

SPAIN COUNTRY FICHE

**AGEING WORKING GROUP October 2017 projection exercise
(2016-2070)**

IMPACT OF AGEING POPULATIONS ON PENSIONS

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EXECUTIVE SUMMARY

This country fiche was presented to the Ageing Working Group (AWG) on 19th October 2017 and once endorsed by the Economic Policy Committee its results shall be included in the Ageing Report 2018 (AR2018).

From the Ageing Report 2015 (AR2015) revisions on the ratio of projected pension expenditure to GDP have been observed. The AR2018 expects a similar total decrease to that of the previous projection up to 2060 (0.8 p.p. in both exercises), going from 12.2 to 11.4 p.p. of GDP, whereas the AR2015 expected an evolution from 11.8 to 11.0 p.p.

The main difference in the new projection is the larger peak in the 2040s in the current projection (14.4 p.p. vs 12.6 p.p. in the AR2015). This is due to both the demographic projections and the worsening of the macroeconomic assumptions in this exercise.

From 2060 to 2070 a further 0.7 p.p. decrease of the expenditure to GDP ratio is expected.

The great macroeconomic adjustment stems from the update in the population projection of Eurostat 2015. Eurostat now projects the overall population of Spain to increase from 46 million to about 50 million by 2070, compared to the stability in population in the previous projections. This correction is mainly explained by the positive levels of net migration expected all through the projection, and the much higher fertility rate. Still, the old age dependency in the AR2018 remains roughly the same as in the previous projection, going from 28.6 to 62.3 in 2048. However, in the last two decades the continued inflows of migrants and the larger fertility rate cause the dependency ratio to decrease down to 46.6. In sum, this evolution of the dependency ratio puts upwards pressure in expenditure during the period 2016-50, but downward pressure thereafter. All factors taken into account, the change in assumptions increases the expenditure to GDP ratio by 0.4 p.p. in 2060.

I. OVERVIEW OF THE PENSION SYSTEM

I.1. Pension Schemes

a) The public system is based on two schemes: an earnings-related social security scheme and a non-earnings related basic scheme. In this projection exercise the earnings-related pensions (including complements to reach the minimum pension) and the old-age non-earnings related pensions have been considered.

- The **earnings-related social security scheme** is a mandatory pay-as-you-go public system and consists of two parts. The Social Security manages the main part, whose expenditure amounted to 10.8% of GDP in 2016. It covers the self-employed, the employees in the private sector and part of the employees at the central, regional and local public administrations.

The military and part of the central, regional and local government employees have their pensions directly managed by the central government (*Clases Pasivas del Estado*, CPE). Its expenditure amounted to 1.2% of GDP in 2016. It has been closed to new entrants as of 1-1-2011. All new civil servants since then join the Social Security system. In 2016, employees under this system were around 803 thousand persons and they will be declining throughout the projection period driven by retirement and mortality. CPE also includes non-earnings related war pensions, amounting to less than 0.012% of GDP in 2016.

Pensions from the Social Security are financed by contributions (from employers, employees, self-employed and part of the unemployed¹) and by state transfers to finance minimum pension complements. Pensions from the CPE system are financed by contributions from the employees and from direct payments of the central government.

Pension benefits are taxed as labour income, except some disability pensions (absolute permanent and great disability pensions). Compulsory social contributions are excluded from the income tax base.

- The **non-earnings related** basic scheme is granted, as a general rule, to people with income below a threshold set every year in the Budget Law (annual €5,164 in 2016 for the basic amount). The benefit is means-tested and no previous contribution is required. It is quantitatively of less importance (0.1% of GDP for old-age pensions).

b) Private pensions are voluntary (non-mandatory), supplementary and cover both individual and occupational pension funds (63% individual and 37% occupational of total private pension funds' assets in 2016). Occupational pensions include occupational plans and collective pension insurance plans (with retirement benefit purposes). Private plans are funded and mostly defined-contribution schemes. Occupational private pension schemes are agreed in the wage bargaining framework. They are usually financed by employers and employees. Private pension benefits are also taxed as labour income. Contributions to private pension plans enjoy a favourable tax treatment following the ETT principle (Exempt contributions, Taxed investment income and capital gains of the pension institution, Taxed

¹ All unemployed receiving benefits, and subsidies if aged over 55.

benefits) with the exception of collective insurance that does not enjoy tax exemptions. Private pensions amount to 0.5% of GDP in 2016.

I.2. Main Pension Formulas

The calculation method for pensions managed by the Social Security is earnings-based. Both the Social Security system and the *Clases Pasivas del Estado* system include retirement pensions, disability pensions and survivor pensions.

a) Social Security System

Old age pensions

Eligibility requirements

In order to be eligible for a contributory retirement pension 15 years of contributions need to be recorded, and at least 2 of these in the last 15 years before the statutory retirement age.

Since the 2011 reform, the statutory retirement age is gradually increasing from 65 in 2012 to 67 in 2027. Workers with contributory careers of more than 38.5 years are allowed to retire at 65 with a full pension.

Early retirement. Since the 2013 reform, early retirement for involuntary retirees (collective dismissals) requires a minimum retirement age of 63 years (increasing progressively from 61 in 2013 to 63 in 2027) and a minimum contributory period of 33 years (same as before). Early retirement for voluntary retirees requires a minimum age of 65 (increasing progressively from 63 in 2013 to 65 in 2027), a minimum contributory period of 35 years (previously 35) and the computed benefit must be greater than the minimum pension.

Reduction coefficients become stiffer in most cases as shown in the Table below.

New (and previous) reduction coefficients for every year remaining until statutory age				
	<38.5 years	38.5-41.5	41.5-44.5	>44.5 years
Involuntary early retirement	7.5% (7.5%)	7.0% (6.5%)	6.5% (6.5%)	6.0% (6.5%)
Voluntary early retirement	8.0% (7.5%)	7.5% (6.5%)	7.0% (6.5%)	6.5% (6.5%)

Early partial retirement. The 2013 reform restricted access to early partial retirement. For longer careers (longer than 36.5 years) the minimum age is increased progressively between 2013 and 2027 from 61 to 63 years. For medium careers (between 33 and 36.5 years) the minimum age is raised progressively from 61 to 65 years. For careers shorter than 33 years, partial retirement is not possible (before the reform only 30 years were required).

Late retirement. The 2011 reform increased premiums for late retirement: +2%, +2¾%, and +4% for an extra year, respectively, for careers below 25 years, between 25 and 37, and over 37. This adds to the normal accrual rate for year of contribution and allows surpassing the maximum pension (though not the maximum contributory base that is the highest upper limit).

Table 1 summarises the regulatory qualifying conditions for retirement, while **Tables 2a, 2b and 2c** illustrate the actual distribution of the age at which people starts to receive a pension.

Table 1 shows the legislated statutory retirement age and the contributory period required, the earliest retirement age and the maximum accumulated penalties in case of earliest retirement, for both voluntary and involuntary retirement. Males and females are subject to the same rules. In the case that a worker with a 40-year career decides voluntarily to retire at the earliest possible age (63 years), the penalty is 15%, 7.5% for each of the two years remaining to reach the statutory retirement age. For involuntary retirement, the earliest retirement age is 61 years and the annual penalty 7%, so that the corresponding penalty is 28%.

For longer contributory periods (over 38 years), the statutory retirement age remains 65.

TABLE 1		Qualifying condition for retiring						
		2016	2020	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension	Contributory period	35.5	36	37	37	37	37	37
	Statutory retirement age	65.33	65.83	67	67	67	67	67
Qualifying condition for retirement WITHOUT a full pension Voluntary	Early retirement age - men	63.33	63.83	65	65	65	65	65
	Penalty in case of earliest retirement age	16%	16%	16%	16%	16%	16%	16%
	Bonus in case of late retirement	>=2%	>=2%	>=2%	>=2%	>=2%	>=2%	>=2%
	Minimum contributory period - men	35	35	35	35	35	35	35
	Minimum residence period - women	:	:	:	:	:	:	:
Qualifying condition for retirement WITHOUT a full pension Involuntary	Early retirement age - men	61.33	61.83	63	63	63	63	63
	Penalty in case of earliest retirement age	30%	30%	30%	30%	30%	30%	30%
	Bonus in case of late retirement	:	:	:	:	:	:	:
	Minimum contributory period - men	33	33	33	33	33	33	33
	Minimum residence period - women	:	:	:	:	:	:	:

TABLE 2a						Number of new pensioners by age group - administrative data (MEN)				
Age group	All	Old age	Disability	Survivor	Other (including minimum)					
15 - 49	30,515	87	18,833	9,988	1,607					
50 - 54	12,546	428	10,261	1,550	307					
55 - 59	19,867	3,473	14,482	1,722	190					
60 - 64	103,439	90,962	10,825	1,573	79					
65 - 69	123,229	121,598	109	1,509	13					
70 - 74	5,901	4,408	20	1,470	3					

TABLE 2b						Number of new pensioners by age group - administrative data (WOMEN)				
Age group	All	Old age	Disability	Survivor	Other (including minimum)					
15 - 49	26,116	22	10,287	14,286	1,521					
50 - 54	11,294	40	5,236	5,637	381					
55 - 59	14,529	146	6,277	7,843	263					
60 - 64	55,069	39,471	5,110	10,340	148					
65 - 69	88,385	73,369	266	14,708	42					
70 - 74	19,276	2,636	43	16,580	17					

TABLE 2c						Number of new pensioners by age group - administrative data (TOTAL)				
Age group	All	Old age	Disability	Survivor	Other (including minimum)					
15 - 49	56,631	109	29,120	24,274	3,128					
50 - 54	23,840	468	15,497	7,187	688					
55 - 59	34,396	3,619	20,759	9,565	453					
60 - 64	158,508	130,433	15,935	11,913	227					
65 - 69	211,614	194,967	375	16,217	55					
70 - 74	25,177	7,044	63	18,050	20					

Calculation of pensions

The pension benefit is calculated as a percentage of the pensionable earnings (the regulatory base, RB). The RB is the average of last years' contribution bases. The period used to calculate pensionable earnings will gradually increase from the last 15 years to 25 years (by 2022). By 2022 the RB will be the average of the contribution

bases (CB) of 300 months prior to retirement (divided by 350). The contribution base (CB) is essentially the monthly earned income within thresholds (the lower bound depends on the occupational category of the worker and the upper bound is the same for all workers). CBs corresponding to the 24 months just prior to retirement are computed in nominal terms. The remaining CBs are updated according to the evolution of the Consumer Price Index.

