UPDATE OF DEMOGRAPHIC AND PENSION EXPENDITURE FORECASTS

TECHNICAL DOCUMENT 1/20

AIReF
Autoridad Independiente de Responsabilidad Fiscal

The mission of the Independent Authority for Fiscal Responsibility (AIReF) is to ensure strict compliance with the principles of budgetary stability and financial sustainability enshrined in Article 135 of the Spanish Constitution.

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EXECUTIVE SUMMARY

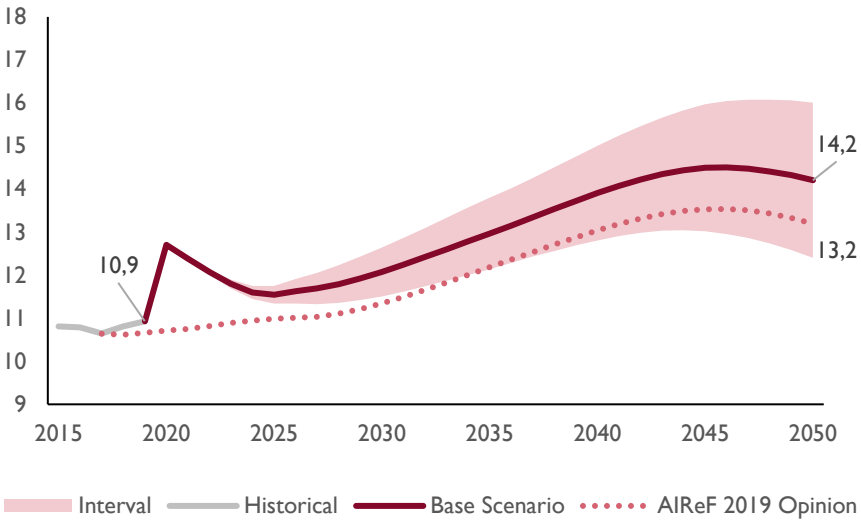
The diagnostic analysis of the sustainability of public finances is one of the responsibilities of the Independent Authority for Fiscal Responsibility (AIReF). In this regard, the evolution of demographic variables is a fundamental determining factor for some items of public spending, especially for pension expenditure, as well as the basis for the projection of macroeconomic variables. That is why, in September 2018, AIReF published its first demographic forecasts.

Based on these demographic forecasts, AIRef then published, in January 2019, its Opinion on the Sustainability of the Social Security system. In addition to the forecasts on the evolution of pension expenditure, this opinion set out proposals to address the structural deficit of the Social Security system in the short term and the challenge of an ageing population in the long term.

Two years after the publication of its demographic forecasts, AIReF has updated both its demographic and its long-term pension expenditure forecasts. These forecasts incorporate the new data known to date, as well as the methodological improvements that AIReF has been incorporating into its forecasting models over recent years. Finally, the impact of the COVID-19 crisis in the short term has also been incorporated into this exercise. However, in view of the level of uncertainty, the long-term forecast assumes that the current crisis will not have structural effects on the Spanish economy.

The update of the baseline scenario suggests that pension expenditure in 2050 will stand at 14.2% of GDP, a rise of 3.3 points on current levels. The demographic factor strongly drives the growth of pension expenditure due to the ageing process. This is partially offset by developments in the job market and institutional factors, which are dependent on the reforms approved.

FIGURE 1. PENSION EXPENDITURE (% GDP)



Source: INE and AIReF.

According to the baseline scenario of AIReF's demographic forecasts, the population in Spain will rise to 54 million inhabitants by 2050, while the working-age population will remain above 30 million people throughout the forecast horizon. The dependency ratio (understood as the population aged over 66 divided by the population aged between 16 and 66) will therefore stand at 53% in 2050.

This evolution is the result of the forecasts for migration, fertility and life expectancy. On the basis of its model of bilateral migration flows between over 100 countries, AIReF estimates an average annual net inflow in the period 2020–2050 of 330,000 people assuming that current migration policies are maintained. With regard to fertility, AIReF forecasts a convergence to 1.4 children per woman by 2050, a recovery from the historically low levels of recent years. Lastly, life expectancy is forecast to continue improving, although at a slower pace than in previous decades, which would place life expectancy at birth at 86.8 years by 2050. The impact of COVID-19 has been incorporated into short-term life expectancy and migration forecasts. This has led to significant, albeit temporary, falls in line with the available data.

In the job market, and in a manner consistent with the aforementioned demographic forecasts, AIReF's baseline scenario assumes average real GDP growth of 1.4% in the period 2020-2050. In the short term, AIReF incorporates its own forecasts, which now reflect the impact of COVID–19. It then makes a convergence hypothesis with regard to the job market and productivity in accordance with usual practice in academic literature. Firstly, the activity rate will grow by 2 points up to 2050, reflecting a convergence of the activity rate

of women to that of men, while the unemployment rate will fall to reach a rate of close to 7% of the active population by 2050. Secondly, productivity will grow on average by 0.9% a year, equal to the historical average (2000-2019), as a result of assuming a convergence in 2035 to 1.1% from current values.

In the baseline scenario, AIReF has considered the impact of the 2011 parametric reforms, which reduce expenditure by 2.9 points of GDP in 2050, and application of the sustainability factor as from 2023, saving an additional 0.9 points of GDP. AIReF has also simulated the impact of further extending the 2011 parametric reforms in line with the proposals in the 2019 Opinion. These further reforms will contain pension expenditure by 1.4 points of GDP, assuming that (1) the effective retirement age is delayed by 2 years without altering the statutory age and (2) the number of years of the contribution career calculated for pensions rises from 25 to 35.

There is a great deal of uncertainty around the demographic and macroeconomic projections and more adverse scenarios may materialise. For this reason, AIReF also includes risk scenario simulations in the update, together with a sensitivity exercise for the main variables. Thus, halving the net migration balance would lead to an increase of 1.9 points of GDP in pension expenditure, while stagnation of the labour market with a convergence of the unemployment rate to 10% would result in an increase of 1.2 points by 2050. A scenario has also been considered in which the current COVID-19 crisis has a structural impact on potential GDP and productivity, raising expenditure by 0.7 points. On the positive side, the Recovery and Resilience Plan may be the trigger for structural reforms that will improve productivity, potential growth and employment

As a result of this analysis and bearing in mind the current situation, AIReF believes that the proposals included in the 2019 Opinion remain valid. In the short term, it would be recommendable to close the structural deficit of the Social Security system, transferring it to those parts of the government with sufficient tools to reduce it. However, a short-term solution for the Social Security's structural deficit should not reduce the need to address long-term challenges or make us forget that the structural deficit of the general government remains unchanged.

The proposals to further extend the parametric reforms in order to contain the expected increase in pension expenditure resulting from an ageing population therefore remain in place. Early implementation of the reforms would allow more gradual application than if they are delayed, thus facilitating social acceptance and adaptation of individuals' decision-making to the new situation.

1. INTRODUCTION

The diagnostic analysis of the sustainability of public finances is one of the responsibilities of the Independent Authority for Fiscal Responsibility (AIReF). The Organic Law creating AIReF (OL 6/2013) makes it responsible for analysing Social Security, both in the short and the long term. In the long term, AIReF's functions focus on the sustainability analysis and diagnosis of the structural situation of this government sub-sector.

The main challenge for the long-term sustainability of the Social Security system stems from the increase in pension expenditure associated with an ageing population. The pension expenditure of the Social Security Funds accounted for 11.1% of GDP in 2019, more than 75% of the sub-sector's total expenditure and over a quarter of total government expenditure. Almost all of this expenditure corresponds to contributory pensions of the Social Security system.

The evolution of demographic variables, long-term economic growth and the performance of the job market are the key factors determining pension expenditure. Therefore, as part of its function of ensuring the sustainability of the Social Security system, AIReF has developed its own methodological and analytical framework for forecasting long-term pension expenditure on the basis of the forecasts of its main determinants, namely: demographic forecasts and a long-term macroeconomic scenario. This methodological framework seeks to ensure consistency between all the determining factors.

This document presents the update of AIReF's demographic forecasts, maintaining the analytical scheme applied in 2018. The essential features of the 2018 methodology[1][2] remain unchanged in this update, which facilitates the comparability of both exercises. The update incorporates the latest available information on the demographic phenomena under analysis (provisional figures for 2019). It also introduces an estimate of the effect of the COVID-19 pandemic. As in the previous report, the estimates are based on

[1] Osés Arranz, A. and Martín Quilis, E. (2018). "Introducing Uncertainty on Fertility and Survival in the Spanish Population Projections: A Monte Carlo Approach". AIReF WP/2018/5.

[2] Fernández-Huertas Moraga, J., López Molina, G. (2018), "Predicting Spanish Emigration and Immigration". AIReF WP 2018/6.

the use of stochastic forecasting models and confidence bands are included to reflect the existing uncertainty.

In addition to updating the demographic forecasts, this report reviews and updates the long-term macroeconomic scenario needed to project pension expenditure. AIReF's model for forecasting pension expenditure is used for this purpose[3] [4]. This is a cohort model based on administrative data on the average pension and the number of Social Security pensions and it projects them towards the future according to a series of assumptions. AIReF stresses the uncertainty about the assumptions that underpin this analysis. Therefore, the analysis is accompanied by an exercise on expenditure sensitivity to the main demographic and macroeconomic assumptions.

The document is divided into three parts. The first section describes the demographic forecasts. The second focuses on the macroeconomic assumptions. The third shows the results of the baseline scenario and quantifies the impact that the following parametric reforms would have on pension expenditure: raising the effective retirement age, extending the contributory period that is taken into account in calculating pensions and introducing the sustainability factor. This section also presents an analysis of the sensitivity of the results to changes in some of the assumptions under consideration.

[3] Pastor, A. and Vila, M., (2019) "AIReF model for forecasting pension expenditure in Spain", WP/2019/1.

[4] Opinion on the Sustainability of the Social Security system, Opinion 1/19.

2. DEMOGRAPHIC FORECASTS

2.1. Fertility

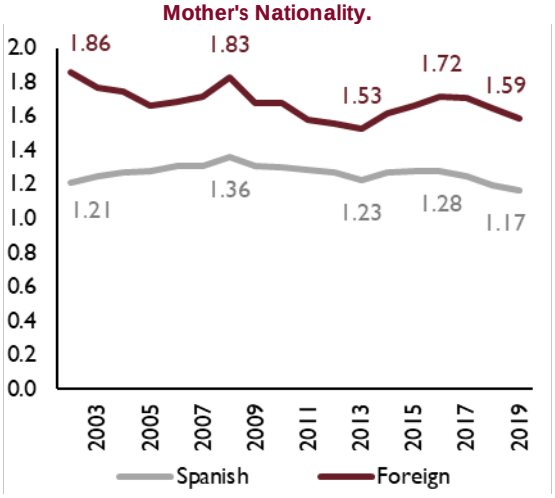
The fertility rate has fallen in recent years to 1.23 children per woman in 2019, following a short recovery in the period between 2013 and 2016. Over the last two decades, the fertility rate of the resident population in Spain has remained at the low values that have characterised this demographic phenomenon since the end of the 20th Century. Specifically, in the case of Spanish mothers, the number of children per woman fell to stand at a value of 1.17 in 2019, while the same ratio for foreign mothers fell to 1.59 children per woman. Despite the clear and gradual synchronisation of the fertility patterns of Spanish mothers and residents with foreign nationality noted over recent decades, there is still a fertility gap between the two groups, which makes it necessary to treat them separately, although interdependently, when modelling this phenomenon.

FIGURE 2. RECENT TRENDS IN THE FERTILITY OF SPANISH AND FOREIGN MOTHERS

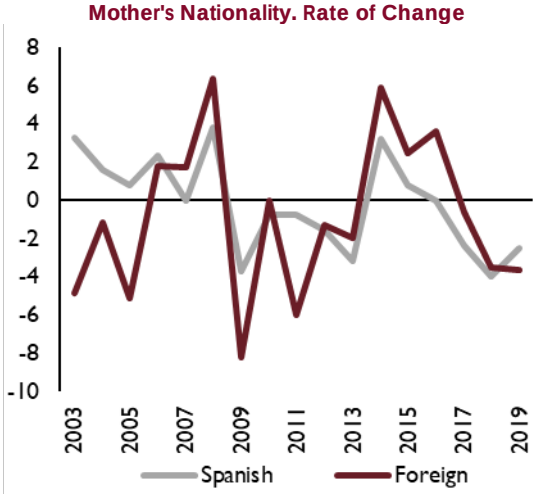
❶ The ratio of the number of children per woman has continued falling to reach one of the lowest values since records began in 2019.

❷ The number of children per woman of foreign mothers is tending to fall, becoming closer to the value for Spanish mothers, although there remains a gap between the two ratios.

Number of Children per Woman, according to the Mother's Nationality.



Number of Children per Woman, according to the Mother's Nationality. Rate of Change



Source: INE.

