GABINETE DE ESTRATÉGIA E PLANEAMENTO

PORTUGAL

COUNTRY FICHE

2018 Ageing Working Group pension projection exercise

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Index

Tables

Graphs

1. OVERVIEW OF THE PENSION SYSTEM

1.1. Description

The Portuguese public pension system incorporates two distinct schemes: the Social Security system, and CGA (*Caixa Geral de Aposentações* subsystem)[1], that covers civil servants who have started working in the public sector until 2005. Additionally, there is the private occupational pension system financed by pension funds which can be complementary to or substitutive of the public system. The most important is the banking sector defined-benefit (DB), under the banking sector collective agreement, which benefits were substitutive of the general regime of social security subsystem. Nevertheless, the legislative framework concerning this type of pension scheme has changed: the first pillar was closed and most banking entities' current beneficiaries are enrolled into Social Security[2]. There are also other complementary schemes which can be defined-benefit (DB) or defined-contribution (DC).

The Portuguese Social Security system provides social protection through three systems that correspond to different social protection levels: the contributory welfare system, designed to replace earnings lost when specific contingencies occur, the social solidarity protection system, which, by definition, covers all Portuguese citizens, and the complementary system, which envisages the sharing of social protection responsibilities by encouraging voluntary complementary schemes[3] (managed by public, private and social economy organizations). In the end of 2016, the welfare contributory regime, that includes new public employees since January 2006, covered 2.6 million pensions and about 3.5 million contributors, and the social solidarity protection system (non-contributory regime), financed by the State Budget, covered 227 thousand pensions. In 2015 the public complementary system had 37.3 million euro of net assets.

The CGA covered circa 464 thousand contributors and about 643 thousand pensions, in the end of 2016. As it is a closed subsystem, and the new public employees are enrolled in the Social Security system since January 2006, the number of contributors will monotonically converge to zero in the 2050s, while the number of pensions will decrease until the end of the period, although not at a steadily pace.

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[1] CGA subscribers enrolled since September 1993 are subject to the same rules of those of general regime of social security and has subjected to a convergence process to SS rules since 2005.

[2] In 2009, Decree-Law no. 54/2009, of March 2, established the enrolment of the new employees into Social Security and was closed to new entrants. In 2011, Decree-Law no. 1-A/2011, of January 3, the remain banking employees started to pay contributions to Social Security for the purpose to receive a retirement pension related to remaining years of future career, although the complement between the total benefit established in the collective agreement and other social benefit (as illness, disability, death and survivor) are paid by the pension fund. Also in 2011, Decree-Law no. 127/2011, of December 31, transferred most of the pension liabilities and the correspondent assets to the SS, while banking funds still have to meet the liabilities of future pension indexation and medical and other post-retirement benefits.

[3] The social security framework law (Law no. 4/2007, January 16) advocates the complementarity of pension systems. However, it is not mandatory and, furthermore, gives freedom to citizens to choose between the public funded scheme or other collective or individual initiative complementary schemes.

At the end of 2016, occupational pension schemes accounted for 186 pension funds, which had 164 thousand members, 121 thousand beneficiaries and assets managed amounting to 17.3 billion euros (9.3% of GDP).

The public social security pension system is basically a defined benefit (DB) system, working on a pay-as-you-go (PAYG) financing basis. The overall rate for the systems of social security is divided in 11% of gross earnings paid by the employee and 23.75% paid by the employer[4]. The self-employed pay 29.6% (or 34.75% for those with management functions) on reference income[5]. From the total 34.75% of gross earnings paid by the insured person and employer to SS, 20.21% finance old-age benefits, 4.29% go to disability benefits, and 2.44% to survivor benefits[6]. In the case of public workers (CGA), 0.73% of the contributions finances old-age and disability and the remaining is allocated to survivor's pensions[7]. As CGA is a closed system, the Government ensures financial balance by covering the gap between its revenue and expenditure.