The 48 most recent months are computed using the minimum CB, and all the previous months using 50% of the minimum CB, instead of 100% of the minimum base.

In the model, the contributions to GDP ratio is kept constant as behavioural changes are not modelled, although it must be noted that increasing the pensionable period in previous reforms (from 2 to 8 years in 1985 and from 8 to 15 years in 1997) incentivised longer contributory records. In any case, a contribution increase would not affect significantly the Social Security balance over the long run since it would be compensated afterwards by a higher average pension.

Compatibility between retirement pension and work. Since 2013 the contributory retirement pension is compatible with any work, both wage- and self-employed, carried out by the pensioner, provided the pensioner has reached the statutory retirement age; the pensioner is entitled to receive a full pension. The compatible work can be both full-time and part-time. The pension benefit will be equivalent to half of the amount the pensioner would be entitled to. For those already retired, the benefit will be half of the amount being perceived up to that moment, excluding minimum complements. The pensioner will not have the right to receive minimum complements. He/she will be considered pensioner for all legal purposes. Once the labour contract or the self-employed activity is ended, the full benefit will be re-established. During the working period, worker and employer will only be subject to contributions regarding professional contingencies and temporary disability.

Measures to avoid discrimination against elder workers in collective dismissals. Since 2013, in order to promote the lengthening of working life, firms have to make a special economic contribution to the pension system when workers over 50 are laid-out in collective dismissals.

Disability pensions take into account the level and the cause of disability, the age of the worker and whether or not the worker is currently employed and contributing. For statistical purposes, after 65 years of age they are registered as retirement pensions.

Survivors' pensions include widow(ers), orphans and other relatives' pensions. In the case of active persons causing a survivor pension, contribution requirements are needed. The pension benefit for the widow(er) amounts to 52 percent of the deceased spouse's RB (in some cases 70%). For the orphans, it is 20 percent of RB. For other relatives, the pension benefit amounts to 20 percent of the RB, but it can be increased to 52 percent if there are neither widow(ers) nor orphans. In any case, the total pension benefit for the family cannot exceed 100 percent of the RB.

b) *Clases Pasivas del Estado* system

Retirement pensions: the eligibility requirements for old age pensions are 65 years of age and 15 years of contributions. Since 1997, civil servants can retire after the age of 65 up to 70 on a voluntary basis. Under the CPE scheme, early retirement is possible at 60,

provided workers have contributed for at least 30 years. However, the pension calculation is less favourable in general. The RB depends on the category the civil servant belongs to and the number of contributory years and is indexed to prices. The accrual rate for the pension benefit depends on the whole career. This system has been closed to new entrants as of 1-1-2011.

c) Indexation and valorisation rules

Since 2014, all contributory pensions, including minimum pensions and civil servants' pensions, increase annually according to the Index for Pension Revaluation, instead of the CPI indexation traditionally used. The index is established annually in the National Budget Law at a level consistent with a balanced budget of the Social Security system over the medium run.

The IPR seeks to ensure the sustainability of the public pension system over the medium run by reaching a balanced budget in structural terms. To this aim, this index determines an annual growth of pension expenditure in pace with the public pension revenues over the medium term.

This indexation method guarantees pension expenditure increases cannot be financed while there are structural deficits in the pension system. The IPR can only be increased as long as the growth in revenues covers the growth in the number of pensions and the growth in the value of the new pensions versus the previous ones. Moreover, a part of the structural deficit has to be corrected each year.

Additionally, the IPR must lie between a bottom cap of 0.25, to ensure pensions are not reduced, and a top cap given by the year-on-year percentage change in annual CPI on December of year t plus 0.5%.

The sustainability factor is an automatic link between the amount of retirement pension benefits and developments in life expectancy of pensioners. It will be applied only once on each pensioner when determining the initial amount of a new pension. It will come into effect in 2019.

Since the Ageing Report 2015 (AR2015) no major reforms have been adopted, as the reference model used during this projection exercise already took into account the 2011 and 2013 pension reforms (Law 27/2011, Royal Decree- law 5/2013 and Law 23/2013), which constitute the latest pension reforms and are entering gradually into force.

I.2. "Constant policy" assumptions on pension revaluation

The model applies a 'no policy change' assumption.

Traditionally, pension benefits (of those already retired) had been indexed to inflation. After the introduction of the 2013 reforms, **all existing earning-related pensions are projected to be indexed to the new Index for Pension Revaluation (IPR)**. Non-contributory pensions are still linked to wages, given that they are not covered in the 2013 reform and that their starting level provides room for improvement.

On the other hand, new pensions have a minimum and a maximum threshold, which are set annually in the annual Budget Law. In the past, minimum pensions have been tracking wages, while the maximum pensions have followed inflation. As a consequence, the general rule in the model is that **new pensions are projected to be linked to wages, with the exception of maximum new pensions, which are assumed to follow inflation**. Moreover, all women new pensions are raised by an additional constant coefficient reflecting the partial convergence to men in career duration. On top of that, new pensions are adjusted by the 2011 reform and by the Sustainability Factor.

The Contributory Bases (CBs) used to compute new pension benefits are also determined in the annual Budget Law. In recent years, maximum CBs have increased significantly above maximum new pensions. As a consequence, **all CBs are assumed to grow in line with wages** and contributions over GDP are kept constant throughout the projection period.

These assumptions seek to project a reasonable evolution for the variables involved. However, they reflect subjective choices taken by the modellers among a pool of other reasonable alternatives and so their results must be considered with caution.

The resulting projected divergence between CBs and new pensions and the assumption of maximum and minimum new pensions growing above the IPR are key features determining the results of this model.

II: DEMOGRAPHIC AND LABOUR FORCES PROJECTIONS

II.1. Demographic developments

The age pyramid and Table 3 provide an overview of the demographic developments until 2070. The size of the population is expected to grow from 46 million to close to 50 million in 2070. This represents a sensible increase from the previous projection round, which is explained mainly by increased migration flows in the first part of the considered time horizon and a much larger fertility rate all through the projection.

The age composition shows significant changes. The old age dependency ratio doubles its starting level in the 2040s, although it is on a downward trend since 2048. The increase in the dependency ratio results from both the increase in the size of the cohorts that reach the age of 65 and beyond (relative to working age population) and the increase in life expectancy at 65. Regardless of all the differences, the dependency ratio remains fairly similar to the one in the AR2015 all through the projection period.