An analysis of the international context points to a certain confluence in the ratios of the number of children per woman in the countries of the most immediate environment[5] towards more or less homogeneous values of around 1.5 children per woman. As shown in Figure 3, fertility rates in advanced economies show a convergence towards values ranging between 1.29 and 1.75, and an average value of 1.52. Factor analysis of this variable for the various countries in the immediate environment indicates a similar behaviour among them, with the first common factor acquiring a value of 1.5 children per woman in 2018. Some of these differences between the countries can be explained by differences in birth-rate policies and other factors that determine household formation (mainly housing policy and the job market). This confluence is somewhat delayed in emerging economies, which include the main countries of origin of migration flows to Spain, for which a slow convergence towards levels of 1.7 children per woman is expected towards the end of this century.

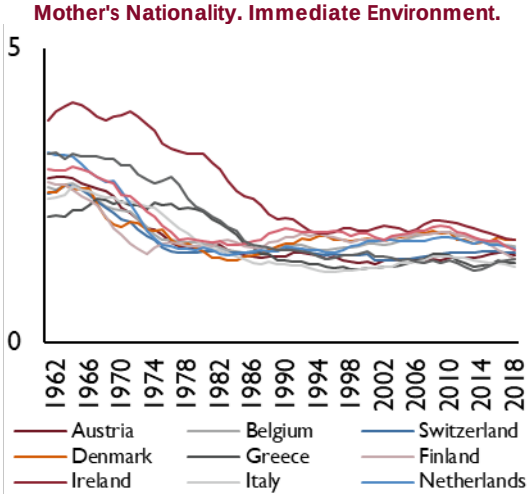
[5] In the immediate environment, the following countries are considered: Portugal, Italy, Belgium Austria, Switzerland, Denmark, Greece, Finland, Norway, Ireland and the Netherlands. France and the United Kingdom have not been included because of a lack of sufficient data to perform the analysis.

FIGURE 3. INTERNATIONAL ENVIRONMENT AND CONVERGENCE HYPOTHESIS

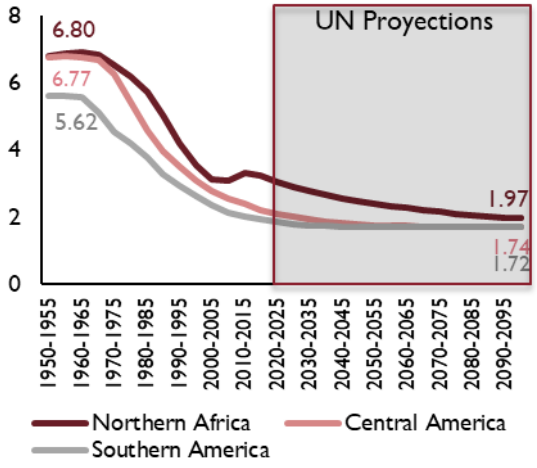
❶ A similar trend can be seen in the countries in our immediate environment, with some stabilisation as from the 1990s at around 1.5 children per woman.

❷ In the main countries of origin of migration towards Spain, a drastic reduction has been noted, but one which converges to values of around 1.7 children per woman.

Number of Children per Woman, according to the Mother's Nationality. Immediate Environment.



Number of Children per Woman. Various Geographical Areas.

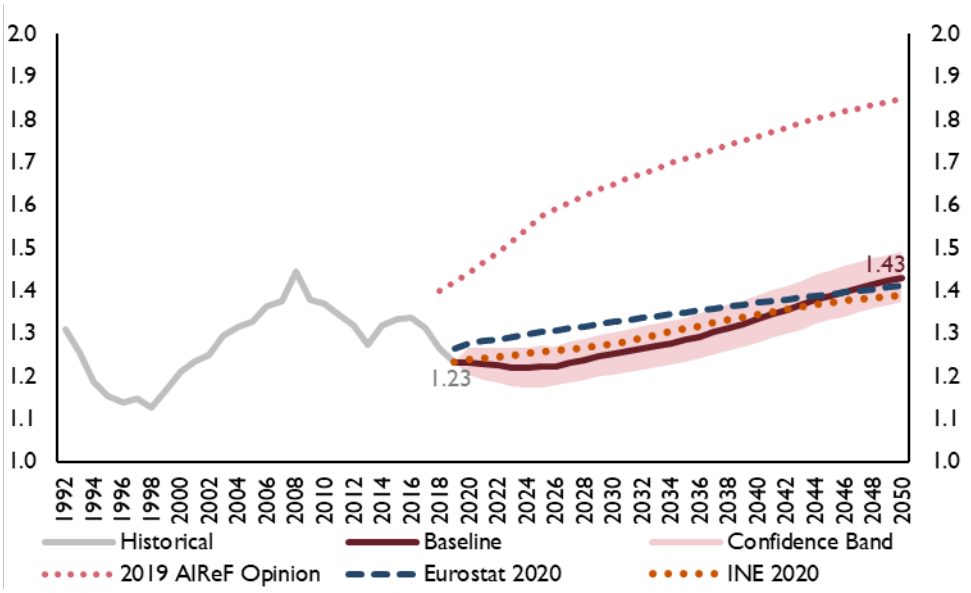


Source: Eurostat and UN.

Together with the most recent developments, these patterns are an essential determining factor for the projections of the Spanish fertility rate. In particular, following the methodological framework presented in Osés Arranz, A. and Martín Quilis, E. (2018), a hypothesis is established for the fertility of Spanish mothers to converge to the values currently recorded in the immediate environment, 1.5 children per woman, towards 2070. This implies a gradual increase from the values of close to 1.2 seen in recent years. In the case of foreign mothers, this study adopts an assumption of convergence towards 1.7 children per woman in 2070, in line with the projections of the United Nations for the countries of origin of immigration to Spain. Consequently, the process of convergence between the fertility rates of Spanish and foreign mothers is maintained over the projection horizon. This convergence is caused by an increase in the fertility of Spanish women, and not, as is currently the case, by the fact that the immigrant population assimilates national fertility patterns.

Furthermore, the impact of the pandemic on fertility rates is considered to be zero (see Box 1).

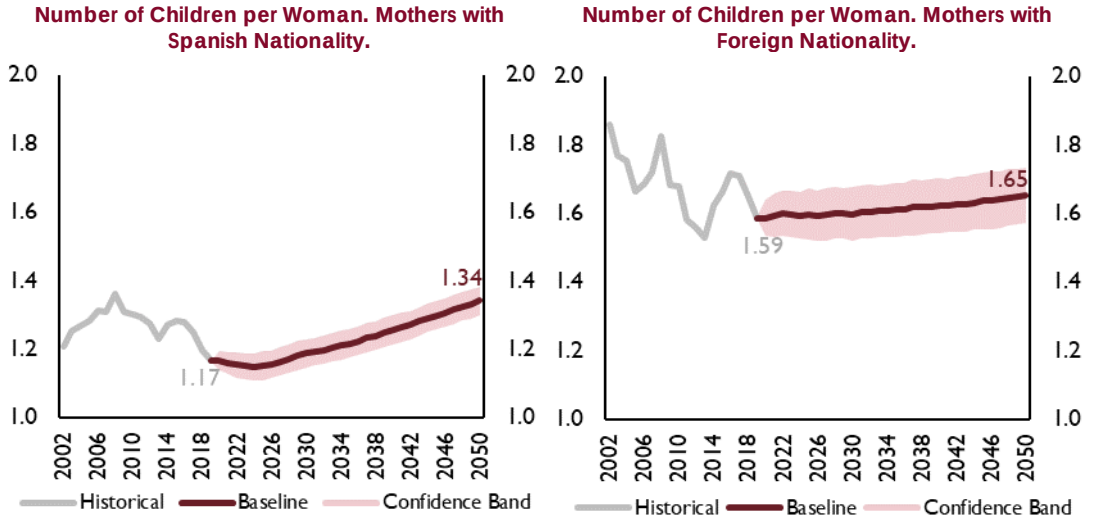
FIGURE 4. NUMBER OF CHILDREN PER WOMAN. COMPARISON



Source: INE, Eurostat and AIReF.

Consequently, the number of children per woman is projected to stand at 1.43, with an interval between 1.37 and 1.49, which, at any event, is below the replacement rate[6]. These values are similar to those forecast by Eurostat and the INE in their recent demographic projections and represent a downward revision of AIReF's 2018 projections. The current forecasts assume that the current policies affecting the fertility rate will be maintained.

FIGURE 5. NUMBER OF CHILDREN PER WOMAN, ACCORDING TO NATIONALITY



Source: INE and AIReF.

[6] The replacement rate refers to the minimum fertility required for the population to remain constant over time (assuming no migration). It is considered to stand at around 2.1 children per woman.

BOX 1

Impact of COVID-19 on fertility

Various academic articles aim to determine the impact of diseases or extreme climate events on fertility. These include the article produced by Evans, R.W., Hu, Y. & Zhao, Z. (2008), which analyses the impact of tropical storms and hurricanes in the US. The authors establish the hypothesis that individuals modify their behaviour depending on the size of these types of events as the uncertainty about future monetary flows associated with these events may contribute towards postponing the decision to become a mother. A depressive effect on fertility may therefore be expected in the short term and perhaps a more uncertain, but positive, effect in the medium term. The results suggest that the most extreme events generate permanent or quasi-permanent responses in fertility. However, given the limited period under analysis, an effect beyond five or six years cannot be guaranteed.

In the case of the coronavirus pandemic, a survey of individuals aged 18-34 in different eurozone countries between late March and early April (see Luppi, F., Arpino, B., Rosina, A. (2020)) might suggest an intention to postpone the decision to have children in the near future. Specifically, individuals were asked about their intention to maintain, postpone or abandon their maternity plans with regard to those expressed at the start of 2020. For Spain, the authors conclude that there seems to be evidence of a tendency to postpone the decision to have children in the near future in the case of numerous individuals surveyed. However, they did not find clear patterns explaining the geographical or socio-economic factors underlying that intention.

PROPORTION OF DECISIONS TO MAINTAIN, POSTPONE OR ABANDON PLANS TO HAVE CHILDREN FOLLOWING THE OUTBREAK OF COVID-19 IN VARIOUS COUNTRIES

(%)	Italy	Germany	France	Spain	UK
Still planners	25.6	30.7	32.0	21.2	23.0
Postponers	37.9	55.1	50.7	49.6	57.8
Abandoners	36.5	14.2	17.3	29.3	19.2
Initial Sample Size	2,000	1,000	1,000	1,000	1,000
Sample of people who said they wanted to have children in January 2020	532	214	275	216	236

Source: Luppi, F., Arpino, B., Rosina, A. (2020), Table 1.

More evidence on the potential impact of the economic crisis on the dynamics of household formation and maternity plans is essential to be able to determine its impact on the fertility rate with greater certainty. The

estimates made do not therefore incorporate the effects of the pandemic on fertility rates.

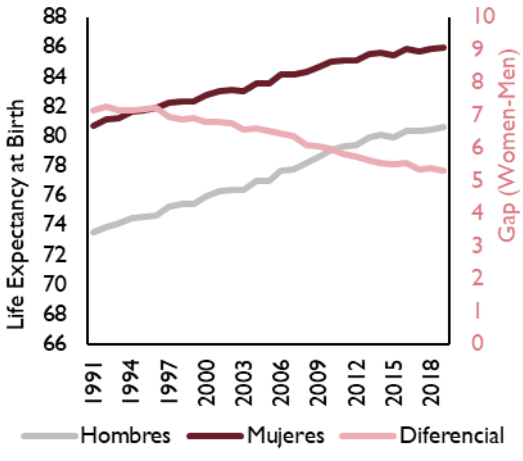
2.2. Survival

Life expectancy at birth has followed an upward trend in Spain since the mid-twentieth century for both men and women, reaching its all-time high of 83.2 years in 2019. Life expectancy has following an upward path over the past 30 years, from 73.5 years in 1991 to 80.6 years in 2019 for men, and from 80.6 to 85.9 years for women (see Figure 6, left-hand panel). Recent life expectancy gains are concentrated in the older age brackets, while improvements in infant mortality appear to have virtually exhausted their potential. It is also worth highlighting that the life expectancy gap between men and women will be maintained. Although this gap has fallen over the last 20 years, the rate at which it is narrowing seems to have slowed since 2013 (see Figure 6, right-hand panel).

FIGURE 6. LIFE EXPECTANCY ACCORDING TO SEX (YEARS)

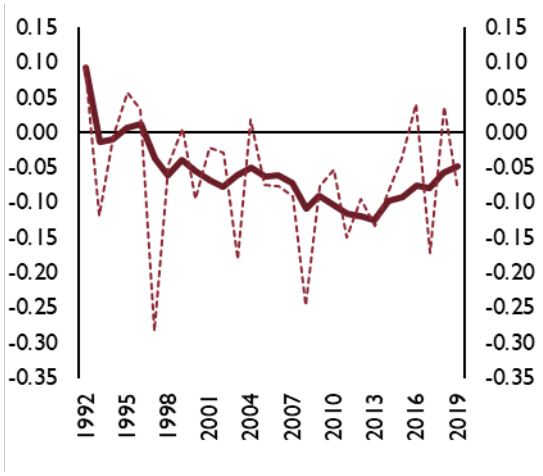
❶ Although the gap in Life expectancy at birth between men and women has been closing over the last twenty years...

