Fundación **MAPFRE**

POPULATION AGING

MAPFRE Economic Research

Population aging

The demographic transition: a reflection on its economic and social security impact

MAPFRE Economic Research

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Foreword

Population aging is one of the greatest challenges of our times. The continuing and marked reduction in fertility rates, together with the increase in life expectancy, outlines a process of demographic transition that will undoubtedly constitute one of the landmarks in the history of humankind.

As with all major social changes, the increase in the percentage of people reaching an advanced age will bring huge challenges for the structure of our society and for the institutions on which that structure is founded. However, this emerging pattern will also offer opportunities for revitalizing social and economic organization, based on a longer-living population that can – with the implementation of appropriate public policies – become a powerful resource in the process of transformation and innovation that will shape the society and economy of the future.

This report prepared by MAPFRE Economic Research presents a general framework of analysis around the implications that the demographic transition will have from a structural point of view for the economy, and particularly for two of the main areas of the insurance industry's activity: pension schemes and health systems.

With regard to the macro-trends arising from this phenomenon, this study aims to complement the work that MAPFRE has been carrying out in coordination with the Deusto Business School, under the heading of "ageingnomics", the new economics of aging. Faced with the inevitable challenge entailed by the demographic transition, one of the aims of the "ageingnomics" project is to identify the ways in which a longer-living population can continue contributing to economic and social development, opening up new opportunities in employment and creativity, as well as in terms of their contribution to saving and consumption.

We hope this MAPFRE initiative will continue to contribute – both from the macroeconomic point of view and in terms of the microcosms of social organization – to the debate around identifying the challenges that face us, as well as on the alternatives and opportunities for transformation and innovation that will help us to meet those challenges.

Antonio Huertas Mejías
Chairman and CEO of MAPFRE

Presentation

The population aging process, which affects all regions of the world to differing degrees, is having an impact on key aspects of its development, such as the dynamic of economic growth and the maintenance of pension and health systems. Although the increase in longevity is undoubtedly one of humanity's greatest achievements, its effects on certain aspects of the economy and the welfare state are proving an enormous challenge, due to both the relative reduction in the working-age population and the increase in the number of older people, potential beneficiaries of pensions and with growing demands for healthcare services, leading to widespread concerns about the future sustainability of social security systems.

This report prepared by MAPFRE Economic Research analyzes the changes that have been occurring in demographic patterns since the end of the 20th century and are producing a generalized process of population aging all over the world. Based on that analysis, the report examines the impacts of the demographic transition on the global economy and on those areas of social life that are intimately linked to demographic patterns, such as pension and health systems. Finally, the study addresses the challenge for public policies in confronting the challenges of the new demographic situation, making mention of the reforms implemented in some countries in order to attempt to tackle the problem.

With the publication of this work, Fundación MAPFRE hopes to continue contributing to a better understanding of issues that are of special importance to society, fulfilling its charitable objective of supporting the dissemination of knowledge about matters relating to insurance and social protection.

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Introduction

The world is facing a fundamental transformation in its demographic pattern: the aging of its population, due to the combined effect of the dramatic reduction in fertility rates and the increase in life expectancy. This emerging pattern has profound social and economic implications. The general hypothesis presented in this document is that the trend toward the propagation of an aged population might be one of the factors that lie behind three current global trends: growing financial interdependence, secular stagnation and increasing economic inequality.

In the short term, it is possible to anticipate a future very similar to the present, characterized by increasing challenges for growth, financial stability and the current pension systems based on cost-sharing mechanisms. Although in the long term, it is foreseeable that the demographic transition could take care of reversing these problems when a situation of stationary populations is reached, the short term (which represents the moment of transition to that new global demographic situation) requires the participation of public policies to protect social well-being, either actively by offering certain guarantees of social coverage or passively by preventing perverse incentives that could distort the production system and the social security scheme associated with it.

We hope that this work may contribute to the reflection on this issue, which constitutes one of the greatest challenges for the global society of the 21st century.

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1. The demographic transition

1.1 Population aging

The world is facing a major demographic change; a transformation that began in the final decades of the 20th century and will be one of the distinctive features of 21st-century society, present both in developed countries and in many developing countries such as China, Emerging Europe and Latin America. The main features of this change in demographic patterns are an increase in longevity and a substantial fall in fertility. The latter is the result of the maturation of the demographic dividend reaped by many countries during the second half of the 20th century (see Box 1.1).

This demographic transition is producing a rapid and generalized aging of the population. Europe and other similar economic regions are aged societies in which, on average, more than 25% of the population is already over the age of 60, the average age is close to or above 40, and adult dependency accounts for more than two thirds of the dependency ratio, which currently exceeds 50% (see Chart 1.1).

Given the current dynamic (and in a scenario where no changes are made to demographic policies), average life expectancy in the countries of the Organisation for Economic Co-operation and Development (OECD) can be expected to reach 88 years by the middle of the 21st century, five years higher than it was at the start of the century. Correlatively, the fertility rate will be less than 1.5 children per woman, compared with the beginning of the century when this exceeded 1.7. The population will therefore age even more, so that the proportion of people over the age of 65 will exceed 35% in some countries of Southern Europe and East Asia by the middle of the century[1].

Chart 1.1.
Dependency ratios by region, 1950-2050
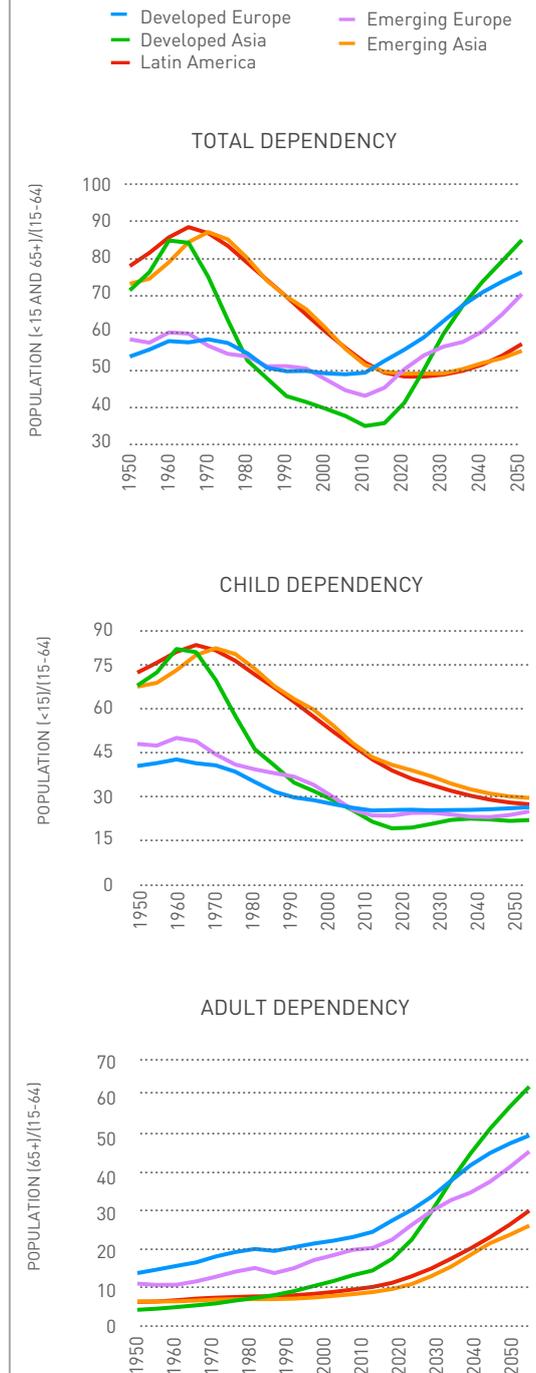
Source: MAPFRE Economic Research (based on UN data)

Box 1.1
The demographic dividend and its effect on growth

Population aging is the result of a continuing fall in fertility rates added to an increase in life expectancy. The main consequence of this demographic change is an increase in the adult dependency ratio, which results in a substantial reduction in the labor force.

The effects on savings, meanwhile, are ambiguous: (i) the increase in life expectancy constitutes an incentive for per capita savings, in a desire to smooth consumption over the lifetime; (ii) a reduction in total savings is expected, given the reduction in the saving sector of the population, and (iii) the reduction in the labor force means that, for a given level of capital per worker, the need to invest in capital decreases, with a consequent fall in interest rates.

Thus, the wealth produced is largely dedicated to financing consumption, which will increase in the short term. However, the long-term effects on consumption are negative, given the reduction in the ratio between the active population and the total number of consumers (*the support ratio*), which determines the per capita consumption capacity, functioning as a kind of budgetary restriction.

In this context, the phenomenon we are currently seeing must be understood as a kind of exhaustion of the demographic dividend that temporarily entailed a boost for economic growth. In other words, the reduction in the fertility rate in the 1970s allowed the resources previously used to support dependent minors to be dedicated to capital investment, which translated into a sharp increase in consumption.

The demographic dividend clock

Increase in the fertility rate Increase in consumption needs due to the increase in the child dependency ratio	**A**	
Increase in the support ratio Increase in investment and consumption due to incorporation of the baby boomer generation	**B**	
Reduction of the fertility rate Reduction of the child dependency ratio	**C**	

D	**Increase in consumption** Temporary improvement in quality of life
E	**Progressive increase in the adult dependency ratio** Due to retirement of the baby boomer generation
F	**Long-term reduction in per capita consumption and standard of living** Due to the reduction of the support ratio

Source: MAPFRE Economic Research

1.2 Demographic transition and the global economy: a hypothesis

Given their characteristics, the changes deriving from the demographic transition that is being experienced by global society could produce three decisive effects for the world economy. First, that we will have a larger aged population, which will moreover increase participation within the global population, with the effect that this has on consumption needs. Second, that there will be a further fall in the ratio between the working population and the consuming population (the support ratio), with the implications that this has for the growth engines (not just for the work factor), for pension systems based on cost-sharing schemes, and for inequality in the distribution of income and consumption (see Chart 1.2). Third, that there will be a change in the ratio between net savers and consumers, which will have effects on total savings, on the money supply, on the velocity of money circulation and, by extension, on inflation and interest rates.

These effects are not speculative, but rather the expression of global trends that have been happening since before the turn of the century. However, since the great recession (2008-2009) they have become more acute and have won more space in the public debate, either because of their obvious consequences (fiscal sustainability, economic growth, employment rate, etc.) or, implicitly, because of their influence on the issues that dominate the global macroeconomic debate and could be closely linked to the current stage of demographic transition:

a) Secular stagnation, understood as the depression of nominal growth and interest rates;

b) The growing evidence of the loss of sustainability of pension systems based on cost-sharing schemes and the dangers that this entails for public social security systems;

c) The increase in inequality within economies, especially inequality in the distribution of income and consumption, and

Chart 1.2
Support ratio, 1950-2050
(active population versus total consumers)

Source: MAPFRE Economic Research (based on UN data)
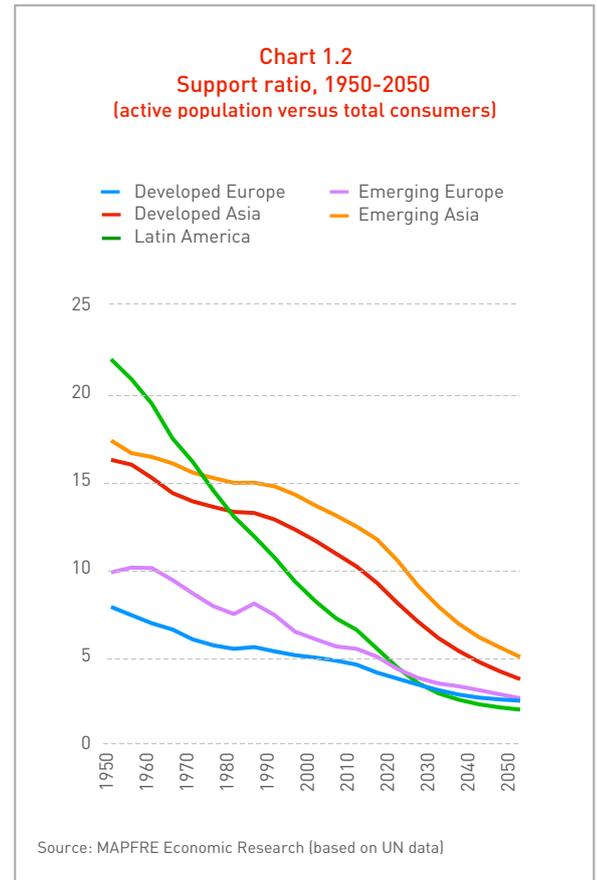
d) The growing financial interdependence between developed and developing countries, with the investment flows serving as the main channeling route for global financial conditions.

2. Global economic consequences

2.1 Demographic transition and secular stagnation

Strictly speaking, there is no formal definition of the concept of "secular stagnation". However, economic theory[2] agrees that it is a phenomenon characterized by three symptoms: (i) a secular slowing of real economic growth; (ii) a deflation that can result in a deflationary process (zero or negative inflation), and (iii) a temporary loss of premium in interest rates.

The outlook for economic growth

As mentioned earlier, it is an increasingly accepted hypothesis that the demographic transition and the loss of the demographic dividend that had been enjoyed since the post-war baby boom constitute the basic force that, accompanied by other factors[3], has played a decisive role in the loss of dynamism in global economic growth in recent years. In this regard, it has been estimated that the loss of growth in global GDP since the start of this century has been approximately 25-50 basis points. On top of this, there could be a slowdown involving a loss of approximately 25 additional basis points before the middle of the century.

The channels through which the demographic transition impacts economic growth – although it is necessary to put these into perspective and understand their mitigating factors – seem to be difficult to dispute. below, we set out some of them that can be likened to the expression of output as the sum of labor, capital and productivity.

Effects via the labor factor

The effects of the demographic transition on economic growth via the labor factor (L) can be of two types: direct and indirect.

Directly, population aging increases the dependency ratio (through the adult dependency ratio, as illustrated in the aforementioned Chart 1.1). All else being equal[4], this essentially entails a reduction in the participation rate, and therefore in the employment rate. This reduction involves a contraction of the contribution of the labor factor to the possibilities of national production and, by extension, a detraction of the economy's capacity for growth. Possible measures for mitigating this effect could be the implementation of public policies such as a raising of the retirement age, an increase in female labor participation, immigration, labor mobility or some type of incentive for the automation of labor, although none of these is innocuous in terms of the final effect or has immediate impacts. The most visible examples are the automation of factories (the result of which, in terms of the contribution to growth, is visible, although the employment creation that offsets the replaced labor is seen only in the long term), and the increase in female labor participation, which, in the absence of changes in public policies, is attributed to the fall in fertility with which the problem would be pushed forward into the future.

Indirectly, moreover, population aging, in the absence of active skills renewal policies,"), results in a reduction of the marginal productivity of labor and, by extension, an increase in real wages that would be disproportionate to the skills, leading to a wage disparity in the remuneration of unemployed older people, thus disincentivizing participation[5].

Effects via capital intensity

Capital intensity means the proportion of physical capital per unit of output (K/Y). Population aging causes a reduction in this ratio, since the capital needs per worker decrease, thus eventually producing an excess in the stock of capital, which results in a contraction of the expected return on capital over the long term and, through the expectations mechanism, an increasing reduction in the capital yield term. This could be regarded as a kind of "population aging duration effect"[6].

At present, it remains debatable whether the effects on investment (on capital) could be mitigated to some extent by the increase in human capital and by automation (A. Hansen, 1938). However, what seems irrefutable from the point of view of economic theory is that as a factor becomes more expensive, its alternative becomes comparatively more attractive. Thus, if population aging reduces the labor supply and therefore the cost of the (qualified) labor factor increases (Acemoglu and Restrepo, 1997), this fact makes investment in physical capital increasingly profitable because its marginal cost is relatively lower. This factor could therefore act as a mitigating element in the medium and long term, as mentioned earlier.

Effects via total factor productivity

The final effect of population aging on total factor productivity (TFP) is difficult to determine for the same reasons outlined earlier. In the absence of a renewal of skills or their replacement via automation, population aging reduces the apparent productivity of labor. However, it is important to point out that there are cases of countries in which the history shows an increase in productivity after going through a demographic transition. The paradigmatic case is Japan, although Taiwan, the United States and Germany could be similar cases.

The outlook for inflation

From the point of view of demand, population aging produces a general increase in savings for various reasons. First, due to a reduction in "vegetative consumption"[7]. And second, counter to the life-cycle theory (Hugget, 1996), by virtue of an increase in savings due to an increase in precautionary saving (because of the need to defray health and long-term care costs), as well as the fall in marginal propensity to consume, which translates into savings and current surpluses (as is the case with Japan and Germany, among other countries subject to significant population aging processes).

The relationship between the propensity to save and per capita consumption is derived from the so-called Golden Rule (Edmund Phelps), which establishes that the marginal propensity to save delimits the stationary growth rate of consumption and therefore of structural per capita consumption. Thus, with a higher propensity to save, there is lower permanent per capita consumption.

Overall, these effects produce a reduction in the velocity of money circulation, downward pressures on demand and a real appreciation of the currency. All of this, in combination with the loss of dynamism in current economic growth via the Philips curve, generates an impulse toward the slowing of inflation (deflation).

The outlook for the natural interest rate

Together, the reduction in structural per capita consumption, the increase in real monetary balances and the growing surplus of capital pushing yields downward result in a lowering of the economy's natural interest rate, which in the long term should equalize with the (depressed) nominal growth. The natural mechanism for this process is enshrined in the so-called Taylor rule.

This reduction in the natural interest rate, combined with the effect of current monetary policies (in recessionary contexts) and the erosion of the long-term growth outlook, depresses interest rates across the curve, with special emphasis on the sections where the demographic pressure toward aging is expected to be greater (see a proxy of this relationship in Chart 2.1).

Chart 2.1
30-year interest rates vs growth in the
adult dependency ratio, 1986-2018

Source: MAPFRE Economic Research (based on UN data)
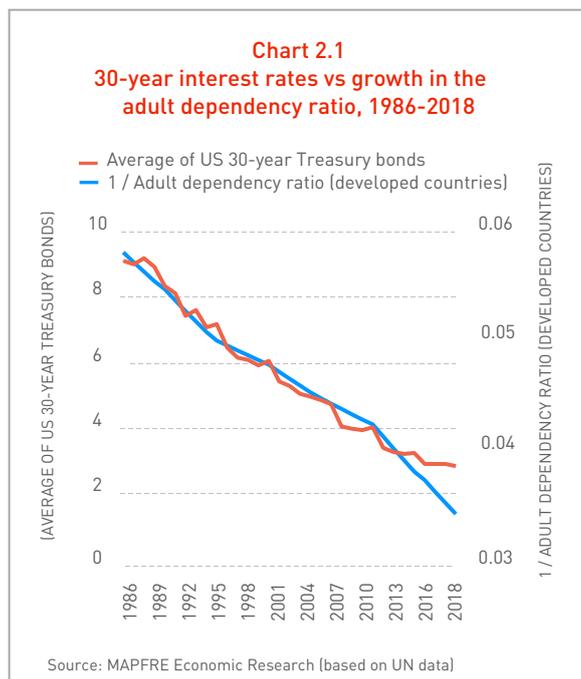
2.2 Demographic transition and fiscal sustainability

The problems associated with the stagnation of economic growth, interest rates and inflation that arise from a demographic transition marked by population aging appear to find their high point in problems of fiscal sustainability.

On the one hand, the demographic transition toward more aged populations brings a **reduction of tax revenues**. Low GDP growth entails lower demand and wage stagnation, and this affects the tax revenues used to support the public accounts, a direct consequence of a low support ratio as mentioned earlier.

However, population aging entails **increasing public spending (e.g. pensions).** In this regard, and counter to all intuition, with population aging and the increase in adult dependency, part of the "demographic consumption" still keeps increasing due to the pure vegetative or natural growth of society (equal to the difference between the birth rate and the mortality rate).

However in addition to this purely vegetative portion, there is consumption that can be explained by the population that passes into the more pronounced phase of old age. This is part of what is known as "age consumption", in other words the consumption related to the needs of each age group. The most obvious spending on this type of consumption in the adult dependent population is that made on health and long-term care (LTC), which, in state welfare systems, is expected to be borne by the State[8] in the form of provision of goods and public services, which is tackled through increasing recourse to public spending and, in the majority of cases, to the public deficit.

Thus, increasingly lower tax revenues[9] caused by the lower growth of economic activity and the depression of income, together with increasing state spending on health (such as would arise from spending on health and long-term care), will necessarily result in an increase in the public deficit. The growth of this deficit, in a context of high public debt, increasingly lower potential growth and low (or even negative) inflation, could cause an explosive public debt dynamic, which the markets anticipate would translate into growing debt servicing costs, further fueling the problem and potentially leading an economy toward the loss of fiscal sustainability.

2.3 Demographic transition, asset prices and the search for yield

Effect on asset prices

In terms of what has been indicated above, the increase in dependency that produces a demographic transition characterized by population aging alters the capital needs, making investment less necessary and therefore rewarding it less, with a consequent reduction in return on capital. As we know, the equilibrium price of assets is proportional to their yield. Thus, the deterioration of economic growth as a result of the factors indicated in the

previous section causes a fall in the price of assets such as equities, to the detriment of others such as residential assets.

Effect on flows, exchange rates and monetary policy

Faced with the above-mentioned fall in the yields on assets, flows of direct investment, whether portfolio or credit, tend to seek yields in markets where the expectations are greater (whether due to demographics or any other factor). This is what is known as the "search for yield", which leads to the relocation of monetary flows from countries with an excess of savings and mature populations toward developing countries where the population is still young but can still be expected to enjoy a demographic dividend and in which there is a need for current account financing[10].

Thus, migrations of portfolio flows are important due to their effect on the price of local assets, currency and on domestic monetary policy[11], and are net generators of current imbalances. In other words, they globalize the countries' financial conditions in part due to the difference of demographic transition stage between issuers of flows (developed countries) and recipients of flows (developing countries).

2.4 Demographic transition and inequality

Another important dimension of demographic transition characterized by population aging is the one that has to do with its effects on inequality in wages, income and consumption.

The reduction in the active population caused by population aging leads to a lower labor supply, which, in the absence of labor flexibility, produces an acceleration in the growth of real wages above the revaluation level of pensions, which in the majority of cases are revalued according to changes in inflation. This disparity is converted into a source of inequality of wages and income.