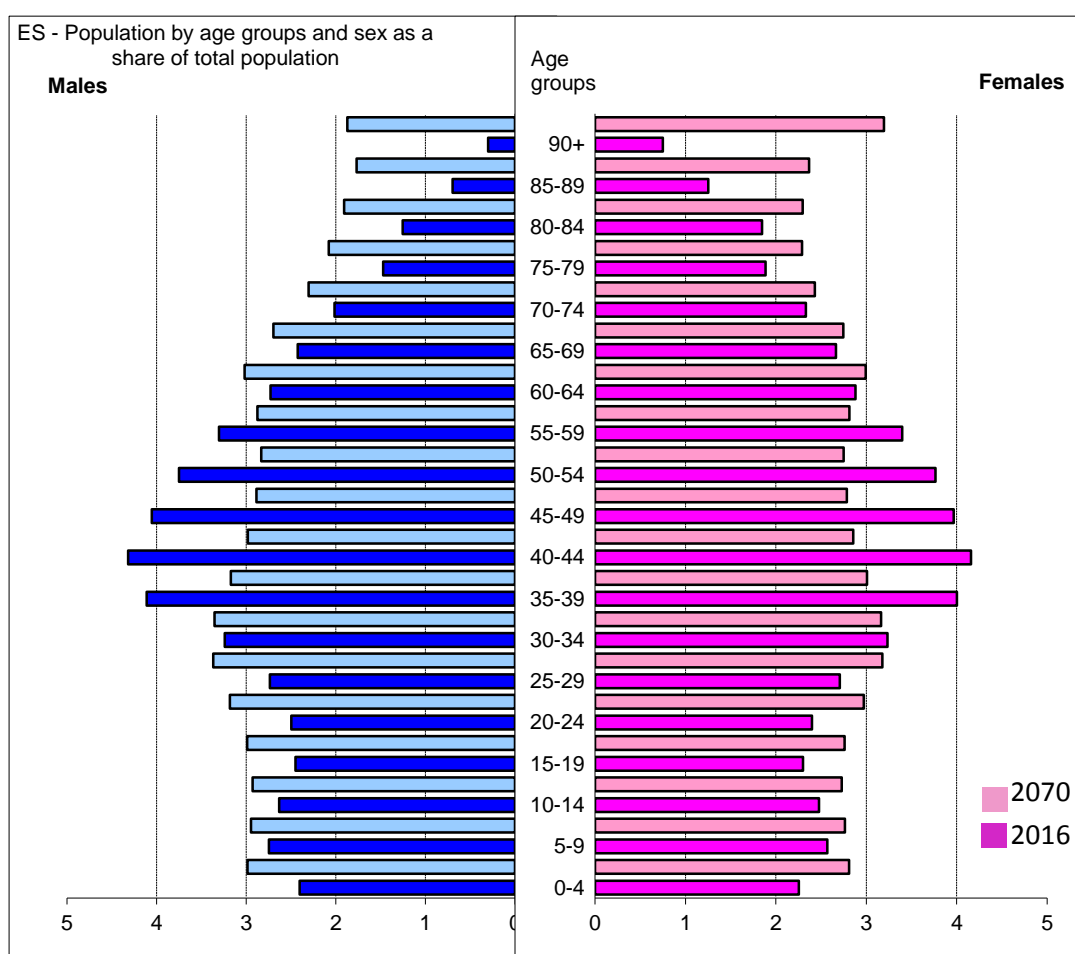


Table 3 Main demographic variables evolution								
	2016	2020	2030	2040	2050	2060	2070	Peak year*
Population (thousand)	46,443	46,582	47,155	48,310	49,288	49,562	49,861	2070
Population growth rate	0.0	0.1	0.2	0.3	0.1	0.0	0.1	2040
Old-age dependency ratio (pop65/pop15-64)	28.6	31.0	40.8	54.7	61.9	53.2	46.6	2048
Ageing of the aged (pop80+/pop65+)	32.3	31.1	30.6	32.3	39.2	50.5	48.0	2063
Men - Life expectancy at birth	80.5	81.0	82.3	83.6	84.8	85.9	86.9	2070
Men - Life expectancy at 65	19.3	19.6	20.6	21.5	22.3	23.2	23.9	2069
Women - Life expectancy at birth	86.0	86.3	87.4	88.4	89.4	90.3	91.2	2070
Women - Life expectancy at 65	23.2	23.4	24.3	25.1	25.9	26.6	27.3	2069
Men - Survivor rate at 65+	88.2	88.7	90.3	91.7	92.8	93.8	94.6	2070
Men - Survivor rate at 80+	62.2	63.6	67.9	71.9	75.4	78.5	81.3	2070
Women - Survivor rate at 65+	94.1	94.4	95.1	95.7	96.3	96.7	97.1	2070
Women - Survivor rate at 80+	80.0	80.8	83.3	85.5	87.4	89.0	90.5	2070
Net migration	12.9	51.2	119.4	163.4	170.9	153.8	136.8	2050
Net migration over population change	-11.2	1.3	1.4	1.3	2.7	14.2	2.2	2060

II.2. Labour force projections

Table 4 provides an overview of the main changes that are expected to take place in the labour market among elderly workers in the period from 2016 to 2070. It is remarkable that labour force participation for ages 55 to 64 will increase from 59.2 to 81.8%, and for ages 65 to 74 from 3.6 to 22.8%.

Table 4 Participation rate, employment rate and share of workers for the age groups 55-64 and 65-74								
	2016	2020	2030	2040	2050	2060	2070	Peak year*
Labour force participation rate 55-64	59.2	66.8	78.5	81.5	81.8	82.4	81.8	2061
Employment rate for workers aged 55-64	49.1	57.4	69.3	74.1	76.5	77.1	76.6	2061
Share of workers aged 55-64 on the labour force 55-64	83.0	85.9	88.3	91.0	93.6	93.6	93.6	2056
Labour force participation rate 65-74	3.6	7.9	17.9	20.7	18.9	20.7	22.8	2070
Employment rate for workers aged 65-74	3.5	7.7	17.4	20.2	18.6	20.4	22.5	2070
Share of workers aged 65-74 on the labour force 65-74	96.1	96.5	97.1	97.8	98.5	98.5	98.4	2052
Median age of the labour force	41.0	43.0	46.0	43.0	41.0	42.0	41.0	2028

Table 5 focuses on career lengths and durations of retirement. The average effective age of retirement rises intensely in the transitional phase 2017-27 of the 2011 pension reform and less so thereafter. The average working career is extended significantly as a result. Despite higher retirement ages, the duration of retirement will rise by more than 2 years due to a higher increase in longevity. The proportion of early retirees to late retirees will drop very significantly.

TABLE 5a Labour market effective exit age and expected duration of life spent at retirement - MEN								
	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM) (II)	63.4	64.8	66.0	66.1	66.1	66.1	66.2	2070
Contributory period	39.7	40.2	41.4	41.5	41.6	41.6	41.7	2070
Duration of retirement	20.9	19.6	19.8	20.6	21.5	22.3	23.1	2070
Duration of retirement/contributory period	0.5	0.5	0.5	0.5	0.5	0.5	0.6	2070
Percentage of adult life spent at retirement	31.5	29.5	29.2	30.0	30.9	31.7	32.4	2070
Early/late exit	6.4	2.6	1.2	0.9	0.7	0.9	0.7	2017

TABLE 5b Labour market effective exit age and expected duration of life spent at retirement - WOMEN								
	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM) (II)	64.5	65.8	66.5	66.6	66.6	66.6	66.7	2070
Contributory period	32.5	33.3	35.3	36.2	37.1	38.0	38.8	2070
Duration of retirement	24.1	22.6	22.5	23.3	24.0	24.8	25.5	2070
Duration of retirement/contributory period	0.7	0.7	0.6	0.6	0.6	0.7	0.7	2016
Percentage of adult life spent at retirement	34.1	32.1	31.7	32.4	33.1	33.8	34.4	2016
Early/late exit	5.1	1.7	0.9	0.8	0.6	0.7	0.6	2017

III. PENSION PROJECTION RESULTS

III.1. Extent of the coverage of the pension schemes in the projections. The projection covers the following pension systems:

- a) **Contributory Public Pensions:** The model covers old-age and early retirement, disability and survivor pensions under the Social Security and the Civil Servant systems. These include the complements to minimum pensions (requiring at least 15 years of contribution). It also includes the SOVI regime (pensions for persons having contributed only before 1967) and other fading pension schemes².
- b) **Non-earnings related Public Pensions:** These are non-earnings means-tested basic pensions³. They accounted for 0.1% of GDP in 2016. Women account for 77% of old-age non-earnings related pensions⁴.
- c) **Private pensions:** Occupational and personal individual pension funds (both are voluntary).

In Table 6, the difference between ESSPROS and AWG public pension expenditure is shown. Discrepancies are explained by minor schemes not accounted for in AWG projections such as former pension schemes linked to social assistance (e.g. LISMI for the handicapped) or complements by local and regional governments and by mutual funds for civil servants. Moreover, ESSPROS excludes all insurance policies taken out on the private initiative of individuals or households solely in their own interest, i.e. private individual pensions.

TABLE 6 Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)								
	2007	2008	2009	2010	2011	2012	2013	2014
1 Eurostat total pension expenditure	9.0	9.2	10.1	10.5	11.1	11.8	12.6	12.8
2 Eurostat public pension expenditure	0.0	0.0	0.0	10.1	10.6	11.4	12.1	12.3
3 Public pension expenditure (AWG)	8.3	8.5	9.3	9.8	10.5	11.4	12.1	12.3
4 Difference (2) - (3)	-8.3	-8.5	-9.3	0.3	0.1	0.0	0.0	0.0

² SOVI pensions can be awarded to persons accrediting contributions before 1967 (but who stopped working afterwards). Persons belonging to mutualism pension schemes after 1967 are awarded additional contribution years (assuming they started working at the minimum working-age).

³ Regulation of these pensions started in 1990 (Law 26/1990).

⁴ In the questionnaire, they are included in the old age public pensions, in line 20 (...of which minimum pensions (non-contributory) i.e. minimum income guarantees for people above 65)

III.2. Overview of projection results

a) Projected total spending

The public pension expenditure in the baseline scenario will decrease by 1.5 p.p. of GDP from 2016 to 2070. **The level in 2070 reaches 10.7% of GDP.** Compared to the 2015 projections, expenditure in 2060 is 0.2 p.p. larger. GDP level and other aggregates for the base year 2016 used in this projection exercise follow the 2010 European System of National and Regional Accounts (ESA-2010).

Expenditure	2016	2020	2030	2040	2050	2060	2070	Peak year*
Gross public pension expenditure	12.2	12.3	12.6	13.9	13.9	11.4	10.7	2045
Private occupational pensions	0.2	0.2	0.3	0.5	0.5	0.4	0.3	2044
Private individual pensions	0.3	0.4	0.5	0.6	0.6	0.5	0.4	2041
<i>Mandatory private</i>	:	:	:	:	:	:	:	:
<i>Non-mandatory private</i>	0.3	0.4	0.5	0.6	0.6	0.5	0.4	2041
Gross total pension expenditure	12.6	12.8	13.4	15.1	14.9	12.3	11.4	2045
Net public pension expenditure	11.3	11.4	11.7	13.0	12.9	10.6	10.0	2045
Net total pension expenditure	11.8	11.9	12.5	14.0	13.8	11.4	10.6	2045
Contributions	2016	2020	2030	2040	2050	2060	2070	Peak year*
Public pension contributions	12.5	12.6	12.8	12.7	12.4	11.9	11.5	2029
Total pension contributions	13.3	13.5	13.5	13.3	12.8	12.2	11.8	2025

The peak year for gross public pension expenditures is 2045, in contrast to the peak observed in 2047 in the previous projection. The impact of the 2013 reforms is large enough so as to neutralize most of the upwards pressure on the dependency ratio by 2050. From then on, the moderation in expenditure growth compared to the AR2015 is mainly explained by both a more benign dependency ratio and a more dynamic labour market.

Table 7 shows the results of the occupational and individual pension projections. Under prudent assumptions and considering no policy changes, the expenditure for both items combined remains in 2070 around 0.7%, a bit over its initial level of 0.5% of GDP.

As for net pensions, the effective marginal tax rate (estimated with the withholding tax rate) for public pensions is 6.8% and for private pensions is 10.3% in 2016 and kept constant through the projection period.

c) Projected spending by type of pensions

In Table 8 projections by type of pension are presented. The main item is retirement pensions which tend to increase their weight on GDP as demographic pressures ensue. However, in the last decade the trend reverses and the expenditure to GDP ratio diminishes thanks to the favourable evolution of the dependency ratio and the labour market. Disability pensions and survivor's pensions decrease almost throughout the projection period. Also, for statistical purposes, disability pensions are transformed into old age pensions when the statutory retirement age is reached. Given the ageing of the population, that part of the disability pensions becomes larger along the projection period.