Life Expectancy at Birth, according to Sex (Years)



... the convergence has slowed down since 2013

Year-on-year Change in Gap of Life Expectancy at Birth (Years)



Source: (AIReF)

AIReF has a model to estimate the survival rate by cohort, which is used to obtain the mortality rate by age and sex and the life expectancy. The model estimates a potential parametric function that approximates the observed survival curves by cohort. The parameters of these curves are estimated for all years so that a time series is obtained for each parameter. These parameters are modelled through a multivariate time series model (VAR model) through

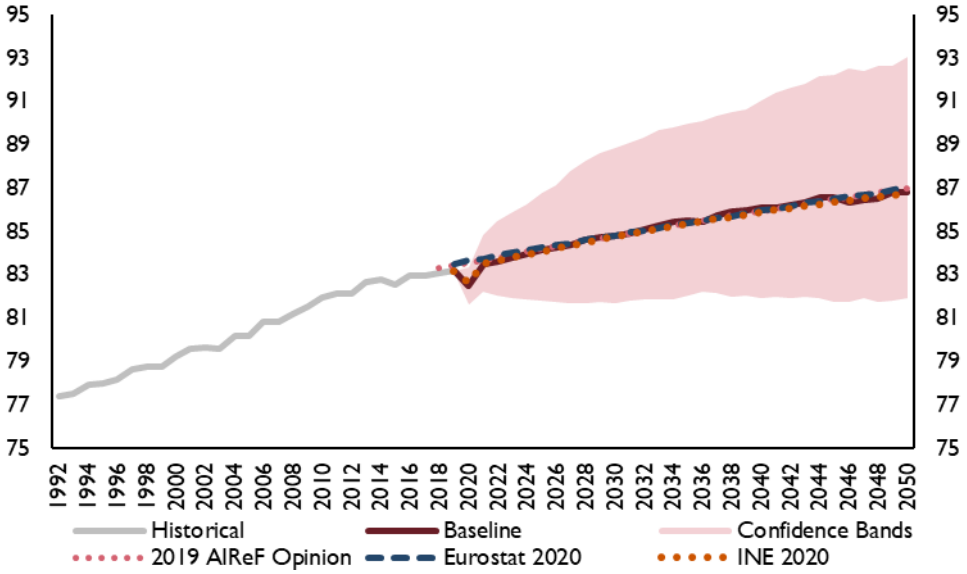
which the forecasts are generated. The variance and covariance matrix reflects the uncertainty of the estimate, allowing both stochastic and deterministic scenarios to be generated. No adjustment is made to moderate the increase in life expectancy resulting from the multivariate forecasting model as there is no consensus in the literature on the existence of a limit to the increase in life expectancy. No assumption is made of convergence of life expectancy to that of countries in our immediate environment as Spain is among the countries with the longest lifespan of its environment and there is no empirical evidence to support the hypothesis of convergence towards values observed in a specific geographical area. In short, no hypothesis of convergence of life expectancy at birth towards a specific value is introduced.

As the only restriction, an adjustment is made to limit the life expectancy gap between women and men. It is assumed that both variables will tend to converge in the long term, and that the signs of lower convergence seen since 2013 are transitory. It is assumed that, as from 2035, the probabilities of death by age group of women will begin to converge with those of men.

Furthermore, a short-term adjustment is added to introduce the effect of excess mortality – for all causes of death – over the expected mortality rate for 2020. It is estimated that in 2020 life expectancy at birth for men will be 79.8 years instead of the 80.7 years that would have been recorded in the absence of the estimated excess mortality for 2020 (see Box 2). In the case of women, life expectancy in 2020 will stand at 85.3 years instead of 86.1 years if this effect had not been included. However, life expectancy as from 2021 is assumed to continue the upward trend observed over recent decades.

Looking ahead, in its baseline scenario, AIReF estimates that life expectancy at birth in 2050 will be approximately 86.8 years. Women's life expectancy at birth will reach around 89.5 years by 2050, compared with 84.3 years for men. This is an evolution of life expectancy that does not substantially differ in the long term from the latest projections by the INE and Eurostat (see Figure 7), or from the 2019 Opinion.

FIGURE 7. LIFE EXPECTANCY AT BIRTH. (YEARS)



Source: INE, Eurostat and AIReF.

BOX 2:

Potential impact associated with COVID-19 on mortality and survival curves

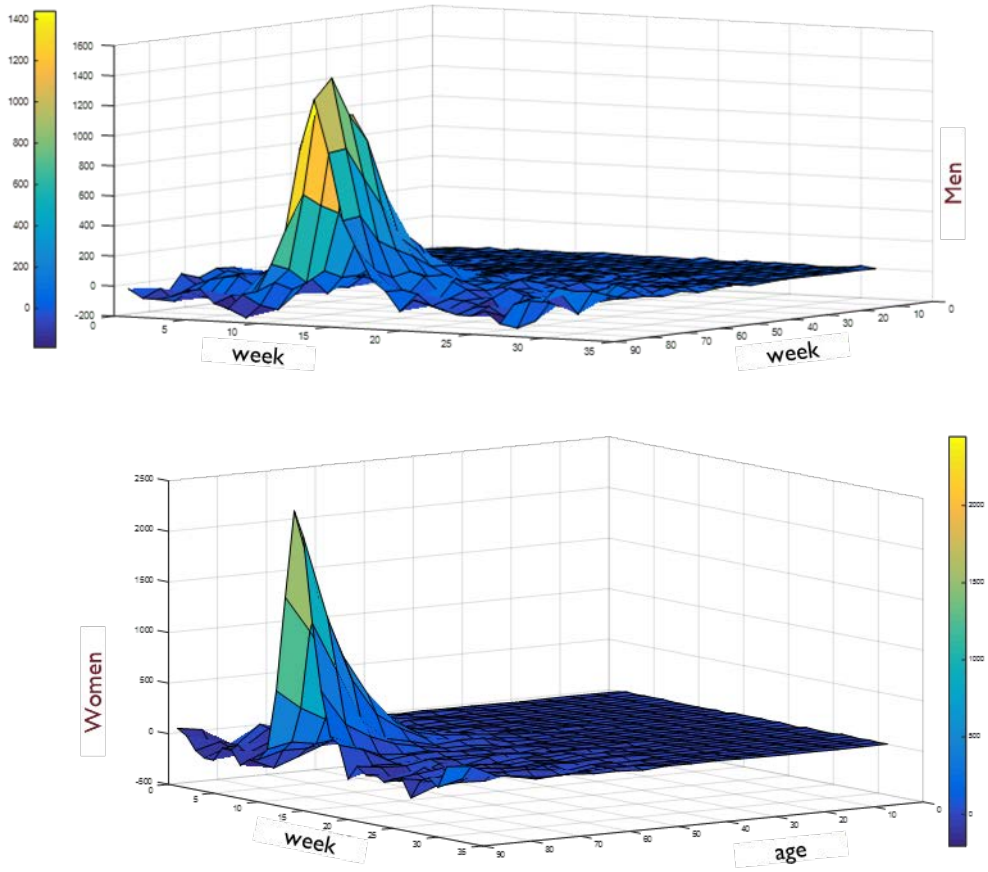
Institutions, such as the French National Institute for Demographic Studies (INED), are currently leading efforts to standardise the study of the impact of COVID-19 on demographic phenomena in the medium to long term, although it remains difficult to draw conclusions. The data available to date provide a clear picture of the impact on the crude mortality rate in 2020, with a particular impact on those aged over 75.

INE data on weekly deaths for 2019 and 2020 (using data available at the cut-off for the estimates, i.e. up to week 31 of the year) reveal an upturn in excess mortality for older age groups. There is also a marginal reduction in mortality compared with 2019 for age groups between 10 and 25. As a proxy for the impact of the COVID-19 on mortality rates, the rates of excess deaths compared with 2019 have been interpolated according to sex and age group, adapting them to the annual age groups of the demographic forecasts. For the sake of simplicity, it is assumed that there are no factors distinguishing the resident population with foreign nationalities from the resident population with Spanish nationality beyond the different age structure.

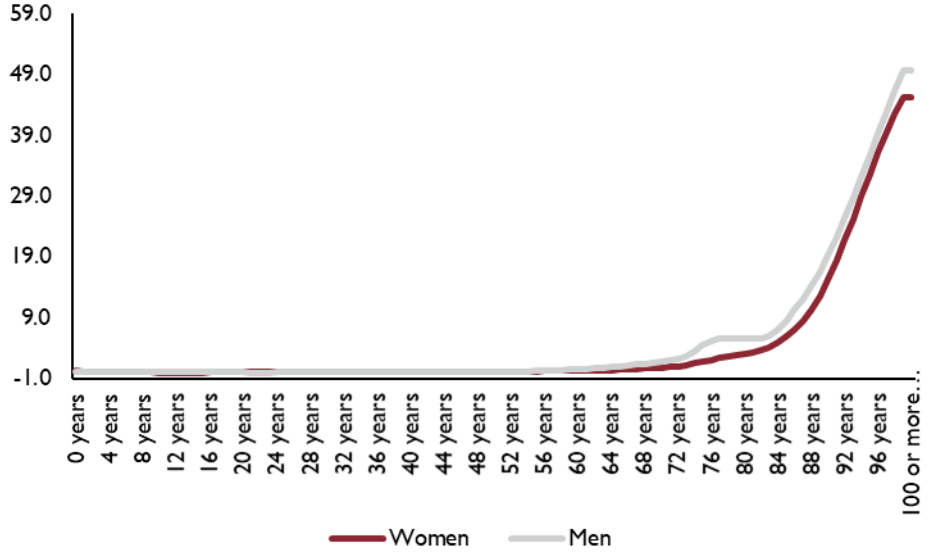
This excess mortality might be offset by a movement in the opposite direction in 2021 and 2022, in line with the behaviour observed in other phenomena,

such as heat waves or flu epidemics. Nevertheless, the current uncertainty about how long the pandemic will last has led to no offsetting being considered for those years.

AVERAGE WEEKLY EXCESS DEATHS COMPARED WITH 2019. BY FIVE-YEAR AGE GROUP AND SEX. ALL CAUSES.



WEEKLY EXCESS DEATHS COMPARED WITH 2019 PER THOUSAND PEOPLE BY ANNUAL AGE GROUPS AND SEX. ALL CAUSES.



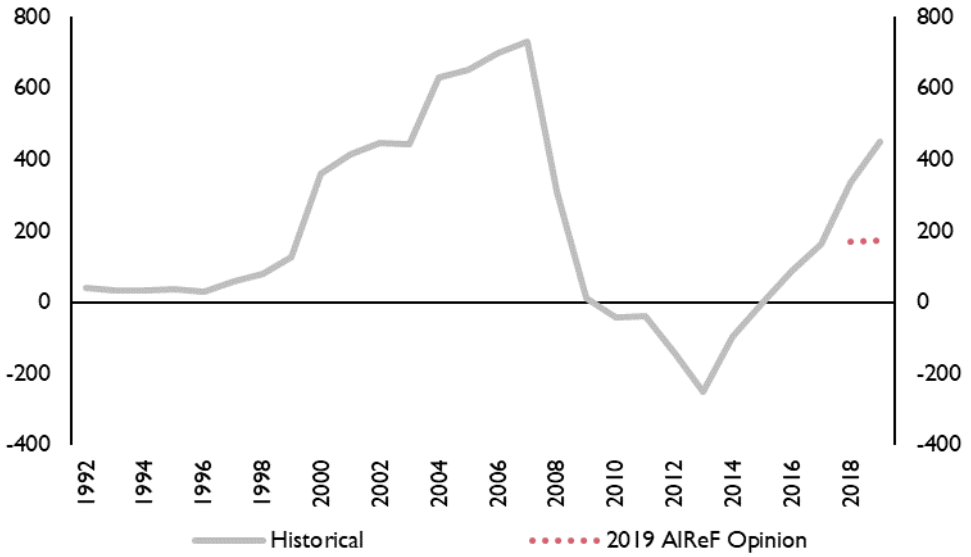
Source: AIReF based on INE data. Up to week 31 (27 July to 2 August).

2.3. Migration

There is a global trend towards greater mobility of working-age people and Spain has been no exception. Since 1990, three stages in the evolution of migration flows in Spain can be distinguished. In the first stage, between 1990 and 2007, there was positive and growing net immigration, especially from 2000, reaching a net inflow of over 730,000 people in 2007. In 2008, coinciding with the international financial crisis, there was an abrupt interruption in net inflows, which even became net outflows as from 2010. In 2014, there was a recovery in the flows that continues up to the latest observed data (see Figure 8).

The recovery of net immigration flows to Spain has been extremely intense, exceeding the forecasts made at the end of 2018 by AIReF and other institutions. Immigration recorded net inflows of 450,000 in 2019 (provisional data), over 275,000 people more than estimated for that year in AIReF's demographic forecasts. However, migration flows are expected to moderate in 2020, against the backdrop of the mobility restrictions linked to the COVID-19 crisis.

