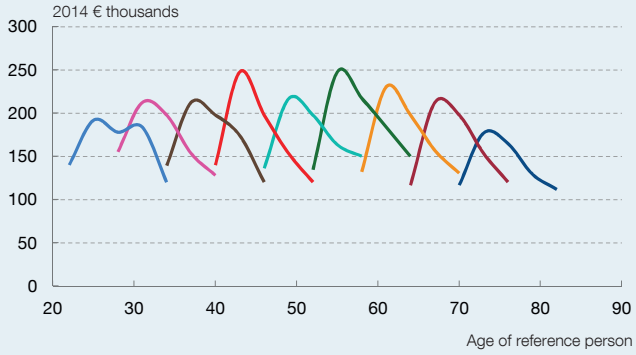


Chart 3
DISTRIBUTION OF HOUSEHOLDS HOLDING RISK-BEARING FINANCIAL ASSETS, BY AGE OF HOUSEHOLD REFERENCE PERSON (b)

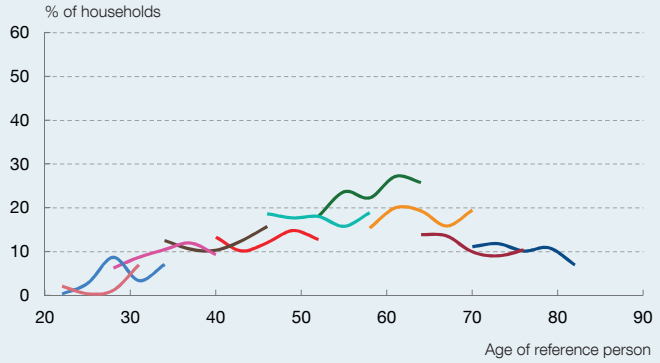


Chart 4
DISTRIBUTION OF HOUSEHOLDS HOLDING FINANCIAL ASSETS, EXCLUDING FIXED-INCOME AND DEPOSITS, BY AGE OF HOUSEHOLD REFERENCE PERSON (c)

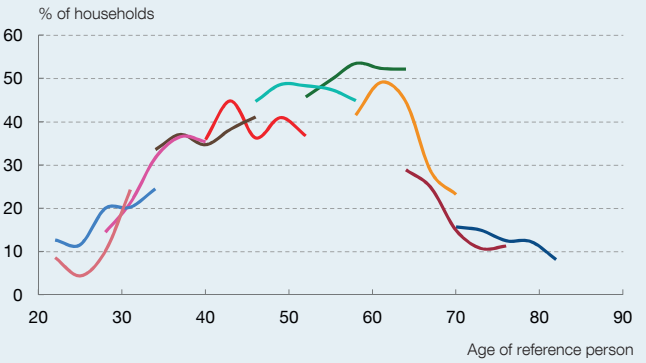


Chart 5
MEDIAN REAL VALUE OF WEALTH OF HOUSEHOLDS HOLDING FINANCIAL ASSETS EXCLUDING FIXED-INCOME AND DEPOSITS, BY AGE OF HOUSEHOLD REFERENCE PERSON (a)

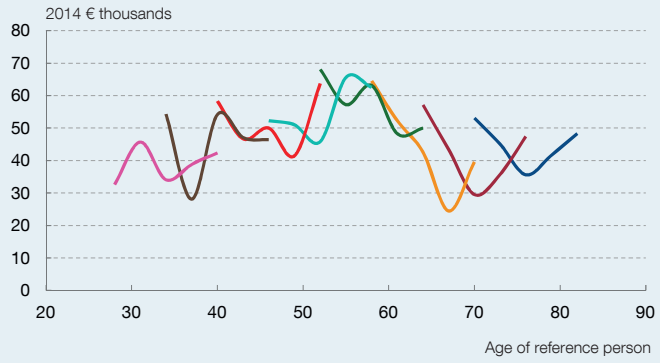
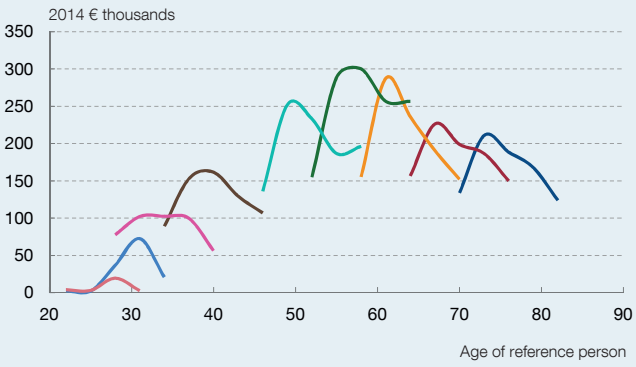
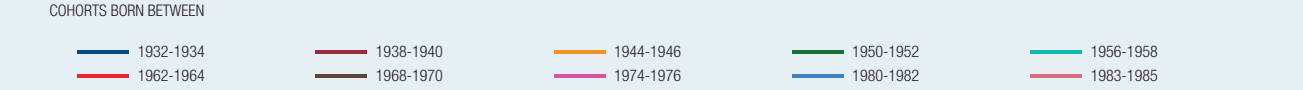