The general scheme keeps its weigh on GDP roughly constant. The civil servants' scheme decreases by 1 p.p. due to its phasing out as no new employees will enter this system. The non-earnings related old-age pension expenditure over GDP is of less quantitative importance (0.1% of GDP).

TABLE 8 Projected gross public pension spending by scheme (% of GDP)								
Pension scheme	2016	2020	2030	2040	2050	2060	2070	Peak year *
Total public pensions	12.2	12.3	12.6	13.9	13.9	11.4	10.7	2045
of which								
Old age and early pensions:	8.7	9.0	9.4	10.8	10.9	8.6	8.0	2046
<i>Flat component</i>	:	:	:	:	:	:	:	:
<i>Earnings related</i>	8.6	8.9	9.2	10.6	10.7	8.4	7.8	2046
<i>Minimum pensions (non-contributory) i.e. minimum income guarantee for people above 65</i>	0.1	0.1	0.2	0.2	0.2	0.2	0.1	2046
Disability pensions	1.18	1.12	1.13	1.06	0.82	0.84	0.99	2016
Survivor pensions	2.28	2.17	2.04	2.10	2.12	1.93	1.75	2016
Other pensions	-	-	-	-	-	-	-	-
of which								
<i>Social Security scheme</i>	10.81	10.85	10.97	12.39	12.65	10.72	10.34	2046
<i>Civil servants scheme</i>	1.22	1.30	1.41	1.34	0.99	0.49	0.20	2027
<i>Non-contributory</i>	0.12	0.14	0.18	0.22	0.22	0.18	0.14	2046

III.3. Main driving forces behind the projection results and their implications for main items from a pension questionnaire

a) Decomposition of the ratio of pension expenditures to GDP

Tables 9a and 9b decompose the decrease in the public pension expenditure to GDP into the impact, measured in percentage points of GDP, of its main drivers, i.e. the dependency ratio, the coverage ratio, the benefit ratio, the labour market impact and a residual. The coverage ratio and the labour market impact are further decomposed into its components.

$$\frac{PensionExp}{GDP} = Depend.Ratio \times CoverageRatio \times Benefit Ratio \times LabourMarket \times Residual =$$

$$= \frac{Pop65+}{Pop20_64} \times \frac{NumberPensions}{Pop65+} \times \frac{AveragePension}{GDPperHourWorked} \times \frac{Pop20_64}{HoursWorked}$$

The main upward driver of pension expenditure is the **dependency ratio** though its influence upwards diminishes after 2040 and turns negative after 2050. The dependency ratio almost doubles, from 28.6% in 2016 to 46.6% in 2070. From 2048 onwards the ratio declines from its peak of 62.3% and its contribution to expenditure becomes negative in the last two projection's decades.

In the first half of the projection, the coverage ratio decreases, yielding a **negative coverage effect**, because the 2011 reform restricts access to retirement pensions, and also because of the reduced prevalence of survivor's pensions. For retirement pensions, the coverage increases in the second half of the projections due to an increase of female pensions, partly compensating the former trend.

The impact of the 2011 and 2013 reforms and demographic developments put downward pressure on the **benefit ratio** and on the average pension. This pressure is larger than the one in the previous exercise due to the worsening of the macroeconomic assumptions in this projection. For the last decade of the projection, the trend changes and the benefit ratio even increases.

Finally, the **employment rate** has an effect towards lowering expenditure to GDP in the first half of the projection, first due to the reduction in the high unemployment rate reached during the crisis, and, afterwards, due to the pension reforms (that increase old-age employment rates) together with cohort effects (younger cohorts having a higher participation rate for each age).

Factors behind the change in public pension expenditures between 2016 and 2070 using pension data (in percentage points of GDP) - pensions								
TABLE 9a	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.1	0.3	1.4	-0.1	-2.5	-0.7	-1.5	-0.027
Dependency ratio effect	1.1	3.7	4.1	2.0	-1.9	-1.5	7.6	13.4%
Coverage ratio effect	-0.2	-0.7	-0.1	0.2	0.4	-0.2	-0.5	-1.1%
Coverage ratio old-age*	0.0	0.0	0.5	0.8	0.3	-0.4	1.0	1.8%
Coverage ratio early-age*	-0.8	-1.9	1.8	0.1	-1.1	0.3	-1.7	-3.6%
Cohort effect*	0.1	-1.5	-4.8	-4.4	2.9	1.6	-6.1	-13.3%
Benefit ratio effect	0.1	-1.4	-1.5	-1.8	-1.3	1.1	-4.8	-8.8%
Labour Market/Labour intensity effect	-0.8	-1.0	-0.8	-0.4	0.3	-0.1	-2.8	-6.0%
Employment ratio effect	-0.7	-0.6	-0.6	-0.5	0.0	0.0	-2.4	-5.2%
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2%
Career shift effect	-0.1	-0.4	-0.3	0.2	0.2	-0.1	-0.5	-1.0%
Residual	-0.1	-0.3	-0.3	-0.1	0.0	-0.1	-0.9	-0.4%

* Sub components of the coverage ratio effect do not add up necessarily.

Factors behind the change in public pension expenditures between 2016 and 2070 using pensioners data (in percentage points of GDP) - pensioners								
TABLE 9b	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.1	0.3	1.4	-0.1	-2.5	-0.7	-1.5	-0.027
Dependency ratio effect	1.1	3.7	4.1	2.0	-1.9	-1.5	7.6	13.4%
Coverage ratio effect	-0.2	-0.6	-0.1	0.2	0.4	-0.1	-0.4	-0.9%
Coverage ratio old-age*	0.0	0.0	0.5	0.8	0.2	-0.4	1.1	2.0%
Coverage ratio early-age*	-0.7	-1.9	1.9	0.1	-1.1	0.4	-1.3	-3.0%
Cohort effect*	0.1	-1.5	-4.8	-4.4	2.9	1.6	-6.1	-13.3%
Benefit ratio effect	0.1	-1.4	-1.5	-1.8	-1.2	1.1	-4.9	-8.9%
Labour Market/Labour intensity effect	-0.8	-1.0	-0.8	-0.4	0.3	-0.1	-2.8	-6.0%
Employment ratio effect	-0.7	-0.6	-0.6	-0.5	0.0	0.0	-2.4	-5.2%
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2%
Career shift effect	-0.1	-0.4	-0.3	0.2	0.2	-0.1	-0.5	-1.0%
Residual	-0.1	-0.3	-0.3	-0.1	0.0	-0.1	-0.9	-0.4%

* Sub components of the coverage ratio effect do not add up necessarily.

b) Evolution of the replacement and benefit ratios

Table 10 shows the evolution of various replacement ratios (RR) at retirement, i.e. first pension of those who retire in a given year over an (economy-wide) average wage at retirement, and various benefit ratios, i.e. the average pension compared to the average wage of the economy.

The level should be taken with caution as it depends on the average wage used. The wage used is taken from INE (*Encuesta Trimestral de Coste Laboral* or ETCL). This wage has been imputed also to the self-employed and is used for computing both replacement and benefit ratios. Direct comparisons with the Theoretical Replacement Rate (TRR) should also be avoided because of the wage definition and because the TRR is calculated for an individual with full career at 65 and no breaks. Under such conditions, the 2011 reform has no effect on the TRR.

The RRs at their starting level are among the highest in the EU and are above their respective BRs, as expected. A decline in the RRs is projected due to the 2011 pension reform, to the sustainability factor and to the threshold effect of the maximum new pension increasing with prices, i.e. lagging behind wages. BRs are also expected to decline driven by lower replacement ratios but also by the IPR when set below CPI. The results presented in Table 10 are influenced not just by the 2011 and 2013 reforms, but are affected crucially by the “constant policy” assumptions and by the projected developments in key macroeconomic variables, notably wages and inflation.

Both ratios stabilize around 2060, with the benefit ratio even increasing in the last decade. This is due to an increase in the substitution factor, and in the case of the benefit ratio, in an increase of the IPR after 2057.

TABLE 10 Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme (in %)							
	2016	2020	2030	2040	2050	2060	2070
Public scheme (BR)	58%	55%	48%	43%	38%	34%	38%
Public scheme (RR)	75%	69%	56%	52%	48%	45%	44%
Coverage	83.8	81.4	77.4	76.3	76.5	76.5	76.2
Public scheme old-age earnings related (BR)	64%	62%	53%	45%	39%	34%	37%
Public scheme old-age earnings related (RR)	79%	72%	58%	54%	49%	46%	45%
Coverage	53.2	52.3	51.9	54.9	57.7	57.0	56.2
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	3.8	3.2	3.5	3.4	3.2	3.2	3.3
Private individual scheme (BR)	:	:	:	:	:	:	:
Private individual scheme (RR)	:	:	:	:	:	:	:
Coverage	5.0	8.2	12.4	14.0	14.0	13.9	14.2
Total (BR)	:	:	:	:	:	:	:
Total (RR)	:	:	:	:	:	:	:

c) Dependency ratios

Tables 11 present the public pension system and demographic dependency ratios.

As shown in Table 11, over the projection horizon the number of pensioners increases by 45%, while employment remains more or less constant. This leads to a more than 30 p.p. rise in the pension system dependency ratio (or SDR) from 51.5% to close to 85% in the 2040s and 2050s. This ratio is the number of beneficiaries the labour market is financing and captures the impact of demographic as well as of institutional factors on the pension system, such as the increase in the retirement age or more generally of participation rates for all ages.

The number of people over 65 experiences an increase similar to that in the number of pensioners. However, the working age population tends to decline. As a result, the old-age dependency ratio (ODR) doubles, from 28.6 to more than 60% in the 2040s and 2050s, which can be used as a proxy of the purely demographic impact of an ageing population on the financial sustainability of the system.