FIGURE 8. NET IMMIGRATION (THOUSAND PEOPLE)



Source: INE and AIReF.

AIReF has a gravity model for predicting migration flows developed by Fernández-Huertas Moraga, J., *et al* (2018) through which bilateral flows between all the countries in the world are estimated over the very long term on the basis of the UN's demographic scenarios and the IMF's growth projections. The main determinants of the probability of emigrating between each pair of countries are fixed factors (such as geographical distance or similarity of languages, histories or cultures), the demographic structure of each country, economic conditions that are proxied using GDP per capita and a network effect, which is proxied by the number of immigrants born in the country of origin and residing in the country of destination. The demographic forecasts are obtained from the UN's demographic scenarios and the economic forecasts from the IMF in the short term and the median from the data available in the long term. The model assumes that migration policies will remain constant in every country.

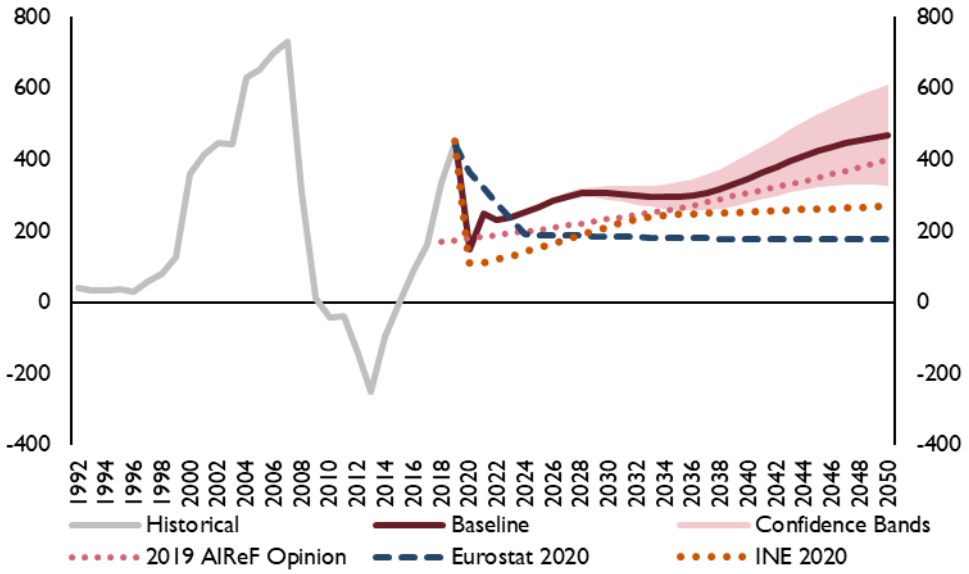
The results indicate an average annual net inflow of 330,000 people between 2020 and 2050. An external short-term adjustment to the forecasts offered by this model has been introduced to reflect the effect of COVID-19 on 2020 migration flows (see Box 3). After incorporating this short-term effect, a net migration forecast of 330.000 people per year is obtained. This figure is higher than the 275,000 people estimated two years ago, and the 197,000 people forecast by Eurostat (see Figure 9).

The breakdown by country of immigration flows to Spain maintains a relatively uniform distribution during most of the forecast period, focused on South America, Central America and the Maghreb. The main countries of origin of

immigration flows throughout a great deal of the period under analysis would be Morocco, Venezuela, Colombia, Peru and Ecuador. However, flows from some Central African countries, such as Nigeria and Angola, would start to rise towards the end of the forecast period.

With these results, the proportion of the foreign population over the total population would increase from the current 11% to almost 18%. This level is comparable with that of countries with a higher proportion of immigrants today (Sweden, Canada).

FIGURE 9. NET MIGRATION. FORECAST COMPARISON



BOX 1

Potential impact of COVID-19 on migration.

The effects of COVID-19 on global migration in the medium term are highly uncertain. In the short term, in contrast, a significant impact can be expected due to the mobility restrictions, and even border closures, that have been imposed in practically every country in the world since March 2020. These restrictions would lie behind the fact that migration flows may have fallen in 2020, but they might also have led to the stock of migrants in each country remaining practically stable, despite the higher rate of unemployment among immigrants.

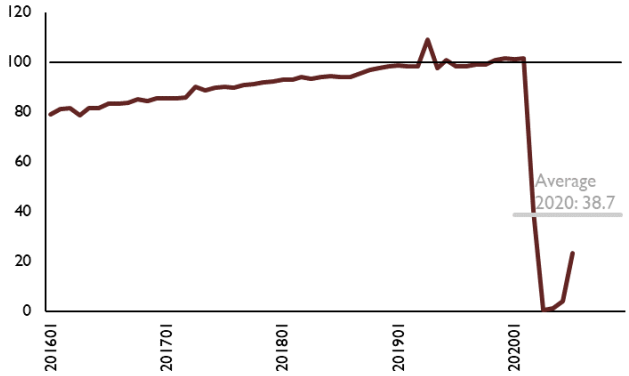
However, once mobility restrictions are eased, there may be factors that mitigate the contraction of migration flows to Spain. In particular, the high rate of COVID-19 among developing countries will deepen the economic shock, thus generating greater incentives for migration. It may therefore be

expected that, although migration flows will fall in the short term, they will stabilise in the medium term.

As a proxy for the short-term effect, we have worked on the assumption that the mobility restrictions are transferred to migration following a similar pattern to that observed to date in air passenger transport. This would mean that over the course of 2020, migration will fall to almost half the migration that would be observed in the absence of restrictions. This assumption is similar to that used by the Belgian Statistical Office (STATBEL) and the Federal Planning Bureau (BfP) in their analysis of the impact of COVID-19 (see Duyck, J., Paul, JM., Vandresse M. 2020).

PASSENGER AIR TRAFFIC AND ASSUMPTION ABOUT NORMALISATION OF MIGRATION.

INDEX 2019=100. CVEC



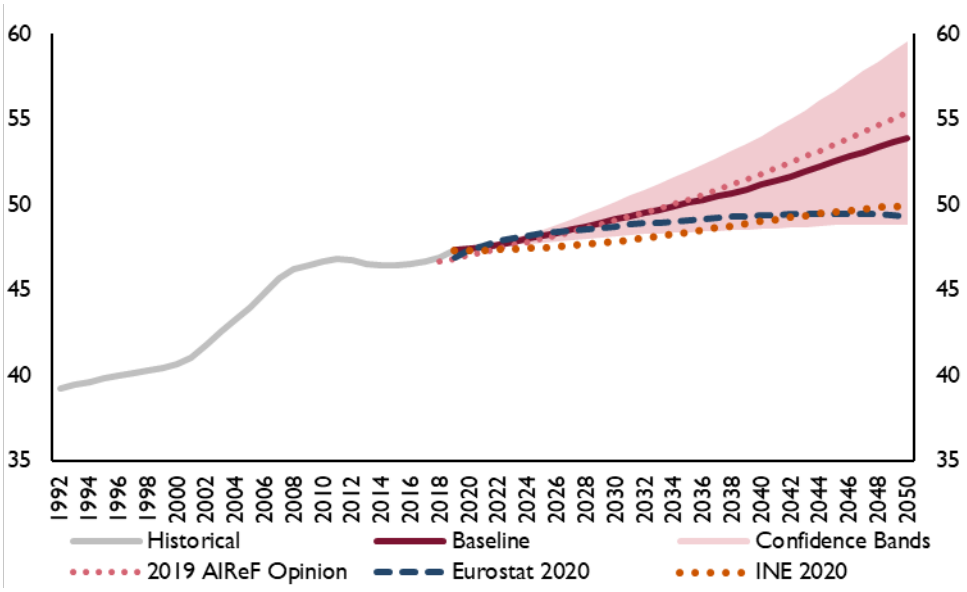
	Air Passengers (Index 2019=100)	Migrations
January	101.1	100.0
February	101.4	100.0
March	40.0	40.0
April	0.5	0.5
May	1.0	1.0
June	3.9	3.9
July	23.3	23.3
August		40.0
September		50.0
October		65.0
November		80.0
December		100.0
Average		50

Source: AENA and AIReF preparation.

2.4. Population forecasts

In its baseline scenario, AIReF estimates that the total population of Spain will rise from 47 to 54 million between 2019 and 2050 under the aforementioned fertility, life expectancy and net migration assumptions. The increase in the resident population estimated by AIReF is higher than that projected by Eurostat (2020) and the INE (2020) for that same year. These institutions estimate that the resident population will total 49 million and 50 million people in 2050, respectively, while AIReF raises the estimate to 54 million (see Figure 10). The discrepancies are largely due to the differences in expected immigrant inflows over the projection period.

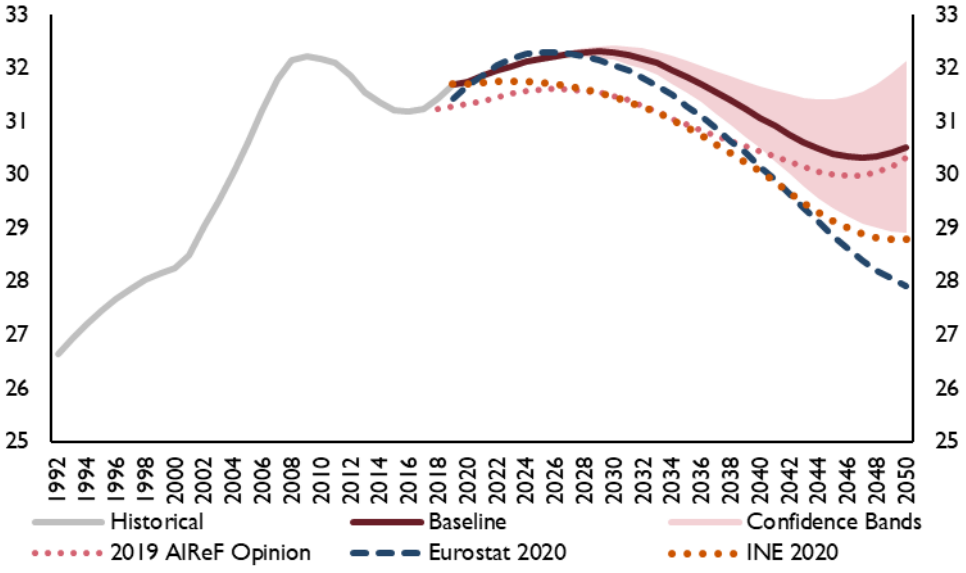
FIGURE 10. **TOTAL POPULATION (MILLION PEOPLE)**



Source: INE, Eurostat and AIReF.

The working-age population will remain above 30 million over the entire forecast horizon. The working-age population, defined as the population between 16 and 66 years of age, will gradually fall as from 2030 and stabilise by 2050 at values of over 30 million people. This forecast differs from those of the INE and Eurostat, which project that the working-age population will contract to around 28 million people by 2050 (see Figure 11).

FIGURE 11. **WORKING-AGE POPULATION (MILLION PEOPLE)**



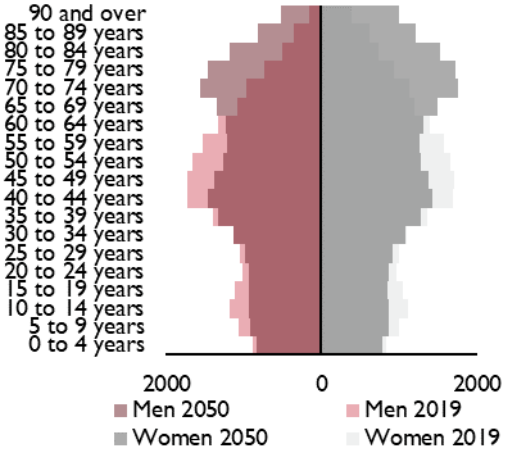
Source: INE, Eurostat and AIReF.

The changes in the population pyramid will reflect both the ageing of the population and the greater weight of the foreign resident population. By 2050, there will be an increase in advanced age groups in the Spanish population and an increase in practically all age groups of the resident population with foreign nationality.

FIGURE 12. DEMOGRAPHIC PYRAMID

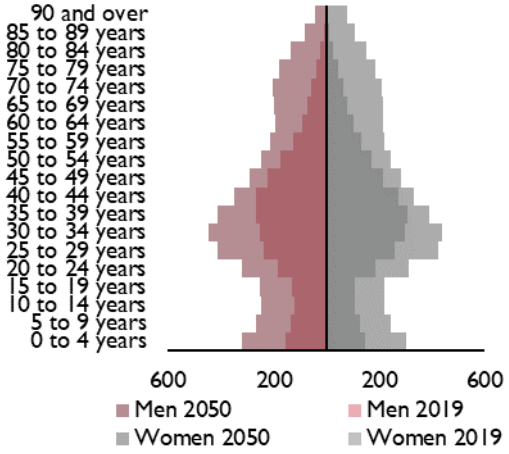
❶ The Spanish resident population will have a notably ageing structure...