Even though the system is run on a PAYG basis, a Social Security Trust Fund (FEFSS) was created to ensure the coverage of foreseeable pension expenditure for a minimum period of two years. This fund is annually financed through the sale of public assets and gains from financial investments. Furthermore, in order to meet this objective, the surplus of the general contributory regime of Social Security is transferred to FEFSS, and 2 to 4 p.p. of the employee's contributions are consigned to the fund, whenever the general contributory regime of Social Security registers a surplus or the economic situation allows. In 2016, FEFSS had almost 15 billion euro of assets.

A. Public system (Social Security System and Caixa Geral de Aposentações)

Old-age pension

Qualifying conditions

Under the general contributory regime the insured person is entitled to an **old-age pension** if he/she has both the normal retirement age and fulfilled the required qualifying period (15 years with earnings registration). The normal retirement age, for the entitlement to the old-age pension, increases in the proportion of two thirds of the evolution of life expectancy at the age of 65[8][9]. Hence,

[4] There are other different contributory rates for some specific professional categories as, for example, professional sportsmen, fishing activity workers, domestic workers.
[5] The reference income is one-twelfth of 70% of the total value of the services rendered or 20% of the income associated with the production and sale of goods in the previous calendar year rounded down to the nearest multiple of the Social Support Index (Indexante dos Apoios Sociais).
[6] The remainder of the contributions finance sickness and maternity, occupational disease and unemployment benefits.
[7] The employer entity is responsible for paying sickness, maternity and occupational disease benefits.
[8] According to the following calculation formula:

$$m_n = \sum_{i=2015}^{n} (LE_{i-2} - LE_{i-3}) \text{ X } 12 \text{ X} \frac{2}{3}$$

«m» corresponds to the integer number of months to be added to the pensionable age in 2014; «n» corresponds to the year of pension entitlement; «LE» corresponds to the average life expectancy at 65. Note that, the pensionable age for 2015

the normal retirement age, in 2016 was 66 years and 2 months (in 2017 is 66 years and 3 months[10]) whereas the minimum contributory period, to receive a full pension, is 40 years.

Table 1. Qualifying condition for retiring

			2016	2020	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension (men/women)	Minimum requirements	Contributory period	40	40	40	40	40	40	40
		Normal retirement age	66y/2m	66y/6m	67y/2m	67y/9m	68y/3m	68y/10m	69y/4m
Qualifying condition for retirement WITHOUT a full pension (men/women)	Early retirement age		>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period	>=60 years old + >=40 contributory period
	Penalty in case of early retirement age		-0.5%/month plus - SF	-0.5%/month plus - SF	-0.5%/month plus - SF	-0.5%/month plus - SF	-0.5%/month plus - SF	-0.5%/month plus - SF	-0.5%/month plus - SF
	Bonus in case of late retirement		[0.33% - 1%] /month	[0.33% - 1%] /month	[0.33% - 1%] /month	[0.33% - 1%] /month	[0.33% - 1%] /month	[0.33% - 1%] /month	[0.33% - 1%] /month
	Minimum contributory period		15	15	15	15	15	15	15
	Minimum residence period		-	-	-	-	-	-	-

Note: Full pension is the first retirement age at which people can retire without paying a penalty.

Source: Instituto da Segurança Social.

Pension benefit formula

The formula to calculate the full monthly pension's value is the product of the *reference earning* (RE), the *global accrual rate* (GAR) and the *sustainability factor* (SF)[11] only to early retirement pensions.

The *reference earning* corresponds to the average monthly salary of the best 40 years with earning's registration (adjusted by the Consumer Price Index – CPI - excluding housing). These rules apply to those registered into SS and in CGA since 2002. As for others, the pension is a weighted average between the pensions resulting from the old formula (best 10 out of last 15 years earnings for SS, and only 80% the last salary for CGA) and the new clauses.

was legally defined as 66 years old, even though the formula applies to 2014 (i.e. 2016 incorporates the cumulative extra months that should be added in 2015).

[9] This change entered in force in 2014. In 2014 the normal retirement age changed from 65 to 66 and from 2015 on it increases according life expectancy at 65.

[10] For 2018 the legal retirement age will be 66 years and 4 months.