Chart 6
MEDIAN REAL VALUE OF NET WEALTH OF HOUSEHOLDS HOLDING REAL AND FINANCIAL ASSETS, BY AGE OF HOUSEHOLD REFERENCE PERSON (a)





SOURCE: Barceló *et al.* (2019).

a In real 2014 terms.
b Shares, listed or unlisted, and international or mixed capital equity investment funds.
c International or mixed equity capital securities investment funds, shares (listed or unlisted), pension funds, life insurance (unit-linked or mixed capital) or managed portfolios.

The median amount invested in risk-bearing financial assets among individuals who own this type of asset increases from €35,000 in the 35-45 age group (observed for generations born after 1970) to around €60,000 in the 50-60 age group (observed for generations born in the 1950s). As Chart 5 shows, the median amount invested in these assets drops to €30,000 after retirement. As explained earlier, this decline is due to the fact that households redeem their pension plans after retirement and place their investments in fixed-term deposits or bank accounts, or in other risk-free financial vehicles.

To analyse total household wealth, it is useful to look at the changes, over the life cycle, in median net wealth, defined as the sum of all household assets minus the amount of debts (see Chart 6). Median net wealth is below €100,000 between the ages of 20 and 35 (observed for generations born after 1970), but above €200,000 at around the age of 60 (for the generation born in the 1950s). After retirement, this figure is around €150,000 (observed for the generation born in the 1930s). It should be noted that in 2014, the net wealth of generations born in the 1950s was €250,000, far higher than the median value of their main residence, suggesting that this cohort owns financial and other real assets in addition to their main residence. However, among the generations born in the 1940s and earlier, the median net wealth in 2014 was similar to the median value of their main residence, indicating that they own practically no other types of assets.

The pattern of wealth accumulation during a person's working life and the shedding of wealth following retirement can be determined by comparing the median net wealth each generation had in 2014 and in 2002. The amount of wealth accumulated during their working life by those born in the 1950s is substantial, but lower for generations born after the 1970s. Median wealth therefore increases during a person's working life and decreases somewhat after retirement. Although both these features conform to the life-cycle theory, the high rate of ownership of the main residence and the absence of dissaving by down-sizing housing following retirement suggest that there are other factors affecting the savings patterns of Spanish households. As mentioned in section 3.1, possible factors include the wish to leave the main residence as inheritance, caution regarding selling the main residence in order to rent another, or the dearth of financial products, such as reverse mortgages, which would allow the accumulated housing wealth to be converted into liquid assets.

To what extent can the behaviour observed for generations born before 1960 be expected from generations born later? Comparisons of net wealth suggest that generations born after 1970 have a lower level of median net wealth than earlier cohorts had at the same age. For example, the generation born around 1974 had median net wealth of around €100,000 between the ages of 20 and 35, while the median wealth of generations born in 1980 or later is less than €75,000. These differences are partly due to the fact that the proportion of households owning their main residence and whose reference person was born after 1980 is 20 pp lower than that of preceding generations at the same age. Moreover, the median debt-to-wealth ratio among the under-35s rose from 51.7% in 2008 to 86.4% in 2014.[6] This increase suggests that the house price slump observed during those years might explain the decline in net wealth among those born in the 1980s that owned their main residence. The differences between ownership and amount of savings according to the year of birth advise caution when extrapolating the behaviour of one generation to subsequent generations.