Comparing the SDR to the ODR, an indicator of the efficiency of the pension system can be calculated. The observed decline from 2016 to 2070 reflects efficiency gains as institutional factors captured in the SDR tend to moderate the impact of the purely demographic ones. In other words, the system can be considered more efficient by 2070 as it achieves the same number of employees with a much diminished and elder working age population.

TABLE 11 System dependency ratio and old-age dependency ratio							
	2016	2020	2030	2040	2050	2060	2070
Number of pensioners (thousand) (I)	9,491.8	10,042.1	11,941.9	14,700.9	16,254.9	15,237.0	13,754.2
Employment (thousand) (II)	18,423.3	19,468.9	20,188.7	19,805.0	19,426.5	20,197.1	21,279.7
Pension System Dependency Ratio (SDR) (I)/(II)	51.5	51.6	59.2	74.2	83.7	75.4	64.6
Number of people aged 65+ (thousand) (III)	8,777.5	9,404.7	11,779.4	14,573.9	15,888.6	14,509.8	13,267.1
Working age population 15 - 64 (thousand) (IV)	30,658.7	30,314.0	28,874.7	26,626.7	25,683.9	27,259.8	28,447.1
Old-age Dependency Ratio (ODR) (III)/(IV)	28.6	31.0	40.8	54.7	61.9	53.2	46.6
System efficiency (SDR/ODR)	1.8	1.7	1.4	1.4	1.4	1.4	1.4

Tables 12 present the ratio of pensioners to inactive population (Table 12a) and to total population (Table 12b) by age group. Tables 13 do the same for women alone. In Table 12b and 13b, the decline in the number of pensioners to total population is remarkable for the age brackets 60-64 and 65-69, reflecting the impact of recent reforms. For elder people, the ratios tend to increase, particularly as women careers expand.

The ratios of pensioners to inactive generally increase mainly due to more women receiving a retirement pension; the ratios for both genders tend to converge. Pensioners in the age group under 65 are mostly under the disability and survivor schemes. The future increases in the ratios for these groups in Tables 12a and 13a mainly reflect a sharp reduction in inactivity (the denominator) and are not the result of more people becoming dependent on these schemes (the numerator). The ratios above 100% for tables 12a and 13a are due to the possibility of working and collecting a pension at the same time. The ratios above 100% for tables 12b and 13b are due to the methodology used to estimate the number of pensioners. The number of pensioners is estimated by applying the official 2016 coefficients published by the Social Security for the different types of pensions and then adding the different types up. These coefficients are not published by age and/or gender, which causes a bias in the number of pensioners. For women, this bias is larger the longer the projection period, as the model includes a convergence of women to the labour market, while there is no adjustment of the coefficients to take this into consideration.

TABLE 12a Pensioners (public scheme) to inactive population ratio by age group (%)							
	2016	2020	2030	2040	2050	2060	2070
Age group -54	6.3	6.4	6.1	4.6	4.2	4.4	4.0
Age group 55-59	41.3	47.7	76.1	100.7	99.6	97.3	102.2
Age group 60-64	57.3	66.0	76.7	101.7	101.7	99.3	100.0
Age group 65-69	82.1	91.7	94.8	106.0	111.4	107.3	106.3
Age group 70-74	83.0	84.2	96.8	98.3	104.0	100.6	98.0
Age group 75+	91.4	89.6	92.1	96.0	98.2	101.1	99.6

TABLE 12b Pensioners (public schemes) to total population ratio by age group (%)							
	2016	2020	2030	2040	2050	2060	2070
Age group -54	2.5	2.5	2.5	2.0	1.9	1.9	1.8
Age group 55-59	11.6	11.2	11.1	12.5	12.7	12.4	13.1
Age group 60-64	32.2	29.2	22.1	23.8	23.8	23.0	23.3
Age group 65-69	77.5	78.9	66.7	69.7	73.5	69.2	67.2
Age group 70-74	81.9	83.1	92.6	92.5	97.4	94.1	91.4
Age group 75+	91.4	89.6	92.1	96.0	98.2	101.1	99.6

TABLE 13a Female pensioners (public scheme) to inactive population ratio by age group (%)							
	2016	2020	2030	2040	2050	2060	2070
Age group -54	5.3	5.5	5.6	4.2	3.8	4.0	3.6
Age group 55-59	29.2	34.2	60.1	91.4	98.0	94.6	98.6
Age group 60-64	41.2	50.9	68.6	107.2	110.1	107.5	107.0
Age group 65-69	67.8	79.1	93.5	109.0	116.5	114.2	112.4
Age group 70-74	69.6	73.1	93.3	98.6	107.4	103.9	100.3
Age group 75+	86.1	84.9	89.4	98.7	104.1	108.8	105.8

TABLE 13b Female pensioners (public scheme) to total population ratio by age group (%)							
	2016	2020	2030	2040	2050	2060	2070
Age group -54	2.2	2.3	2.3	1.9	1.7	1.8	1.6
Age group 55-59	10.8	10.2	10.1	11.5	11.6	11.1	11.7
Age group 60-64	25.5	25.0	21.0	23.0	22.5	21.5	21.6
Age group 65-69	64.6	69.2	67.4	72.2	76.6	73.0	70.3
Age group 70-74	69.0	72.3	89.3	92.7	100.2	96.9	93.2
Age group 75+	86.1	84.9	89.4	98.7	104.1	108.8	105.8

d) Decomposition of new pension expenditure

A **decomposition of the average new pension** of the **retirement Social Security pensions** tries to assess the consistency of the projection (Table 14a, b and c). New public pension expenditure is the product of the average contributory period, average pensionable earnings, average accrual rates, the number of new pensions and the sustainability factor. It has to be taken into account that it relies on the *Muestra Continua de Vidas Laborales* (or MCVL, a sample of two million registries provided by the Ministry of Employment and Social Security) for the pensionable earnings and years of contribution's starting points while the average new retirement pension is the observed in 2016.

The **average new pension** calculation is driven upwards by the average contributory period (which tends to increase with increased female participation and with reform-induced behavioural response) and pensionable earnings (which evolve in line with productivity). On the other hand, a declining accrual rate and the sustainability factor put downward pressure on the pension benefit for new entrants.

The **average contributory period** increases by 4 years. This is due to pension reforms (especially the 2011 reform) and to the increase in the female average contributory period linked to higher participation. In fact, contributory careers of women increase by 6.6 years, compared to a 2.1 year-increase for men.

Pensionable earnings (regulatory base or RB) tend to increase with wages. The gap on pensionable earnings is assumed to remain constant (with earnings for women equal to 80% men's earnings). Closing the gender gap in wages could also contribute to closing the gender gap in pension benefits.

The **sustainability factor** is effective since 2019 and shows a linear decline since then, from 100% to 81%. Further details can be found in Part IV of this fiche.

The **effective accrual rate** takes into account the rules affecting the percentage applied to the pensionable earnings (the "legal" accrual rate), penalisations and premiums for early and late retirement, composition effects, complements to minimum pensions and maximum thresholds. The effective accrual rate in Tables 14 diminishes significantly throughout the period 2016-2070. It is computed as the average benefit of new pensions divided by the average contributory career, the monthly average pensionable earnings (Regulatory Base, RB) and the sustainability factor (SF).

$$Accrual = \frac{AvNewPension}{Career * RB * SF}$$

The accrual rate is obtained as a mere application of the formula. However, using an average may distort the picture by underestimating the effective accrual rate for workers with careers below the 37 years required to get a full pension benefit. After 37 years of contributions, the accrual rate is close to null and increasingly a higher share of workers will reach such a long career. For males, the underestimation of the effective accrual rate for individuals with short careers is greater, given that more men have a contribution record above 37 years.

Finally, the **number of new pensions** is linked to the CSM exits from the labour market. A peak is reached in the 2040s due to the baby-boom effect. Compared to the equivalent table in the AR2015, the number of new pensions is significantly higher all through the period as

these tables include both the Social Security and the CPE pensions. The latter are being phased out of the system, but the total number of new pensions is still larger than in the AR2015 due to the larger population assumptions.

TABLE 14a Projected and disaggregated new public pension expenditure (old-age and early earnings-related pensions)							
New pension	2016	2020	2030	2040	2050	2060	2070
I. Projected new pension expenditure (millions EUR)	3,211.9	3,577.3	4,854.0	7,752.3	7,674.4	7,891.2	12,477.9
II. Average contributory period	36.7	37.5	38.9	39.1	39.5	39.8	40.3
III. Monthly average pensionable earnings	1,636.3	1,838.8	2,464.6	3,408.1	4,853.9	6,927.5	9,861.5
IV. Average accrual rates (%)	2.3	2.1	1.7	1.6	1.5	1.5	1.5
V. Sustainability/Adjustment factor	1.0	1.0	0.9	0.9	0.9	0.8	0.8
VI. Number of new pensions ('000)	330.6	358.9	451.5	559.9	425.7	325.3	372.9
VII. Average number of months paid the first year	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Monthly average pensionable earnings / Monthly economy-wide average wage	93%	93%	93%	93%	93%	93%	93%

TABLE 14b Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - MEN							
New pension	2016	2020	2030	2040	2050	2060	2070
I. Projected new pension expenditure (millions EUR)	2,133.4	2,231.5	2,790.0	4,286.8	4,080.8	4,008.2	6,238.2
II. Average contributory period	39.6	40.2	41.4	41.5	41.6	41.6	41.7
III. Monthly average pensionable earnings	1,759.9	1,977.7	2,650.7	3,665.5	5,220.5	7,450.7	10,606.4
IV. Average accrual rates (%)	2.2	2.0	1.7	1.6	1.5	1.4	1.4
V. Sustainability/Adjustment factor	1.0	1.0	0.9	0.9	0.9	0.8	0.8
VI. Number of new pensions ('000)	202.9	205.5	234.6	283.6	209.9	158.5	183.8
VII. Average number of months paid the first year	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Monthly average pensionable earnings / Monthly economy-wide average wage	100%	100%	100%	100%	100%	100%	100%