[11] In Social Security and CGA there are some minor special regimes that has lower legal retirement age or/and other specific parameters.

Table 2. Pension benefit formula

Pension Benefit Formula		
20 years or less of contributory career	21 years or more of contributory career	
	RE versus SSI	Pension formula
P = RE x 2% x N	RE <= 1.1 SSI	RE x 2.3% x N
	1.1 SSI < RE <= 2 SSI	(1.1 SSI × 2.3% × N) + [(RE–1.1 SSI) × 2.25% × N]
	2 SSI < RE <= 4 SSI	(1.1 SSI × 2.3% × N) + (0.9 SSI × 2.25% × N) + [RE – 2 SSI) × 2.2% × N]
	4 SSI < RE <= 8 SSI	(1.1 SSI × 2.3% × N) + (0.9 SSI × 2.25% × N) + (2 SSI × 2.2% × N) + [(RE – 4 SSI) × 2.1% × N]
	RE > 8 SSI	(1.1 SSI × 2.3% × N) + (0.9 SSI × 2.25% × N) + (2 SSI × 2.2% × N) + (4 SSI × 2.1% × N) + [(RE – 8 SSI) × 2% × N]
x SF(t) = [LE_65(n) / LE_65(t-1)], where n=2000 (old-age) or n=2006 (disability); if old-age pensionner < normal retirement age or disability pensioner < 65 years		

Note: SSI - Social Support Index; RE – Reference Earning; SF – Sustainability Factor; LE – Life Expectancy; N – Contributory Career.

Source: Instituto da Segurança Social.

The *global accrual rate* (GAR) is the product of the accrual rate and the number of contribution years (N). The accrual rate varies between 2% and 2.3%, are applied to certain reference earnings brackets, which are indexed to the SSI (Table 2). Hence the GAR goes from 30% to 92%, as the minimum contributory period is 15 and the maximum for the calculation is 40 years.

The *sustainability factor* (SF) is an adjustment feature of the pension's system to the demographic evolution, introduced in 2008, and applied to old-age pensions and disability pensions[12] when converting to an old-age pension. Since 2014, the reduction factor, of each year, is equal to the ratio between the life expectancy at 65 years of age – in 2000 (for early retirement pensions) or 2006 (for the conversions from disability to old age pension at age 65) – and the life expectancy at 65 years of age in the year prior to the pension attribution. Since October 2017, the sustainability factor for disability pensions is no longer applied.

The automatic annual update of the pension benefit (*indexation rule*) is done according the amount of the pension benefit[13] and the GDP real growth, alongside with the CPI excluding housing, in the following manner[14]: This mechanism of update pension benefits lower pensions.

[12] The sustainability factor is not applied to disability pensions if the pensioner has 65 years old and has been receiving the total disability pension for more than 20 years.
[13] The pension benefit is classified into bracket that uses the SSI as reference.
[14] Between 2010 and 2016, the indexation rule was suspended and the SSI remains at €419.22. This means that disability, old-age pensions and other allowances and supplements granted under the SS system and CGA also suffered a nominal freeze. Only minimum pension amounts and other non-contributory schemes were update in line with inflation.

Table 3. Pension benefit indexation formula

Pension Benefit Indexation Formula			
	Real GDP growth < 2%	**2% ≤ Real GDP growth < 3%**	**Real GDP growth ≥ 3%**
Pensions < 2 SSI (SSI Update)	CPI change rate (a)	(a) + 20% real GDP growth [min.: (a) + 0.5 p.p.]	(a) + 20% real GDP growth
2 SSI ≤ Pensions < 6 SSI	(a) – 0.5 p.p.	(a)	(a) + 12.5% real GDP growth
6 SSI ≤ Pensions < 12 SSI	(a) - 0.75 p.p.	(a) - 0.25 p.p.	(a)

Note: SSI - Social Support Index; CPI Consumer Price Index, excluding housing.

Source: Instituto da Segurança Social.