6 See Banco de España (2017), "Survey of Household Finances (EFF) 2014: methods, results and changes since 2011", *Economic Bulletin,* 1/2017, and Banco de España (2014), "Survey of Household Finances (EFF) 2011: methods, results and changes since 2008", *Economic Bulletin,* January.

Box 4.3

THE EFFECTS OF DEMOGRAPHIC AND TECHNOLOGICAL CHANGES ON LONG-TERM GROWTH

The demographic changes which will accelerate population ageing are going to happen along with a new wave of technological progress arising from developments in robotics and artificial intelligence. Questions arise in this scenario about the relationship between demographics and technology and its consequences for long-term economic growth.

An assumption which should be considered is that, as a result of technological progress, productivity gains will offset the reduction in the working-age population so that per capita GDP growth will rise as the population ages. Acemoglu and Restrepo (2017)[1] find evidence of a positive association between per capita income growth and the ratio of the population over 50 to the population between 20 and 49 in a broad sample of countries (including less developed countries) during the last 25 years. However, Aksoy *et al.* (2019),[2] who analyse a panel of OECD countries, reach the opposite conclusion (see Chart 1). They attribute the negative impact of demographic change on economic growth to the fact that the effectiveness of technological innovation is affected as the young working-age population decreases.

To analyse the mechanisms possibly relating demographics, innovation and economic growth in the long term, Basso and Jimeno (2019)[3] use an overlapping generation model with two stages in the life cycle (working life and retirement). In this model the technological innovation sector has two components: the production of new products/tasks and the automation of these tasks through the introduction of robots which replace human labour in the production of certain goods and services, whose relative weight is determined on the basis of their individual rates of return on investment.

The model has three characteristics which make the analysis especially important: i) a demographic structure which determines the labour supply and saving rate of the economy and, therefore, the available resources for capital accumulation, the production of new ideas and the robotisation of production; ii) a production function where certain tasks are performed exclusively through the combination of capital and robots (without human labour); and iii) a relationship of subsidiarity between technological innovation (whose efficiency decreases as the population ages) and robotisation. Accordingly, in the long term the productivity gains from the robotisation of production can only continue insofar as new products are created, i.e. it is assumed that before a production task can be performed by robots, it has to be invented and performed by humans.

Chart 2 shows the results of feeding into the model the demographic projections of the United States and Europe (understood as the aggregation of Germany, Italy, France and Spain), relative to the projected paths of per capita GDP growth and other macroeconomic variables.[4] First, it is interesting to highlight that, since population ageing will occur more quickly in Europe than in the United States, the results of the simulations predict that robotisation will grow more rapidly in Europe. Consequently, the decreases of the weight of labour in production and of the share of wages in GDP are estimated to be higher in Europe than in the United States. In any event, in this simulation, in which the technological innovation sector does not experience any efficiency improvement and it is assumed that the economy converges on a path where the weights of the labour-intensive and robot-intensive production sectors remain constant, long-term economic growth would be affected in both areas due to the ageing effect. In short, the potential productivity gain from automation would not be sufficient, based on these simulations, to offset the lower economic growth associated with demographic decline.