TABLE 14c Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - WOMEN							
New pension	2016	2020	2030	2040	2050	2060	2070
I. Projected new pension expenditure (millions EUR)	1,078.6	1,345.8	2,063.9	3,465.5	3,593.6	3,883.0	6,239.8
II. Average contributory period	32.3	33.3	35.3	36.2	37.1	38.0	38.8
III. Monthly average pensionable earnings	1,401.8	1,575.3	2,111.3	2,919.6	4,158.2	5,934.5	8,448.1
IV. Average accrual rates (%)	2.7	2.4	2.0	1.9	1.8	1.8	1.8
V. Sustainability/Adjustment factor	1.0	1.0	0.9	0.9	0.9	0.8	0.8
VI. Number of new pensions ('000)	127.7	153.4	216.9	276.3	215.8	166.8	189.1
VII. Average number of months paid the first year	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Monthly average pensionable earnings / Monthly economy-wide average wage	79%	79%	79%	79%	79%	79%	79%

Tables 14a to 14c show the ratio of monthly average pensionable earnings to monthly economy-wide average wage remains constant all through the projection period for both men and women. This is due to the fact that the model indexes the monthly average pensionable earnings to grow in line with wages. The ratio is lower all through the projection for women, as their pensionable earnings are lower in the base year, while the economy-wide average wage is the same for both genders.

III.4. Financing of the pension system

Table 15 shows the legislated parameters of revenues of the pension system as per 2016. As can be seen, there is a maximum and a minimum contribution base. Most of the contribution weight falls on the employer (23.6%) with only 4.6% falling on the employee. The state covers the contributions for the civil servants, as well as the supplement for minimum pensions. The maximum and minimum contributions are a result of multiplying the contribution base by the total contribution percentage.

Table 16 shows the revenue side of the system. Employer contributions grow in line with GDP. The Employee and State contributions increase at a slower pace mainly due to the fact that they include the contributions for the special scheme for the civil servants, which tend to reduce their size as the scheme phases out. On the contrary, the Employee and State contributions for the Social Security grow in line with GDP. Total contributions therefore grow at a slightly lesser pace than GDP.

TABLE 15 Financing of the system			
	Public employees	Private employees	Self-employed
Contribution base (maximum)		3.642 €/month	3.642 €/month
Contribution base (minimum)		764,4 €/month	893,24 €/month
Contribution rate/contribution		28,3%	29,8%
<i>Employer</i>		23,6%	
<i>Employee</i>		4,7%	29,8%
<i>State</i>			
<i>Other revenues</i>	Central government complements minimum pensions		
Maximum contribution		1.030,7 €/month	1.085,3 €/month
Minimum contribution		216,3 €/month	266,2 €/month

TABLE 16 Revenue from contribution (Millions), number of contributors in the public scheme (in 1000), total employment (in 1000) and related ratios (%)							
	2016	2020	2030	2040	2050	2060	2070
Public contribution	139,598.6	157,849.8	217,934.3	295,022.6	401,117.5	568,986.3	829,700.1
<i>Employer contribution</i>	97,771.2	109,701.2	149,754.4	203,202.1	283,976.2	421,110.3	631,088.6
<i>Employee contribution</i>	21,735.7	24,542.5	33,806.6	45,608.6	61,847.7	87,766.6	128,126.6
<i>State contribution</i>	20,091.7	23,606.1	34,373.4	46,211.8	55,293.6	60,109.5	70,484.9
<i>Other revenues</i>	:	:	:	:	:	:	:
Number of contributors (I)	18,540.5	19,422.9	19,821.2	19,216.6	18,721.4	19,447.0	20,489.3
Employment (II)	18,423.3	19,468.9	20,188.7	19,805.0	19,426.5	20,197.1	21,279.7
Ratio of (I)/(II)	1.0	1.0	1.0	1.0	1.0	1.0	1.0

III.5. Sensitivity analysis

Table 17 presents the effect on pension expenditure under the alternative sensitivity shocks. The results are expressed as deviations in the expenditure to GDP ratio with regards to the baseline scenario. If the shock considered increases (decreases) expenditure, the value in the Table is red (green).

TABLE 17 Public and total pension expenditure under different scenarios (p.p. deviation from the baseline)							
	2016	2020	2030	2040	2050	2060	2070
Public Pension Expenditure							
Baseline	12.2	12.3	12.6	13.9	13.9	11.4	10.7
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.2	0.2	0.1	0.0
Higher Total Factor Productivity Growth (+0.4 pp.)	0.0	0.0	0.0	-0.2	-0.6	-0.3	-0.4
Lower Total Factor Productivity Growth (-0.4 pp.)	0.0	0.0	0.1	0.5	1.0	0.9	0.1
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	0.0
Lower emp. rate (-2 pp.)	0.0	0.1	0.4	0.5	0.5	0.3	0.0
Higher emp. of older workers (+10 pp.)	0.0	-0.2	-1.3	-1.5	-1.0	-0.3	-0.7
Higher migration (+33%)	0.0	0.0	0.0	-0.1	-0.5	-0.3	-0.2
Lower migration (-33%)	0.0	0.0	0.1	0.4	0.8	0.8	0.1
Lower fertility	0.0	0.0	0.1	0.3	0.9	1.0	0.1
Risk scenario	0.0	0.0	0.2	0.4	0.6	0.4	0.1
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	0.1	0.1	0.2	0.1	-0.6
Total Pension Expenditure							
Baseline	12.6	12.8	13.4	15.1	14.9	12.3	11.4
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.2	0.2	0.1	0.1
Higher Total Factor Productivity Growth (+0.4 pp.)	0.0	0.0	0.0	-0.2	-0.7	-0.4	-0.5
Lower Total Factor Productivity Growth (-0.4 pp.)	0.0	0.0	0.1	0.5	1.1	1.0	0.3
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.3	-0.2	-0.2	-0.1	0.0
Lower emp. rate (-2 pp.)	0.0	0.1	0.4	0.5	0.5	0.3	0.0
Higher emp. of older workers (+10 pp.)	0.0	-0.2	-1.3	-1.5	-1.0	-0.4	-0.7
Higher migration (+33%)	0.0	0.0	0.0	-0.1	-0.5	-0.3	-0.3
Lower migration (-33%)	0.0	0.0	0.1	0.4	0.9	0.8	0.1
Lower fertility	0.0	0.0	0.1	0.3	0.9	1.1	0.2
Risk scenario	0.0	0.0	0.2	0.4	0.7	0.5	0.1
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	0.1	0.1	0.2	0.1	-0.6

The scenarios proposed in this exercise are the following:

- *Life expectancy*: mortality rates are adjusted so as to achieve an increase in life expectancy at birth which is 2 year higher at the end of the projection period compared with the baseline scenario. The sustainability factor neutralizes most of the impact of any change in life expectancy.
- *Higher/Lower total productivity growth*: in this scenario total factor productivity growth is assumed to converge by 2045 to a steady-state growth rate which is 0.4 p.p. higher/lower than in the baseline scenario. Increasing total productivity generates negative deviations from baseline which are in most years smaller in absolute value than the positive deviations experienced in the event of lower productivity. In both instances, the effect on the denominator (GDP) more than offsets the resulting higher/lower new pension entitlements due to indexation rules (lower and upper cap on the IPR).
- *Higher/Lower employment rate*: the employment rate of the population aged 20 to 64 increases/decreases by 2 p.p. from 2016 to 2025 compared to the baseline scenario, and thereafter the employment rate is kept 2 p.p. higher/lower than in the baseline scenario until the end of the projection period. The higher/lower employment rate is assumed to be achieved by lowering the rate of structural unemployment (i.e. the NAIRU). By 2070 the effect is almost neutralized. This effect

is rather low because activity rates are kept constant, so most of the effect is due to the increase (decrease) in GDP.

- *Older workers employment rate*: the sensitivity test consists in an increase in employment of the population aged 55 to 64, by 10 percentage points from 2016 to 2025 compared to the baseline scenario, and keeping the employment rate 10 p.p. higher than in the baseline scenario thereafter. The higher employment rate of this group of workers is assumed to be achieved through a reduction in the inactive population (activity rates increase). It results in a 0.7 p.p. decline in expenditure compared to the baseline due to a decrease in the number of pensions (because of the postponement of the effective retirement age) and the resulting increase in the average pension (due to larger accumulated rights).
- *Higher/Lower migration*: a 33% increase/decline in migration decreases/increases public expenditure-to-GDP ratio by -0.2/0.1 p.p. by 2070.
- *The Lower fertility scenario*: a 20% decrease in the fertility rate increases public expenditure-to-GDP ratio by 0.1p.p. by 2070.
- *The Risk scenario* is similar to the lower productivity scenario in both design and impact. Its main assumption is that TFP growth converges to 0.8% by 2045 instead of the 1% assumed as a general case. Under this scenario minor increases in expenditure to GDP ratio are expected.
- *The policy scenario* consists of linking the statutory retirement age and other age requirements to increases in life expectancy. In Spain, up to 2027 the statutory retirement age increases faster than life expectancy, so the model is kept unchanged in that period. Afterwards, the age-related elements of the pension system are linked to life expectancy at 67, yielding savings amounting to 0.6 p.p. in 2070. This result is probably biased to the low side, since labour market participation, employment and disability rates for elderly workers are kept unchanged with regards to the baseline scenario, which is an optimistic assumption.