Minimum pensions

Under the general contributory regime, minimum amounts are guaranteed according to the pensioner's insurance career. When the pensions' amount calculated according to the general rules is lower than the guaranteed minimum amount, it will be increased by the so called social supplement whose value is equal to the difference between the guaranteed minimum amount and the statutory pension amount. The social supplement granting is not subject to a means test. The *minimum pension's values* depend on the contributory career, as shown in table below, and are not applied to early pensions.

Table 4. Minimum pension amount in 2016 (and 2017)

Minimum Pension Amount - SS		Minimum Pension Amount - CGA	
Contributory career (years)	**Pension in 2016 (2017)**	**Contributory career (years)**	**Pension in 2016 (2017)**
< 15	€263.00 (€264.32)	5 - 12	€245.79 (€247.02)
		13 - 18	€256.20 (€257.48)
15 - 20	€275.89 (€277.27)	19 - 24	€273.87 (€275.24)
21 - 30	€304.44 (€305.96)	25 -30	€306.47 (€308.00)
> 30	€380.56 (€382.46)	> 30	€406.06 (€408.09)

Source: Instituto da Segurança Social.

Early old-age earning-related pensions

Before the normal retirement age, an early old-age pension could be claimed if the insured person has both at least 60 years old and 40 years of contributory career (except for long career employees and workers in a very specific set of hardness jobs). Although, the pension benefit is subject to a penalty of 0.5% for each month of anticipation to the normal age of retirement.

However, the normal retirement age could be reduced in 4 months by each year that exceeds the 40 years of contributory career at the age of 65 years and up to the minimum of 65 years old[15].

[15] There are special conditions for unemployed person, who used the maximum length of time of unemployment benefit including the social unemployment benefit, for applying an old-age pension according when started receiving unemployment benefit (before or after January, 2007), the age when get unemployed and the age when started receiving the old-age pension.

Since October 2017, it was eliminated any penalty for workers with very long careers (at least 60 years old and career lengths of 48 years or more or at least 60 years of age with a 46 year long career and started working, and paying contributions, before the age of 15) who claim early old-age pension.

Bonus regime

For those who retired after the normal retirement age (until the upper limit of age 70) and was entitled to standard retirement at that age, there is bonus, that depends on contributory period. This bonus is given by multiplying the number of months completed between the month of pension beginning and the month when the person reached the normal age of retirement and the bonus rate (Table 5).

Table 5. Bonus regime for who retire after normal retirement age

Bonus Regime	
Contributory career (years)	**Monthly bonus rate (%)**
15 - 24	0.33
25 - 34	0.5
35 - 39	0.65
>= 40	1

Source: Instituto da Segurança Social.

When one reaches the normal retirement age and is not covered by any compulsory social protection scheme, or does not have the required contributory period, he/she could be entitled to a **social pension under the non-contributory regime**. Benefits provided by this scheme are mean-tested dependent, ensuring that the person's income does not exceed the legally prescribed pension's value: 40% of the Social Support Index – SSI (in 2017, the gross monthly income could not surpass €168.53)[16] - nor 60% of PSI (€252.79), if it is a couple. The basic social pension value was €202.40 in 2016 (€203.35 in 2017). A supplement is added to this amount according the pensioner age: €17.61 (€17.70 in 2017) for pensioners under 70 years and €35.20 (€35.38 in 2017) for pensioners aged 70 years or more. This pension is indexed to the SSI and is updated according the same rule as lower pensions (Table 6).

Table 6. Social Support Index update formula

Social Support Index Update Formula			
	Real GDP growth < 2%	**2% ≤ Real GDP growth < 3%**	**Real GDP growth ≥ 3%**
SSI update	CPI change rate (a)	(a) + 20% real GDP growth [min.: (a) + 0.5 p.p.]	(a) + 20% real GDP growth

Note: SSI - Social Support Index; CPI Consumer Price Index, excluding housing.

Source: Instituto da Segurança Social.

[16] The SSI value in 2016 was €419.22 (€421.32 in 2017).