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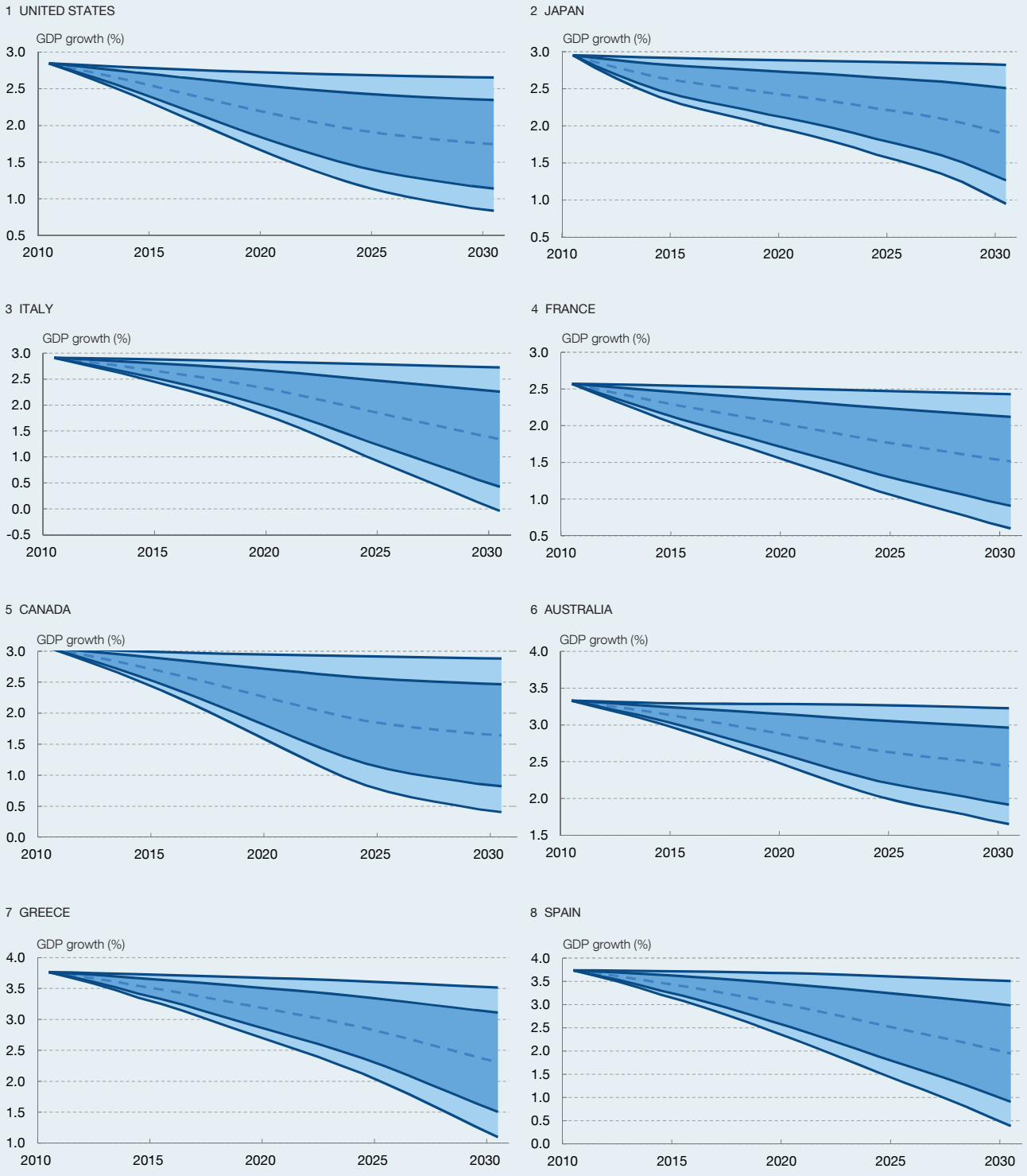
1 D. Acemoglu and P. Restrepo (2017), "Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation", *American Economic Review,* 107(5), pp. 174-179.

2 Y. Aksoy, H. S. Basso, R. P. Smith and T. Grasl (2019), "Demographic Structure and Macroeconomic Trends", *American Economic Journal: Macroeconomics,* Vol. 11, No 1, January, pp. 193-222.

3 H. Basso and J. F. Jimeno (2019), *From Secular Stagnation to Robocalypse? Implications of Demographic and Technological Changes,* Banco de España Working Paper, forthcoming.