And on the other hand, population aging depresses interest rates, so that the discounted present value of the assets of the youngest cohorts (having a greater discount time in the value of their assets) increases more than that of the more mature cohorts. This type of "duration effect" produces different wealth effects on the two age groups, so that young people consume more. This, together with the disparity in wages, generates inequality of consumption.

In summary, as can be seen from the above review, the effects of a demographic transition characterized by population aging would appear to produce (generally speaking, and isolating the long-term mitigating effect of factors such as technological change), negative externalities for society. This fact is especially relevant because it represents an effect that is intergenerational and therefore movable and capable of perpetuating over time. This makes it necessary to implement public policies that mitigate the negative effects of this demographic process and seek to maximize social well-being.

3. Population aging: pensions and health

The process of demographic transition that is being seen all over the world, as well as having macroeconomic impacts that have been discussed in the previous sections, has concrete effects on certain areas of social life intimately linked to demographic patterns. Two of these appear to be the most relevant: pension and health systems.

3.1 Pensions

According to information from the Organisation for Economic Co-operation and Development (OECD), total spending on pensions and health (including long-term care costs) currently accounts for between a third and half of total primary public spending in the countries of the OECD[12]. The analysis of key indicators relating to pension systems anticipates difficulties in relation to the sustainability and adequacy of pensions, which are already becoming apparent in many developed and some developing economies, regardless of the model adopted: cost-sharing, capitalization or a combination of both.

As indicated in the previous section, the population aging process produced by the fall in the birth rate in combination with a generalized increase in life expectancy will progressively increase the pressure on public accounts and on the adequacy ratios of retirement pensions. In this section, we present a comparative international analysis of two key indicators that can give an approximate idea of the scale of the problem, which is prompting in-depth debates on possible public policy measures, in order to address the question of how to minimize its impact on the available income of retired people.

In the case of the cost-sharing components, which are included in the majority of the world's current pension systems, the increase in pressure on public accounts is largely linked to the declining trend in working population ratios supporting the retired population with their contributions (dependency ratio) and to the increase in life expectancy at age 65 (typical effective retirement age), as the main factors.

In the capitalization components of the pension systems, in addition to the increase in life expectancy, another important factor is the interest rate environment and the circumstances in which this can give rise to a persistent situation of low interest rates, as has happened in Japan and the eurozone in recent times. These factors significantly reduce the capital accumulated at the end of the working life and substantially increase the acquisition cost of the life annuities that make up or supplement the retired persons' pensions and their possible reversion to the surviving relatives under some systems.

There follows an analysis of the above-mentioned indicators based on historical data and population projections performed by the United Nations (UN). We analyze the dependency ratio, expressed for the purposes of this study as the ratio between the number of people of working age (between 20 and 64) and the number of retired people (65 and over) that they would have to support. This approximation highlights the importance of having a well-developed labor market so that people of working age actually work and can contribute to supporting retirement pensions. This acquires greater importance as the dependency ratio decreases.

Projections of dependency ratios

The dependency ratios constructed on the basis of the UN population projections[13] show a clear declining trend in the proportion of people of working age compared with people over the age of 65 in all the major regions of the world (see Chart 3.1-a).

Chart 3.1-a
Dependency ratios, 1950-2100

WORLD
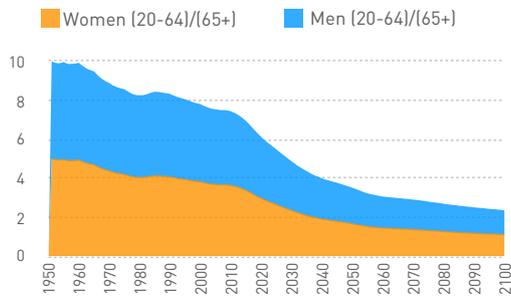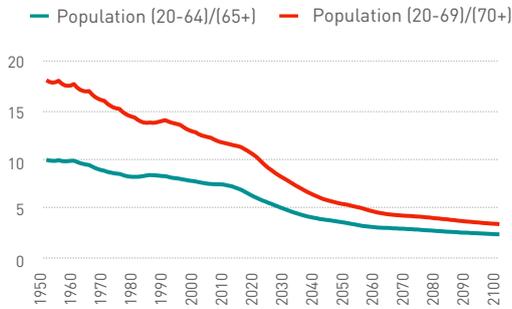
EUROPE
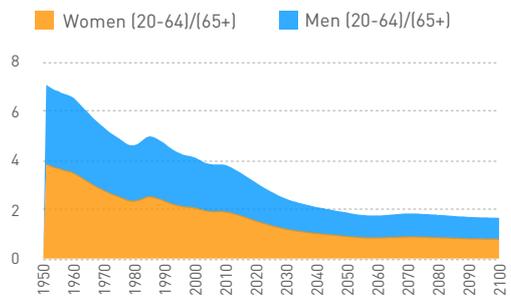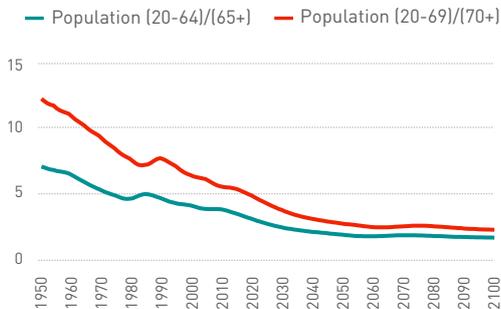
NORTH AMERICA
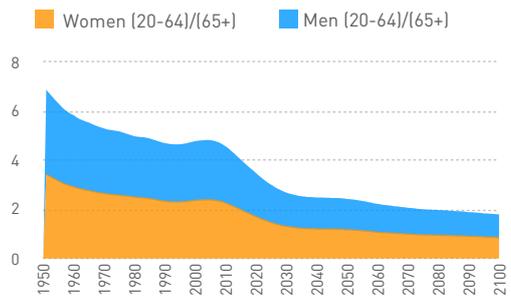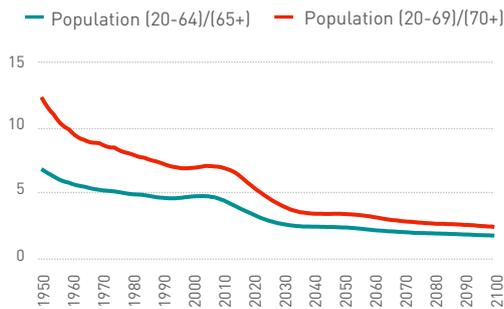
LATIN AMERICA AND THE CARIBBEAN
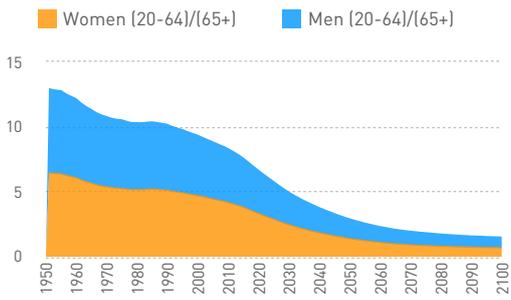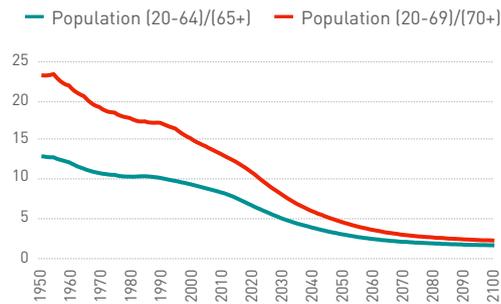
Chart 3.1-a (continued)
Dependency ratios, 1950-2100

ASIA

Population (20-64)/(65+) — Population (20-69)/(70+)

Women (20-64)/(65+) — Men (20-64)/(65+)

OCEANIA

Population (20-64)/(65+) — Population (20-69)/(70+)

Women (20-64)/(65+) — Men (20-64)/(65+)

AFRICA

Population (20-64)/(65+) — Population (20-69)/(70+)

Women (20-64)/(65+) — Men (20-64)/(65+)
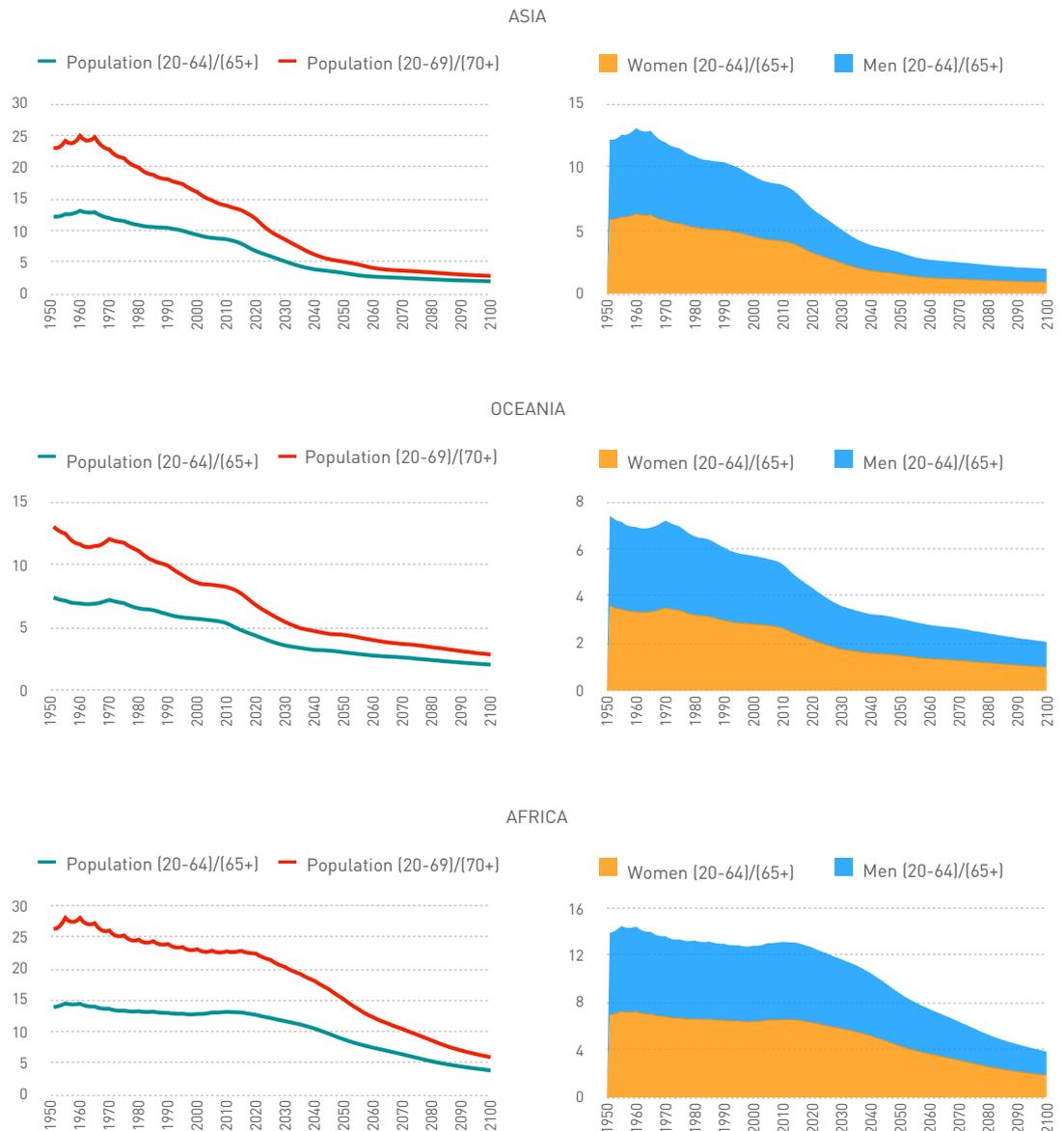
Source: MAPFRE Economic Research (based on UN data)

The sensitivity analysis in which the effective retirement age is raised to 70 years also shows a clear declining trend, although the level of the ratio improves notably in the decades closest to the present time.

If we analyze the dependency ratios with a higher level of regional disaggregation (see Table 3.1-a), we find confirmation that in Europe, Australia and North America the ratio currently (2019) shows values of less than four people of working age for each person reaching the retirement age.

In the 20-year projections (2039), in Southern Europe and Western Europe this ratio is less than two people of working age for each retired person.

However, the problem becomes generalized in all regions of the world as time advances, with the exception of Western, Central and Sub-Saharan Africa. Table 3.1-b shows the dependency ratio projections at country level, while Charts 3.1-b to 3.1-e show the geographical representation of the expected change over the coming decades.

The analysis by country makes it clear that in the next few decades, countries such as Japan, South Korea, Taiwan, Spain, Hong Kong, Greece, Portugal, Poland, Singapore and Italy will reach dependency ratio values of less than 1.5 people of working age for each person reaching retirement age in 2059. Only a few African countries, Iraq and Papua New Guinea have ratios of around four or higher at the end of the projection period.

In summary, this information clearly confirms the gradual worldwide process of reduction in dependency ratios anticipated for the coming decades.

Projections of life expectancy at age 65

As indicated earlier, the second factor that can have a significant impact on the sustainability and adequacy of pension systems at global level is the generalized increase in life expectancy. This is a phenomenon that, in a manner similar to what happens with dependency ratios, will be a distinctive feature of the world population in the coming decades.

Table 3.1-a
Dependency ratios by region, 1959-2099
(population 20-64 / population 65+)

Region	1959	1979	1999	2019	2039	2059	2079	2099
Southern Europe	6.9	4.8	3.8	2.8	1.7	1.4	1.4	1.4
Eastern Asia	12.3	10.0	7.9	4.9	2.3	1.6	1.6	1.5
Western Europe	5.2	3.9	3.9	2.8	1.9	1.7	1.7	1.6
Eastern Europe	8.7	5.4	4.7	3.8	2.7	1.9	2.1	2.0
Northern Europe	5.2	3.9	3.8	3.1	2.2	2.0	1.9	1.7
Australia/New Zealand	6.2	5.8	4.9	3.7	2.6	2.2	2.0	1.7
Northern America	5.9	5.0	4.8	3.6	2.5	2.3	2.0	1.8
South America	12.3	10.6	9.5	6.6	3.8	2.3	1.8	1.6
Caribbean	11.3	7.9	7.3	5.6	3.3	2.5	2.1	1.8
Central America	12.7	10.9	10.1	8.1	4.6	2.7	1.9	1.5
Polynesia	15.3	13.1	10.8	7.6	4.0	3.2	2.3	1.9
South-Eastern Asia	12.6	11.4	10.9	8.9	4.7	3.2	2.6	2.2
Southern Asia	14.6	12.8	11.6	9.4	6.1	3.6	2.6	2.1
South-Central Asia	14.2	12.5	11.5	9.5	6.1	3.6	2.6	2.1
Western Asia	11.5	9.7	10.1	10.0	5.8	3.6	2.8	2.3
Central Asia	8.4	8.2	9.5	10.8	6.1	3.7	3.0	2.4
Micronesia	14.5	13.8	13.6	7.6	4.1	3.8	2.6	2.3
Northern Africa	12.8	11.1	10.3	9.5	6.2	4.0	3.2	2.6
Southern Africa	11.9	12.6	12.8	10.4	7.5	4.6	3.3	2.5
Melanesia	15.9	15.7	14.5	11.7	8.5	6.3	4.6	3.6
Eastern Africa	15.0	13.9	13.6	14.2	12.5	8.0	5.1	3.6
Sub-Saharan Africa	14.9	14.0	13.8	14.1	12.6	8.9	5.9	4.2
Middle Africa	13.7	13.2	13.3	14.0	13.2	10.1	6.6	4.3
Western Africa	16.3	15.0	14.5	15.3	13.9	10.7	7.4	5.1

Source: MAPFRE Economic Research (with UN data)

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Table 3.1-b
Dependency ratios by country, 1959-2099
(population 20-64 / population 65+)

</div>

Country	1959	1979	1999	2019	2039	2059	2079	2099
Japan	9.7	7.0	3.8	2.0	1.5	1.3	1.3	1.3
South Korea	12.9	12.2	9.2	4.4	1.7	1.3	1.3	1.3
Taiwan	17.1	12.9	7.4	4.5	1.9	1.3	1.4	1.4
Spain	7.0	4.9	3.8	3.0	1.7	1.3	1.4	1.4
Hong Kong	19.9	8.9	6.0	3.8	1.7	1.3	1.6	1.5
Greece	8.3	4.5	3.8	2.9	1.8	1.4	1.3	1.4
Portugal	6.9	4.8	3.8	2.7	1.7	1.4	1.3	1.3
Poland	9.7	5.6	5.0	3.5	2.3	1.4	1.4	1.4
Singapore	22.6	11.9	9.1	4.6	1.9	1.4	1.2	1.1
Italy	6.2	4.3	3.5	2.5	1.5	1.4	1.5	1.4
Slovenia	7.5	5.0	4.6	3.0	1.8	1.5	1.6	1.5
Cuba	10.9	6.4	6.4	4.0	1.7	1.5	1.5	1.4
Malta	6.6	5.8	5.0	3.0	2.2	1.5	1.5	1.4
Macao	10.2	7.9	8.4	6.3	2.3	1.5	1.8	1.6
Estonia	5.7	4.6	4.1	2.9	2.1	1.6	1.7	1.6
Austria	4.8	3.6	4.0	3.1	1.8	1.6	1.6	1.5
Czech Republic	6.3	4.1	4.5	3.0	2.2	1.6	1.8	1.7
Slovakia	8.1	5.2	5.3	3.9	2.5	1.6	1.7	1.6
Germany	5.3	3.6	3.9	2.8	1.7	1.6	1.6	1.5
Croatia	8.4	5.1	4.0	2.9	2.1	1.6	1.5	1.5
Puerto Rico	8.2	6.6	5.1	3.8	2.5	1.6	1.2	1.2
Bosnia and Herzegovina	14.6	9.3	5.8	3.6	2.2	1.6	1.5	1.5
Moldova	8.6	7.3	6.1	5.6	3.4	1.7	1.7	1.7
Bulgaria	7.8	5.0	3.7	2.8	2.2	1.7	1.9	1.8
China	12.7	10.5	8.9	5.6	2.5	1.7	1.7	1.6
Albania	8.2	8.9	7.7	4.4	2.3	1.7	1.3	1.2
Latvia	5.6	4.5	4.0	2.9	2.1	1.7	1.9	1.8
Martinique	9.8	6.2	4.9	2.8	1.5	1.7	1.5	1.3
Iran	10.9	14.2	11.2	10.7	4.8	1.7	1.5	1.5
Thailand	13.4	12.1	9.6	5.2	2.2	1.7	1.5	1.5
Romania	8.6	5.5	4.5	3.2	2.3	1.7	1.7	1.7
Switzerland	5.8	4.3	4.1	3.2	2.0	1.7	1.7	1.5
Lebanon	7.4	8.3	7.8	6.8	3.4	1.7	1.4	1.3
Hungary	6.6	4.3	4.1	3.1	2.3	1.7	1.7	1.7
Saint Lucia	10.6	7.6	6.5	6.3	3.1	1.8	1.3	1.3
Channel Islands	4.5	3.9	4.4	3.3	2.0	1.8	1.7	1.6
Armenia	7.3	8.5	5.7	5.3	3.2	1.8	1.6	1.5
Macedonia	9.8	8.6	6.1	4.5	2.8	1.8	1.8	1.6
Netherlands	6.1	5.1	4.6	3.0	1.9	1.8	1.7	1.6
Cyprus	8.1	5.9	5.8	4.5	2.8	1.8	1.5	1.5
Ukraine	8.2	5.0	4.5	3.7	2.7	1.8	2.1	1.9
Maldives	18.0	16.1	11.9	15.6	6.2	1.8	1.6	1.5
Lithuania	6.9	4.9	4.3	3.1	2.1	1.9	2.0	1.8
Montenegro	7.9	6.6	5.3	3.8	2.6	1.9	1.6	1.5
Belgium	5.0	3.9	3.6	3.1	2.1	1.9	1.8	1.7
Guadeloupe	8.6	6.8	5.8	3.0	1.6	1.9	1.4	1.3
Costa Rica	14.1	11.6	9.6	6.1	3.1	1.9	1.5	1.4
France	4.9	4.0	3.7	2.7	2.0	1.9	1.8	1.6
Virgin Islands (USA)	6.0	10.2	6.9	2.7	1.8	1.9	1.4	1.1
Jamaica	10.7	6.3	6.5	5.9	3.3	1.9	1.4	1.1