Disability pension

Concerning **disability pensions**, the required qualifying period is 5 years in case of relative disability pension and 3 years in case of total disability pension. The disability is deemed relative[17] when the insured person cannot earn more than one third of the current salary, in that year, or 50% of regular earnings in the following 3 years. The incapacity is considered total when the insured person loses the capacity to work in any profession, in that year, or it is expected that the person won't recover that capacity until the age of 65. The pension benefit formula is the same as old-age one. In these cases the SF was applied only when disability pension's converts to old age pension at age 65, but since October 2017, will no longer be applied in these pensions.

The minimum pension benefit amount, in case of relative disability pension, depends of the contributory career (see Minimum Pension Amount in Table 4) and, in case of total disability, corresponds to a minimum old-age pension benefit or a minimum relative disability pension benefit with 40 years of contributory career. A social disability pension could be granted and follows the same rule as the social old-age pension.

Survivor pension

Survivor's pension is a benefit paid to spouse, ex-spouse, person with whom the beneficiary was living in a *de facto* relationship, descendants[18] and relatives in the ascending line when there are no other family members with an entitlement. The amount paid corresponds to certain percentages multiplied by the amount of disability or old-age pension that the beneficiary was receiving or was going to receive. In the non-contributory regime, heirs of an old-age or disability social pensioner (or of a person that did not pay contributions to any pension regime) can receive a survivor social pension if the income is lower or equal to 40% of SSI[19]. The amount allocated to each is equal to the social pension[20] times the correspondent (see Table 7).

[17] In CGA, the years of contributory career are the effective ones plus the product of the disability rate with the remaining years until 40, when the disability rate is below 100%. Total incapacity has a disability rate of 100%.
[18] Unborn children, adopted children and stepchildren are considered descendants.
[19] The widow/widower social pension could be received if the person receives a social old-age pension.
[20] In 2016, the social pension was €202.34 (€203.35 in 2017).

Table 7. Survivor pension benefit distribution by legal heirs

Survivor pension benefit distribution by legal heirs	
Beneficiary	% of pension
Spouse, ex-spouse and de-facto relationship	60% if there is one
	70% if there is more than one
Descendants	20% if there is one*
	30% if there are two*
	40% if there are three or more*
Ascending line	30% if there is one
	50% if there are two
	80% if there are three or more

*The descendant's percentages are doubled if there is no spouse or ex-spouse entitled to the pension.

Source: Instituto da Segurança Social and Caixa Geral de Aposentações.

2015 administrative data

According to the administrative data, in 2015, the majority of the old-age pension was granted to persons aged between 65 and 69, when the normal retirement age was 66 years. It should be noted that the suspension of early-pension was first partially reversed in 2015 to later be totally re-established in first three months of 2016[21]. After this period the early retirement scheme changed again to age 60 and 40 years of contributions.

Table 8. Number of new pensioners by age group - administrative data (MALE)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	4,630	127	2,809	1,694	0
50 - 54	2,728	465	1,837	426	0
55 - 59	11,129	7,404	3,140	585	0
60 - 64	19,206	15,174	3,255	777	0
65 - 69	20,591	19,332	158	1,101	0
70 - 74	2,394	1,021	44	1,329	0

Source: *Instituto da Segurança Social* and *Caixa Geral de Aposentações*.

Table 9. Number of new pensioners by age group - administrative data (FEMALE)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	5,122	43	2,126	2,953	0
50 - 54	3,113	34	1,554	1,525	0
55 - 59	10,005	5,035	2,723	2,247	0
60 - 64	14,362	8,291	3,130	2,941	0
65 - 69	27,163	23,166	86	3,911	0
70 - 74	5,916	1,154	0	4,762	0

Source: Instituto da Segurança Social and Caixa Geral de Aposentações.

[21] In 2015, under Social Security, an early-pension was possible for persons with 60 years old and 40 contribution years. Before April 2012, an early-pension could be granted to contributors with 55 years old and 35 years of contributory career. In CGA, even under the economic adjustment programme was possible to get an early-pension with 55 years old and 35 of contributory career.