Spanish Resident Population. Thousand people. Five-year age groups.



❷ ... while a younger structure is expected for the foreign population.

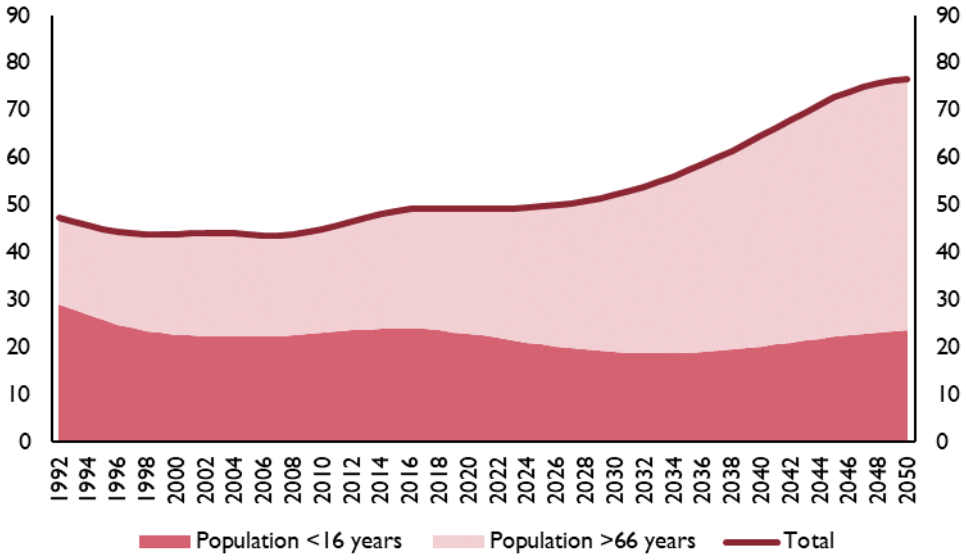
Foreign Resident Population. Thousand people. Five-year age groups.



Source: INE and AIReF.

The old-age dependency ratio (population aged over 66 divided by the working-age population) will double from 26% today to 53% in 2050. For its part, the dependency ratio, defined as the proportion of the population under 16 and over 66 years of age over the working-age population (aged between 16 and 66), will rise from 49% in 2019 to 77% by 2050.

FIGURE 13. BREAKDOWN OF THE DEPENDENCY RATIO (% OF POPULATION AT WORKING AGE).



Source: (AIReF)

3. MACROECONOMIC FORECASTS

3.1. Starting hypothesis

The preparation of the long-term macroeconomic scenario distinguishes three time horizons. The short term, which in this exercise refers to 2020 and 2021; the medium term, between 2022 and 2025, in which economic growth shifts towards its potential or long-term values; and the long term, between 2026 and 2050.

3.1.1. Short-term assumptions

In the short term (2020-2021), AIReF bases its estimates on the macroeconomic scenario of the Report on Budgetary Execution, Public Debt and the Expenditure Rule 2020, published in July 2020. In this report, the uncertainty resulting from the COVID-19 crisis led to forecasts in two alternative scenarios based on assumptions about the evolution of the pandemic. For the purposes of this exercise, it is considered that the development of the key variables (nominal GDP, real GDP, GDP deflator, inflation and employment) will be the average of the two published scenarios as shown in the following table.

TABLE 1. MACROECONOMIC SCENARIO

	SCENARIO 1 (growth rate)		SCENARIO 2 (growth rate)		AVERAGE	
	2.020	2.021	2.020	2.021	2.020	2.021
Nominal GDP (growth rate)	-9,7	6,0	-12,2	6,4	-11,0	6,2
Real GDP (growth rate)	-10,1	5,2	-12,4	5,8	-11,2	5,5
GDP deflator	0,4	0,8	0,2	0,6	0,3	0,7
CPI	-0,2	1,0	-0,8	0,8	-0,5	0,9
Total equivalent employment	-10,7	4,2	-12,8	4,6	-11,8	4,4

Source: AIReF assumptions.

3.1.2. Medium-term assumptions (2022-2025)

Over the medium term, the fundamental assumption is that the production gap that was opened by the COVID-19 crisis will gradually close until it is eliminated in 2025. This five-year transition period is significantly shorter than that required to close the gap opened following the financial crisis of 2008-2009. At that time, the Spanish economy had to cope with the downsizing process of some sectors, such as the construction sector, and the correction of the high debt levels and the current account imbalance that forced spending to be contained for a long period of time. On this occasion, the baseline scenario assumes that the COVID-19 crisis is of a transitory nature and therefore potential GDP growth maintains its path, growing in 2020 and 2021 at a similar rate to that of previous years, at 1.6%. As a result of this assumption, in 2020 the production gap is estimated to widen on an extraordinary basis, to -12.6% of potential GDP. This reflects the hibernation period that needed to be imposed on the economy and the subsequent persistence of social distancing measures. This gap will then gradually narrow until it disappears by 2025. For its part, real GDP growth converges with potential GDP over the same period, performing identically as from 2025. However, uncertainty about the structural impact that a crisis of this nature might have on the business world calls for sensitivity exercises where alternative paths for potential growth are assumed (see Section 4.3).

Inflation is assumed to converge from the expected figures in 2020 and 2021 in the short-term scenario to 1.8%, which is compatible with the European Central Bank's monetary policy reference value. Calculating nominal GDP also requires establishing an expected path for inflation. In this case, it is assumed that after recording rates of 0.3% in 2020 and 0.7% in 2021, there is a linear convergence towards the monetary policy reference value - an inflation rate close to, but below, 2%. In addition, from 2022 onwards, the GDP deflator and the consumer price index are assumed to maintain the same growth rates over the forecast horizon. The projected pathways for real GDP growth and inflation determine nominal GDP growth.

3.1.3. Long-term assumptions (2025-2050)

Finally, the long-term forecast is based on an integrative approach based on the production function developed in Pastor, A. and Vila, M., (2019). Under this approach, GDP is determined as a combination of the labour factor *(L)* and apparent labour productivity *(*ALP), which includes the effect of capital and technical progress. The labour factor is estimated through the product of the working-age population (WAP), the participation rate (*PART*) and the employment rate (1 minus the unemployment rate (U)).

GDP=L*ALP

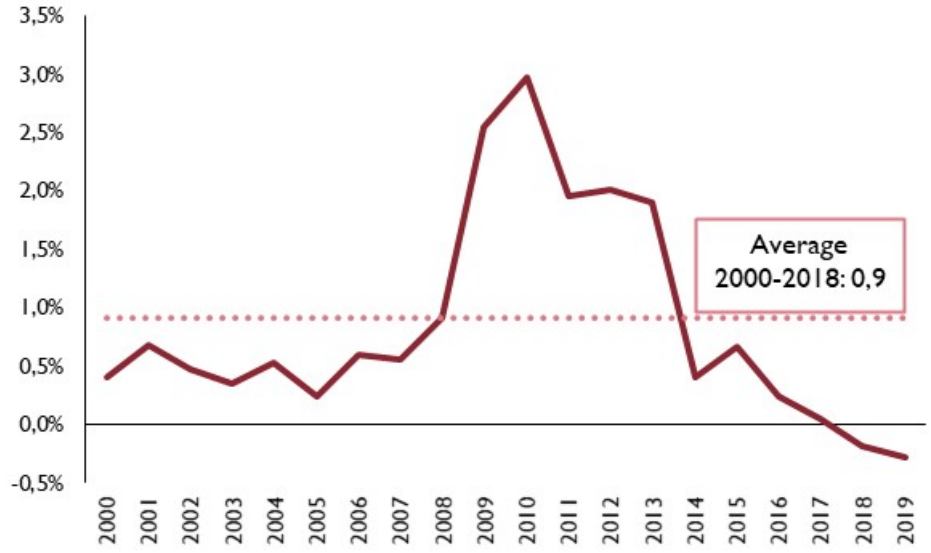
L=WAP*PART*(1-U)

Real GDP is obtained by making assumptions about the evolution of these variables. Specifically, the activity rate, the unemployment rate and labour productivity. The working-age population is taken from the demographic module.

3.1.3.1 Productivity

AIReF estimates that labour productivity growth will converge to 1.1pp by 2050. This value is slightly higher than its historical contribution, which has remained at around 1% per year from 2000 to 2019. The very moderate performance of productivity in the most recent period has led AIReF to revise downward the expected growth of this variable in the coming years. Thus, average productivity growth for the period 2020-2050 stands at 0.9%, in line with the historical average, but below the 1.2% established in the 2018 edition of the European Commission's *Ageing Report* (AR2018, European Commission, 2018) or the 1% estimated by AIReF in 2019. In the long term, however, the hypothesis of convergence towards its historical average, which is common in this literature, is maintained.

FIGURE 14. LABOUR PRODUCTIVITY



Source: INE and AIReF preparation.

3.1.3.2 Unemployment rate

The unemployment rate is defined as the ratio of unemployed people aged 15-74 to the active population of the same age. The historical data and its breakdown by age are obtained from the Labour Force Survey. It is considered that the baseline demographic and economic scenario, in which the working-age population declines while economic growth and, consequently, demand for labour is maintained, will lead to falls in structural unemployment.

AIReF considers gradual convergence from current levels of unemployment to an unemployment rate of 7% by 2050[7]. This convergence value, which is common in the empirical work performed for the Spanish economy, is determined from the median unemployment recorded in European countries. In 2019, average unemployment for the EU27 was 6.7%. In the case of the Spanish economy, however, it cannot be ignored that achieving these unemployment rates permanently would require a thorough reform of the labour market that would eliminate its structural deficiencies. The uncertainty surrounding this assumption suggests that scenarios of pension expenditure sensitivity to this variable should be carried out (see Sections 4.3 and 4.4).

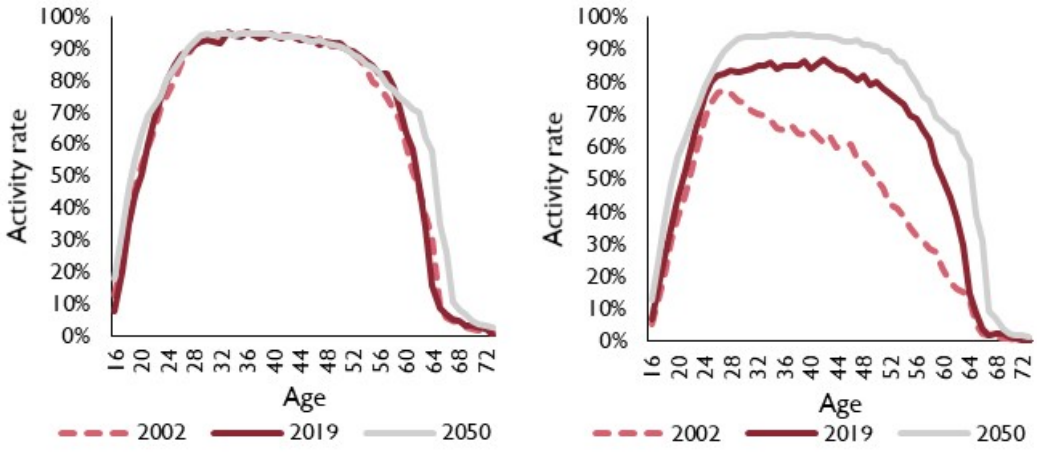
3.1.3.3 Activity rates

The male activity rate has remained at around 70% since the start of the century, while the female activity rate has risen from 45% to 60%. The activity rate is defined as the active population aged between 15 and 74 over the total population of the same age. The historical data are obtained from the microdata of the Labour Force Survey (LFS), which also allows for breakdowns by sex and simple ages[8]. Disaggregating by age, it is found that the male activity rate has remained relatively constant over the past 20 years, while the female activity rate has shown some convergence towards the male activity rate (see Figure 3). In addition, the activity rate of young people has not yet recovered the levels of prior to the 2008-09 financial crisis.

[7] The distribution of this unemployment rate by age and sex is assumed to be identical to that observed in the base year.

[8] The AIO variable is used, which defines the relationship with the activity of the interviewees, and includes employed people (values 3 and 4), unemployed people (values 5 and 6) and inactive people (values 7, 8 and 9).

FIGURE 15. ACTIVITY RATE OF MEN AND WOMEN. BASELINE SCENARIO



Source: INE and AIReF preparation.

The activity rate of young men is expected to converge towards the levels seen prior to the financial crisis until 2027. This implies an increase of 10 points in the activity rate of men under 25.

It is also assumed that the activity rates of women will progressively converge towards those observed for men, thus reducing the current gap, which at the average age stands at around 10 points, to around two points by 2050.