Table 3.1-b (continued)
Dependency ratios by country, 1959-2099
(population 20-64 / population 65+)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Serbia	8.6	6.3	4.5	3.2	2.6	1.9	1.8	1.6
Chile	9.8	8.9	7.7	5.2	2.8	1.9	1.6	1.5
Finland	7.5	5.0	4.1	2.6	2.1	1.9	1.8	1.6
Canada	6.6	6.2	4.9	3.4	2.2	1.9	1.8	1.6
Iceland	6.2	5.4	4.9	3.9	2.5	1.9	1.7	1.5
United Kingdom	5.0	3.7	3.7	3.1	2.2	2.0	1.8	1.6
Sweden	5.0	3.5	3.4	2.8	2.2	2.0	1.9	1.7
Belarus	6.7	5.3	4.5	4.1	2.7	2.0	2.2	2.0
Barbados	7.0	4.6	5.2	3.7	2.2	2.0	1.8	1.7
Vietnam	10.4	8.0	8.0	8.1	3.6	2.0	1.8	1.7
Brazil	14.2	12.4	10.9	6.7	3.5	2.0	1.6	1.4
Ireland	4.5	4.6	5.5	3.9	2.6	2.1	1.9	1.7
Mauritius	16.2	14.2	9.9	5.3	2.9	2.1	1.6	1.6
New Zealand	5.9	5.5	5.0	3.6	2.3	2.1	1.8	1.6
Georgia	6.2	6.0	4.7	3.9	2.7	2.1	2.0	1.8
Denmark	5.4	4.0	4.1	2.9	2.2	2.1	1.9	1.7
Brunei Darussalam	11.3	15.4	23.5	12.3	3.9	2.1	1.8	1.6
Sri Lanka	9.1	11.3	9.1	5.4	3.0	2.1	1.6	1.4
Reunion	11.9	10.2	8.5	4.7	2.3	2.1	1.6	1.4
Russia	9.7	5.8	4.9	4.1	2.9	2.2	2.5	2.2
Norway	5.2	3.8	3.8	3.4	2.4	2.2	1.9	1.7
Curaçao	9.2	8.3	5.8	3.4	2.1	2.2	1.9	1.6
Australia	6.3	5.9	4.9	3.7	2.6	2.2	2.0	1.7
Seychelles	7.7	6.6	7.0	6.8	3.0	2.2	2.2	1.8
Bahamas	11.7	11.3	10.7	6.5	3.2	2.2	1.9	1.7
Colombia	13.0	11.6	11.3	7.3	3.6	2.2	1.7	1.6
Uruguay	6.8	5.2	4.2	3.8	3.0	2.2	1.8	1.6
Luxembourg	5.7	4.3	4.4	4.3	2.7	2.3	2.1	1.8
United States	5.9	4.9	4.7	3.6	2.5	2.3	2.0	1.8
Turkey	14.5	9.6	8.9	6.9	3.8	2.3	1.7	1.5
French Polynesia	16.0	13.7	13.1	7.2	3.4	2.3	1.8	1.5
Grenada	7.8	5.7	5.8	7.7	5.0	2.3	1.8	1.4
Tunisia	11.6	11.0	8.0	7.1	3.8	2.3	2.1	1.7
Trinidad and Tobago	12.4	8.8	8.7	5.9	3.7	2.4	2.2	2.1
Aruba	18.8	8.2	8.5	4.4	2.3	2.5	1.9	1.8
Mexico	12.3	10.4	10.0	7.9	4.3	2.5	1.8	1.5
Guam	32.0	18.9	10.8	5.6	3.1	2.5	1.8	1.5
Saint Vincent and the Grenadines	9.2	6.5	7.4	7.4	3.7	2.5	1.8	1.6
Morocco	14.9	12.3	9.6	7.9	4.2	2.5	1.9	1.6
Bhutan	18.8	17.9	12.5	11.8	6.0	2.5	1.8	1.6
Nicaragua	15.7	14.4	11.7	9.6	5.2	2.6	1.7	1.4
Republic of Korea	14.1	14.1	10.6	6.8	3.2	2.6	2.1	1.8
Azerbaijan	8.8	8.9	9.2	9.8	4.3	2.6	2.4	2.0
Algeria	13.4	11.2	11.6	8.6	4.9	2.6	2.2	1.8
Antigua and Barbuda	10.9	9.4	8.1	8.2	3.2	2.7	2.1	1.8
Malaysia	11.9	12.5	13.6	9.1	5.1	2.7	2.1	1.7
Argentina	10.2	6.6	5.4	4.9	3.9	2.7	2.1	1.8
New Caledonia	13.5	11.3	9.9	5.9	3.4	2.7	2.1	1.8
El Salvador	12.4	12.1	9.0	6.4	4.4	2.7	1.7	1.4
Peru	12.6	11.8	10.5	7.6	4.5	2.7	2.0	1.6

Table 3.1-b (continued)
Dependency ratios by country, 1959-2099
(population 20-64 / population 65+)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Panama	11.7	10.6	9.7	6.8	3.9	2.8	2.1	1.7
Bangladesh	16.5	13.4	12.7	11.2	5.7	2.8	1.8	1.5
Saudi Arabia	12.0	14.3	16.3	18.1	5.7	2.9	2.3	1.8
Ecuador	8.9	10.4	10.2	7.4	4.4	2.9	2.1	1.7
Israel	11.3	5.8	5.3	4.3	3.6	2.9	2.4	1.9
Oman	14.4	15.2	20.9	29.1	9.2	3.0	1.8	1.5
Venezuela	18.2	13.9	12.0	8.2	4.6	3.0	2.2	1.8
Libya	11.1	14.1	13.5	13.0	5.8	3.0	2.4	2.0
Dominican Republic	15.5	13.9	9.8	7.5	4.6	3.0	2.1	1.6
Uzbekistan	8.2	7.8	10.2	12.3	6.2	3.3	2.6	2.1
Suriname	9.4	9.6	9.7	8.1	4.4	3.4	2.5	2.1
Honduras	12.6	11.7	11.5	11.0	6.6	3.4	2.2	1.7
Cape Verde	8.9	6.7	8.1	12.2	7.1	3.5	2.3	1.8
Paraguay	12.3	11.2	10.5	8.1	6.0	3.5	2.5	2.0
Kazakhstan	8.7	8.3	8.2	7.9	5.0	3.5	3.1	2.4
Mongolia	10.6	8.8	13.2	13.8	6.1	3.6	3.2	2.4
Fiji	17.8	18.0	15.0	8.6	5.2	3.6	2.7	2.1
India	15.4	12.9	11.6	9.0	5.9	3.7	2.6	2.1
Nepal	18.9	13.8	11.9	8.7	6.8	3.7	1.9	1.5
Cambodia	16.6	16.4	13.6	11.7	6.8	3.7	2.7	2.0
Kuwait	26.5	28.5	41.0	25.7	5.4	3.8	3.0	2.4
Indonesia	12.8	12.3	11.6	10.5	5.5	3.8	2.9	2.4
Bolivia	9.1	11.4	9.1	7.5	6.0	3.8	2.7	2.1
French Guiana	7.8	10.4	14.1	9.1	4.8	3.9	2.8	2.2
Kyrgyzstan	7.0	7.7	8.9	11.5	6.0	3.9	3.2	2.4
Qatar	15.4	33.2	40.2	50.3	8.2	3.9	2.4	2.0
Botswana	10.0	15.9	16.0	13.3	8.4	4.0	3.0	2.3
Guatemala	16.1	13.7	10.3	10.2	7.7	4.1	2.5	1.9
United Arab Emirates	12.3	44.3	59.9	62.8	8.3	4.1	2.5	2.2
Myanmar	14.0	11.2	10.7	9.4	5.7	4.1	3.0	2.7
Lao People's Democratic Republic	17.8	12.2	11.7	12.8	8.3	4.1	2.6	2.0
Western Sahara	18.9	15.6	20.8	19.2	7.7	4.1	3.1	2.3
Syria	10.1	12.4	13.0	10.2	7.2	4.2	2.5	1.9
Bahrain	15.7	24.9	24.1	29.3	7.7	4.3	2.0	1.7
Turkmenistan	9.0	9.7	11.4	12.3	6.9	4.4	3.7	2.9
Jordan	9.5	11.7	15.1	13.3	7.2	4.4	3.0	2.2
Egypt	12.2	9.9	9.6	10.0	7.2	4.4	3.5	2.6
Samoa	18.6	13.6	10.0	8.0	4.7	4.4	2.7	2.1
South Africa	12.0	12.6	12.8	10.1	7.2	4.5	3.2	2.5
Haiti	14.3	10.8	10.7	10.6	8.0	4.5	3.3	2.6
Belize	10.4	8.0	10.9	13.9	7.9	4.6	3.0	2.3
Djibouti	18.8	16.9	15.1	12.8	8.2	4.6	3.4	2.8
Guyana	11.9	11.2	12.6	10.0	5.8	4.7	3.1	2.4
Tajikistan	10.1	8.8	11.5	14.1	7.8	4.8	3.6	2.6
Vanuatu	16.3	13.7	13.0	10.9	7.4	4.8	3.4	2.6
Mayotte	6.8	8.5	13.7	11.1	7.3	4.9	2.9	2.0
Philippines	12.8	13.1	14.7	10.7	7.0	5.0	3.5	2.7
Gabon	7.7	7.5	7.3	11.5	8.6	5.1	3.9	2.8
Micronesia	11.6	10.2	11.4	9.6	9.5	5.2	3.5	2.6
Tonga	12.8	13.0	7.8	8.3	5.9	5.2	3.2	2.6

Table 3.1-b (continued)
Dependency ratios by country, 1959-2099
(population 20-64 / population 65+)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Pakistan	10.3	11.2	10.8	11.4	8.6	5.5	4.0	3.0
Rwanda	13.6	16.2	13.2	14.8	10.7	5.9	3.7	2.6
Solomon Islands	17.6	12.4	15.6	13.3	8.7	5.9	3.7	2.7
Kiribati	11.0	13.1	13.6	12.6	7.8	5.9	4.7	3.7
Palestine	9.4	15.8	17.5	15.2	10.2	6.0	3.9	2.7
Namibia	12.0	11.5	13.6	13.7	10.3	6.1	4.0	2.8
Kenya	11.4	11.8	14.8	16.6	11.4	6.3	4.0	2.9
Swaziland	15.2	13.9	13.7	15.4	14.4	6.6	4.0	2.8
Ethiopia	16.1	13.6	12.7	12.7	11.5	6.7	3.7	2.5
Zimbabwe	12.4	12.4	13.1	16.2	14.9	6.8	4.1	2.9
Papua New Guinea	15.6	15.9	14.7	12.7	9.4	6.9	5.0	3.9
Eritrea	15.1	16.5	11.8	12.6	14.1	6.9	4.3	3.0
Yemen	12.4	13.2	12.9	15.8	14.6	7.0	4.4	2.9
Lesotho	9.9	9.9	9.5	11.0	14.1	7.1	4.3	3.0
Iraq	15.4	9.5	12.1	14.0	10.6	7.4	5.5	4.0
Ghana	17.8	15.7	14.7	14.3	10.8	7.4	5.3	4.0
São Tomé and Príncipe	14.2	8.0	8.4	15.6	11.7	7.7	5.3	4.1
Congo	12.8	10.9	12.2	12.9	10.0	7.9	5.5	4.0
Senegal	16.3	15.6	12.7	14.5	12.5	7.9	5.4	3.8
Madagascar	14.0	11.6	13.8	15.0	11.4	7.9	5.2	3.7
Comoros	14.1	12.9	13.6	15.5	11.8	7.9	5.8	4.3
Malawi	15.0	16.9	13.8	14.5	14.9	8.1	4.9	3.5
Afghanistan	15.7	16.7	17.0	16.4	14.0	8.2	4.1	2.8
Mauritania	23.0	14.4	13.4	14.8	11.1	8.3	6.4	4.9
Cameroon	13.0	11.3	11.9	13.9	13.1	8.3	5.4	3.9
Liberia	18.7	16.2	13.9	14.5	12.0	8.4	5.4	3.7
Sudan	12.8	13.5	13.8	12.4	10.7	8.5	5.7	4.4
Guinea-Bissau	15.9	12.3	13.8	14.6	13.7	8.6	6.1	4.4
United Republic of Tanzania	17.5	15.5	14.6	13.4	12.4	8.9	6.0	4.2
Guinea	13.0	14.0	12.2	13.8	12.8	8.9	5.7	3.8
Togo	13.1	13.9	14.6	15.8	12.9	9.2	6.6	5.1
Equatorial Guinea	9.6	10.9	11.9	18.4	18.6	9.2	4.8	3.3
South Sudan	16.0	16.5	14.1	13.1	12.3	9.3	6.3	4.5
Benin	8.9	9.3	12.4	13.4	12.0	9.4	6.8	5.1
Zambia	16.5	14.6	15.0	17.1	14.9	9.5	6.3	4.6
Central African Republic	11.0	10.6	11.1	11.6	13.3	9.9	5.3	3.6
Burundi	14.8	12.6	11.9	16.0	14.4	10.0	7.5	5.2
Mozambique	16.1	14.4	13.6	13.1	13.5	10.1	6.2	4.2
Sierra Leone	16.7	14.3	17.1	17.7	15.7	10.1	6.2	4.4
Timor-Leste	16.9	20.7	17.8	11.5	9.5	10.3	5.2	3.3
Democratic Republic of the Congo	14.4	14.6	13.9	13.4	13.0	10.5	6.6	4.1
Burkina Faso	19.8	13.0	13.8	17.4	15.1	10.7	7.0	4.7
Angola	17.1	15.2	16.0	16.0	13.8	10.9	7.5	5.3
Uganda	15.8	15.0	14.0	18.2	16.8	11.0	6.6	4.3
Ivory Coast	18.5	17.2	15.7	14.9	14.3	11.2	8.2	6.0
Nigeria	15.9	15.4	15.0	15.7	14.5	11.4	7.8	5.2
Gambia	22.1	14.4	14.7	17.6	15.3	11.4	7.1	4.7
Chad	11.9	11.8	13.0	15.8	16.8	12.2	7.6	5.2
Mali	20.1	13.4	11.5	15.7	16.0	12.6	7.8	4.9
Somalia	15.3	13.6	15.3	14.6	14.8	13.0	8.9	6.1
Niger	36.6	21.1	16.2	14.3	15.4	16.4	10.8	6.8

Source: MAPFRE Economic Research (with UN data)

Chart 3.1-b
Dependency ratio (20-64/65+), estimated values for 2019

■	(0, 2.88]
■	(2.88, 3.40]
■	(3.40, 3.43]
■	(3.43, 3.68]
■	(3.68, 4.13]
■	(4.13, 6.73]
■	(6.73, 10.00]
■	(10.00, 12.70]
■	(12.70, 100]
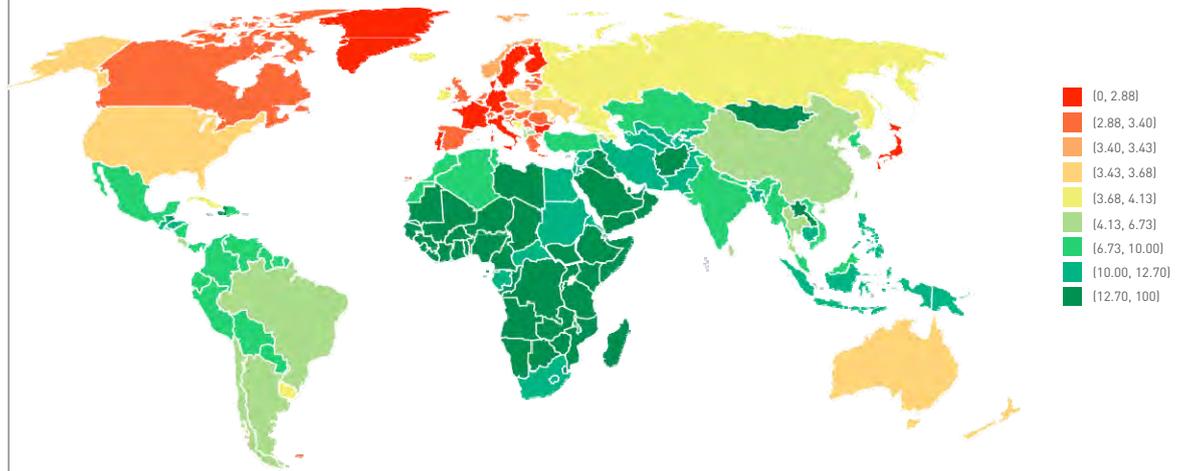
Source: MAPFRE Economic Research (with UN data)

Chart 3.1-c
Dependency ratio (20-64/65+), estimated values for 2039

■	(0, 2.88]
■	(2.88, 3.40]
■	(3.40, 3.43]
■	(3.43, 3.68]
■	(3.68, 4.13]
■	(4.13, 6.73]
■	(6.73, 10.00]
■	(10.00, 12.70]
■	(12.70, 100]
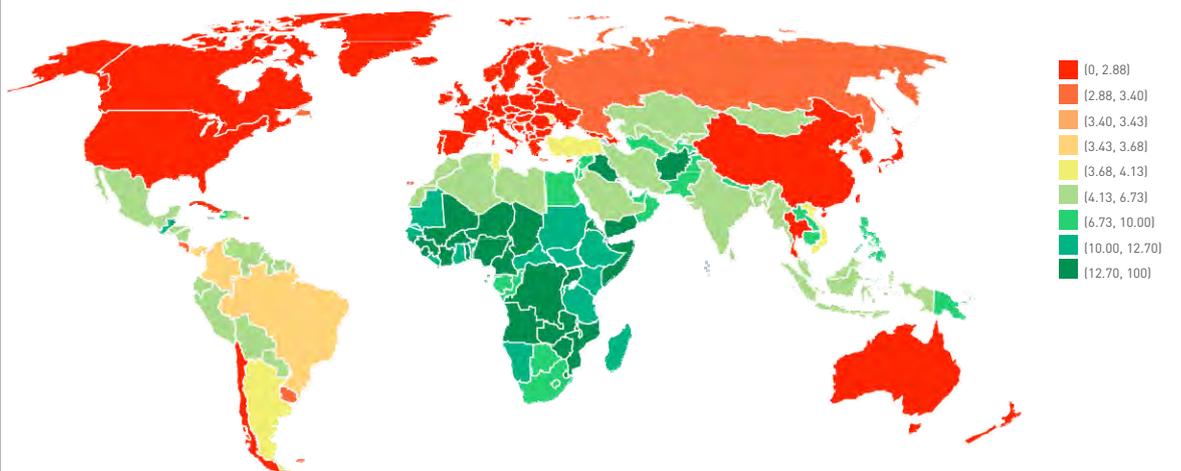
Source: MAPFRE Economic Research (with UN data)

Chart 3.1-d
Dependency ratio (20-64/65+), estimated values for 2059

■	[0, 2.88)
■	[2.88, 3.40)
■	[3.40, 3.43)
■	[3.43, 3.68)
■	[3.68, 4.13)
■	[4.13, 6.73)
■	[6.73, 10.00)
■	[10.00, 12.70)
■	[12.70, 100)

Source: MAPFRE Economic Research (with UN data)

Chart 3.1-e
Dependency ratio (20-64/65+), estimated values for 2099

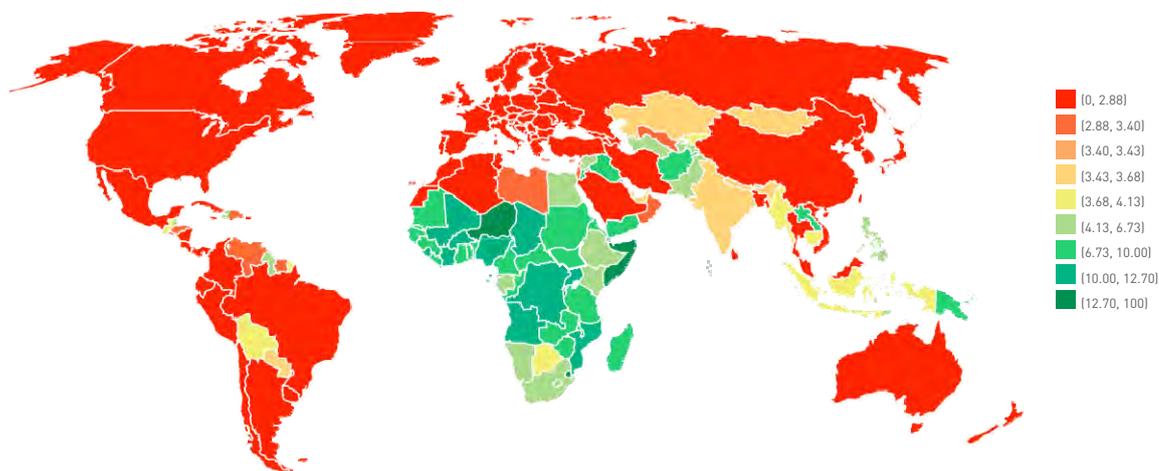|	
■	[0, 2.88)
■	[2.88, 3.40)
■	[3.40, 3.43)
■	[3.43, 3.68)
■	[3.68, 4.13)
■	[4.13, 6.73)
■	[6.73, 10.00)
■	[10.00, 12.70)
■	[12.70, 100)
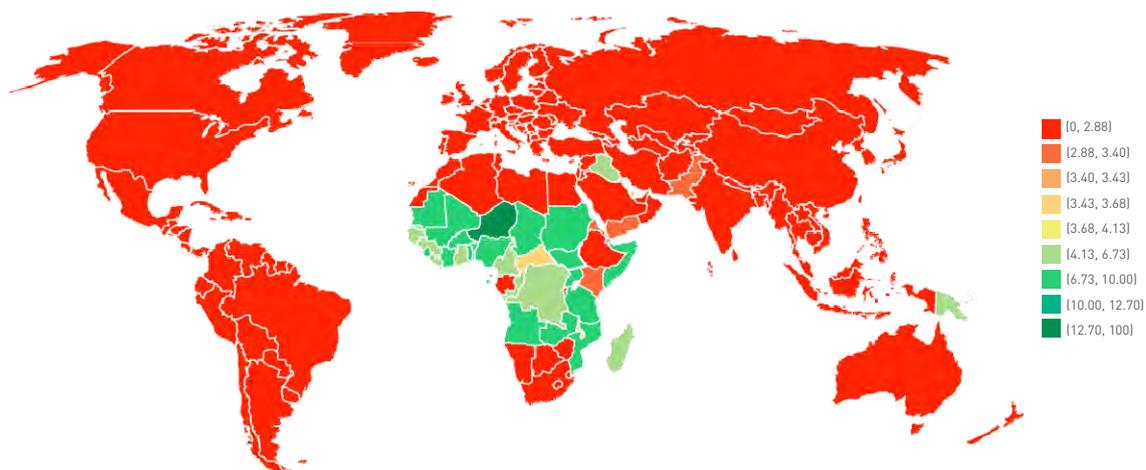
Source: MAPFRE Economic Research (with UN data)

There follows a comparative analysis of life expectancy at age 65, representing the estimated average time of life when the retirement pension will be collected, constructed on the basis of the UN projections[14], which show a clear rising trend in all the major regions of the world (see Table 3.1-c).

Similarly, Table 3.1-d shows the historical data and UN projections for life expectancy at age 65 for the period 1955-2100 by country, while Charts 3.1-f to 3.1-i show the geographical representation of the expected change over the coming decades. In this case, the periods and regions with a higher life expectancy are shown in green, since this is positive information, but the impact on pensions is not positive unless it is managed with adequate public policies.

It can be observed that the regions of Australia/New Zealand, Europe and North America have life expectancies at age 65 of more than 23 years in the 2055-2060 period, while the projection for the end of the century the figure reaches 28 years in some regions of Australia/New Zealand, Western Europe and Southern Europe.

This analysis makes it clear that in the next few decades, countries such as Hong Kong, Macao, Japan, Martinique, Singapore, France, Guadeloupe, Spain, South Korea, Switzerland and Italy will have life expectancies at age 65 of 25 years upward in the 2055-2060 period and around 30 years by the end of the century, while the countries of Sub-Saharan Africa are the ones that will have lower life expectancies.