Table 10. Number of new pensioners by age group - administrative data (TOTAL)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	9,752	170	4,935	4,647	0
50 - 54	5,841	499	3,391	1,951	0
55 - 59	21,134	12,439	5,863	2,832	0
60 - 64	33,568	23,465	6,385	3,718	0
65 - 69	47,754	42,498	244	5,012	0
70 - 74	8,310	2,175	44	6,091	0

Source: Instituto da Segurança Social and Caixa Geral de Aposentações.

Additionally, in the SS the disability pension are converted into old-age pension when one reaches the age of 65 – explaining the decrease of the former above 65-69 cohorts (in CGA there is no converting to old-age pension). The proportion of disability pensions was very similar for all age brackets, with the utmost weight at ages of 55-64 years old.

The number of survivor pensions is higher at younger ages and at older ages, explained by the descendants and widows, respectively.

Comparing by gender, women most often claim for an old-age pensions when reach the normal retirement age, while men also have a higher frequency on years before the normal retirement age. It could be explained by the fact that men have longer career and have a higher salary that could compensate the penalty applied to the early pension.

Taxation

Pensions are subject to **taxation**. When the pensioner does not reside in Portugal, the pension benefit with source in Portugal is subject to personal income tax (PIT), at a withholding rate of 21.5%. When he/she is resident in Portugal the worldwide income is subject to PIT and the pension income incorporates the household total gross income, which comprises wages, pensions, capital and property income. Some automatic deductions are made according to the type of income of the taxpayer (dependent worker, retirement pension) and the composition of the household.

The tax rate on pensions is applied to the annual income starting at €4,104, in 2017. Specific deductions to pension income are granted. Namely, 150% of trade union fees are deducted up until they reach 1% of gross income, and the amount of mandatory contributions – to social protection systems and health subsystems – that exceeds €4,104. The tax rate is determined according to the value of the pension and the family situation of each pensioner[22]. Moreover, total income is also subject to an extraordinary surcharge on PIT (implemented in 2011), which is currently being phased out and is planned to be completely abolished in 2018.

[22] Between 2011 and 2016, pension income was subject to an extraordinary solidarity contribution and its specifications and contribution base had been changed.

1.2. Recent reforms of the pension system included in the projections

Since the last Ageing Report, there were some reforms in the pension system that should be included in this year's projection exercise. During the adjustment period (2011-2014), there was significantly changed in public pension scheme (earning-related pensions). Among others, the initial reference year of the average life expectancy at 65 of the sustainability factor was changed, from 2006 to 2000, leading to a rather high increase on the penalty rate (from 4.78% in 2013 to 12.34% in 2014), and became only applicable to early retirement. Also in 2014, the normal retirement age rose to 66 and ceased to be fixed, evolving every year according the evolution of life expectancy at the age of 65 years. The changes describe below mainly compensate reforms undergone during the adjustment period (2011-2014):

1. In January 2015 the suspension of early pensions ended up, entering in force the rules approved in 2007 which defined that an early retirement could be done with 55 years of age and 30 years of contributory career. However, these conditions were only in force for about 2 months. This possibility, combined with the implementation of the sustainability factor on the pension's benefit formula, as well as the increasing normal retirement age according to the life expectancy, implied a significant reduction of pension benefits[23] - which in some cases were lower than the social old-age pension. As a result, in March 2015, the qualifying conditions for an early old-age pension changed to 60 years and 40 of contributory career. At that time, the bonus given to a contributor who claims an early pension and has more than 40 years of contributory career was also changed: for each year that exceeds 40 of career (when the contributor has 65), the months left until the normal retirement age are reduced by four[24].
2. The public employee's wage cut decided during the economic adjustment programme was completely put back on track on October 2016 and the extraordinary solidarity contribution on pensions was abolished in 2017.
3. In 2017, the indexation rule of pensions already in payment was resumed and the first threshold value of the rule was changed for twice the SSI, instead of 1.5 times the SSI[25]. Additionally, an extraordinary increase of pensions below or equal 1.5 times Social Support Index (€631.98) was decided in 2017: each pensioner receives, from August onwards, the difference between the ruled increase and €10; the increase of those pensions which had been extraordinarily updated between 2011 and 2015 only have an increase of €6. An equal extraordinary increase is planned in the State Budget for 2018[26].
4. In October 2017, entered in force a law that protects very long careers and reparation for early labour: contributors with 60 years and 48 or more of career, or 46 years of career and started