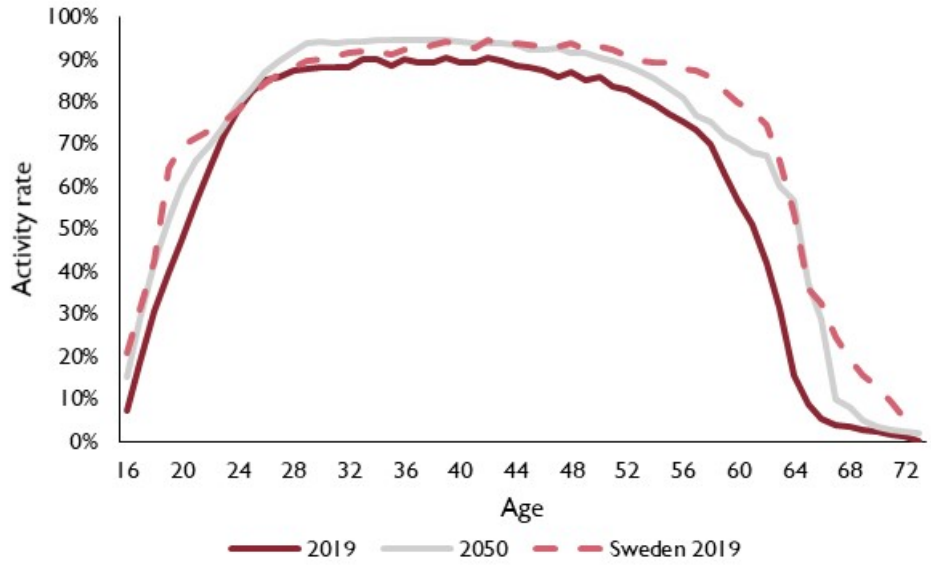
AIReF considers that the effect of the 2011 reform[9] during the forecast period will be to increase the effective retirement age by one and a half points, which will lead to an increase in the activity rates of older people. When the reform is fully implemented[10] and the statutory retirement age is extended to 67, particularly for workers with careers of less than 38 years, participation rates for older workers will increase. Specifically, the employment rate of workers aged over 65 will increase by over 4 points, from 4.9% to 9.1%.

The resulting activity curves raise the rate from 65.1% today to 67.4% in 2050. This would bring Spain closer to the European "top performers", as can be seen in the comparison of the participation rates of the baseline scenario with those of Sweden (see Figure 15). Germany, for its part, has a rate of over 69%.

[9] Law 27/2011 on the updating, adaptation and modernisation of the Social Security system

[10] The 2011 reform establishes, among other measures, a gradual increase in the statutory retirement age until 2027.

FIGURE 16. ACTIVITY RATE OF BOTH SEXES. COMPARISON WITH SWEDEN

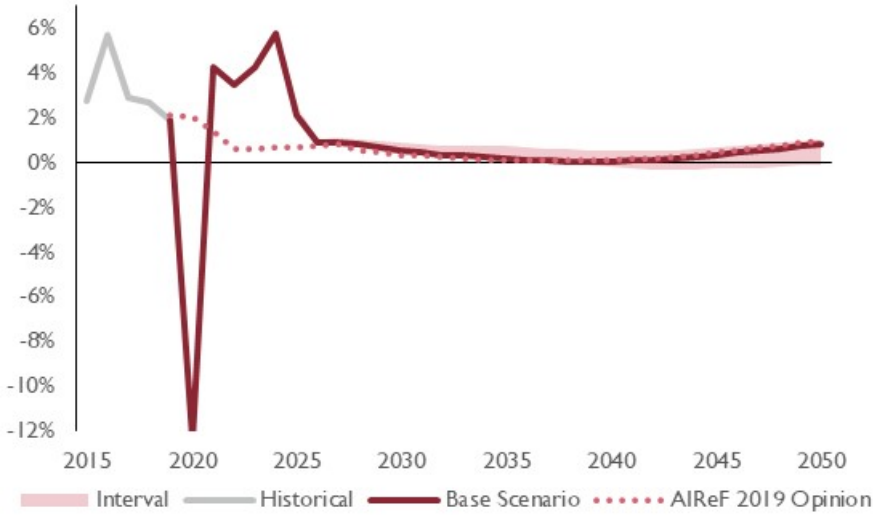


Source: INE, AR2018 and AIReF preparation.

3.1.3.4 Labour factor contribution

In its baseline scenario, AIReF estimates an average contribution of the labour factor to GDP growth of 0.5pp of GDP for the period 2020-2050. The contribution of the labour factor to GDP growth is estimated by combining the assumptions about the working-age population, the activity rate and the unemployment rate. The curve is Initially determined by the effect on employment of the COVID-19 crisis, but in the long term the key determinant is the working-age population, as shown by the similarity in the shape of the curves. The assumptions of the 2016 update of Eurostat's demographic projections lead to a reduction in the working-age population and, therefore, a reduction in the contribution of the labour factor, which even turns negative in the macroeconomic scenario of the AR2018. The latest update of Eurostat's demographic projections also estimates that the working-age population will fall.

FIGURE 17. LABOUR FACTOR (CONTRIBUTION TO GDP GROWTH)



Source: INE and assumptions AIReF 2020-2050.

3.1.3.5 Other macroeconomic assumptions

Inflation and the GDP deflator are considered to converge to 1.8% by 2025 and remain at that level thereafter. This rate matches the ECB's medium-term objective of keeping inflation rates below but close to 2%. The AR2018 assumes an inflation rate of 2%.

The average wage in the economy grows with productivity. This assumption is in line with standard microeconomic theory. The historical data are taken from the INE's Annual Labour Cost Survey.

3.2. Results

AIReF estimates that average annual growth in real GDP will be 1.4% for the period 2020-2050 (see Figure 6). The evolution is estimated on the basis of the assumptions relating to the inputs of the production function. This growth is somewhat higher than the 1.2% estimated by the Ageing Working Group (AWG) for AR2018.

FIGURE 18. REAL GDP PER CAPITA. GROWTH RATE

Source: INE, and AIReF 2020-2050 assumptions.

The difference in the macroeconomic forecast with regard to the AR2018 is mainly due to divergences in the population assumptions. Comparing the results with the historical data by component shows that the contribution of the labour factor to GDP growth in the AR2018 is much lower than that obtained under AIReF's demographic assumptions (see Table 2).

TABLE 2. COMPARISON OF MACROECONOMIC ASSUMPTIONS (AVERAGE)

		1981-2019	AIReF 2020-2050		AR2018 2018-2050
			Central	Range	
	Activity rate	58,3	65,4	+/-1,4	66,6
	Unemployment rate	16,6	10,9	+/-1,3	12,0
A	Labour factor contribution	1,2	0,5	+/-0,3	0,0
B	Productivity	1,1	0,9	+/-0,2	1,3
A+B	Real GDP	2,3	1,4	+/-0,5	1,3
	GDP per capita	1,4	1,0	+/-0,5	1,0

Source: INE, and AIReF 2020-2050 assumptions.

4. PENSION EXPENDITURE

AIReF has its own model for forecasting Social Security contributory pension expenditure (hereinafter, pension expenditure over GDP[11]) in Spain for the 2050 horizon. This model integrates the demographic and macroeconomic components discussed above with the institutional features of the pension system. This allows the impact of alternative demographic and macroeconomic scenarios or regulatory reforms to be modelled. The model estimates the expected evolution of pension expenditure as the product of the number of pensions and the average pension. The number of pensions is in turn obtained as the number of pensions of the previous period plus the number of new retirements in the period less the number of terminations. The number of new retirements in turn depends on the evolution of the population pyramid, activity rates and unemployment and the regulation of the pension system. The terminations are mainly the result of applying the mortality rates of the demographic scenario. The average pension depends on the evolution of wages and the pension system[12].

In this exercise, historical data from the Social Security and AIReF's own forecasts have been used for 2020 and 2021. Specifically, the model introduces registry data on new retirements, terminations, number of pensions and pension expenditure by age, sex and type of pension (retirement, disability and survivor's) between 2011 and 2019 and the Continuous Sample of Working Lives of 2018. For 2020 and 2021, AIReF's forecasts for the growth in the average pension and the number of pensions have been used.

The results of the model under the different scenarios allow the long-term evolution of the Social Security pension system to be analysed in terms of sustainability and adequacy. Regarding sustainability, the evolution of expenditure over GDP is analysed. Under the assumption that Social Security revenue grows at the same rate as GDP, this increase in expenditure would be

[11] For the sake of simplicity. The contributory pension expenditure of the Social Security accounts for almost 90% of public pension expenditure in Spain. The remaining percentage is made up of expenditure on contributory pensions of Social Security and State Civil Servants, a regime that is in extinction, and non-contributory pensions.

[12] For a more detailed description of the model, see Sections 3 and 4 of WP/2019/1 "AIReF model for forecasting pension expenditure in Spain".

carried over entirely to the deficit. The adequacy analysis is based on the evolution of the coverage rate, calculated as the average pension over the average wage.

AIReF considers that scenarios more adverse to the one proposed may materialise. To reflect the uncertainty inherent to these forecasts, an analysis of risk scenarios is added in which migration is lower, the unemployment rate higher and where the COVID-19 crisis has structural effects on the economy. Lastly, the analysis is completed with a study of the sensitivity of the estimates to changes in the assumptions. Specifically, the impact of changes in the main demographic and macroeconomic assumptions is assessed.

4.1. Baseline scenario

In its baseline scenario, AIReF estimates that pension expenditure will grow from 10.9% of GDP in 2019 to 14.2% in 2050 (3.3pp), one point more than the estimate in AIReF's 2019 Opinion (see Figure 7). Pension expenditure over GDP will soar in 2020 due to the contraction of the denominator as a result of the COVID-19 crisis to later moderate towards the end of this decade. Over the next two decades, expenditure over GDP will accelerate due to the retirement of the baby boom generation, reaching its highest value in 2046 (14.5% of GDP) and falling thereafter. The baseline scenario uses the demographic and macroeconomic baseline assumptions described in this document.

The coverage rate calculated as the average pension over the average wage will fall from 59.4% in 2019 to 53.3% in 2050. However, it will increase sharply in the first few years as a result of the effect on wages of the fall in GDP due to the COVID-19 crisis. As a result, pensions will grow at a higher rate than the average wage in the years in which the production gap closes, which leads to an increase in the coverage rate (see Figure 8).

The baseline scenario incorporates the effects of the 2011 reform and the implementation of the sustainability factor as from 2023. The impact of the 2011 reform is estimated at 2.9pp, while the sustainability factor will reduce spending by 0.9pp. Furthermore, following the principle of constant policies, it is assumed that pensions will rise in line with the CPI, as has been the case in the last three years and in line with the consensus expressed by all political forces. However, the legislation establishing the Pension Revaluation Index (PRI) mechanism is still formally in force. Under the assumptions of the baseline scenario and in the absence of revenue measures, the PRI will lead to an annual rise of 0.25% throughout the period, which should mean a reduction in

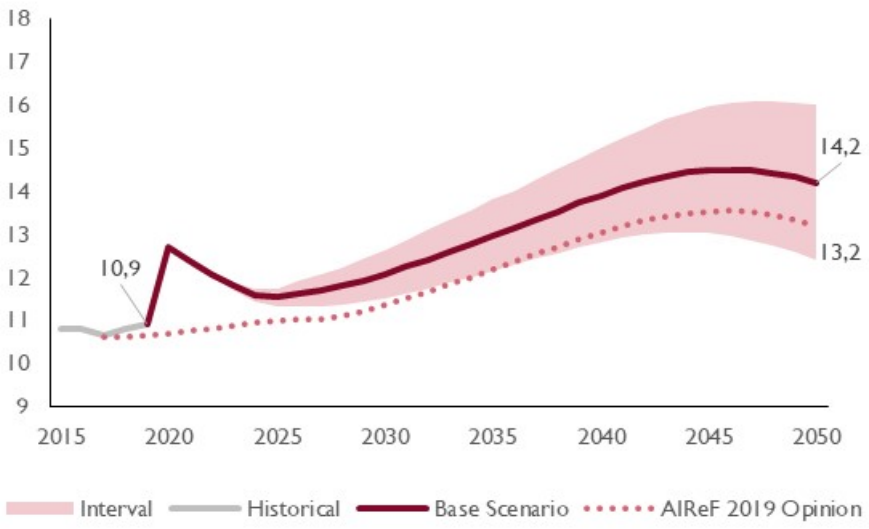
expenditure of 2.3pp in 2050 and a reduction of 8.5 points in the coverage rate.