Table 3.1-c
Life expectancy at age 65 by region, 1955–2100
(years from age 65)

Region	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040	2055-2060	2075-2080	2095-2100
Australia/New Zealand	14.0	15.5	18.3	21.1	23.0	24.8	26.6	28.5
Western Europe	13.7	15.0	17.8	20.5	22.6	24.4	26.2	28.1
Southern Europe	13.6	15.1	17.6	20.3	22.4	24.3	26.1	28.1
Northern Europe	13.9	15.0	16.9	20.0	22.2	24.0	25.8	27.6
Northern America	14.4	16.3	17.7	20.0	21.9	23.7	25.2	26.7
Central America	13.3	15.2	17.1	19.2	20.9	22.6	24.1	25.5
South America	12.6	13.5	15.8	18.4	20.2	22.0	23.6	25.1
Polynesia	10.8	12.2	14.1	16.6	18.8	21.0	22.8	24.6
Caribbean	13.0	15.1	16.5	18.5	20.1	21.0	21.9	23.1
Eastern Asia	8.9	13.2	15.1	17.2	18.9	20.9	22.9	24.7
Western Asia	11.8	13.6	14.8	16.4	18.2	19.7	21.1	22.4
Micronesia	12.0	13.0	14.3	16.4	18.4	19.5	20.7	21.8
Eastern Europe	13.6	14.2	13.9	16.3	17.7	19.3	21.0	22.4
Northern Africa	11.8	12.8	13.9	15.4	17.1	18.7	20.1	21.5
South-Eastern Asia	11.4	12.7	14.1	15.4	16.7	18.1	19.4	20.9
Southern Asia	10.4	11.9	13.3	14.8	15.9	17.4	18.8	20.3
South-Central Asia	10.5	12.0	13.3	14.8	15.9	17.4	18.8	20.4
Central Asia	13.0	14.6	13.9	14.4	15.7	17.1	18.7	20.6
Eastern Africa	10.5	11.7	12.6	14.4	15.5	17.0	18.6	20.0
Southern Africa	11.6	11.4	12.6	13.8	15.1	16.5	18.2	19.7
Middle Africa	10.4	11.6	12.1	13.6	14.7	15.9	17.2	18.7
Sub-Saharan Africa	9.9	11.2	11.8	13.2	14.3	15.6	17.1	18.5
Melanesia	10.0	11.7	12.9	14.1	14.8	15.5	16.3	17.4
Western Africa	8.9	10.4	10.8	11.6	12.6	13.6	14.8	16.3

Source: MAPFRE Economic Research (with UN data)

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Table 3.1-d
Life expectancy at age 65 by country, 1955-2100
(years from age 65)

</div>

Country	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040	2055-2060	2075-2080	2095-2100
Hong Kong	13.9	15.6	18.9	21.9	24.2	26.6	28.5	30.3
Macao	12.9	15.7	18.8	21.5	23.9	26.2	28.2	30.3
Japan	12.8	15.8	19.6	22.1	24.0	26.0	27.9	29.8
Martinique	11.9	15.1	18.4	21.2	23.4	25.5	27.3	29.1
Singapore	11.9	13.5	17.0	21.0	23.3	25.4	27.4	29.5
France	14.1	15.8	18.7	21.7	23.6	25.4	27.1	28.9
Guadeloupe	12.4	15.3	18.4	21.3	23.4	25.3	27.0	28.7
Spain	13.8	15.8	18.4	21.4	23.3	25.2	27.1	29.0
South Korea	11.9	13.1	16.2	20.6	23.0	25.1	27.2	29.3
Switzerland	13.9	16.1	18.6	21.4	23.2	25.1	26.9	28.9
Italy	14.0	15.2	18.2	21.1	23.1	25.0	26.9	28.8
Australia	13.9	15.5	18.4	21.2	23.1	24.9	26.7	28.7
Canada	14.6	16.4	18.2	21.1	23.0	24.7	26.4	28.2
Israel	14.0	15.0	17.7	20.7	22.7	24.6	26.5	28.5
Sweden	14.6	16.0	18.2	20.5	22.6	24.4	26.2	28.1
Iceland	15.8	17.5	18.1	20.6	22.7	24.4	26.2	28.0
Mayotte	11.8	14.4	17.3	20.1	22.4	24.4	26.2	27.9
Reunion	12.4	14.9	17.6	20.2	22.5	24.4	26.2	27.9
New Zealand	14.2	15.1	17.7	20.6	22.6	24.3	26.0	27.8
Austria	13.4	14.5	17.5	20.2	22.4	24.2	26.1	28.0
United Kingdom	13.6	14.7	16.9	20.3	22.5	24.2	26.0	27.8
Portugal	13.4	14.4	17.0	20.1	22.3	24.2	26.1	28.0
Luxembourg	13.0	14.1	17.3	20.3	22.4	24.2	26.0	27.8
Norway	15.4	16.0	17.7	20.4	22.4	24.2	25.9	27.7
Belgium	13.7	14.6	17.4	20.1	22.3	24.1	25.8	27.6
Finland	12.8	14.7	17.3	20.2	22.3	24.1	25.9	27.7
Taiwan	12.7	13.7	16.6	19.9	22.2	24.0	25.7	27.5
Costa Rica	12.8	15.1	18.1	20.2	22.3	24.0	25.5	27.2
Cuba	13.2	16.4	17.4	19.8	22.0	24.0	25.7	27.4
Netherlands	14.8	15.9	17.2	20.1	22.1	23.9	25.5	27.3
Ireland	13.5	14.0	15.9	19.6	21.9	23.8	25.7	27.7
Germany	13.4	14.4	17.3	19.8	22.0	23.8	25.6	27.5
Greece	13.0	15.0	17.6	19.8	22.0	23.8	25.6	27.5
Chile	13.2	14.5	17.5	19.7	22.0	23.8	25.4	27.1
Puerto Rico	15.7	17.3	17.7	20.2	22.2	23.8	25.3	27.0
Slovenia	12.9	14.0	16.3	19.7	21.8	23.7	25.6	27.5
Panama	13.4	15.7	18.0	20.5	22.1	23.6	25.1	26.5
French	12.1	13.4	15.5	19.0	21.5	23.6	25.5	27.5
Channel Islands	14.3	15.1	16.9	19.5	21.7	23.6	25.4	27.3
Malta	11.8	14.2	16.7	19.1	21.5	23.5	25.4	27.4
United States	14.4	16.3	17.6	19.8	21.7	23.5	25.0	26.4
Denmark	14.5	15.7	16.4	19.4	21.6	23.4	25.2	27.0
Guam	12.6	13.7	15.3	18.5	21.1	23.2	25.2	27.1
Virgin Islands (USA)	13.2	14.2	16.2	18.6	21.0	23.1	24.9	26.8
Lebanon	12.8	13.5	14.9	18.5	20.9	23.1	25.1	27.0
Cyprus	14.2	15.4	16.6	18.5	21.0	23.1	25.0	26.9
Nicaragua	11.2	13.7	15.7	19.2	21.1	22.9	24.4	25.9
Curaçao	13.8	15.7	16.9	19.2	21.0	22.9	24.3	25.9
Ecuador	12.4	14.2	18.3	19.5	21.0	22.8	24.3	25.8
Vietnam	12.6	15.1	17.3	19.1	21.0	22.8	24.3	25.8

Table 3.1-d (continued)
Life expectancy at age 65 by country, 1955-2100
(years from age 65)

Country	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040	2055-2060	2075-2080	2095-2100
Mexico	13.8	15.6	17.4	19.3	20.9	22.7	24.3	25.8
Brazil	12.3	12.9	15.3	18.6	20.5	22.5	24.1	25.6
Oman	10.2	11.9	14.5	17.5	20.1	22.4	24.3	26.2
Maldives	9.4	11.2	12.7	16.6	19.9	22.4	24.3	26.2
Albania	14.8	14.7	15.1	17.8	20.1	22.3	24.1	26.0
Estonia	14.1	14.3	14.9	18.4	20.4	22.2	23.8	25.5
Czech Republic	13.0	13.2	15.2	18.1	20.1	22.1	23.8	25.6
Uruguay	14.0	14.8	16.6	18.7	20.3	22.1	23.6	25.2
Poland	13.3	14.3	15.2	18.3	20.2	22.0	23.6	25.2
Turkey	11.3	13.5	15.1	17.3	19.7	21.9	23.8	25.6
Thailand	13.5	14.5	16.5	18.4	20.1	21.9	23.4	24.9
Bahamas	13.0	14.8	16.7	18.9	20.2	21.8	23.4	24.9
Saint Lucia	14.4	14.7	15.8	18.1	19.9	21.8	23.5	24.9
Peru	11.1	12.8	15.9	18.0	19.8	21.8	23.5	25.1
French Polynesia	11.1	12.5	14.4	17.1	19.3	21.7	23.6	25.4
El Salvador	11.4	13.6	15.3	18.2	20.0	21.7	23.1	24.4
Argentina	13.8	14.4	16.3	18.1	19.8	21.7	23.3	24.9
Croatia	11.7	13.4	15.5	17.3	19.5	21.6	23.4	25.2
Qatar	13.2	15.4	15.9	17.3	19.4	21.6	23.4	25.1
Samoa	9.7	11.3	13.6	16.6	19.1	21.6	23.6	25.3
New Caledonia	11.9	13.3	14.9	16.9	19.3	21.6	23.5	25.3
Algeria	10.8	12.1	14.6	18.1	19.7	21.6	23.4	25.1
Guatemala	12.0	13.2	15.4	18.4	20.0	21.5	23.1	24.6
Bangladesh	9.3	10.7	14.1	16.6	19.1	21.5	23.7	25.5
Bosnia and Herzegovina	11.5	13.9	15.0	17.0	19.1	21.3	23.2	25.0
Dominican Republic	11.9	13.6	17.3	18.6	19.9	21.3	22.8	24.2
Antigua and Barbuda	12.9	14.6	16.2	18.0	19.5	21.2	22.9	24.5
Morocco	11.2	12.2	13.7	16.4	18.7	21.2	23.3	25.3
Brunei Darussalam	12.6	14.0	15.6	16.9	19.0	21.2	23.2	24.9
Montenegro	13.2	15.8	15.0	16.9	19.0	21.2	23.0	24.8
Sri Lanka	12.0	14.0	13.8	17.2	19.1	21.1	22.9	24.6
Jamaica	14.3	15.4	17.0	18.6	19.7	21.1	22.7	24.1
United Arab Emirates	11.3	13.0	14.9	16.7	18.7	21.0	22.9	24.7
Bhutan	9.4	11.4	14.0	17.4	19.3	20.9	22.7	24.5
Colombia	12.4	13.9	16.0	18.0	19.4	20.9	22.6	24.1
Venezuela	13.2	14.6	16.0	17.6	19.2	20.9	22.6	24.0
Honduras	11.5	14.1	17.0	18.7	19.6	20.8	22.3	23.7
Iran	10.6	11.5	14.0	15.9	18.3	20.8	22.9	24.9
Slovakia	13.5	13.9	14.7	17.2	18.9	20.7	22.5	24.1
Tunisia	10.4	12.2	15.0	16.4	18.4	20.6	22.5	24.2
Hungary	13.1	13.4	14.6	17.0	18.6	20.4	22.2	23.7
Lithuania	15.5	15.7	15.1	17.4	18.9	20.3	21.8	23.1
China	8.3	12.7	14.2	16.1	18.1	20.3	22.4	24.1
Romania	12.9	13.7	14.1	16.8	18.5	20.3	22.1	23.7
Barbados	12.7	13.7	14.9	16.1	18.1	20.3	22.4	24.2
Mauritius	10.7	13.0	14.1	17.0	18.5	20.3	22.1	23.7
Malaysia	11.8	13.0	14.2	16.3	18.2	20.2	22.3	24.1
Bolivia	9.9	10.3	13.8	18.0	18.9	20.1	21.5	23.0
Latvia	14.7	14.4	14.8	16.8	18.4	20.0	21.7	23.1
Armenia	14.1	16.2	14.9	16.1	18.0	20.0	21.9	23.6

Table 3.1-d (continued)
Life expectancy at age 65 by country, 1955-2100
(years from age 65)

Country	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040	2055-2060	2075-2080	2095-2100
Seychelles	12.1	14.7	15.2	16.3	18.2	19.9	21.7	23.2
Syria	11.8	13.1	14.8	15.8	18.2	19.9	21.5	23.2
Aruba	13.2	14.5	15.2	16.4	18.0	19.8	21.7	23.3
Bahrain	11.2	12.9	14.4	15.9	17.7	19.8	21.8	23.4
Macedonia	12.1	14.2	14.2	15.6	17.5	19.6	21.7	23.6
Belarus	13.9	14.7	12.9	15.8	17.6	19.6	21.4	23.1
Serbia	12.7	13.9	14.2	15.8	17.6	19.4	21.4	23.3
Bulgaria	14.0	13.8	14.0	16.1	17.6	19.1	20.9	22.5
Paraguay	13.5	14.1	16.0	17.6	18.2	19.0	20.2	21.7
Georgia	12.4	14.8	15.0	15.4	17.1	18.9	20.8	22.5
Saudi Arabia	11.5	12.9	14.3	15.2	16.9	18.9	21.0	22.8
Jordan	11.7	13.2	14.3	15.6	17.1	18.7	20.6	22.5
Tonga	11.7	13.1	14.2	15.5	17.0	18.6	20.4	22.3
Ukraine	13.9	14.4	13.7	15.4	16.9	18.6	20.3	21.9
Grenada	11.6	12.4	13.5	15.6	17.0	18.6	20.4	22.3
Saint Vincent and the Grenadines	13.1	11.7	15.3	16.4	17.4	18.5	19.9	21.5
Palestine	11.2	12.6	14.1	15.1	16.7	18.5	20.5	22.4
Republic of Korea	10.0	12.5	12.8	14.5	16.4	18.5	20.6	22.6
Russia	14.0	14.4	13.6	15.8	16.9	18.4	19.9	21.4
Cape Verde	11.4	12.7	13.6	15.0	16.6	18.3	20.4	22.4
Nepal	9.5	10.9	12.7	14.1	16.0	18.2	20.2	22.3
Vanuatu	10.9	12.0	13.2	14.7	16.3	18.2	20.3	22.3
Cambodia	10.2	8.0	12.1	14.0	15.9	18.1	20.1	22.1
Tajikistan	13.6	15.1	14.6	15.2	16.6	18.1	19.8	21.7
Islands	11.0	12.2	12.7	14.2	16.0	17.9	19.9	21.8
Kenya	11.4	13.0	13.4	15.1	16.2	17.9	19.4	20.8
Gabon	10.4	12.5	14.0	15.0	16.2	17.7	19.3	20.7
Rwanda	10.8	11.6	11.8	15.0	16.0	17.6	19.2	20.6
Tanzania	11.1	12.2	12.7	14.9	16.0	17.6	19.2	20.6
Suriname	12.6	13.6	14.2	15.3	16.3	17.6	19.0	20.7
Libya	9.9	12.6	13.9	14.8	16.1	17.5	19.2	21.1
Congo	11.7	12.9	12.9	14.8	16.0	17.5	19.1	20.5
Ethiopia	10.1	11.3	12.4	14.6	15.7	17.5	19.2	21.0
Kuwait	12.2	12.7	13.1	14.0	15.5	17.4	19.4	21.3
Moldova	11.4	12.7	12.9	14.3	15.8	17.4	19.2	21.1
Kyrgyzstan	12.6	14.4	13.9	14.5	15.8	17.4	19.1	21.0
Malawi	9.8	10.7	12.2	14.7	15.8	17.3	18.8	20.1
Egypt	12.8	13.4	13.7	14.1	15.7	17.3	19.2	21.2
Eritrea	10.0	11.4	12.0	13.4	15.1	17.3	19.4	21.5
Kazakhstan	12.7	14.5	13.0	14.0	15.5	17.3	19.1	21.0
Azerbaijan	13.5	14.6	14.1	14.9	15.9	17.2	18.8	20.6
Mongolia	10.7	11.9	11.2	14.1	15.4	17.1	18.9	20.9
Timor-Leste	9.2	9.0	12.2	13.7	15.3	17.1	18.9	20.9
Uzbekistan	13.6	14.9	14.9	14.7	15.8	17.0	18.5	20.4
Western Sahara	9.9	11.2	12.7	13.9	15.2	16.9	18.9	21.0
Trinidad and Tobago	12.0	13.2	14.1	15.0	15.8	16.9	18.3	19.8
Belize	12.9	15.2	13.4	13.8	15.3	16.9	18.6	20.5
Fiji	9.5	11.0	12.6	14.0	15.3	16.9	18.7	20.6
India	10.3	11.9	13.1	14.6	15.6	16.9	18.3	20.1
Zambia	11.3	12.4	12.2	14.4	15.4	16.9	18.6	20.1

Table 3.1-d (continued)
Life expectancy at age 65 by country, 1955-2100
(years from age 65)

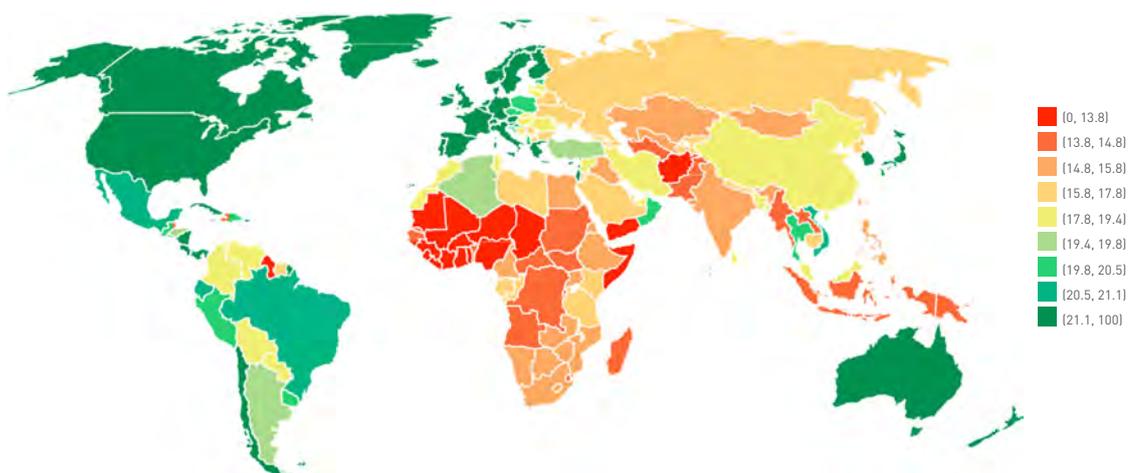| Country	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040	2055-2060	2075-2080	2095-2100
Botswana	11.6	12.6	12.9	14.2	15.4	16.8	18.4	19.8
Zimbabwe	12.2	13.3	13.6	14.6	15.1	16.8	18.6	20.0
Namibia	11.0	12.3	13.0	14.0	15.1	16.6	18.1	19.6
Madagascar	10.2	11.3	12.4	13.7	14.8	16.5	18.2	20.1
South Africa	11.6	11.3	12.6	13.9	15.1	16.5	18.2	19.8
Senegal	9.1	10.7	12.3	13.3	14.6	16.4	18.3	20.3
Iraq	11.2	12.7	14.3	14.1	15.1	16.4	17.9	19.6
Equatorial Guinea	9.9	10.9	12.4	13.7	14.8	16.3	18.3	20.5
Philippines	12.4	12.7	13.5	14.1	15.0	16.3	17.9	19.6
Uganda	11.0	12.1	12.3	14.0	15.0	16.3	17.9	19.3
Cameroon	10.7	12.2	12.3	13.8	14.9	16.2	18.0	19.5
Mozambique	9.5	11.0	12.0	13.9	14.8	16.2	18.0	19.6
Lao People's Democratic Republic	10.5	11.3	12.3	13.5	14.7	16.2	17.9	19.9
Democratic Republic of the Congo	10.7	11.6	12.0	13.6	14.8	16.0	17.5	19.2
Indonesia	10.6	11.7	12.5	13.3	14.3	15.8	17.4	19.3
São Tomé and Príncipe	12.0	13.6	14.1	14.7	15.2	15.8	16.6	17.6
Liberia	8.5	10.5	11.9	12.4	13.7	15.7	17.8	19.9
Haiti	11.1	12.0	12.9	14.5	15.0	15.6	16.5	17.8
Angola	9.3	10.6	11.4	13.9	14.7	15.5	16.5	17.6
Turkmenistan	12.1	13.6	13.7	14.3	14.8	15.5	16.5	17.9
Central African Republic	9.8	11.9	12.0	12.9	14.1	15.4	17.1	18.8
Swaziland	10.8	11.8	12.5	13.1	13.8	15.3	17.2	18.8
Guinea	8.6	9.8	11.5	12.1	13.4	15.1	17.0	19.0
Pakistan	12.4	13.4	13.8	14.3	14.6	15.1	16.0	17.4
Lesotho	11.0	11.8	12.5	12.8	13.6	15.0	16.9	18.5
Kiribati	11.3	12.2	13.0	13.5	14.2	15.0	16.0	17.4
Micronesia	12.1	13.1	13.4	13.8	14.4	15.0	16.0	17.2
Djibouti	11.1	12.5	13.3	14.1	14.5	14.9	15.6	16.7
Sudan	11.8	12.8	13.3	14.4	14.5	14.9	15.7	16.7
Burundi	10.7	11.7	12.4	13.3	14.0	14.8	15.8	17.3
Papua New Guinea	10.0	11.7	12.9	13.9	14.2	14.7	15.4	16.4
Afghanistan	9.0	10.3	11.9	13.1	13.8	14.7	15.8	17.2
Myanmar	10.5	11.9	12.7	13.4	13.9	14.6	15.5	16.6
Benin	9.0	11.9	13.1	13.8	14.2	14.5	15.0	15.7
Niger	8.8	9.8	11.7	12.8	13.5	14.4	15.5	16.9
South Sudan	8.9	10.4	12.0	13.3	13.8	14.3	15.1	16.2
Guyana	12.8	12.4	12.6	12.8	13.5	14.3	15.3	16.7
Yemen	10.2	11.6	12.6	13.1	13.6	14.2	15.3	16.8
Ghana	10.2	11.1	11.6	12.4	13.2	14.1	15.3	16.8
Comoros	10.3	11.4	12.5	13.0	13.5	14.0	14.8	15.7
Chad	10.2	11.3	12.1	12.8	13.3	14.0	14.7	15.6
Burkina Faso	8.5	10.4	11.1	12.2	13.1	14.0	15.3	16.8
Somalia	9.9	11.3	12.3	13.0	13.5	13.9	14.5	15.4
Mali	7.6	9.7	11.1	12.1	13.0	13.8	14.8	16.2
Mauritania	9.8	11.5	12.5	13.0	13.4	13.8	14.4	15.1
Guinea-Bissau	9.4	10.5	11.5	11.9	12.8	13.7	14.8	16.4
Gambia	8.1	10.1	11.4	12.0	12.7	13.2	13.9	14.7
Togo	9.3	11.3	11.2	11.9	12.6	13.1	13.8	14.6
Ivory Coast	10.4	12.0	10.8	11.5	12.4	13.1	13.9	14.8
Nigeria	8.9	10.2	10.3	10.9	12.0	13.0	14.2	15.9
Sierra Leone	8.2	9.4	8.0	10.4	11.4	12.2	12.9	13.8