4 The demographic projections of the United Nations Population Division are used.

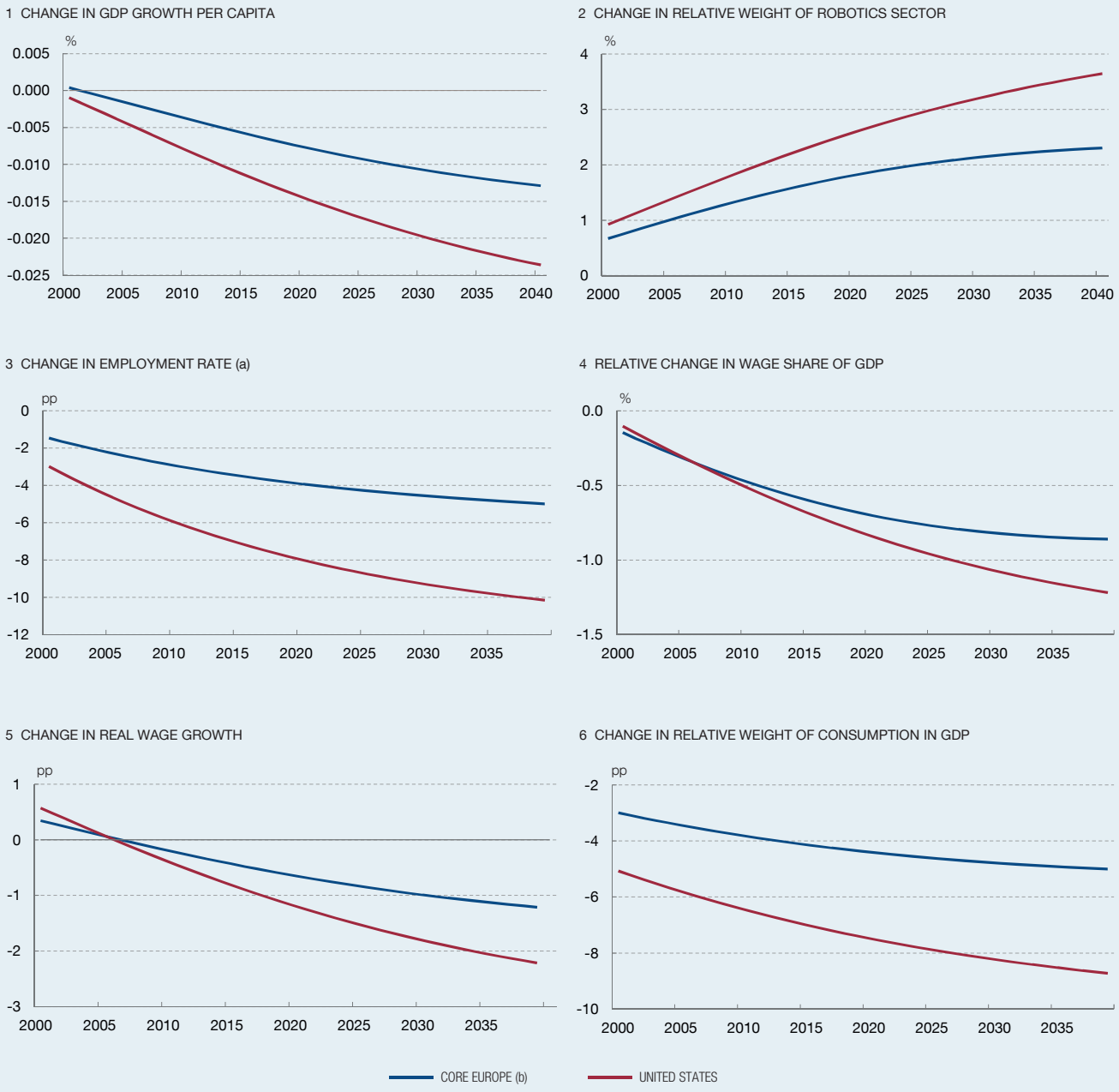
Chart 1
EFFECTS OF DEMOGRAPHIC AND TECHNOLOGICAL CHANGES ON GDP GROWTH, CALCULATED WITH HISTORICAL DATA



SOURCE: Aksoy, Basso, Smith and Grasl (2019).
NOTE: The two confidence bands in Charts 1.1 to 1.8 refer to the statistical significance of the estimates with a confidence level of 60% and 80%.

THE EFFECTS OF DEMOGRAPHIC AND TECHNOLOGICAL CHANGES ON LONG-TERM GROWTH (cont'd)

Chart 2
SIMULATIONS OF SOME MACROECONOMIC VARIABLES BASED ON DEMOGRAPHIC PROJECTIONS



SOURCE: Basso and Jimeno (2019).

a Defined as the ratio of persons employed to the working-age population.
b Aggregation of Germany, Spain, France and Italy.