TABLE 3. EVOLUTION OF PENSION EXPENDITURE, THE COVERAGE RATE AND DEBT

	Expenditure (% GDP)		Benefit ratio		Debt
	Value	Range	Value	Range	% GDP
2019	10,9	--	59,4%	--	--
2030	12,1	+/-0,6	61,7%	+/-0,3	8,8
2040	13,9	+/-1,1	57,6%	+/-1,5	27,8
2050	14,2	+/-1,8	53,3%	+/-2,9	56,3

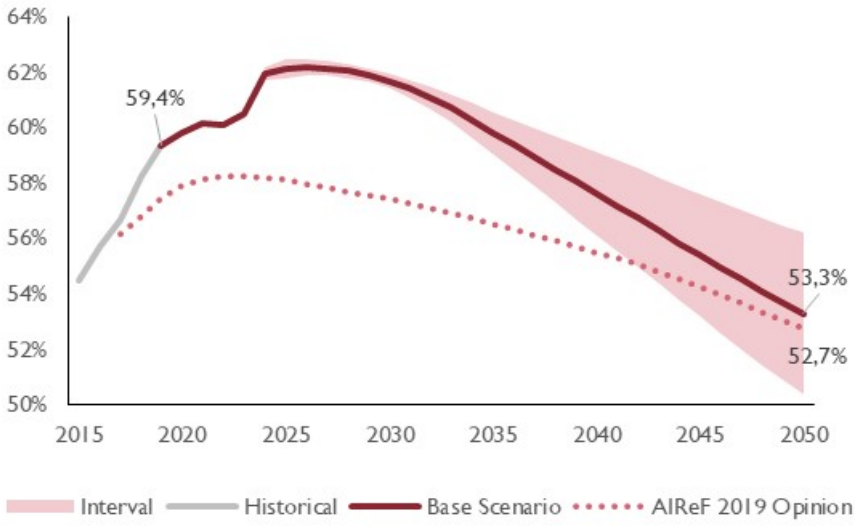
Source: INE, Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions

FIGURE 19. PENSION EXPENDITURE (% GDP)



Source: INE, Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions

FIGURE 20. COVERAGE RATE (AVERAGE PENSION / AVERAGE WAGE)



Source: INE, Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions

AIReF has revised upwards the forecast for pension expenditure over GDP compared with the 2019 Opinion, mainly as a result of the increase in the number of pensions and a more negative GDP forecast than two years ago. The average pension is lower in this forecast, which limits the increase in expenditure. This is due to greater ageing of the population, which is reflected both in a higher number of pensions and a lower average pension due to the increased impact of the sustainability factor (see Table 4). Part of this difference, 0.3 points, is a result of the difference with the starting point due to increased pension expenditure as a consequence of measures not included in the Opinion, such as the revaluation of non-contributory pensions and supplements to minimum income above the CPI.

TABLE 4. INPUTS OF PENSION EXPENDITURE

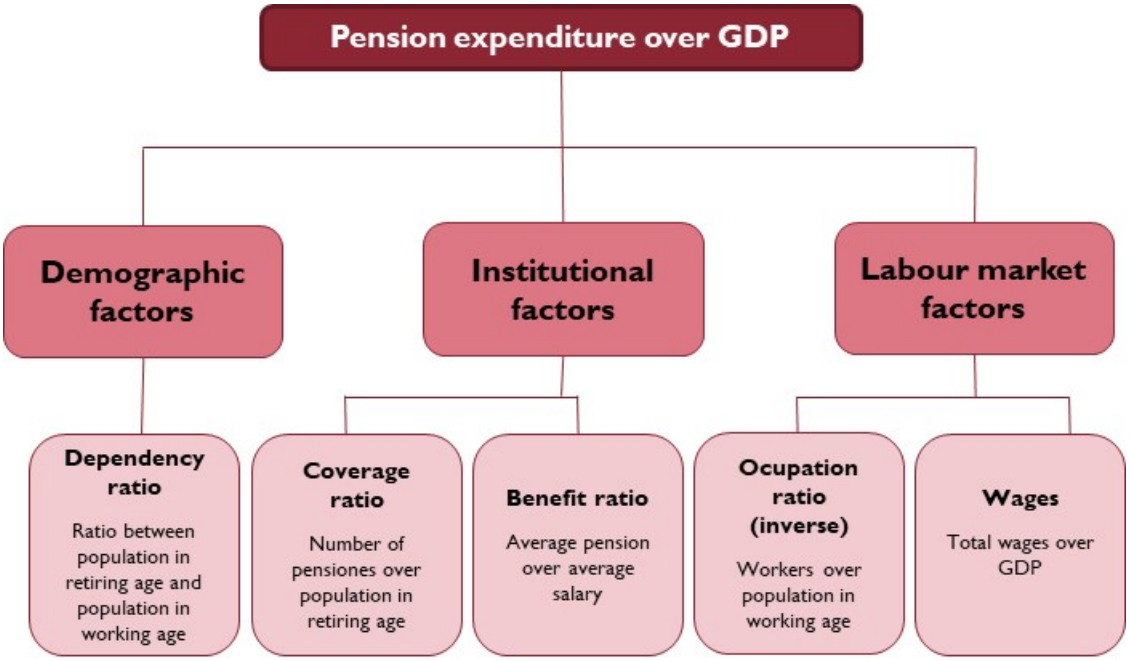
		AIReF 2020		AIReF 2019 Opinion	
	2019	2050	Av. growth rate	2050	Av. growth rate
Number of pensions (millions)	9,80	16,45	1,7%	15,26	1,4%
Av. Pension (€)	992	1.954	2,2%	2.171	2,6%
Nominal GDP (M€)	1.245	3.168	3,1%	3.517	3,4%
Expenditure / GDP	10,9	14,2	0,11	13,2	0,07

Source: Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

The rise in pension expenditure can be broken down into demographic, institutional and labour market factors. The demographic factor is reflected in the evolution of the dependency ratio. Institutional factors are reflected in the

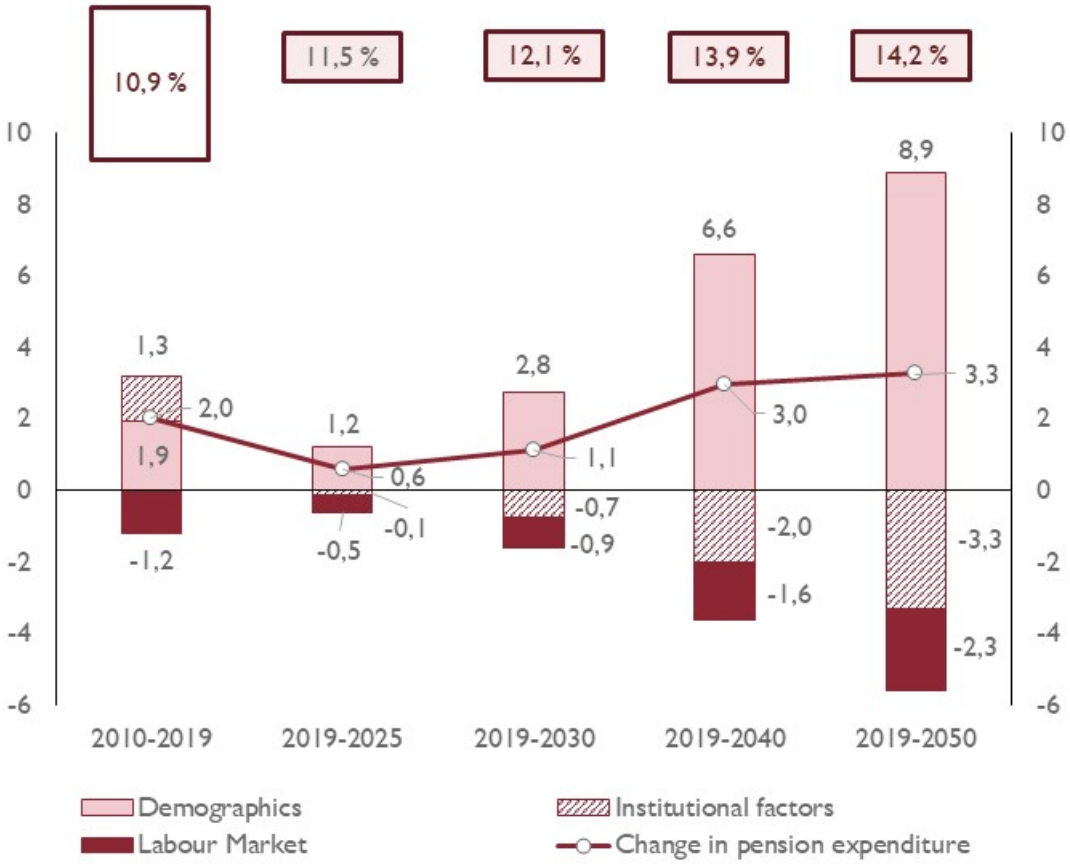
eligibility ratio and the coverage rate. For its part, the labour market is shown in the evolution of the inverse of the employment rate and labour participation.

TABLE 5. BREAKDOWN OF PENSION EXPENDITURE



The key factor in the rise in pension expenditure is demographics, while institutional and labour market factors moderate this growth (see Figure 10). The downward push on expenditure exerted by institutional and labour market factors will intensify during the projection as a result of full application of the 2011 reform and the sustainability factor.

FIGURE 21. FACTORS OF CHANGE IN PENSION EXPENDITURE OVER GDP



Source: INE, Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions

4.2. Parametric reforms

AIReF estimates that the 2011 reform will reduce expenditure by 2.9 points of GDP by 2050. Measuring the impact by factor, the impact of the demographic factor reduces it by one point, the institutional factor by 1.6pp and the labour market factor by 0.3. For its part, the impact of the sustainability factor will be 0.9pp, which is included in the institutional factor as it directly affects the average pension and, therefore, the coverage rate.

AIReF believes that parametric reforms are an appropriate way to tackle the long-term challenge to the sustainability of the system posed by ageing. Specifically, the 2019 Opinion proposed further extending the parametric reforms introduced in the pension system in 2011. These offer a way to reduce the increase in pension expenditure in the long term, thus improving their sustainability, while at the same time moderating the impact on adequacy.

AIReF has re-examined the two reform proposals set out in the Opinion:

1. **Delaying the effective retirement age by two years would reduce expenditure by 0.8pp by 2050 and improve the coverage rate by 1.6pp.** In our forecast, the effective retirement age has been deemed to be the age of exit from the labour market. According to that assumption, in 2019 that value stands at 62.6 compared with a statutory retirement age slightly over 65. It is expected to reach 64.1 in 2027, when the statutory age will be 67. There is considered to be scope for raising the effective age through means that do not necessarily imply an increase in the statutory age as almost 40% of the population retire before the ordinary retirement age and under 10% delay the time of retirement beyond the minimum statutory age for doing so (see Table 5).

TABLE 6. NEW RETIREMENTS BY AGE

	NEW PENSIONS			
	2019		2020 (until July)	
Age	Number	% new pensions	Número	% new pensions
Before 65 years of age	120.011	39,6%	56.537	37,6%
Legal age (65 years of age)	155.939	51,4%	78.939	52,5%
Delay in retirement age	27.444	9,0%	14.886	9,9%

Source: State Secretariat for Social Security.

TABLE 7. INTERNATIONAL COMPARISON OF RETIREMENT AGE

	Age of exit of labour market (2018)	Legal retirement age (legal early retirement age)			
		2018	2020	2040	2060
Spain 2019	62.1	65.6 (63)	65.8 (63)	67 (63)	67 (63)
Spain 2050 (Central)	64,1				
España 2050 (Aumento Edad)	66.0				
Alemania	64	65.7 (63)	65.8 (63)	67 (63)	67 (63)
Francia	60.8	65.9 (60,8)	67 (62)	67 (62)	67 (62)
Italia	63.3	66	66.8	68.4 (65.4)	70 (67)
Suecia	66.4	67 (61)	67 (61)	67 (61)	67 (61)
Reino Unido	64.7	65 (65)	66 (66)	66,7 (66,7)	68 (68)

Source: OECD (exit age) and European Commission (retirement age - AR2018)

2. **Increasing the contribution career considered for calculating the pension from the 25 years of the baseline scenario to 35 years in 2027 would control spending by 0.6pp.** An international comparison shows

that there is scope for increasing the number of years of the contribution career, which is relatively low in Spain compared with comparable countries[13]. The coverage rate would fall by 2.1pp compared with the baseline scenario. Such a measure would strengthen the contributory nature of the system and encourage lifelong contributions.