Source: MAPFRE Economic Research (with UN data)

Chart 3.1-f
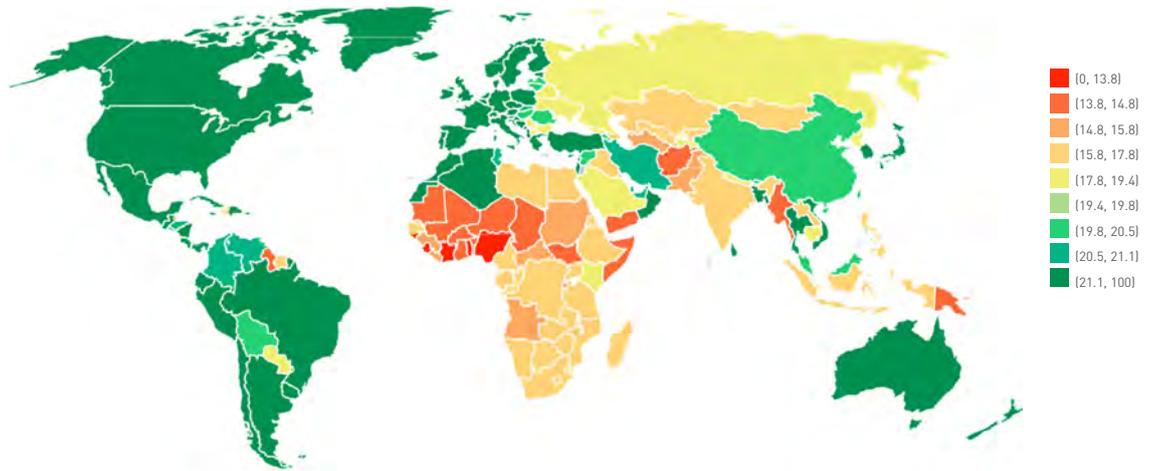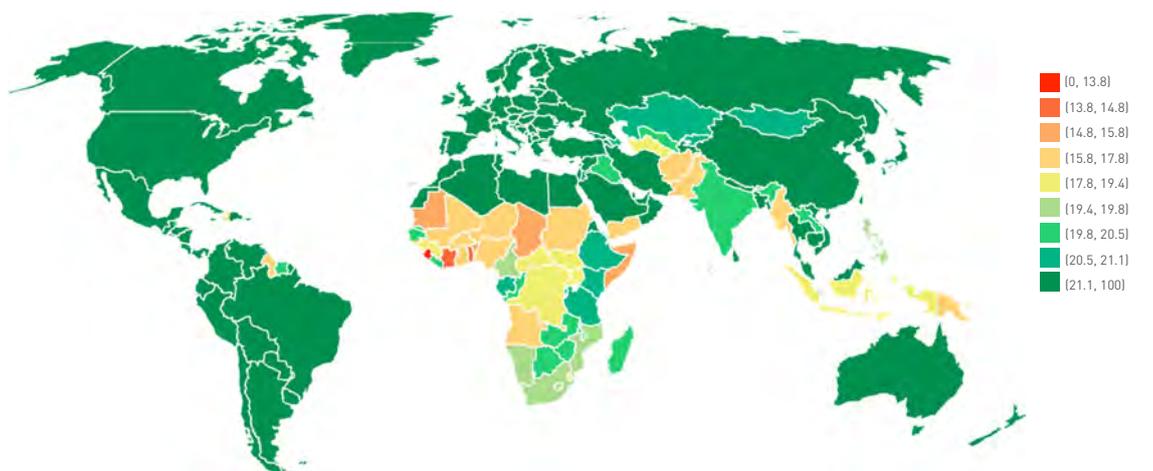**Life expectancy at age 65, estimated values for 2015-2020**
(years)

Legend:
- (0, 13.8]
- (13.8, 14.8]
- (14.8, 15.8]
- (15.8, 17.8]
- (17.8, 19.4]
- (19.4, 19.8]
- (19.8, 20.5]
- (20.5, 21.1]
- (21.1, 100]
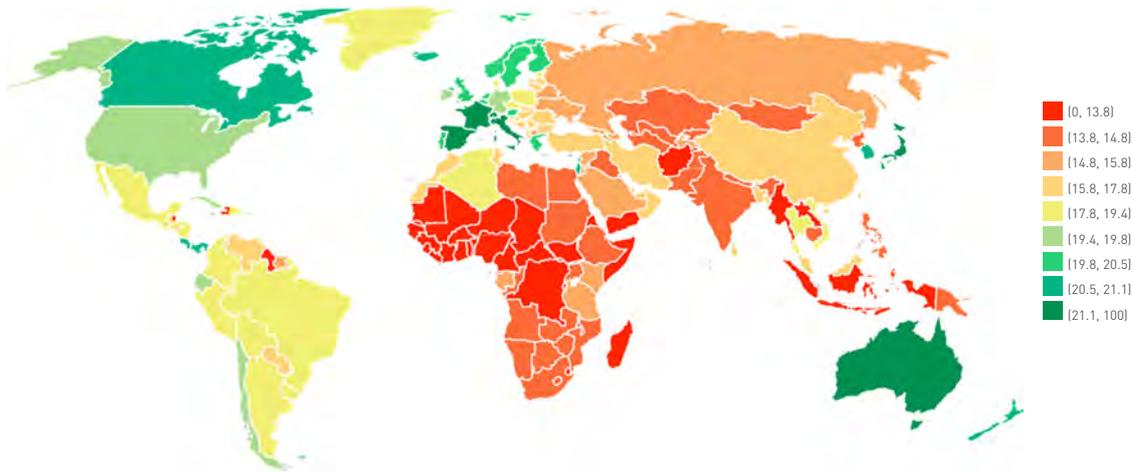
Source: MAPFRE Economic Research (with UN data)

Chart 3.1-g
Life expectancy at age 65, estimated values for 2035-2040
(years)

Legend:
- (0, 13.8]
- (13.8, 14.8]
- (14.8, 15.8]
- (15.8, 17.8]
- (17.8, 19.4]
- (19.4, 19.8]
- (19.8, 20.5]
- (20.5, 21.1]
- (21.1, 100]

Source: MAPFRE Economic Research (with UN data)

**Chart 3.1-h
Life expectancy at age 65, estimated values for 2055-2060
(years)**

■	(0, 13.8]
■	(13.8, 14.8]
■	(14.8, 15.8]
■	(15.8, 17.8]
■	(17.8, 19.4]
■	(19.4, 19.8]
■	(19.8, 20.5]
■	(20.5, 21.1]
■	(21.1, 100]

Source: MAPFRE Economic Research (with UN data)

**Chart 3.1-i
Life expectancy at age 65, estimated values for 2095-2100
(years)**

■	(0, 13.8]
■	(13.8, 14.8]
■	(14.8, 15.8]
■	(15.8, 17.8]
■	(17.8, 19.4]
■	(19.4, 19.8]
■	(19.8, 20.5]
■	(20.5, 21.1]
■	(21.1, 100]

Source: MAPFRE Economic Research (with UN data)

Box 3.1
Technological change and its impact on pensions

The effect of technological change on the sustainability of pensions as a consequence of the implementation of Machine Learning technologies is a subject that has barely begun to be thought about, but one that is already widely debated. In principle, there are three channels via which there is believed to be a link between the two aspects: tax revenue, the sustainability of the pension systems, and medium- and long-term savings.

The tax revenue channel is fundamentally linked to the short- and long-term effects of automation on the labor market. There are two schools of opinion on its long-term effects: those who think the State will assist with the transformation through the implementation of public policies, and those who believe this support will not be provided.

Those in the latter camp assume that automation will entail three effects: (i) less work, because no work will be created to replace that taken over by machines; (ii) lower real wages due to wage depression in response to the difference in productivity between humans and machines, and (iii) greater polarization of incomes, because holders of capital (now human capital as well, not only physical) will receive incomes well above average wage incomes, creating an inequality based on skills and on starting socio-demographic environments. This analytical stance proposes quasi-Luddite measures such as limiting automation or extracting capital from the automation ("*tax the robot*"). Moreover, this school of opinion also supposes that this phenomenon will create growing international differences in income and wealth due to the reshoring effect, whereby work is lost in areas previously rich in unqualified labor that served as the basis for outsourcing (in the emerging countries), resulting in the belief that automation will widen the domestic and international poverty gap. Those who are of this opinion also see the sustainability of the pension systems faced with impossible challenges if the total wage bill is increasingly lower and inequality increasingly widened.

However, those who assume that automation will be accompanied by processes of educational and social transformation driven via public policies, as well as economic policy measures to help with the transition (especially the labor factor), believe that automation will produce a higher tax revenue capacity for a variety of reasons. The first of these is that it will increase growth. The consensus expects an additional 2% global growth until 2030, thanks to the generation of more qualified employment to replace that lost due to automation. Thus, wage incomes will grow in line with the additional productivity gained, and the labor force will also be of higher quality (less subject to physical debilitation). Moreover, there will be an increase in investment in capital (physical and human), as this will become profitable due to the rise in the value of the labor factor (Restrepo and Acemoglu, 2008), increasing the total productivity of the factors as a consequence of the technology itself. Secondly, in addition to greater growth, the higher tax revenue could derive from other sources, such as the increase and creation of additional tax charges on capital (robots) and on corporate profits. And finally, there would be a reorientation of savings toward assets that will provide greater returns in the future, which would be those related to productive capital rather than other traditional assets such as residential.

As regards the channel of the sustainability of pension systems per se, the predominant opinion anticipates widespread challenges that will affect not only countries' pension mechanisms, but also their public finances. However, the more benign opinions on the subject argue that automation could open the door to a new and more advanced form of exit from the labor market, not like the traditional binary retirement but in the form of an intermittent and regulated exit from the labor force, allowing an "active retirement" (if it is combined with work) or even an "intelligent retirement" in which there are work-free periods combined with other times of life when working activity may be resumed.

Other factors

Finally, it should be noted that there are other factors, such as the interest rate environment, economic performance and its effects on employment and wages, the possibility of scientific discoveries involving treatments that succeed in extending the limits of human life beyond what can currently be imagined, or indeed the effects of technological change (see Box 3.1), that could have a significant impact on the future of the sustainability and adequacy of pensions.

3.2 Health

In the previous section, we analyzed two key indicators relating to pension systems that, in the medium term, anticipate difficulties regarding the sustainability and adequacy of pension systems in most regions of the world if appropriate public policy measures are not taken.

As regards health spending, the process of demographic transition characterized by population aging will put additional pressures on the public accounts to maintain adequate healthcare coverage. Japan can be regarded as a paradigmatic case when it comes to studying the potential impact of this demographic transition on healthcare spending. The fact that Japan is facing a population aging process ahead of other developed countries, and its concern over the tensions that could arise regarding the sustainability of its healthcare system, has prompted the country's authorities to compile information on the scale of the problem.

Behavior of healthcare spending by age group: Japan – a paradigm

Since 2011, Japanese local authorities have been compiling information on the healthcare bills borne by municipalities (cities, towns and smaller local entities) in connection with the country's national health system, by age and type of illness. This spending, which is published by the Health Ministry, accounts for around 15% of total healthcare spending in the 2011-2016 period, and in 2016 alone involved healthcare spending of 7.87 trillion yen (89.77 billion USD).

The analysis of this information, which is illustrated in Chart 3.2-a and in Table 3.2-a, shows that around 30.8% of healthcare spending in 2016 was made for people over the age of 70. Meanwhile, spending for people between the ages of 65 and 69 has been growing in relative terms in recent years, accounting for around 27.8% of total healthcare spending in 2016.

Chart 3.2-a
Japan: healthcare spending by age group, 2011-2016 (%)

Source: MAPFRE Economic Research (with Japanese Health Ministry data on the payment of national health insurance bills by municipalities)
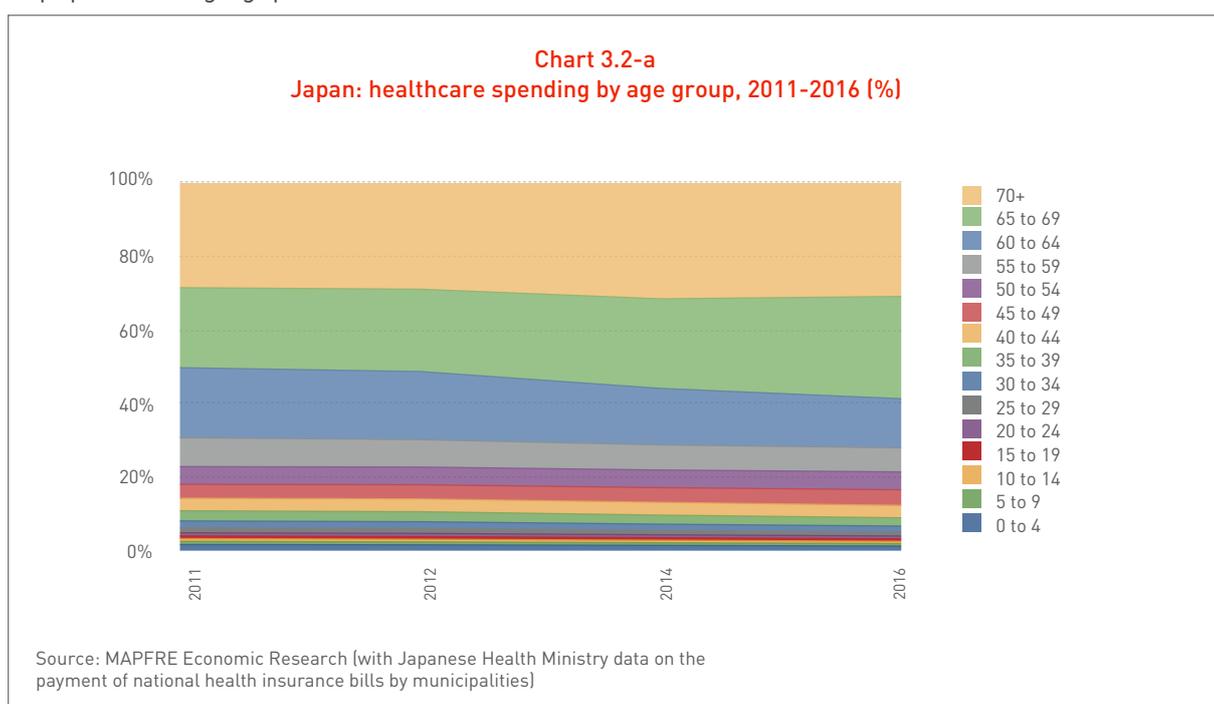
Table 3.2-a
Japan: structure of healthcare spending by age group, 2011–2016
(%)

|	2011	2012	2014	2016
0 to 4	1.9%	1.8%	1.6%	1.4%
5 to 9	0.8%	0.8%	0.7%	0.7%
10 to 14	0.8%	0.7%	0.7%	0.6%
15 to 19	0.7%	0.7%	0.7%	0.7%
20 to 24	0.9%	0.9%	0.8%	0.8%
25 to 29	1.3%	1.3%	1.2%	1.1%
30 to 34	1.9%	1.9%	1.7%	1.6%
35 to 39	2.8%	2.7%	2.5%	2.3%
40 to 44	3.4%	3.5%	3.5%	3.4%
45 to 49	3.8%	3.9%	4.0%	4.3%
50 to 54	4.8%	4.8%	4.8%	4.9%
55 to 59	7.9%	7.5%	6.8%	6.5%
60 to 64	19.0%	18.5%	15.3%	13.3%
65 to 69	21.7%	22.4%	24.3%	27.8%
70+	28.4%	28.8%	31.4%	30.8%

Source: MAPFRE Economic Research (with Japanese Health Ministry data on the payment of national health insurance bills by municipalities)

This means that people over the age of 65 account for around 58.5% of total healthcare spending in that country.

Meanwhile, the change in spending by the municipal healthcare services for the different age groups in the 2011-2016 period is shown in Chart 3.2-b and in Table 3.2-b. Analysis of this data again shows the increase in the growth of healthcare spending for people between the ages of 65 and 69.

In the 2015 population pyramid for Japan, constructed on the basis of UN data, we see the increase in the population coming to form part of that age range, which, in combination with the higher healthcare spending for the elderly, makes it the greatest increase of all the age groups (45.9% increase in the 2011-2016 period). Also notable is the 28.1% increase in healthcare spending for people between the ages of 45 and 49 in the 2011-2016 period. This growth can be explained by the arrival of a large cohort in this age group, as can be seen in the aforementioned population pyramid for 2015.

Finally, the projected population pyramids for 2030 and 2050 anticipate an aggravation of the phenomenon in those years, in which that cohort grows to become the most significant age segment in Japan's population structure (see Chart 3.2-c).

The progressive rise of spending in the Japanese health system due to the demographic change and the increase in per capita healthcare spending for people over the age of 65 has forced various reforms in order to adapt to the new situation. It should be noted that in 1972 Japan established a unique health insurance system for the elderly, making health services free for virtually everyone over the age of 70. However, a decade later it had to partially reverse this measure, introducing a small copayment and raising the entry age to 75.

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Table 3.2-b
Japan: changes in healthcare spending by age group, 2011-2016
(index 2011=100)

</div>

	2011	2012	2014	2016
0 to 4	100.0	108.9	100.8	87.9
5 to 9	100.0	106.7	98.9	90.1
10 to 14	100.0	109.0	104.3	95.1
15 to 19	100.0	116.9	113.2	107.3
20 to 24	100.0	115.1	107.3	100.9
25 to 29	100.0	113.9	103.9	93.3
30 to 34	100.0	112.5	105.2	97.0
35 to 39	100.0	112.3	103.0	92.7
40 to 44	100.0	116.8	119.1	113.2
45 to 49	100.0	116.7	122.8	128.1
50 to 54	100.0	114.5	116.2	115.3
55 to 59	100.0	108.5	101.2	95.0
60 to 64	100.0	111.5	94.0	80.1
65 to 69	100.0	117.9	130.5	145.9
70+	100.0	116.2	128.9	123.7

Source: MAPFRE Economic Research (with Japanese Health Ministry data on the payment of national health insurance bills by municipalities)

Chart 3.2-b
Japan: changes in healthcare spending by age group, 2011-2016
(index 2011=100)
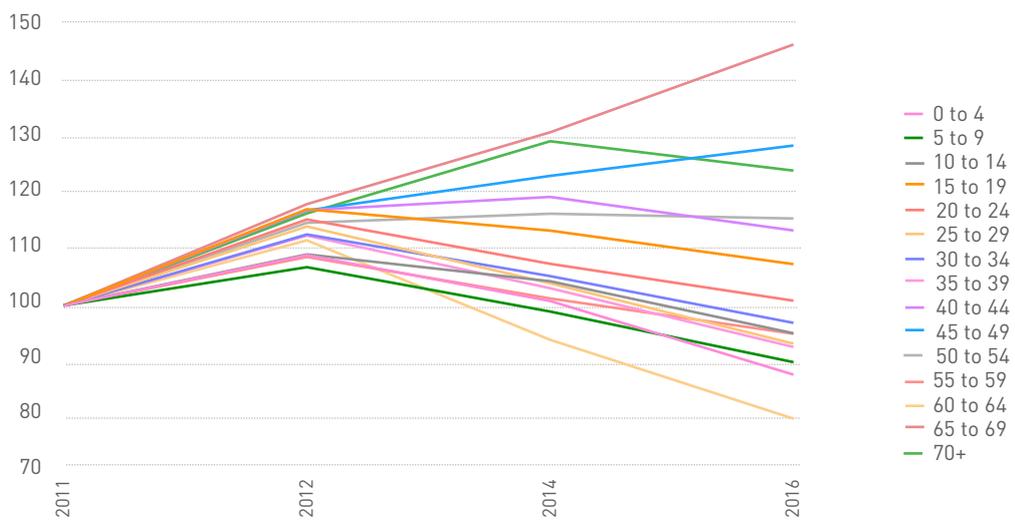
Source: MAPFRE Economic Research (with Japanese Health Ministry data on the payment of national health insurance bills by municipalities)

Chart 3.2-c
Japan: population pyramids,
2015, 2030 and 2050

Women   Men

2015

2030

2050
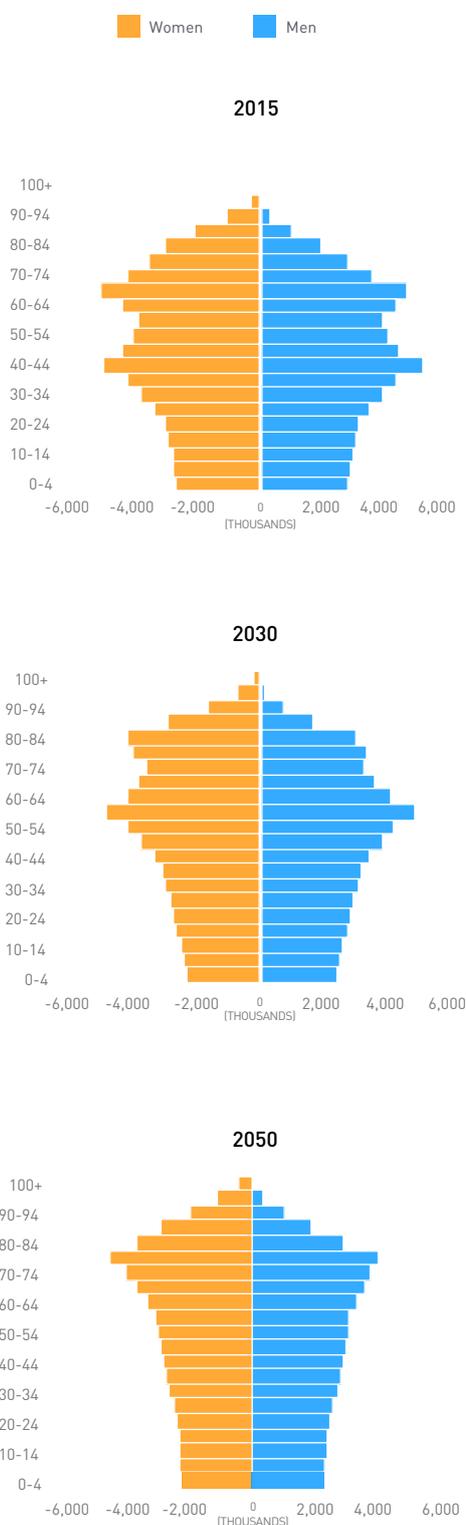
Source: MAPFRE Economic Research (with UN data)

This is a situation that will, in time, reach the developed economies and many of the emerging economies.