In general, the symmetric scenarios do not have symmetric impacts due to the indexation rules. The current system indexes pensions to the IPR which depends mostly on the state of the social security accounts with a bottom and a top cap (see IV.8 for further clarification). These limits cause changes in the expenditure to GDP ratio to be dominated by the denominator effect. In these projections, as compared to the AR2015 ones, the numerator effect starts having a compensating effect for the positive scenarios earlier (due to an increase in the IPR), which causes the total impact on the ratio to be smaller in those scenarios. Once the IPR exceeds the 0.25 bottom cap in the negative scenarios, the gap with the baseline scenario starts decreasing. As a result, in 2070 pension expenditure is smaller than in 2050 in all the scenarios.

III.6. Changes in comparison with previous projections

a) Comparison by main drivers

Table 18 shows a decomposition of the public pension to GDP ratio into its underlying drivers for previous projection exercises and the current one. The decomposition follows a similar structure to that of Tables 9, with contributions measured in percentage points of GDP.

It can be observed how the increase in public pensions-to-GDP ratio has been declining since the 2006 projection due to favourable demographic and macroeconomic assumptions until the 2009 Ageing Report and to deep reforms thereafter. The main driving force pushing **Social Security expenditure** upwards has been demography, with old age dependency ratio doubling. The other drivers soften that pressure, particularly the benefit ratio and the employment effect.

Note that the different projection exercises are not directly comparable, but just a valid approximation, for two reasons. First, because the reference period has been changing; and second, because until the AR2012 (included) the decomposition in drivers was done only for Social Security expenditure and not for the whole public pension system (i.e. including civil servants' and non-contributory schemes), as it has been done since the AR2015.

TABLE 18 Overall change in public pension expenditure to GDP under the 2006, 2009, 2012 and 2015 projection exercises

	Public pensions to GDP	Dependency ratio	Coverage ratio	Employment effect	Benefit ratio	Labour intensity	Residual (incl. Interaction effect)
2006 *	7.05	12.45	-2.28	-1.83	-0.84	:	-0.45
2009 **	6.69	10.72	-0.86	-0.89	-1.73	:	-0.54
2012 ***	-0.38	8.90	-1.23	-2.18	-4.76	0.06	-1.16
2015****	-0.84	8.91	-0.71	-3.46	-4.29	0.04	-1.38
2018*****	-1.46	7.59	-0.51	-2.44	-4.77	0.10	-1.44

* 2004-2050: ** 2007-2060: *** 2010-2060: **** 2013-2060: *****2016-20

b) Comparison by assumptions

TABLE 19 Decomposition of the difference between 2015 and the new public pension projection (% of GDP)

	2016	2020	2030	2040	2050	2060	2070
Ageing report 2015	12.02	11.78	11.24	11.93	12.34	10.96	:
<i>Change in assumptions</i>	0.14	0.51	1.31	2.01	1.52	0.42	:
<i>Improvement in the coverage or in the modelling</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Change in the interpretation of constant policy</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Policy related changes</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
New projection	12.15	12.29	12.55	13.94	13.86	11.38	10.69

Table 19 shows the decomposition of the difference between 2015 and the current pension projection for overall public pension expenditure. No new regulation has been taken since the previous projection, which means that all changes are due to the different demographic and macroeconomic assumptions.

The new demographic assumptions estimates a 4 million growth in population compared to the EUROPOP2013, which causes an increase in the overall expenditure. Macroeconomic assumptions are less positive in this projection which creates a further increase.

IV. PROJECTION METHODOLOGY AND ASSUMPTIONS

The model has been developed in the Ministry of Economy, Industry and Competitiveness and is essentially the same which was used in 2015. The description of the public pension projection model and its base data are explained in this section.

IV.1. Data used to run the models

The macroeconomic and demographic variables used in the projections are exogenous as agreed by the Ageing Working Group (AWG).

The basic data used to run the pension model were supplied in 2017 by the Ministry of Employment and Social Security and the Ministry of Finance and Civil Service (for civil servants and private pensions) and refer to the base year 2016 and to historical data. All data are categorized by type of pensions (old-age and early retirement, disability and survivors), by sex and age (at 31 December each year) and include details on the number of new registrations and their average pension, number of withdrawal and their average pension, number of existing pensions and their average pension.

The projection method of the new registrations for each period and their corresponding pension benefit follow the rules of each pension type. The number of new pensions is linked to the participation rates and exit rates provided by the commonly agreed scenario.

The relevant historical data are also taken from an individual data set published by the Social Security, the MCVL⁵. This data set has been mainly used to analyse the impact of the reform on pension benefits.

Finally, the projection of people leaving the system is obtained taking into account the possible causes of withdrawal from the system. Given that the main cause is mortality, the general projection applies age and gender specific mortality rates given by the 2015 Eurostat population projections.

⁵ *Muestra Continua de Vidas Laborales* (Ministry of Employment and Social Security, 2015).

IV.2. General description of the models

The projections of pensions are composed by 4 independent and deterministic models:

Model 1. A model for projecting Social Security pensions (for private sector employees, self-employed, unemployed and the public sector employees of the central, regional and local administrations). It includes old age and early retirement public pension expenditure, disability public pension expenditure and survivors' public pension expenditure (widowhood, orphanage, relatives).

Model 2. A model for projecting public pension expenditure for public sector employees of the central administration, administered by the State (civil servants), including old age and early retirement pensions, disability pensions, survivors' pensions and war pensions.

Model 3. A model for projecting non-earnings related minimum pensions. This model is connected with the results of the other models.

Model 4. A model for projecting private pensions (occupational and individual voluntary schemes). This model is elaborated by the General Directorate of Insurance and Pension Funds.

IV.3. Projecting public earnings-related pensions: Model 1 methodology

The model simulates the net number of public earnings-related pensions of each category every year, their average pension benefit, and the total pension expenditure per year. The basic formula [1] is decomposed by class of pension (k), sex (s), age (e) and year (t). The types of pension are five: Retirement, Disability, Widowhood, Orphanage and other relatives. Expenditure is the product of the total number of pensions (TP) and the average Total pension Benefit (TB). The ratio to GDP is calculated by dividing expenditure over GDP:

$$\frac{PensionExpenditure_t}{GDP_t} = \frac{\sum_{k=1}^5 \sum_{s=1}^2 \sum_{e=0}^{100} TP_{k,s,e,t} TB_{k,s,e,t}}{GDP_t} \quad [1]$$

The projection of demographic variables:

The number of pensions (TP) at 31 December each year, per year of age, is calculated adding to the existing number at 31 December of the previous year and one year of age younger the new entrants (NP) and subtracting people withdrawn from the system (WP) of the same age and year (mortality affects existing pensions and new pensions). The starting point is the registered pensions of the Social Security.

$$TP_{k,s,e,t} = TP_{k,s,e-1,t-1} + NP_{k,s,e,t} - WP_{k,s,e,t} \quad [2]$$

The projection of quantitative variables [simplified by expression 3 that follows] considers these inter-related components:

- The average pension benefit of new registrations (NB): this is the core of the projection and considers the rules of each type of pension as well as minimum (indexed to productivity (prod) and inflation (inf)), maximum (indexed to inflation), within thresholds (indexed to productivity and inflation), SOVI pensions and others.
- The average pension benefit of people withdrawing from the system (WB) is a weighted average of the existing pensions indexed to the IPR and new entrant's pensions.
- The average total pension benefit (TB) is calculated as a weighted average of existing pensions indexed to the IPR, new pensions and deducting withdrawals of the year.

$$\begin{aligned} NB_{s,e,t} &= NB_{s,e,t-1} * (1 + prod_t + inf_t) \\ WB_{s,e,t} &= \frac{(TP_{s,e-1,t-1} * TB_{s,e-1,t-1} * (1 + IPR_t) + NP_{s,e,t} * NB_{s,e,t})}{TP_{s,e-1,t-1} + NP_{s,e,t}} \\ TB_{s,e,t} &= \frac{(TP_{s,e-1,t-1} * TB_{s,e-1,t-1} * (1 + IPR_t) + NP_{s,e,t} * NB_{s,e,t} - WP_{s,e,t} * WB_{s,e,t})}{TP_{s,e-1,t-1} + NP_{s,e,t} - WP_{s,e,t}} \end{aligned} \quad [3]$$

Data from the MCVL is used to estimate the impact of all reforms on the variables used in the model.

Specific detailed rules for the transition period 2013-27 are duly taken into account. A gradual but incomplete convergence of female careers to men is assumed, also reflected in developments in participation rates.

IV.4. Projecting public earnings-related pensions: Model 2 methodology

The same structure of model 1 applies as regards the basic formula of expenditure. The main difference is that new contributors are not allowed as of 1-1-2011. Therefore, the number of contributors decreases according to mortality and new pensions. The figures for new pensions are derived from a coefficient of new pensions over contributors of last year and previous age applied to the remaining contributors each year. The average entry pension takes into account the different rules of the system as explained in part 1.

IV.5. Projecting non-earnings-related pensions: Model 3 methodology

The number of new old-age entrants is the people at their retirement age not receiving any earning-related pension, adjusted by a coefficient that takes into account that there are people not entitled to a means-tested non-contributory pension (for having high income or assets) and people who do not claim their right to a pension. Both the average pension benefit of new entrants and the average pension benefit of existing pensions are linked to wages. The rest of variables are modelled in the same vein as in model 1.

IV.6. Projecting private pensions: Model 4 methodology

The agreed Eurostat demographic and AWG macroeconomic assumptions have been incorporated in the model for private pensions (occupational and individual schemes) elaborated by the Ministry of Economy and Competitiveness (Directorate General for Insurance and Pension Funds). The base data have required additional information from entities that has been gathered through an extended questionnaire (numbers of contributors, contributions, consolidated rights, beneficiaries, all by age) to the major entities, comparing results with own databases.

This questionnaire has been modified in this projection. The occupational plans are only included now when their main purpose is the old-age pension, as opposed to the previous projection, where plans that were specifically for survivors or disability were included too.

The model runs separate projections for individual and occupational pension plans and collective pension insurance plans. The assumptions made are very prudent and do not foresee changes in behaviour.