Box 4.4

THE EFFECTS OF DEMOGRAPHIC CHANGES ON THE FISCAL MULTIPLIERS OF PUBLIC CONSUMPTION AND INVESTMENT PROGRAMMES

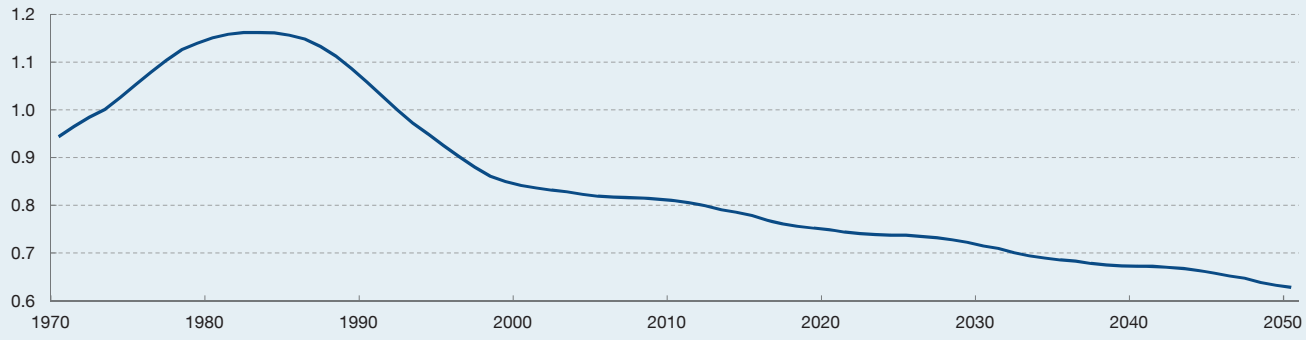
Fiscal policy, whether it is implemented through discretionary decisions on expenditure and taxation or in the form of automatic stabilisers, can contribute to stabilising macroeconomic fluctuations. To do this, it should help to sustain economic activity during downturns and restrain public spending during booms. Its effectiveness in achieving these objectives depends above all on how fiscal measures affect household consumption expenditure and firms' investment decisions or, in other words, on the fiscal multiplier of the measure in question. In this respect, not all public spending and revenue programmes affect economic activity in the same way. In particular, public consumption and investment programmes boost the labour income of workers employed in the sectors benefiting from this consumption and investment. By contrast, programmes involving direct transfers to households entail a stimulus to household disposable income. The fiscal multiplier associated with each spending programme depends, therefore, on the marginal propensity to consume and labour supply elasticities of the workers benefitting from the stimulus measures.

Insofar as the marginal propensity to consume and labour supply elasticities vary according to age, as a result of a change in the population age composition, the pass-through of counter-cyclical fiscal measures to consumption and, finally, to the level of aggregate demand and economic activity (for example, the value of the fiscal multipliers) varies according to the weight of younger population cohorts with respect to older ones. This happens in particular in the case of public consumption and investment programmes which pass through the stimulus measures essentially via changes in the labour income of the workers affected by these programmes.

In a recent Banco de España Working Paper,[1] evidence is found for the United States which shows that the fiscal multipliers associated with higher public consumption and investment have lower multiplier effects in states with older populations. The possible channels behind these empirical findings are analysed using a neo-Keynesian life-cycle model comprising three stages (youth, maturity and retirement). The combined duration of the last two stages is approximately 60 years and individuals accumulate assets by taking optimum decisions on their labour supply and consumption. The model includes standard monetary policy decision-making (represented through a Taylor rule) and a government which finances its expenditure by collecting taxes, issuing debt and earmarking a portion of its resources to finance a pension system with a set benefit ratio.

By extending the same model to a scenario comprising two areas (Spain and the rest of the euro area), calibrated using data that provide the best possible approximation of its findings to actual observations, it is possible to anticipate the extent to which the demographic shift envisaged in coming decades changes the fiscal multiplier

Chart 1
CHANGES IN THE FISCAL MULTIPLIER ASSOCIATED WITH HIGHER PUBLIC SPENDING



SOURCES: European Commission and Banco de España.

1 H. Basso and O. Rachedi (2018), *The young, the old, and the government: demographics and fiscal multipliers,* Banco de España Working Paper 1837.