From the analysis performed in the previous section, it can be concluded that the demographic transition characterized by population aging results in healthcare spending for people aged 65 and over representing a large proportion of total healthcare spending, and that the arrival of new cohorts in this age group will have a major impact on the total healthcare spending of a country that has adopted universal healthcare coverage, and therefore on variables such as the public deficit and public debt.

This is the case with Japan, as has been illustrated above, but in other countries that follow a liberal healthcare model, this reality has led to the conclusion that the situation cannot be left to be solved by the free market (via the interaction between supply and demand) because a time comes when the supply disappears and a market failure occurs, resulting in a lack of adequate healthcare coverage for those cohorts. A paradigmatic example in this regard is the United States, which, despite following a free-market liberal model, has developed a public protection program for people over the age of 65 (Medicare).

The global comparative analysis of the percentage of people over the age of 65, constructed on the basis of the UN's projections15 as illustrated in Table 3.2-c, shows a clear rising trend in all the major regions of the world. In this regard, it can be observed that at the beginning of the year 2000, with the exception of a few regions such as Europe, Australia/New Zealand and North America, the ratio was below 7.6%. If we exclude East Asia and the Caribbean, the ratio was below 5.5%. However, in the 20-year projections (2039) the ratio of people aged 65 is well above 20% in all the developed economies, and in 2059 it approaches 30%, with even higher values in Southern Europe and East Asia.

As a complement, Table 3.2-d shows the projections for the ratio of people over the age of 65 by country, while Charts 3.2-d to 3.2-g show the geographical representation of the expected change over the coming decades. This analysis makes it clear that in the next four decades,

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Table 3.2-c
Population over the age of 65 by region, 1959-2099
(%)

</div>

Region	1959	1979	1999	2019	2039	2059	2079	2099
Southern Europe	8.2%	11.6%	16.2%	21.3%	31.0%	33.8%	33.4%	33.8%
Eastern Asia	4.0%	5.0%	7.6%	13.1%	24.3%	31.0%	31.0%	32.0%
Western Europe	11.2%	14.6%	15.8%	20.7%	27.8%	29.2%	29.9%	31.5%
Eastern Europe	6.6%	10.7%	12.8%	16.4%	21.7%	27.2%	25.3%	26.6%
Northern Europe	11.2%	14.4%	15.5%	18.9%	24.1%	26.4%	27.7%	30.0%
Australia/New Zealand	8.6%	9.5%	12.2%	16.0%	21.3%	24.2%	26.4%	29.5%
Northern America	9.0%	11.2%	12.4%	16.4%	21.9%	23.8%	26.2%	28.0%
South America	3.7%	4.4%	5.5%	9.0%	15.8%	23.7%	28.7%	31.3%
Caribbean	4.1%	5.8%	7.3%	10.3%	17.0%	22.0%	25.9%	28.9%
Central America	3.3%	3.7%	4.8%	7.0%	13.0%	21.2%	28.1%	31.8%
South-Eastern Asia	3.6%	3.8%	4.8%	6.7%	12.6%	17.8%	21.6%	24.7%
Polynesia	2.7%	3.1%	4.5%	7.2%	13.5%	17.1%	23.0%	27.0%
Southern Asia	3.2%	3.5%	4.2%	6.0%	10.0%	16.3%	21.8%	25.5%
South-Central Asia	3.3%	3.6%	4.3%	6.0%	10.0%	16.3%	21.6%	25.4%
Western Asia	4.0%	4.5%	4.8%	5.7%	10.1%	15.6%	19.7%	23.1%
Central Asia	5.9%	5.5%	5.2%	5.3%	9.8%	15.5%	18.9%	23.3%
Micronesia	3.1%	3.3%	3.8%	7.2%	13.3%	15.0%	20.7%	23.6%
Northern Africa	3.5%	3.8%	4.6%	5.7%	9.2%	14.0%	17.2%	21.2%
Southern Africa	3.8%	3.5%	3.9%	5.4%	8.0%	12.9%	17.7%	22.2%
Melanesia	2.8%	2.8%	3.2%	4.4%	6.5%	9.2%	12.7%	16.1%
Eastern Africa	2.9%	2.9%	2.9%	3.1%	4.0%	6.9%	11.1%	15.5%
Sub-Saharan Africa	3.0%	3.0%	3.0%	3.1%	3.9%	6.0%	9.5%	13.6%
Middle Africa	3.3%	3.2%	3.0%	2.9%	3.5%	5.2%	8.6%	13.2%
Western Africa	2.8%	2.8%	2.9%	2.8%	3.4%	4.9%	7.6%	11.3%

Source: MAPFRE Economic Research (with UN data)

countries such as South Korea, Taiwan, Japan, Portugal, Greece, Singapore, Spain, Poland and Hong Kong will exceed the ratio of 35% for people over the age of 65. Currently (2019), the countries with the highest ratios are Japan (27.9%), Italy (23.6%), Portugal (22.3%), Finland (22%) and Germany (21.9%).

Finally, Table 3.2-e shows the countries that will experience the largest increases in the 2019-2059 period. According to this information, some of the largest increases will be seen by the big emerging economies such as China (+18.7%), Brazil (+17.6%), Colombia (+16.2%), Mexico (+15.2%) and Turkey (+15.2%).

Table 3.2-d
Population over the age of 65 by country, 1959-2099
(%)

Country	1959	1979	1999	2019	2039	2059	2079	2099
South Korea	3.4%	4.1%	6.9%	15.0%	30.5%	36.8%	35.7%	35.6%
Taiwan	2.5%	4.0%	8.3%	14.9%	28.1%	36.5%	34.9%	34.3%
Japan	5.5%	8.7%	16.4%	27.9%	33.8%	36.5%	35.2%	35.4%
Portugal	7.9%	11.3%	16.1%	22.3%	31.6%	35.7%	36.5%	35.5%
Greece	7.0%	12.4%	16.1%	20.8%	30.5%	35.5%	35.7%	34.6%
Singapore	2.0%	4.6%	7.1%	14.3%	29.1%	35.5%	38.2%	40.0%
Spain	8.1%	10.9%	16.5%	20.0%	31.5%	35.4%	34.1%	34.6%
Poland	5.6%	10.2%	11.8%	17.9%	25.5%	35.3%	35.2%	34.1%
Hong Kong	2.6%	6.2%	10.8%	17.5%	30.2%	35.0%	31.1%	32.8%
Italy	9.4%	13.2%	17.8%	23.6%	33.2%	33.5%	32.7%	33.4%
Cuba	4.6%	7.6%	9.7%	15.7%	29.7%	33.0%	32.9%	33.9%
Slovenia	7.6%	11.4%	13.8%	20.2%	29.1%	32.7%	30.4%	31.6%
Malta	7.1%	9.8%	12.1%	20.3%	25.7%	32.6%	32.6%	33.3%
Austria	12.0%	15.3%	15.3%	19.6%	28.7%	31.8%	31.2%	32.5%
Puerto Rico	5.1%	7.5%	11.1%	15.8%	23.3%	31.8%	37.3%	37.1%
Macao	4.8%	7.2%	7.4%	11.2%	24.3%	31.7%	28.9%	30.8%
Germany	11.3%	15.7%	16.2%	21.9%	29.9%	31.6%	31.5%	32.8%
Croatia	6.9%	11.6%	15.2%	20.5%	26.8%	31.5%	32.8%	32.9%
Bosnia and Herzegovina	3.4%	5.8%	10.6%	17.5%	25.5%	31.4%	32.7%	32.7%
Slovakia	6.7%	10.6%	11.2%	16.1%	23.4%	31.3%	29.7%	30.7%
Estonia	10.5%	12.6%	14.7%	20.0%	25.9%	31.3%	30.0%	31.2%
Moldova	6.4%	7.7%	9.4%	12.1%	18.6%	31.2%	30.7%	30.4%
Czech Republic	9.2%	13.7%	13.8%	19.9%	25.4%	31.1%	28.7%	29.8%
Albania	5.5%	5.3%	6.9%	14.0%	23.8%	30.7%	35.6%	37.0%
China	3.8%	4.6%	6.8%	11.7%	23.4%	30.4%	30.7%	31.7%
Thailand	3.3%	3.7%	6.3%	12.3%	25.2%	30.3%	33.5%	33.0%
Bulgaria	7.5%	11.8%	16.4%	21.3%	25.5%	30.3%	27.8%	29.1%
Iran	4.2%	3.0%	4.1%	6.0%	13.8%	30.0%	32.3%	33.3%
Saint Lucia	4.0%	5.0%	7.6%	10.1%	19.5%	29.9%	35.5%	35.5%
Martinique	4.5%	7.6%	11.9%	19.9%	32.3%	29.8%	32.7%	34.7%
Lebanon	6.1%	5.4%	6.9%	9.0%	17.4%	29.8%	33.7%	35.1%
Hungary	8.8%	13.7%	15.0%	19.7%	24.4%	29.7%	29.6%	30.4%
Latvia	10.6%	13.2%	14.7%	20.2%	25.7%	29.6%	27.8%	28.9%
Romania	6.7%	10.2%	13.3%	18.7%	24.8%	29.6%	29.7%	30.4%
Switzerland	10.1%	13.6%	15.2%	18.9%	26.8%	29.6%	29.9%	32.2%
Channel Islands	13.0%	15.0%	14.4%	18.8%	27.1%	29.4%	30.3%	31.9%
Cyprus	6.1%	9.4%	10.2%	14.0%	21.3%	29.0%	32.7%	33.0%
Armenia	6.7%	6.0%	9.6%	11.7%	18.8%	28.8%	31.7%	32.6%
Macedonia	4.9%	6.3%	9.7%	14.1%	21.2%	28.8%	29.4%	30.8%
Maldives	2.7%	2.6%	3.5%	4.2%	10.9%	28.6%	32.2%	33.7%
Netherlands	8.8%	11.3%	13.5%	19.6%	27.4%	28.3%	30.0%	31.5%
Montenegro	6.3%	8.1%	11.2%	15.7%	22.2%	28.0%	31.7%	32.7%
Ukraine	7.2%	11.7%	13.6%	17.1%	21.8%	27.9%	25.7%	27.2%
Costa Rica	3.0%	4.0%	5.6%	10.1%	18.8%	27.9%	32.8%	34.2%
Guadeloupe	5.1%	6.7%	10.0%	18.6%	29.9%	27.7%	33.0%	35.0%
Lithuania	8.1%	11.5%	13.6%	19.3%	25.4%	27.5%	26.7%	28.4%
Serbia	6.6%	9.3%	13.2%	18.4%	22.3%	27.3%	29.2%	30.7%
Chile	4.7%	5.6%	7.3%	11.8%	20.3%	27.3%	31.2%	32.9%
Jamaica	4.3%	6.6%	7.8%	10.1%	17.5%	27.3%	34.0%	39.3%
Belgium	11.8%	14.5%	16.7%	19.0%	25.2%	27.2%	28.0%	29.8%

Table 3.2-d (continued)
Population over the age of 65 by country, 1959-2099
(%)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Virgin Islands (USA)	7.4%	4.6%	8.3%	19.7%	27.9%	27.1%	33.9%	39.0%
Canada	7.7%	9.2%	12.5%	17.8%	24.9%	27.0%	28.5%	30.4%
Iceland	8.0%	9.7%	11.6%	15.2%	22.3%	26.9%	30.3%	32.7%
Brazil	3.1%	3.7%	4.9%	9.2%	17.3%	26.8%	32.0%	33.4%
Finland	7.2%	11.8%	14.9%	22.0%	25.5%	26.8%	28.4%	30.5%
France	11.6%	14.0%	15.9%	20.4%	26.1%	26.8%	28.5%	30.4%
Mauritius	2.5%	3.4%	6.0%	12.0%	20.5%	26.7%	31.2%	31.0%
United Kingdom	11.7%	14.9%	15.9%	18.8%	24.1%	26.6%	27.9%	30.2%
Sweden	11.6%	16.1%	17.4%	20.2%	23.9%	26.2%	27.0%	29.3%
Belarus	8.5%	10.8%	13.3%	15.3%	21.4%	26.0%	24.4%	26.4%
Vietnam	4.7%	5.3%	6.3%	7.7%	16.5%	25.8%	27.8%	30.0%
Barbados	6.7%	10.4%	11.3%	15.9%	24.2%	25.8%	27.4%	29.1%
Ireland	11.1%	10.6%	10.6%	14.6%	21.8%	25.4%	27.4%	29.7%
Brunei Darussalam	4.0%	3.0%	2.4%	5.2%	15.6%	25.4%	28.8%	31.2%
New Zealand	8.7%	9.6%	11.8%	16.0%	22.9%	25.3%	28.6%	31.3%
Denmark	10.4%	14.3%	14.9%	20.0%	24.6%	25.3%	27.5%	29.2%
Sri Lanka	4.8%	4.3%	6.2%	10.8%	18.7%	24.9%	30.5%	33.4%
Georgia	8.9%	9.2%	12.2%	15.2%	20.6%	24.9%	25.9%	28.6%
Reunion	3.6%	4.4%	6.6%	12.2%	22.7%	24.8%	30.3%	34.0%
Norway	10.8%	14.5%	15.4%	17.2%	22.5%	24.7%	27.1%	29.5%
Colombia	3.2%	3.7%	4.7%	8.3%	16.5%	24.5%	29.8%	31.6%
Curaçao	4.9%	6.0%	9.9%	17.3%	24.7%	24.4%	27.5%	30.3%
Bahamas	3.9%	4.1%	5.2%	9.7%	18.3%	24.4%	27.3%	29.5%
Uruguay	8.2%	10.4%	13.0%	14.9%	18.9%	24.2%	28.6%	31.1%
Russia	6.0%	10.2%	12.3%	15.1%	19.8%	24.1%	21.9%	24.2%
Australia	8.6%	9.5%	12.2%	16.0%	21.0%	24.0%	26.1%	29.2%
Luxembourg	10.8%	13.7%	14.1%	14.7%	21.3%	23.9%	25.4%	28.2%
Seychelles	6.2%	6.5%	7.6%	9.2%	19.1%	23.8%	24.5%	28.5%
French Polynesia	2.7%	3.3%	4.1%	8.4%	17.3%	23.8%	28.9%	32.1%
Turkey	3.2%	4.7%	5.9%	8.6%	15.6%	23.7%	29.4%	32.5%
United States	9.1%	11.4%	12.4%	16.2%	21.5%	23.4%	25.9%	27.7%
Grenada	4.9%	6.9%	7.8%	7.5%	12.2%	23.4%	28.8%	33.6%
Trinidad and Tobago	3.5%	5.4%	6.4%	10.7%	16.6%	23.3%	24.5%	25.7%
Tunisia	3.8%	3.9%	6.5%	8.5%	15.6%	23.1%	25.7%	29.4%
Aruba	2.3%	6.6%	7.4%	14.1%	23.4%	22.7%	27.1%	28.8%
Mexico	3.3%	3.8%	5.0%	7.3%	14.0%	22.5%	29.3%	32.9%
Saint Vincent and the Grenadines	4.0%	5.7%	6.8%	8.2%	16.0%	22.4%	28.5%	32.0%
Bhutan	2.4%	2.5%	3.4%	5.1%	10.6%	22.3%	28.4%	31.2%
Nicaragua	2.6%	2.7%	3.8%	5.9%	11.7%	22.0%	30.0%	34.0%
Guam	1.6%	2.8%	5.2%	10.2%	17.8%	22.0%	28.4%	32.6%
Republic of Korea	3.2%	3.5%	5.7%	9.2%	18.2%	21.7%	25.3%	28.4%
Morocco	3.0%	3.3%	5.2%	7.3%	14.0%	21.7%	27.0%	31.5%
Azerbaijan	5.6%	5.1%	5.7%	6.5%	14.4%	21.4%	23.2%	26.2%
Malaysia	3.6%	3.6%	3.9%	6.7%	12.1%	21.4%	26.1%	29.5%
Antigua and Barbuda	3.9%	5.1%	6.8%	7.5%	17.7%	21.2%	25.9%	28.9%
El Salvador	3.4%	3.5%	5.3%	8.6%	13.3%	20.9%	29.6%	34.1%
New Caledonia	3.7%	4.3%	5.7%	10.2%	16.9%	20.7%	25.2%	28.5%
Peru	3.4%	3.6%	4.8%	7.5%	13.1%	20.6%	26.4%	30.7%
Algeria	3.2%	3.5%	4.2%	6.6%	12.1%	20.6%	24.1%	28.8%
Bangladesh	2.8%	3.1%	3.7%	5.1%	10.8%	20.5%	29.1%	33.3%

Table 3.2-d (continued)
Population over the age of 65 by country, 1959-2099
(%)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Oman	3.0%	2.8%	2.3%	2.4%	7.6%	20.4%	29.4%	32.5%
Argentina	5.4%	8.1%	9.9%	11.5%	14.6%	20.4%	24.9%	28.6%
Saudi Arabia	3.6%	3.1%	3.0%	3.6%	11.1%	20.2%	24.1%	28.6%
Panama	3.6%	4.1%	5.4%	8.3%	14.4%	20.1%	25.0%	29.4%
Ecuador	4.8%	4.1%	4.9%	7.6%	13.0%	19.6%	25.6%	30.2%
Libya	4.0%	2.8%	3.7%	4.6%	10.9%	19.2%	23.4%	26.7%
Venezuela	2.3%	3.1%	4.3%	7.0%	12.9%	19.1%	24.8%	29.0%
Dominican Republic	2.6%	3.0%	5.0%	7.4%	12.6%	19.0%	25.6%	30.6%
Israel	4.5%	8.5%	10.0%	12.2%	15.1%	18.2%	22.4%	27.0%
Uzbekistan	5.9%	5.3%	4.6%	4.8%	9.9%	17.5%	21.5%	25.5%
Qatar	3.0%	1.7%	1.6%	1.6%	9.0%	17.3%	25.2%	27.9%
Honduras	3.3%	3.3%	3.7%	4.9%	9.1%	17.3%	25.1%	29.4%
Suriname	4.3%	4.3%	5.4%	7.2%	13.1%	17.2%	22.1%	26.0%
Cape Verde	5.2%	5.1%	5.0%	4.6%	8.7%	17.0%	24.3%	28.9%
Nepal	2.5%	3.3%	3.7%	6.1%	9.2%	16.8%	28.2%	32.7%
United Arab Emirates	3.5%	1.5%	1.1%	1.3%	9.0%	16.5%	24.0%	26.3%
Paraguay	3.2%	3.8%	4.4%	6.8%	9.9%	16.5%	22.0%	26.4%
India	3.1%	3.6%	4.3%	6.4%	10.4%	16.3%	21.9%	25.7%
Kuwait	2.1%	1.7%	1.5%	2.7%	12.0%	16.2%	19.7%	23.2%
Kazakhstan	5.8%	6.1%	6.9%	7.4%	11.6%	15.9%	18.3%	22.8%
Fiji	2.2%	2.6%	3.4%	6.6%	11.1%	15.8%	20.8%	25.3%
Bahrain	2.9%	2.1%	2.5%	2.5%	9.1%	15.6%	27.5%	31.1%
Indonesia	3.7%	3.6%	4.6%	5.6%	10.9%	15.6%	19.8%	23.3%
Mongolia	4.8%	4.6%	3.7%	4.3%	9.8%	15.5%	17.8%	22.3%
Cambodia	2.6%	2.8%	3.1%	4.7%	8.7%	15.5%	20.9%	26.0%
Bolivia	4.7%	3.8%	5.0%	7.0%	9.5%	15.0%	20.8%	25.6%
Myanmar	3.4%	4.0%	4.8%	6.2%	10.7%	14.8%	19.1%	21.1%
Botswana	4.1%	2.5%	2.9%	4.2%	7.2%	14.7%	19.2%	23.6%
Lao People's Democratic Republic	2.6%	3.4%	3.6%	4.2%	7.3%	14.7%	21.8%	27.1%
Western Sahara	2.6%	3.1%	2.5%	3.2%	8.1%	14.6%	19.0%	23.6%
Kyrgyzstan	7.3%	5.9%	5.5%	4.8%	9.5%	14.4%	17.7%	22.9%
Guatemala	2.6%	3.0%	3.9%	4.9%	7.5%	14.3%	22.1%	27.5%
French Guiana	6.4%	4.8%	3.7%	5.8%	11.3%	14.2%	19.3%	23.9%
Syria	4.1%	3.0%	3.3%	4.7%	8.1%	14.1%	22.5%	27.6%
South Africa	3.8%	3.6%	4.0%	5.6%	8.4%	13.4%	18.1%	22.5%
Turkmenistan	5.4%	4.3%	4.2%	4.6%	8.6%	13.3%	15.9%	19.9%
Belize	4.1%	4.6%	4.0%	4.0%	7.6%	13.2%	19.1%	23.8%
Djibouti	2.3%	2.3%	3.0%	4.3%	7.4%	13.2%	17.3%	20.5%
Jordan	4.3%	3.2%	3.0%	3.9%	7.9%	13.2%	18.9%	24.7%
Haiti	3.2%	4.1%	4.1%	5.0%	7.4%	13.0%	17.7%	21.5%
Guyana	3.5%	3.7%	4.0%	5.6%	10.1%	13.0%	18.9%	23.0%
Egypt	3.8%	4.4%	4.9%	5.3%	7.9%	12.7%	16.3%	21.4%
Samoa	2.0%	2.7%	4.5%	5.9%	10.5%	12.2%	19.3%	24.3%
Philippines	3.2%	3.2%	3.2%	5.0%	8.1%	11.8%	16.4%	21.1%
Tajikistan	4.8%	4.7%	3.7%	3.7%	7.1%	11.7%	15.8%	21.1%
Vanuatu	2.5%	3.0%	3.4%	4.6%	7.4%	11.7%	16.4%	21.3%
Mayotte	6.3%	4.3%	3.0%	4.1%	7.2%	11.6%	19.1%	25.8%
Micronesia	3.6%	3.7%	3.8%	5.3%	5.9%	11.4%	16.7%	21.6%
Gabon	7.0%	6.2%	5.9%	4.4%	6.4%	11.0%	14.8%	19.7%
Pakistan	4.4%	3.8%	4.1%	4.5%	6.6%	10.7%	14.8%	19.2%