IV.7. Sustainability factor for retirement pensions.

The sustainability factor is an automatic link between the amount of retirement pension benefits and developments in life expectancy of pensioners. It will be applied only once on each pensioner when determining the initial amount of a new pension. It will come into effect in 2019.

The formula is the following:

$$SF_t = SF_{t-1} * e_{67}^*$$

Where SF is the sustainability factor (equal to one up to 2018), t is the year of application of the factor and e_{67}^* is the average annual change in life expectancy at 67 (according to Social Security mortality tables) in a previous period of five years. The value of e_{67}^* is kept fixed for periods of five years. The formula for computing e_{67}^* for the period 2019-2023 is the following:

$$e_{67,2012-17}^* = \left[\frac{e_{67}^{2012}}{e_{67}^{2017}} \right]^{\frac{1}{5}}$$

The SF will be applied only to old-age Social Security contributory pensions, but minimum complements may be exempted in the budget Law.

Life expectancy developments will be published systematically and transparently. Moreover, pensioners will be informed of the effect of the SF in their new pension when receiving their pension for the first time.

The sustainability factor (SF) is computed based on Eurostat's projected life expectancy, which may have wide differences when compared to Social Security mortality tables.

IV.8. New index for pension revaluation (IPR).

A. Legal definition

All social contributory social security pensions, including minimum pensions and civil servants' pensions (*Clases Pasivas del Estado*), are increased annually according to the Index for Pension Revaluation (or IPR), which is fixed annually by the National Budget Law. It has entered into force in 2014, immediately after the adoption of the 2013 reform.

The IPR seeks to ensure the sustainability of the public pension system over the medium run by reaching a balanced budget in structural terms. To this aim, this index determines an annual growth of pension expenditure in pace with the public pension revenues over the medium term.

The Index is defined according to the following formula:

$$IPR_{t+1} = \bar{g}_{R,t+1} - \bar{g}_{P,t+1} - \bar{g}_{S,t+1} + \alpha * \frac{R^*_{t+1} - E^*_{t+1}}{E^*_{t+1}}$$

Where the IPR for all pensions in year t+1 equals the arithmetic mean rate of revenues ($\bar{g}_{R,t+1}$) minus the mean rate of the number of pensions ($\bar{g}_{P,t+1}$), minus the average substitution effect ($\bar{g}_{S,t+1}$), plus/minus the adjustment needed to cover the structural disequilibrium of the system. The substitution effect is the year-on-year change of the average pension when no revaluation is applied, and it results from the replacement of dying pensioners with new ones whose average pension is higher.

The system disequilibrium is computed as the difference between the geometric mean of revenues (R^*) and expenses (E^*) as a proportion of geometric mean expenses. The alpha parameter α measures the correction speed of imbalances and should lie between 0.25 and 0.33, being its value revised every five years. For years 2014-2018 α will be 0.25.

The mean values (both arithmetic and geometric) are centred on the reference year t+1, taking into consideration eleven values. The IPR must lie between a bottom cap of 0.25 and a top cap given by the year-on-year percentage change in annual CPI on December of year t plus 0.5%.

This indexation method guarantees pension expenditure cannot be financed while there are structural deficits in the pension system. The IPR can only be increased as long as the growth in revenues covers the growth in the number of pensions and the growth in the value of the new pensions versus the previous ones. Moreover, a part of the structural deficit has to be corrected each year. Additionally, a bottom cap is established to ensure pensions are not reduced.

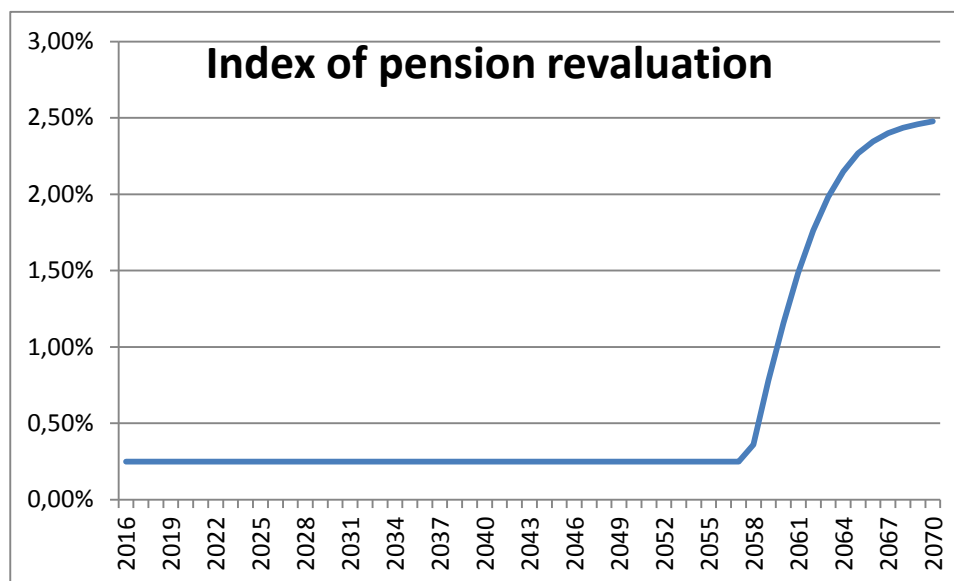
For computing the formula, total non-financial revenues and expenditures of the system will be considered, excluding the following items:

- Budget corresponding to the National Institute of Health Management (INGESA) and the Institute for the Elderly and Social Services (IMSERSO).
- Non-recurrent items, as determined by the General Intervention Board of the State Administration (IGAE).
- Social contributions and benefits for cessation of business.

- On the revenue side, State transfers for financing non-contributory benefits (except transfers for minimum complements of contributory pensions); and, on the expenditure side, non-contributory benefits (except minimum complements of contributory pensions).

The Ministry of Economy and Competitiveness will provide annually to the Social Security administration the macroeconomic projections needed to carry out the calculation of revenue and expenditure for years t+1 to t+6. The value of all variables involved in the IPR formula will be published annually.

The resulting values for the IPR for the projection can be seen in the following graph.



V. ANNEX

V.1. Institutional context

These projections have been prepared by the General Directorate for Macroeconomic Analysis and International Economy of the Ministry of Economy and Competitiveness of Spain. The projections have been submitted prior to the AWG peer review to the Ministry of Employment and Social Security, to the Ministry of Finance and Public Administrations and to the Bank of Spain. Most inputs from these institutions have been incorporated into the fiche.

According to the Law 23/2013, the Ministry of Employment and Social Security is responsible for the calculation of the IPR. This Ministry shall publish annually the values of the variables used in the computation of the IPR. Therefore, the IPR calculation made in this fiche does not necessarily coincide with the calculation made by the Ministry of Employment and Social Security.

The Ministry of Economy and Competitiveness shall provide to the Social Security Administration the values of the macroeconomic variables needed to determine revenue and expenditure of the Social Expenditure for years $t+1$ to $t+6$. The Independent Authority for Fiscal Responsibility (AIReF) shall issue an opinion on the values calculated by the Ministry of Employment and Social Security of the IPR and of the Sustainability Factor. The government shall elaborate every five years from the adoption of Law 23/2013 a study on the impact of the adopted measures on the sufficiency and adequacy of Social Security pensions and shall present it in the Congress and in the context of the social dialogue with unions and business organizations.

V.2. Alternative pension spending decomposition

TABLE A1 Factors behind the change in public pension expenditures between 2016 and 2070 using pension data (in per cent)

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Public pensions to GDP	0.1	0.3	1.4	-0.1	-2.5	-0.7	-1.5
Dependency ratio effect	1.1	4.2	6.1	3.4	-3.7	-3.0	8.2
Coverage ratio effect	-0.2	-0.6	-0.1	0.2	0.3	-0.2	-0.6
Coverage ratio old-age*	0.0	0.0	0.4	0.7	0.3	-0.5	0.8
Coverage ratio early-age*	-0.8	-1.7	1.4	0.1	-0.9	0.3	-1.7
Cohort effect*	0.1	-1.5	-3.7	-2.1	1.2	0.9	-5.0
Benefit ratio effect	0.1	-1.4	-1.2	-1.2	-0.8	0.8	-3.7
Labour Market/Labour intensity effect	-0.8	-0.9	-0.7	-0.2	0.2	-0.1	-2.5
Employment ratio effect	-0.7	-0.6	-0.5	-0.4	0.0	0.0	-2.2
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Career shift effect	-0.1	-0.4	-0.2	0.1	0.2	-0.1	-0.5
Residual	-0.1	-1.1	-2.7	-2.2	1.5	1.8	-2.8

TABLE A2 Factors behind the change in public pension expenditures between 2016 and 2070 using pensioners data (in per cent)

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Public pensions to GDP	0.1	0.3	1.4	-0.1	-2.5	-0.7	-1.5
Dependency ratio effect	1.1	4.2	6.1	3.4	-3.7	-3.0	8.2
Coverage ratio effect	-0.2	-0.6	-0.1	0.2	0.3	-0.2	-0.5
Coverage ratio old-age*	0.0	0.0	0.5	0.7	0.2	-0.5	0.9
Coverage ratio early-age*	-0.7	-1.7	1.4	0.1	-0.9	0.4	-1.4
Cohort effect*	0.1	-1.5	-3.7	-2.1	1.2	0.9	-5.0
Benefit ratio effect	0.1	-1.4	-1.3	-1.2	-0.8	0.8	-3.7
Labour Market/Labour intensity effect	-0.8	-0.9	-0.7	-0.2	0.2	-0.1	-2.5
Employment ratio effect	-0.7	-0.6	-0.5	-0.4	0.0	0.0	-2.2
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Career shift effect	-0.1	-0.4	-0.2	0.1	0.2	-0.1	-0.5
Residual	-0.1	-1.1	-2.7	-2.3	1.5	1.8	-2.9