Box 4.4

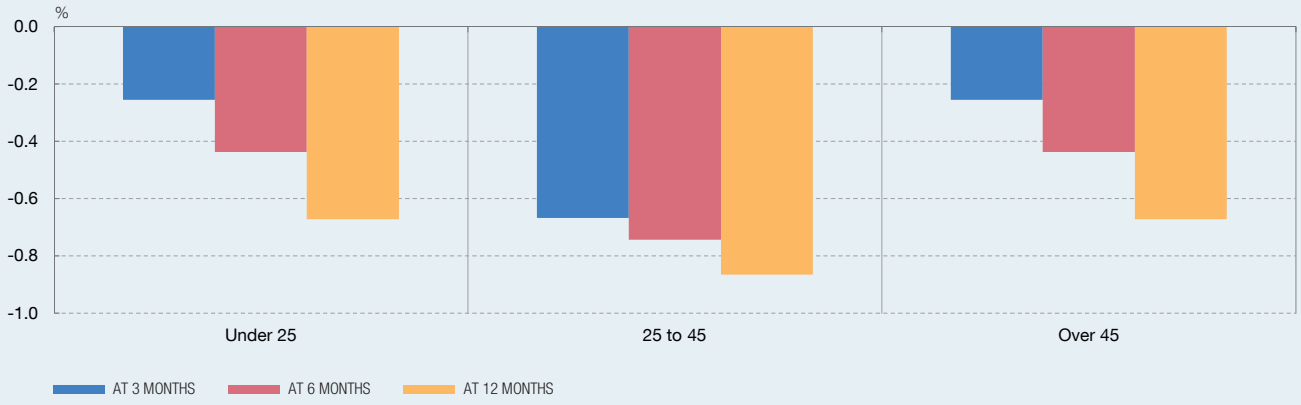
THE EFFECTS OF DEMOGRAPHIC CHANGES ON THE FISCAL MULTIPLIERS OF PUBLIC CONSUMPTION AND INVESTMENT PROGRAMMES (cont'd)

associated with higher public consumption and investment in Spain.[2] Chart 1 shows the changes in this fiscal multiplier over time. As can be seen, following a period of relatively high fiscal multipliers which coincided with baby boomers reaching working age, the effectiveness of changes in public consumption and investment for stabilising the economy trended downwards. Thus, for example, the value of this fiscal multiplier is estimated to have decreased by 35% from 1985 to 2015 (from 1.2 to 0.78) and is expected to fall a further 21% (from 0.78 to 0.62) from now until 2050.

Nevertheless, the above findings refer to the effects of fiscal policies implemented through changes in public consumption and investment. Consequently, of particular importance for the value of the fiscal multiplier associated with those programmes is knowing in which sectors and occupations the higher demand for labour needed to implement them is concentrated. Another recent paper shows evidence of the demographic profile of workers who benefit after a fiscal stimulus in Spain based on public investment projects at municipal level.[3] The findings (see Chart 2) suggest that the fiscal policy effect on the reduction in unemployment is different according to the age of the groups impacted. Thus, for example, the response to this fiscal programme seen in the numbers unemployed in an average municipality during the first three months would be 2.5 times larger for workers aged between 25 and 45 than for older workers. These differences reflect the greater labour elasticity of certain groups and the fact that the fiscal stimulus has a different effect on different economic sectors that have labour forces with different demographic compositions. And, the lower the marginal propensity to consume of the groups of workers affected by the stimulus measures, the lower the associated fiscal multiplier.

Furthermore, if the fiscal policy stimulus measures were implemented through direct transfers of income to households, the fiscal multipliers might be higher, based on the ages of the households receiving them and on how these transfers were financed. Thus, for example, income transfers from cohorts of intermediate age to younger and older cohorts, which have a greater marginal propensity to consume, would be a greater stimulus to economic activity than the fiscal multipliers shown in Chart 1. Nevertheless, aside from the intergenerational income transfers through the public pension system, which in future will be limited by the reduction in the size of the intermediate-age population, it is complicated to design other mechanisms for intergenerational transfers (based solely on age differences) which might be used for economic stabilisation purposes.

Chart 2
AVERAGE EFFECT OF A FISCAL STIMULUS ON UNEMPLOYMENT, BY AGE GROUP (a)



SOURCE: Banco de España.

a Effect in an average municipality after receiving a €1 million fiscal stimulus.

2 Eurostat's population projections for the 19 euro area countries were used for this quantitative exercise.

3 See M. Alloza and C. Sanz (2019), *Jobs multipliers: evidence from a large fiscal stimulus in Spain,* Banco de España Working Paper 1912.