Table 3.2-d (continued)
Population over the age of 65 by country, 1959-2099
(%)

Country	1959	1979	1999	2019	2039	2059	2079	2099
Tonga	3.2%	3.2%	5.7%	5.8%	8.8%	10.7%	17.0%	21.1%
Rwanda	3.0%	2.4%	3.1%	3.2%	5.1%	9.8%	15.8%	21.7%
Solomon Islands	2.5%	3.2%	2.8%	3.6%	6.2%	9.6%	15.2%	20.3%
Namibia	3.8%	3.5%	3.3%	3.6%	5.4%	9.5%	14.6%	19.9%
Palestine	4.2%	2.3%	2.2%	3.1%	5.2%	9.4%	14.6%	20.2%
Kiribati	3.8%	3.4%	3.4%	4.1%	6.9%	9.3%	12.1%	15.4%
Swaziland	2.8%	2.7%	2.9%	3.2%	4.0%	9.1%	14.7%	20.3%
Kenya	3.7%	3.1%	2.7%	2.8%	4.7%	9.0%	14.2%	19.2%
Ethiopia	2.7%	3.1%	3.1%	3.6%	4.8%	8.9%	16.0%	22.2%
Yemen	3.5%	2.9%	2.9%	3.0%	3.9%	8.7%	14.0%	19.9%
Zimbabwe	3.4%	3.0%	3.1%	2.8%	3.7%	8.5%	14.1%	19.8%
Lesotho	4.3%	4.1%	4.5%	4.5%	4.0%	8.4%	13.7%	19.2%
Papua New Guinea	2.9%	2.7%	3.1%	4.0%	5.8%	8.3%	11.7%	14.9%
Eritrea	2.8%	2.6%	3.3%	3.5%	3.8%	8.1%	13.2%	18.6%
Ghana	2.4%	2.6%	3.0%	3.4%	5.0%	7.6%	10.9%	14.6%
Afghanistan	2.8%	2.5%	2.3%	2.6%	3.9%	7.6%	14.8%	20.6%
Iraq	3.0%	4.1%	3.5%	3.3%	4.8%	7.2%	10.2%	14.1%
Comoros	3.3%	3.2%	3.1%	3.1%	4.5%	7.1%	10.1%	13.5%
São Tomé and Príncipe	4.0%	4.7%	4.7%	2.8%	4.3%	7.0%	10.5%	14.0%
Madagascar	3.3%	3.4%	3.0%	3.0%	4.4%	6.9%	10.8%	15.3%
Malawi	2.8%	2.4%	2.9%	2.9%	3.4%	6.8%	11.4%	16.3%
Senegal	2.7%	2.6%	3.2%	3.0%	4.0%	6.7%	10.3%	14.7%
Congo	3.6%	3.8%	3.6%	3.4%	4.9%	6.7%	9.9%	13.8%
Mauritania	1.9%	2.8%	3.2%	3.2%	4.6%	6.6%	8.9%	11.6%
Cameroon	3.6%	3.7%	3.4%	3.2%	3.8%	6.5%	10.3%	14.6%
Sudan	3.3%	2.9%	3.1%	3.6%	4.8%	6.5%	9.9%	13.1%
Liberia	2.4%	2.6%	3.1%	3.1%	4.2%	6.5%	10.5%	15.1%
Guinea-Bissau	3.0%	3.6%	2.9%	3.1%	3.8%	6.4%	9.4%	13.3%
Equatorial Guinea	5.1%	4.3%	3.8%	2.8%	2.9%	6.3%	12.1%	17.2%
Guinea	3.6%	3.2%	3.4%	3.2%	3.9%	6.1%	10.1%	14.9%
Togo	3.3%	2.9%	2.9%	2.9%	4.0%	6.0%	8.6%	11.5%
South Sudan	2.8%	2.6%	3.0%	3.4%	4.1%	5.9%	9.1%	13.0%
Sierra Leone	2.9%	3.1%	2.5%	2.5%	3.4%	5.8%	9.8%	13.6%
Tanzania	2.4%	2.6%	2.8%	3.1%	3.8%	5.8%	9.0%	13.1%
Central African Republic	4.4%	4.1%	3.9%	3.6%	3.7%	5.7%	11.0%	16.1%
Benin	5.2%	4.4%	3.3%	3.3%	4.1%	5.7%	8.3%	11.2%
Zambia	2.5%	2.7%	2.6%	2.5%	3.2%	5.4%	8.4%	11.9%
Timor-Leste	2.7%	2.2%	2.2%	3.6%	4.9%	5.4%	11.0%	17.3%
Mozambique	2.8%	3.0%	3.0%	3.2%	3.5%	5.3%	9.0%	13.6%
Burundi	3.0%	3.3%	3.0%	2.7%	3.3%	5.1%	7.4%	11.0%
Democratic Republic of the Congo	3.0%	2.9%	3.0%	3.0%	3.5%	5.1%	8.6%	14.1%
Burkina Faso	2.3%	3.2%	2.8%	2.4%	3.2%	5.0%	8.1%	12.2%
Gambia	2.2%	3.0%	2.7%	2.4%	3.2%	4.9%	8.4%	12.7%
Uganda	2.6%	2.6%	2.6%	2.2%	2.8%	4.8%	8.5%	13.4%
Ivory Coast	2.4%	2.5%	2.7%	3.0%	3.4%	4.7%	6.8%	9.4%
Nigeria	2.8%	2.8%	2.8%	2.7%	3.3%	4.7%	7.3%	11.1%
Angola	2.6%	2.6%	2.5%	2.5%	3.3%	4.7%	7.2%	10.5%
Chad	3.9%	3.5%	2.9%	2.5%	2.8%	4.4%	7.5%	11.3%
Mali	2.3%	3.2%	3.4%	2.5%	2.8%	4.2%	7.4%	11.9%
Somalia	2.9%	3.1%	2.7%	2.8%	3.0%	3.9%	6.2%	9.4%
Niger	1.1%	1.9%	2.4%	2.6%	2.6%	2.8%	4.9%	8.3%

Source: MAPFRE Economic Research (with UN data)

Chart 3.2-d
Population over the age of 65, estimated values for 2019
(%)

[20.0, 100)
[17.8, 20.0)
[17.2, 17.8)
[16.0, 17.2)
[15.1, 16.0)
[9.21, 15.1)
[5.97, 9.21)
[4.19, 5.97)
[0, 4.19)
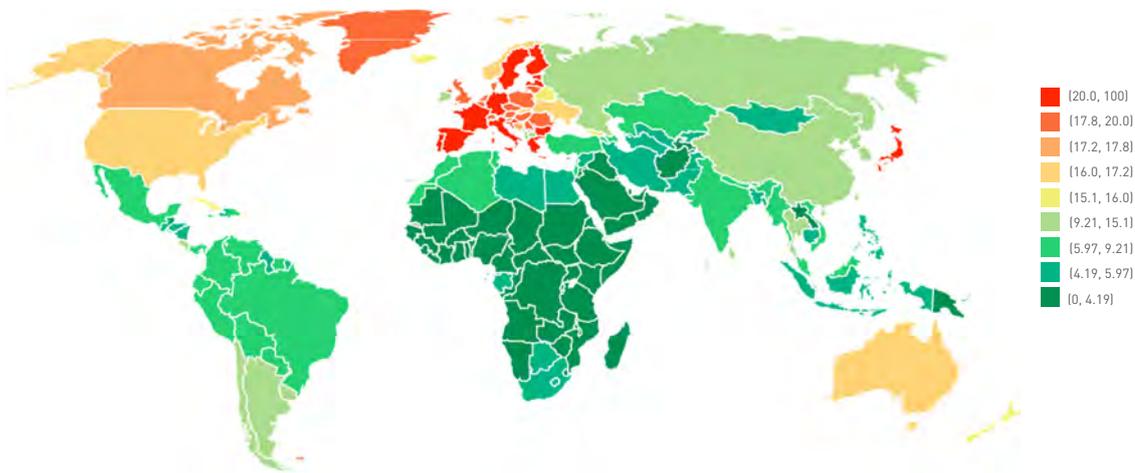
Source: MAPFRE Economic Research (with UN data)

Chart 3.2-e
Population over the age of 65, estimated values for 2039
(%)

[20.0, 100)
[17.8, 20.0)
[17.2, 17.8)
[16.0, 17.2)
[15.1, 16.0)
[9.21, 15.1)
[5.97, 9.21)
[4.19, 5.97)
[0, 4.19)
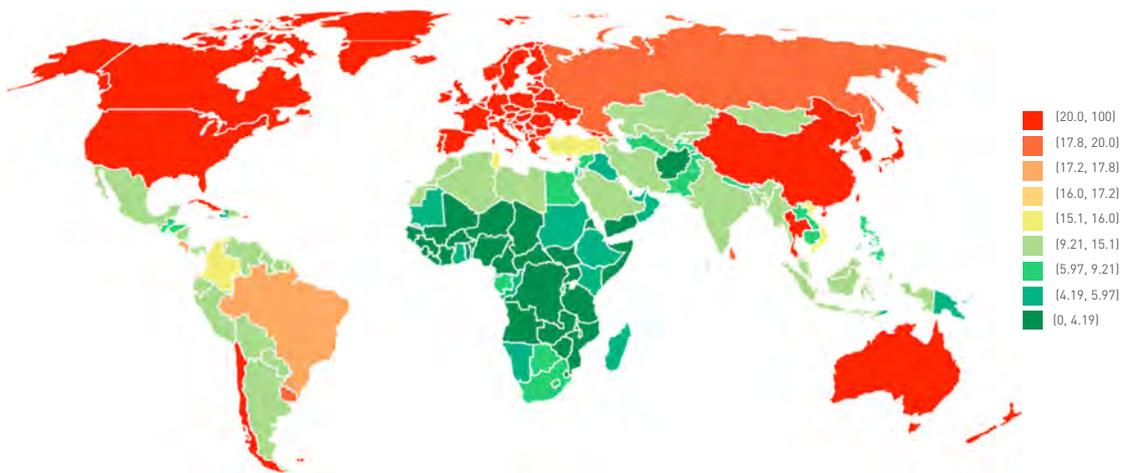
Source: MAPFRE Economic Research (with UN data)

Chart 3.2-f
Population over the age of 65, estimated values for 2059
(%)

Legend:
- (20.0, 100)
- (17.8, 20.0)
- (17.2, 17.8)
- (16.0, 17.2)
- (15.1, 16.0)
- (9.21, 15.1)
- (5.97, 9.21)
- (4.19, 5.97)
- (0, 4.19)
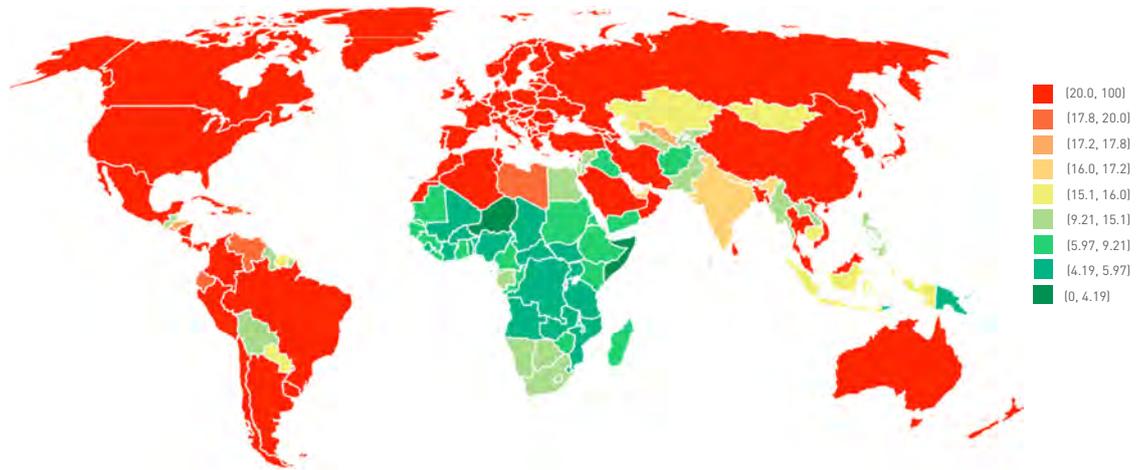
Source: MAPFRE Economic Research (with UN data)

Chart 3.2-g
Population over the age of 65, estimated values for 2099
(%)

Legend:
- (20.0, 100)
- (17.8, 20.0)
- (17.2, 17.8)
- (16.0, 17.2)
- (15.1, 16.0)
- (9.21, 15.1)
- (5.97, 9.21)
- (4.19, 5.97)
- (0, 4.19)
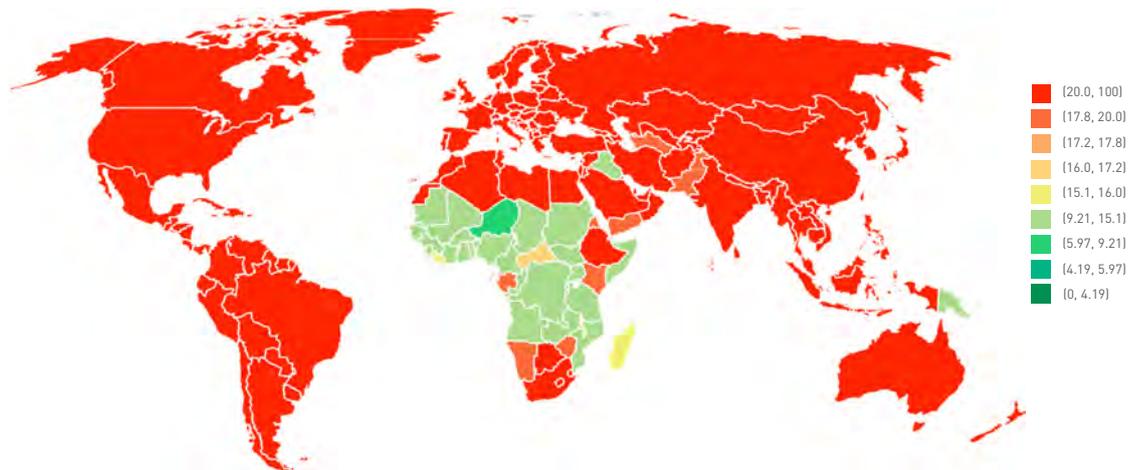
Source: MAPFRE Economic Research (with UN data)

Table 3.2-e
Growth of population over the age of 65 by country, 1959-2099
(percentage points)

Country	Δ2019-2059 (percentage points)	Country	Δ2019-2059 (percentage points)
Maldives	24.4	Algeria	13.9
Iran	24.0	Bosnia and Herzegovina	13.9
South Korea	21.8	Antigua and Barbuda	13.7
Taiwan	21.7	Kuwait	13.4
Singapore	21.2	Portugal	13.4
Lebanon	20.8	Bahrain	13.1
Macao	20.5	Peru	13.1
Brunei Darussalam	20.1	Uzbekistan	12.6
Saint Lucia	19.8	Trinidad and Tobago	12.6
Moldova	19.2	Reunion	12.6
China	18.7	Republic of Korea	12.5
Vietnam	18.1	Slovenia	12.5
Oman	18.0	Cape Verde	12.4
Thailand	18.0	Malta	12.3
Costa Rica	17.8	Honduras	12.3
Brazil	17.6	El Salvador	12.3
Hong Kong	17.5	Montenegro	12.3
Poland	17.4	Austria	12.2
Cuba	17.4	Venezuela	12.1
Jamaica	17.2	Ecuador	12.0
Bhutan	17.2	Panama	11.8
Armenia	17.1	Guam	11.7
Albania	16.7	Iceland	11.7
Saudi Arabia	16.6	Dominican Republic	11.6
Colombia	16.2	Western Sahara	11.4
Nicaragua	16.1	Mongolia	11.3
Puerto Rico	16.1	Estonia	11.2
Grenada	15.9	Czech Republic	11.2
Qatar	15.7	Croatia	11.0
Chile	15.5	Romania	10.9
Bangladesh	15.4	Ukraine	10.8
Spain	15.4	Cambodia	10.8
French Polynesia	15.3	Ireland	10.8
United Arab Emirates	15.3	Switzerland	10.7
Mexico	15.2	Belarus	10.7
Turkey	15.2	Nepal	10.7
Slovakia	15.1	Channel Islands	10.6
Cyprus	14.9	New Caledonia	10.5
Azerbaijan	14.9	Lao People's Democratic Republic	10.5
Mauritius	14.7	Botswana	10.4
Greece	14.7	Hungary	10.0
Macedonia	14.7	Suriname	10.0
Libya	14.7	India	10.0
Bahamas	14.6	Indonesia	10.0
Malaysia	14.6	Italy	9.9
Seychelles	14.6	Barbados	9.9
Tunisia	14.5	Martinique	9.9
Morocco	14.4	Paraguay	9.8
Saint Vincent and the Grenadines	14.2	Georgia	9.7
Sri Lanka	14.1	Germany	9.7

Table 3.2-e (continued)
Growth of population over the age of 65 by country, 1959-2099
(percentage points)

Country	Δ2019-2059 (percentage points)	Country	Δ2019-2059 (percentage points)
Kyrgyzstan	9.5	Sweden	6.0
Latvia	9.4	Namibia	5.9
Guatemala	9.4	Swaziland	5.9
Syria	9.4	Yemen	5.7
New Zealand	9.3	Zimbabwe	5.7
Jordan	9.3	Ethiopia	5.3
Uruguay	9.3	Denmark	5.3
Belize	9.3	Kiribati	5.2
Fiji	9.2	Afghanistan	4.9
Luxembourg	9.2	Tonga	4.9
Canada	9.2	Finland	4.9
Guadeloupe	9.1	Eritrea	4.6
Russia	9.0	Papua New Guinea	4.4
Serbia	9.0	Ghana	4.2
Argentina	9.0	São Tomé and Príncipe	4.2
Bulgaria	8.9	Comoros	4.0
Djibouti	8.9	Iraq	3.9
Netherlands	8.8	Malawi	3.8
Turkmenistan	8.7	Madagascar	3.8
Japan	8.6	Lesotho	3.8
Myanmar	8.6	Senegal	3.7
Aruba	8.6	Equatorial Guinea	3.5
Kazakhstan	8.5	Mauritania	3.4
French Guiana	8.5	Liberia	3.4
Belgium	8.2	Cameroon	3.4
Lithuania	8.2	Guinea-Bissau	3.3
Tajikistan	8.0	Sierra Leone	3.3
Haiti	8.0	Congo	3.2
Bolivia	8.0	Togo	3.1
Australia	8.0	Zambia	3.0
South Africa	7.8	Guinea	2.9
United Kingdom	7.8	Sudan	2.9
Norway	7.5	Tanzania	2.7
Virgin Islands (USA)	7.5	Uganda	2.6
Mayotte	7.5	Burkina Faso	2.6
Egypt	7.4	Gambia	2.5
Guyana	7.4	South Sudan	2.5
United States	7.2	Burundi	2.5
Curaçao	7.1	Benin	2.4
Vanuatu	7.0	Angola	2.1
Philippines	6.8	Central African Republic	2.1
Rwanda	6.7	Mozambique	2.1
Gabon	6.6	Democratic Republic of the Congo	2.0
France	6.4	Nigeria	1.9
Palestine	6.3	Chad	1.9
Samoa	6.3	Timor-Leste	1.7
Kenya	6.2	Ivory Coast	1.7
Pakistan	6.2	Mali	1.7
Micronesia	6.1	Somalia	1.1
Solomon Islands	6.0	Niger	0.3
Israel	6.0		

Source: MAPFRE Economic Research (with UN data)

4. The demographic transition: a public policy challenge

4.1 The role of public policies

From the point of view of public policies, addressing the effect of population aging involves the use, with different degrees of intensity, of mechanisms for the intertemporal transfer of income. Generally speaking, three intertemporal transfer environments are considered to exist: (i) family support, (ii) private savings, and (iii) recourse to the public sector.

Income transfer via the family channel continues to be a key social mechanism. This route, formerly oriented toward supporting child dependency, is increasingly used instead to channel support for elderly dependency. From the point of view of public policies, in societies facing the challenge of demographic transition characterized by population aging, the promotion of family support for dependency should be organized around fiscal incentive mechanisms that generate the stimuli needed to ensure that this happens and is strengthened.

Income transfer based on private savings, meanwhile, constitutes a more efficient and less distorting mechanism that should be promoted by the public sector through the implementation of public policies. It is a mechanism that does not entail problems of intergenerational solidarity and is efficient insofar as it results from the proper process of individual optimization in the choice between consumption and saving based on income and wealth[16]. For this reason, in the process of managing the higher levels of dependency involved in the demographic transition the world is going through, states should promote private saving, particularly via fiscal tools. The implementation of this type of public policy would involve, for example, taxing consumption in order to encourage saving if it is anticipated that there will be a demographic transition toward higher rates of child dependency (as was the case with the baby boomer generation), or taxing capital gains in order to encourage consumption if a population aging process is foreseen. The latter measure could be complemented with incentives for private saving in the form of LIFE insurance and capitalization pensions.

In addition, population aging relates to governments via the spending channel and the revenue channel. Via the spending channel, insofar as provision for spending on health and long-term care, as well as the contribution to the financing of the pension system, involve a larger current spending component for governments[17]. And via the revenue channel because, as indicated earlier, tax revenue depends on economic growth and the level of activity to finance the pension and health systems. The channeling **of intergenerational income transfers that takes place via the public sector** is based on intergenerational solidarity, which is, however, inefficient due to problems of adverse selection. This generates inefficiencies that, in the end, can substantially disrupt a country's productive structure.