TABLE 8. INTERNATIONAL COMPARISON OF CONTRIBUTORY PERIODS FOR CALCULATING PENSIONS

	Reference period used to calculate pension
Spain	Last 25 years (2022)
Germany	Full career
France	Best 25 years
Italy	Full career
Netherlands	Years of residence
Portugal	Full career up to last 40 years
Sweden	Full career
United Kingdom	Years of contribution

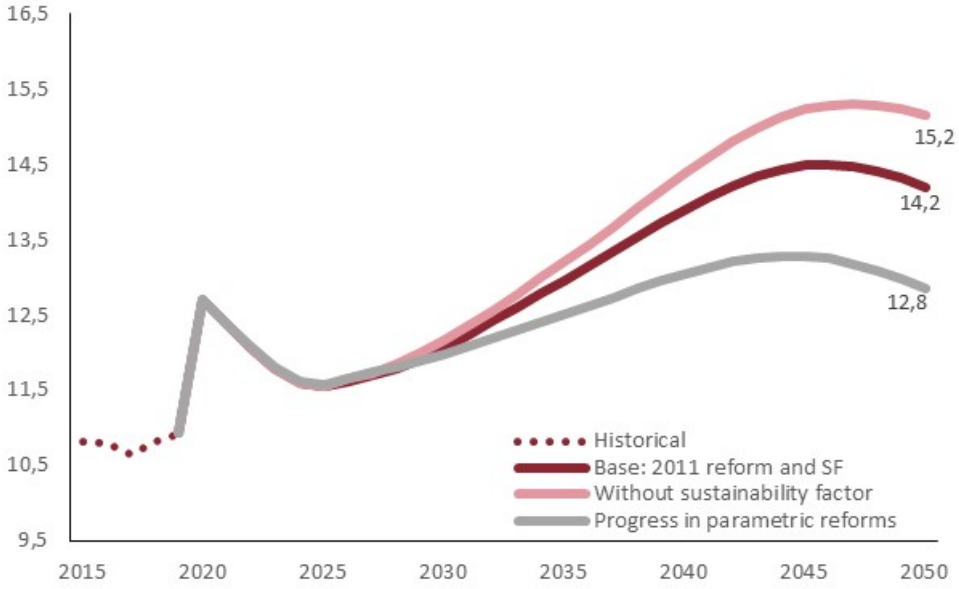
Source: European Commission (AR2018)

The combination of the two measures would contain pension expenditure over GDP by 1.4pp in 2050 and reduce the coverage rate by 0.6pp. This would reduce the increase in expenditure, which would be 1.9pp of GDP in 2050 more than in 2019. These types of reforms would be a way to reduce the long-term increase in pension expenditure, thus improving their sustainability, while at the same time mitigating the impact on adequacy. The two measures can be combined to varying degrees in order to achieve the desired level of expenditure containment and system adequacy.

Finally, the entry into force from 2023 of the sustainability factor will contain expenditure by 0.9pp in 2050. The impact is greater than that estimated two years ago due to the fact that the new demographic forecasts provide for a higher life expectancy at 67 years of age. In the 2013 reform, the sustainability factor was expected to enter into force in 2019, but it was later put back to 2023. It should be pointed out that most comparable countries have some type of mechanism that links the entry pension to life expectancy.

[13]The most common system in neighbouring countries is to consider the entire working career to calculate the initial pension. However, the Continuous Sample of Working Lives does not have data on the full contribution careers and it is therefore not be possible to simulate that measure.

FIGURE 22. PENSION EXPENDITURE OVER GDP. BASELINE SCENARIO, SCENARIO OF FURTHER EXTENSION OF PARAMETRIC REFORMS AND SCENARIO WITHOUT SUSTAINABILITY FACTOR



Source: Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

TABLE 9. IMPACT ON EXPENDITURE, COVERAGE RATE AND DEBT

	Pension expenditure			Benefit ratio	Impact on debt
	2019	2035	2050	2050	2050
Expenditure / GDP	**10,9**	**13,0**	**14,2**	**53,3**	**56,3**
Without sustainability factor	--	0,2	0,9	56,9	65,9
Increase in effective retirement age (1)	--	-0,1	-0,8	54,9	40,7
Increase in years of reference (2)	--	-0,3	-0,6	51,2	47,9
Progress in parametric reforms (1)+(2)	--	-0,4	-1,4	52,7	40,2

Source: Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

4.3. Risk scenarios

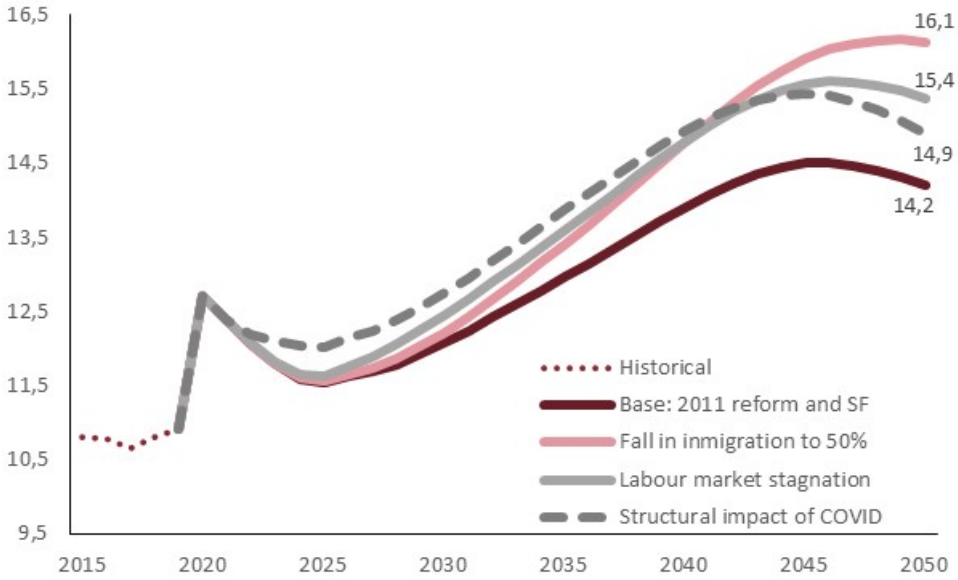
AIReF quantifies the effect of more adverse scenarios than the one proposed as the baseline. The uncertainty around the demographic and macroeconomic forecasts is high, particularly with regard to some variables. A certain evolution of the variables is assumed in the baseline scenario that is subject to a high number of conditioning factors, including implementation of various public policies and exogenous elements, such as the current COVID-19 crisis. Three risk scenarios from among the many that might materialise are set out below.

The halving of annual net migration flows would cause expenditure to rise by 1.9pp in 2050 and the coverage rate to fall from 53.3% to 53.1%. The migration flows forecast in the baseline scenario are closely linked to the maintenance of a favourable macroeconomic scenario in relation to other economies and maintenance of current migration policies. If these assumptions are not fulfilled and as a result the annual net migration flow is half that forecast in the baseline scenario, the working-age population would fall, which will have a direct impact on the economy's GDP, raising expenditure mainly due to the denominator effect.

Lower labour market dynamism, both in terms of unemployment and activity, would lead to an increase in pension expenditure of 1.2pp to 15.4% of GDP in 2050 and an increase in the coverage rate to 54.6%. The baseline scenario estimates that structural unemployment will fall from the estimated level prior to the crisis (the EU estimated a NAWRU for Spain of around 14.5%) to 7%. This assumption is common in forecasting exercises, but it would require a number of labour market reforms. AIReF presents a scenario of a slowdown in the labour market, in which unemployment converges to 10% and activity rates lose some of the dynamism of the baseline scenario, only rising from 65.1% in 2019 to 66.1% in 2050 instead of up to the 67.5% of the baseline scenario. The increase in expenditure is explained by the contraction of the denominator due to the reduction in the contribution of the labour factor to potential GDP growth, which drops from 0.8 to 0.6 in 2050. The coverage rate rises because the average pension grows more than the average wage, which remains at similar levels to those in the baseline scenario, given that productivity remains largely unchanged.

A scenario in which the COVID-19 crisis has structural effects on the economy raises expenditure by 0.7pp from the baseline scenario to 14.9% of GDP and increases the coverage rate from 53.3% to 55.2%. Although it has been assumed in the baseline scenario that the current crisis will have no structural effects on the Spanish economy, at the time of publication, the duration and possible permanent socio-economic effects of the COVID-19 pandemic are unknown. The structural effects have been simulated by considering that potential GDP for 2020 falls by 2.5% (instead of maintaining its growth of around 1.6%). Furthermore, the convergence of productivity to 1.1% does not take place until 2050, instead of in 2035. The increase in expenditure is almost exclusively due to the denominator effect, while the increase in the coverage rate is due to the drop in wages. Although the average pension also falls, it does so to a lesser extent than wages, especially in the early years.

FIGURE 23. PENSION EXPENDITURE OVER GDP. RISK SCENARIOS



Source: Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

TABLE 10. IMPACT ON EXPENDITURE, COVERAGE RATE AND DEBT

	Pension expenditure			Benefit ratio	Impact on debt
	2019	2035	2050	2050	2050
Expenditure / GDP	**10,9**	**13,0**	**14,2**	**53,3**	**56,3**
Fall in inmigration to 50%	--	0,4	1,9	53,1	79,4
Labour market stagnation	--	0,6	1,2	54,6	74,2
Structural impact of COVID	--	0,9	0,7	55,2	78,2

Source: Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

4.4. Sensitivity analysis

AIReF has performed an analysis of the estimate's sensitivity to changes in the assumptions. Specifically, the impact on sustainability and adequacy of changes in the main demographic and macroeconomic assumptions is assessed.

Within demographic factors, changes in fertility, survival and migration assumptions are simulated. Apart from the impact of reducing migration by half discussed in the previous section, the effect of an increase in the fertility rate is simulated so that it converges to 1.7 by 2050 instead of 1.4. This change has very little effect as the path of the number of children per woman hardly changes until 2030, and the changes in fertility take about 15 or 20 years to impact on GDP, when those born start to join the workforce. Additional

analyses have shown that if the number of children per woman were to increase by 30% today, the impact in 2050 would be a 0.5pp reduction in expenditure. In addition, with regard to survival, an increase in life expectancy of two years by 2050 would increase expenditure by approximately 0.4pp.

Within the macroeconomic factors, changes in productivity, the participation rate and the unemployment rate are simulated. An increase in the participation rate of 2 points in 2050 (up to 69.5%) would reduce expenditure by 0.2 points. An increase in the convergence value of the apparent labour productivity growth rate from 1.1% to 1.6% would reduce expenditure by 0.7pp. Finally, if the convergence value of the unemployment rate is not 7% but 10%, expenditure will rise by 0.4pp. If unemployment converges to the historical value in Spain (an average of 16.3% between 2002 and 2019), expenditure would rise by 1.5pp by 2050.

TABLE 11. SENSITIVITY OF PENSION EXPENDITURE TO CHANGES IN THE MAIN ASSUMPTIONS

	Pension expenditure		
	2019	2035	2050
Expenditure / GDP	**10,9**	**13,0**	**14,2**
↓ Net inmigration down 50% every year 2019-50		0,4	1,9
Δ Fertility + 0,3 children per women in 2050		-	-
Δ Life Expectancy + 2 years in 2050		-	0,4
Δ Productivity convergence to 1,6pp		-0,3	-0,7
Δ Activity + 2 p.p. 2050		-0,3	-0,2
Δ Unemployment 3 p.p. in 2050		0,2	0,4
Δ Unemployment to historical value 2002-2019 in 2050 (16,3%)		0,5	1,5

Source: INE, Ministry of Inclusion, Social Security and Migration and AIReF's 2020-2050 assumptions.

5. CONCLUSIONS

In its baseline scenario, AIReF estimates that pension expenditure in 2050 will stand at 14.2% of GDP, a rise of 3.3 points on current levels. This is an increase of 1 point over the baseline scenario in the 2019 Opinion. Part of this difference, 0.3 points, is a result of the difference with the starting point due to increased pension expenditure as a consequence of measures not included in the Opinion, such as the revaluation of non-contributory pensions and supplements to minimum income above the CPI.

The structural deficit of the Social Security system remains at levels similar to, or higher than, those estimated in the 2019 Opinion. At that time, AIReF estimated a structural deficit of between 1.3% and 1.5% of GDP. However, as a result of the COVID-19 crisis, the nominal deficit would rise significantly due to the measures taken and lower incomes due to the deterioration of the labour market. Although this deficit will fall as the measures are withdrawn and the economy recovers, the current situation of uncertainty prevents the structural deficit been quantified for the time being.

The conclusions of the 2019 Opinion remain valid in the short and long term and, therefore, its proposals remain fully valid. In the short term, it remains necessary to address the structural deficit of the Social Security system in order to place the deficit in that part of the government that has the tools to solve it. In this way, it would be viewed as a problem for the government as a whole and it would reduce the current uncertainty with regard to the sustainability of the Social Security system, which distorts the decisions of workers and pensioners. However, a short-term solution for the Social Security's deficit should not reduce the need to address long-term challenges.

In the long term, further extending the parametric reforms of the system is a way of improving its sustainability. Encouraging the raising of the effective retirement rate and increasing the pension contributory period beyond 25 years in line with the rules in other European countries would allow the expected increase in pension expenditure to be reduced. Early implementation of the reforms would allow more gradual application, thus facilitating social acceptance and the adaptation of agents' decision-making to the new situation.

There is a great deal of uncertainty around the demographic and macroeconomic projections and more adverse scenarios may materialise. In this case, the uncertainty inherent to such long-term forecasts is compounded by the crisis we are currently enduring as a result of COVID-19. As the risk scenarios and sensitivity exercises described in this document show, the materialisation of circumstances that are more adverse than those expected would raise the pressure of the increase in pension expenditure. This high level of uncertainty means that it is advisable to begin studying and debating other options that will guarantee the system's sustainability, adequacy and equity should more adverse scenarios materialise. It is also essential to implement policies that facilitate the materialisation of more favourable scenarios, taking advantage of the opportunities which, for example, will be provided by a good design and prompt execution of the European Recovery and Resilience Plan in order to raise the potential growth of our economy and reduce its structural unemployment rate.

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