Thus, there are two paths of public policy and economic policy that can be taken into account in relation to the challenge of population aging. The first would consist of providing public services (health and long-term care) with the aim of reducing precautionary saving and encouraging consumption, which would stimulate growth in levels of economic activity and, to a certain extent, inflation, while the second relates to avoiding distortions in the relationship with the pension and health systems, which are especially affected by the demographic transition process.

4.2 The challenge of aging: macroeconomic sustainability faced with the impact on public spending on pensions and health

Population aging is perceived as a problem due both to the relative reduction in the working-age population and the increase in the number of older people, potential beneficiaries of pensions and with growing demands for healthcare services, leading to widespread concerns about the future sustainability of social security systems.

From an economic point of view, the change in the age structure could lead to a problem of distribution between generations, due to its impact on the composition by age group of global consumption demand. Given that the pension systems represent the main way of transferring income to older people, so that their participation in consumption evolves in harmony with general consumption, the weight of social security revenue should be increased, whether by increasing the size of the wage bill relative to GDP, increasing contribution rates, or implementing supplementary medium- and long-term saving systems.

While levels of well-being are not threatened by a change in the relationship between consumption demand and income availability, changes in the composition of consumption demand call into question at least the dynamic of intergenerational income transfers. Thus, the design of social security financing (pension and health systems) is at the heart of its viability, raising challenges regarding the sustainability of social security in contexts of population aging.

According to information from the OECD, total spending on pensions and health (including long-term care costs) currently accounts for between a third and half of total primary public spending in the countries of the OECD[18]. In addition, it is expected that the population aging process will bring an increase in pressure on public accounts in practically all regions of the world, due to the effect that this phenomenon will have on the size of both budget lines.

Longevity and public policies on pensions

As has been outlined in this study, the analysis of key indicators relating to pension systems anticipates difficulties in relation to their sustainability and adequacy of pensions, which are already becoming apparent in many developed and some developing societies, regardless of the model adopted (cost-sharing, capitalization or a combination of both).

In the case of the cost-sharing components, which are included in the majority of the world's current pension systems, the increase in pressure on public accounts is linked to the declining trend in working population ratios supporting the retired population with their contributions (dependency ratio) and to the increase in life expectancy at age 65 (typical effective retirement age), as the main factors.

In the capitalization components of the pension systems, in addition to the increase in life expectancy, another important factor is the interest rate environment (and the circumstances in which this can give rise to a persistent situation of low interest rates, as has happened in Japan and the eurozone in recent times), as well as the general economic dynamic that affects employment and real wages. These factors significantly reduce the capital accumulated at the end of the working life and substantially increase the acquisition cost of the life annuities that make up or supplement the retired persons' pensions and their possible reversion to the surviving relatives.

The analysis performed in this study of the above-mentioned indicators, based on historical data and population projections, makes it clear that in the next few decades, countries such as Japan, South Korea, Taiwan, Spain, Hong Kong, Greece, Portugal, Poland, Singapore and Italy will reach dependency ratio values of less than 1.5 people of working age for each person reaching retirement age in 2059. Only a few African countries, Iraq and Papua New Guinea have ratios of around four or higher at the end of the projection period (2100).

The second factor that can have a significant impact on the sustainability and adequacy of pensions is the generalized increase in life expectancy. The comparative analysis performed in this study in relation to life expectancy at age 65 (which represents the estimated average time of life when the retirement pension will be collected) shows a clear rising trend in all the major regions of the world. Thus, the regions of Australia/New Zealand, Europe and North America have life expectancies at age 65 of more than 23 years in the 2055-2060 period, while the projection for the end of the century the figure reaches 28 years in some regions of Australia/New Zealand, Western Europe and Southern Europe. The disaggregated analysis at country level makes it clear that in the next few decades, countries such as Hong Kong, Macao, Japan, Martinique, Singapore, France, Guadeloupe, Spain, South Korea, Switzerland and Italy will have life expectancies at age 65 of 25 years upward in the 2055-2060 period and around 30 years by the end of the century, while the countries of Sub-Saharan Africa are the ones that will have lower life expectancies.

Finally, it should be noted that there are other factors, such as the interest rate environment, the possibility of scientific discoveries involving treatments that succeed in extending the limits of human life beyond what can currently be imagined, or indeed the effects of technological change, that could have a significant impact on the future of the sustainability and adequacy of pensions.

After performing a comparative analysis of the reforms implemented in different countries in order to attempt to tackle the problem caused for their respective pension systems by the generalized improvement in life expectancy and fall in fertility rates, the following appear to be the most relevant aspects addressed by those reforms, which could be taken as a reference for the design of public policies aimed at confronting this demographic transition[19]:

a) maintenance of a basic social support system;

b) increase in the retirement age;

c) adjustment of contribution rates;

d) adjustment of budget transfers for the payment of pensions;

e) adjustment of replacement rates;

f) generation of incentives for businesses to create and manage supplementary pension plans;

g) establishment of fiscal incentives for individual voluntary medium- and long-term saving, similarly intended to supplement pensions, and

h) greater transparency toward workers regarding the pensions they are likely to receive.

In addition, we see that in the pension systems that have proved most stable, given the absence of any need for successive reforms, the strengthening of pillar 2 (employment-based supplementary pension plans) and pillar 3 (incentive for individual voluntary saving in financial products to supplement the pension) always play a significant role. However, to achieve the greater stability that is derived from a better balance between the different pillars, it has been necessary to sustain significant contribution percentages over long periods of time.

Profound reforms designed to substantially alter the weight of the different pillars, in which the individual capitalization component plays a key role, have only been successful when carried out sufficiently in advance because they require many years of substantial contributions from companies and workers. This is the case of the Dutch system, which is a paradigm in this respect and whose reform dates back to the 1950s. In that period, contributions through second-pillar supplementary pension systems allowed the accumulation of an aggregated fund

that is now one of the largest in the world. however even in this case, the estimated impact of improvements in life expectancy has recently led to the introduction of certain additional adjustments to offset the possible negative effect on the system accounts.

All pension systems are exposed to a series of risks which, if they materialize, will be assumed by the government, the private companies involved in the system, the active workforce, or retired pensioners. One common denominator in the recent reforms analyzed is that they have all implemented measures to spread these risks, to a greater or lesser extent, between the different actors involved by introducing public control mechanisms to prevent poor risk management due to an inefficient system leading to situations in which people who reach retirement age suffer the consequences in the form of lower replacement rates.

The development of this type of mechanism is important, and the most recent reforms tend to involve public institutions to which they assign greater surveillance responsibilities. The measures analyzed include the following: (i) the creation of public mechanisms to compensate workers who have suffered a loss of their rights due to irregular functioning of the companies involved in the corporate pension plans system (as is the case with the United States); (ii) outsourcing requirements for funds intended to cover companies' pension commitments toward their workers (as in the Dutch and Spanish systems); (iii) the assumption by public institutions of some of the higher-risk elements that could have a greater impact on retired people, such as life annuities, so that the coverage of demographic risks, both idiosyncratic and aggregated or systematic, falls upon a public company (as in the case of the Swedish system), and (iv) public control of competition and the fees collected by the companies that manage the capitalization funds, through the creation of public bodies that participate in the system (as in the cases of the United Kingdom, Sweden and Chile).

Another important aspect is the one relating to mechanisms to protect people reaching retirement age against losses in their purchasing power as a consequence of inflationary processes. Cases vary in this respect, although all the systems analyzed introduce review mechanisms at least annually and even more frequently. There is a tendency to introduce mechanisms in which the indices used for the indicators that measure the loss of purchasing power (the consumer price index, changes in salaries, or a mixture of both) are coupled with other indicators related to the sustainability of the system.

Another aspect to note is that fiscal incentives, as public policy tools, have a great impact on all the pension systems analyzed, especially as regards the voluntary individual savings components in Pillars 2 and 3. In this respect, they are regarded as fiscal incentives in direct taxes (taxes on income) aimed at stimulating medium- and long-term saving when this is done in corporate supplementary pension schemes, or (in the Pillar 3 modalities) when it is channeled into financial products intended to supplement pensions that will be received from the schemes of Pillars 1 and 2.

2. These contributions are generally deductible at the time when they are made, being taxed on receipt of the benefits arising from them during retirement, and are subject to lower marginal rates, with certain limits on the deductible annual contributions, and in other cases through exemptions on the yields.

Meanwhile, the analysis of the dependency ratio highlights the importance of having a well-developed labor market so that people of working age actually work and can contribute to supporting retirement pensions. This acquires greater importance, if that is possible, as the dependency ratio decreases. In this regard, it must be added that a further factor in addition to the demographic transition is represented by the effects that

economic crises might have on the pension systems. It is therefore impossible to go on without mentioning the importance of economic and employment policies that avoid situations of structural unemployment, highly prejudicial to the sustainability of pension systems, in an environment in which dependency rates tend to rise markedly. In some economies, factors such as low labor market integration of women or particular groups according to their age or low incomes can additionally have damaging effects on the respective systems for those groups. The public policies analyzed always seek, with greater or lesser success, to address these problems by also attempting to open the possibility of formulas for active aging, even for retired people, by making receipt of the pension compatible, under certain conditions, with the performance of paid work.

It can be concluded that faced with the pressure of the demographic transition, the approach that offers the greatest possibilities for providing sustainability and stability to pension systems in the medium and long term involves moving forward to a better balance between pillars, as a mechanism for redistributing the risks to which those systems are exposed and, ultimately, being able to better absorb the economic effects caused by their potential materialization.

From an instrumental point of view, a better balance between pillars (and, consequently, between risks) can only be achieved in a scenario of medium and long-term implementations, which can be summarized in the following general principles:

- Maintenance and reinforcement of a basic system of social protection (Pillar 0), i.e. a minimum non-contributory solidarity pension to support the strata of workers who were unable to complete their working life and therefore do not qualify for a contributory pension.

- Creation of a first contributory pillar that combines intergenerational solidarity with the effort of individual saving, aligning benefits more closely with individual contributions

- Generation of incentives for companies to create and manage (directly or indirectly through professional fund managers) supplementary pension plans of the contributory variety (especially defined-contribution plans) to supplement Pillar 1 contributory pensions.

- Incentives for medium- and long-term voluntary individual saving which workers can channel through professional managers into financial products designed to generate an income during retirement, thus supplementing the pensions from Pillars 1 and 2.

Longevity and public policies on health

As regards health spending, the process of demographic transition characterized by population aging will also put additional pressures on the public accounts to maintain adequate healthcare coverage. As has been indicated in this study, Japan can be regarded as a paradigmatic case when it comes to studying healthcare spending by age group. Since 2011, Japanese local authorities have been compiling information on the healthcare bills borne by municipalities (cities, towns and smaller local entities) in connection with the country's national health system, by age and type of illness. The analysis of this information shows that around 30.8% of healthcare spending in 2016 was made for people over the age of 70, and that spending for people between the ages of 65 and 69 has been growing in relative terms in recent years, accounting for around 27.8% of total healthcare spending in 2016.

This means that people aged 65 and over account for around 58.5% of total healthcare spending, so that the arrival of new cohorts in this age group will have a major impact on total healthcare spending. Even for those countries that follow a liberal healthcare model, this reality leads to the conclusion that the situation cannot be left to be solved by the free market (via the interaction between supply and demand) because a time comes when the supply disappears and a market failure occurs, resulting in a lack of adequate healthcare coverage for those cohorts.

The global comparative analysis of the percentage of people aged 65 and over shows a clear rising trend in all the major regions. Thus, it can be observed that in the year 2000, with the exception of a few regions such as Europe, Australia/New Zealand and North America, the ratio was below 7.6%. If we exclude East Asia and the Caribbean, it was below 5.5%. However, in the 20-year projections (2039) the indicator is well above 20% in all the developed economies, and in 2059 it approaches 30%, with even higher values in Southern Europe and East Asia. A more disaggregated analysis at country level makes it clear that in the next four decades, nations such as South Korea, Taiwan, Japan, Portugal, Greece, Singapore, Spain, Poland and Hong Kong will exceed the ratio of 35% for people over the age of 65. Currently (2019), the countries with the highest ratios are Japan (27.9%), Italy (23.6%), Portugal (22.3%), Finland (22%) and Germany (21.9%). Finally, some of the largest increases in this indicator over the 2019-2059 period will be seen by the big emerging economies such as China (+18.7%), Brazil (+17.6%), Colombia (+16.2%), Mexico (+15.2%) and Turkey (+15.2%).

Health systems represent a fundamental element in the design of the institutional framework of our societies. From a public policy perspective, preserving sustainability and improving the effectiveness of healthcare models is a factor of major importance for raising levels of well-being and, ultimately, for maintaining social equilibrium. In this regard, it can be observed that the traditional patterns of healthcare models (Bismarckian, Beveridgian or free-market) are currently becoming blurred, with a trend toward extending healthcare coverage universally to all the residents of each country, employing variants of the original models or a combination thereof.

Regardless of the specific health model, the public sector plays a fundamental role in establishing the necessary public policies to

make it obligatory for providers of healthcare services (public or private) to provide adequate healthcare to people who are entitled to it. The manner in which this coverage is provided follows different patterns, with a diversity in the typology and participation of healthcare institutions and providers, in the sources of funding and even in the very scope of the coverage.

In any event, the current generalized increase in public debt and fiscal deficit volumes, aggravated by the increase in spending on pensions, poses difficulties for any budgetary extension of the public funding intended to provide coverage for free universal and cost-sharing healthcare. Once again, Japan offers itself as a paradigm in this regard. This country founded a unique health insurance structure for older people, making healthcare free for those over the age of 70 and subsidizing their 30% cost sharing. However, problems of sustainability arose due to the country's marked process of population aging, and it had to partially reverse this measure by raising the entry age to 75 and requiring a small copayment.

At international level, meanwhile, we see that the role of the insurance companies is determined to a large extent by the healthcare model of the territory in which they operate. Normally, they play a role complementary to that of the public sector, with some notable exceptions such as in the Netherlands, the United States and Japan. As the population aging process advances, health insurance (and the insurance companies that manage it) can play a significant complementary role in the context of variants that consider public-private associations geared toward supporting the sustainability of healthcare systems and improving their effectiveness. In this way, the healthcare systems would partially alleviate that pressure and could devote more resources to long-term and palliative care.

From a review of the international experience of a series of health systems that show a high level of effectiveness, a number of public policies emerge that should be highlighted as elements to be considered for confronting the challenge of the demographic transition[20].

Savings plans to meet health expenses

Medium- and long-term saving to cover healthcare needs has always been one of the aspects regarded as key to improving the medical care provided to citizens. In this regard, Singapore's healthcare system includes a savings plan for its citizens to cover their future health needs, called "MediSave". Through this mechanism, the citizens have a fund that is built up while they are healthy in order to meet future healthcare costs.

Incentives for taking out voluntary health insurance

With a view to complementarity as mechanisms for universalizing healthcare for the population, the establishment of incentives for taking out voluntary insurance constitutes an essential component. In this regard, with the aim of alleviating the load on the public health systems, some countries have established a mechanism of incentives for taking out voluntary private insurance to supplement the care provided by Pillar 1 schemes.

In Australia, the incentivization is achieved by means of a penalty applied through income tax, by imposing a progressive surtax on the Medicare rate (applicable to all taxpayers for the funding of the public system) if private insurance is not taken out. In Spain, some companies offer their employees supplementary health insurance in addition to the mandatory coverage, as a work incentive. The tax regime applicable to this form of remuneration currently offers tax advantages, since exemption from income tax is granted for the income in kind entailed for the employee, on the sums paid for him/her, his/her spouse and his/her offspring, subject to certain quantitative limits. In the United States, Brazil and Mexico, tax credits are also established for taking out this type of work incentive, or for taking out individual private health insurance.

Markets and online comparators

Various countries in which private health insurance plays a significant role in the general health scheme have introduced, by law, online comparators to facilitate price and coverage comparisons when taking out private health insurance. In the United States, with the aim of encouraging small and medium-sized enterprises to take out private health insurance for their employees, in addition to tax credits, an online health insurance market has been created to make it easier for them to take out this type of insurance and access a wider offering, called the Small Business Health Options Program (SHOP). There are also digital platforms for taking out individual insurance, managed by the different states, or otherwise at federal level (called "exchanges"), with standardized policies which by law must provide certain minimum coverage in terms of benefits.

Strengthening of the role of private insurance

In a number of health systems around the world, the strategy for the universalization of coverage has explicitly addressed the strengthening of the role of private health insurance. In this regard, the Dutch health system provides universal coverage through mandatory medical insurance managed by private insurance companies. Insurance companies that decide to take part in the mandatory coverage system must ensure that the services included in a basic package of coverage are available to all their insured parties. They are also obliged to accept all applicants and cannot differentiate premiums according to the health risks of the insured person, who can change insurer each year. In the United States, in addition to the mandatory coverage through the programs for vulnerable people and the large companies' mandatory health plans for their employees, the 2010 Patient Protection and Affordable Care Act established the obligation to take out private health insurance, with certain minimum requirements, for all persons not covered through such programs and plans.

Correction of market failures

Finally, it should be noted that in those countries that have established a health system with free-market characteristics, there are public protection programs for certain more vulnerable sections of the population, including the elderly and those with limited resources, which would otherwise be unable to access healthcare coverage at a reasonable cost. Given the concentration of healthcare spending on people aged 65 and over, and the rising trend in the number of people who will be joining these cohorts, public policies that introduce correction mechanisms into the operation of the free market will become increasingly relevant.

4.3 Final considerations

As has been conveyed throughout the report, the consequences of the demographic transition have structural effects on the economy and society, with effects on savings, productivity and long-term growth as well as on equality and financial stability at the global level.

In economies where, in addition to increases in life expectancy and decreases in fertility, labour market deficiencies coexist, there are serious challenges to the sustainability of the pension system. However, as Elisa Chuliá (2019) critically states, it is important that their approach be accompanied by full information on their scope and by a political consensus for their effective achievement.

"The problem of pensions does not lie exclusively in demographics (ageing of the population) or in the labour market (insufficient employment and productivity), but in the conjunction of situations in both areas. In Spain, the combination of particular efficiency in increasing the life expectancy of the older population and structural difficulties in the labour market to create stable employment aggravates the financial tensions experienced by all advanced welfare states. Trusting pension sustainability entirely to job growth or productivity gains can generate expectations of financial sustainability whose noncompliance is verified too late to reverse critical situations.

In the light of global demographic and economic developments, it does not seem risky to say that any pension system is free of reforms to ensure the best fulfilment of its commitments without compromising the sustainability of public finances or the growth and competitiveness of the economy. It is important that these reforms be accompanied by (and preferably preceded by) sufficient and clear information to know their scope and assess their justification. Political consensus on the basic requirements that the pension system must meet in order to generate confidence (especially in the medium and long term) is probably the best basis for making progress in the design of socially acceptable and economically effective reforms" (Elisa Chuliá, 2018).

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1/ Europe is an aged continent, with more than 25% of the population over the age of 60 and a growth forecast that pushes this percentage to 35% in 2015. The average age of the inhabitants of the European Union stands at around 43 in 2016. The total dependency ratio exceeds 50%, with an adult dependency ratio of close to 30%.

1/ The United Nations' dependency ratio projections show a clear declining trend in the proportion of people of working age compared with people over the age of 65 in all the major regions of the world.

2/ A detailed analysis can be found in the following report: MAPFRE Economic Research, Economic and Industry Outlook 2017, Madrid, Fundación MAPFRE, 2017, pp. 9-16.

3/ The great recession (2008-2009) or the short-term effects of technological change, for example, can be regarded as complementary factors to explain the loss of dynamism in global economic growth in recent years.

4/ In other words, in the absence of alterations to economic policy such as an increase in the retirement age, the promotion of female labor participation or immigration.

5/ By distancing the reservation wage of the labor force with respect to its marginal productivity.

6/ The opposite effect would occur when the population is young and child dependency is high. This factor (together with idiosyncratic sovereign factors) would help to explain the fact that yields per term are higher in developing countries with high fertility rates.

7/ Consumption attributable to demographic growth.

8/ Not only because this is one of the proper characteristics of a welfare state system, but as a public policy measure to mitigate the propensity to save (precaution) in aged populations. In fact, the European Commission anticipates that by the middle of the century, the total for both budget lines will be close to 12% of regional GDP (>8% of GDP on health and >3% of GDP on LTC), which will evidently put greater pressure on the region's fiscal sustainability.

9/ In the absence of economic policy changes, such as the creation of new fiscal figures, for example the debated taxes on automation.

10/ Saving in the Chinese economy and its role in financing the current account of the United States during the final quarter of the last century is a good example of this.

11/ This view is attributable to Bullard (2012), Shirakawa (2011) and Goodhart (2015).

12/ OECD, *The Long View: Scenarios for the world economy to 2060*. In: https://www.oecd-ilibrary.org/docserver/b4f4e03e-en.pdf

13/ United Nations. *World Population Prospects: The 2017 Revision* (File POP/15-1: Annual total population (both sexes combined) by five-year age group, region, subregion and country, 1950-2100 (thousands))

14/ United Nations. *World Population Prospects: The 2017 Revision* (File MORT/16-1: Life expectancy at exact age, e(x), for both sexes combined, by region, subregion and country, 1950-2100)

15/ United Nations. *World Population Prospects: The 2017 Revision* (File POP/15-1: Annual total population (both sexes combined) by five-year age group, region, subregion and country, 1950-2100 (thousands))

16/ In which non-disclosable information that, in general, entails a problem of adverse selection for an external administrator or planner would necessarily result in inefficiencies (life expectancy, health, preferences, etc.). The endogenous decision on saving versus consumption reveals and maximizes the consumer's preferences.

17/ It is estimated that in the OECD the tax charge required to meet the costs of aging will double by 2030.

18/ OECD, *The Long View: Scenarios for the world economy to 2060.* In: https://www.oecd-ilibrary.org/docserver/b4f4e03e-en.pdf?

19/ See: MAPFRE Economic Research. *Pension Systems*. Madrid, Fundación MAPFRE, 2017, pp. 97-106.

20/ See: MAPFRE Economic Research *Health systems: a global analysis*. Madrid, Fundación MAPFRE, 2018, pp. 153-172.

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