[23] In 2015, if a person claimed an early pension at 55 years (and had at least 30 of career) he/she would have a penalty of 67% (as the normal retirement age was 66 years and 2 month, the penalty was (11years x 12 months/year + 2 months) x 0.5) which with the sustainability factor (13.34% in 2015) resulted in a cut of at least 70.34% in the pension's benefit.
[24] In 2007, it was defined that for three years over the 30 of career was reduced 3 months in the penalty of the early pension.
[25] As a result, the second threshold was changed to between 2 and 6 times the SSI.
[26] The 2018's State Budget is going to have a final vote on 27 November 2018 and enter in force in January 1, 2019.

paying contributions at age 14 or less, will not suffer any penalty (including the sustainability factor).

5. At the same time it was eliminated the sustainability factor for disability pensioners in the date of the respective conversion into old-age pensions (at age 65). According to the 2018's State Budget, that conversion into old-age pensions becomes when pensioner reaches the normal retirement age.

1.3. Description of the actual "constant policy" assumptions used in the projection

These projections are anchored in the 2016 data and rules, assuming "constant policy" since then, except for the 2017 and 2018 planned extraordinary increases of pensions, the protection law for very long careers, and the elimination of the sustainability factor for disability pensions when the Social Security scheme's pensioner reaches 65 years[27].

In this exercise the non-contributory pensions (minimum pensions) were updated according to the Portuguese rule of indexation by 2026 and from 2027 onwards linked to wage growth. This follows the agreement of the Ageing Working Group for the 2018 Ageing Report pension projections that minimum pensions should be indexed to CPI for ten years and then to wage growth. The decision was supported by the idea that minimum pensions are designed to fulfil minimum income support and then it should be assumed that it would continue to do so in the future.

This exercise does not take into account the expenditure arising from the transfer of responsibilities from pension funds of Portuguese banks' employees to Social Security.

It is also important to stress that, as there is no administrative data for the number of pensioners, a proxy was used. According to annual income tax returns submitted by households in 2016, there were 2,153,094 old-age and disability pensioners and 635,908 survivor pensioners of which 1,904,551 received only one pensions (on total 18% of tax payers received 2 or more pensions between survivor and old-age pensions). However, tax payers that have an annual income lower or equal to €8,500.00 do not have to submit an annual income tax return. Therefore, in the exercise the number of public pensioners was computed adding the CGA and Social Security pensions, deducted by the percentage of unified pensions (24.1%) and limited by population in each cohort. The number of total pensioners is calculated adding the public pensioners with the private occupational scheme deducted by the number of duplications found in by the personal income tax database. It was assumed that the percentage of duplications is going to decrease steadily until 2030 as the number of pensioners that has a pension paid by an occupational fund is going to decrease. In result, in some projection years the early ages have a higher coverage than the older ones. To avoid this, a compensation was introduced between younger cohorts (65-69) and older ones (70-74 and 75+).

[27] This legislative provision is also applied to CGA. However, it was not considered in the projection given that the calculation of the disability pension's expenditure is done together with the old-age pension's expenditure.

2. DEMOGRAPHIC AND LABOUR FORCES PROJECTIONS

2.1. Demographic development

The Eurostat's 2015 population projections embody crucial underlying predictions which serve as a starting point for our pension projection exercise. According to Table 11, which presents an overview for the evolution of the main population indicators, one can see that total population is expected to pursue its downward trend – initiated in the beginning of this decade, decreasing by 24% between 2016 and 2070. Despite the fact that these projections are higher than those of the last Ageing Report based on Eurostat's 2013 population projections (EUROPOP2013), they still display a worrisome scenario where total population is expected to go below 10 million in the late 20s, fall behind 8.8 million by mid-2050s (a similar value to 1960s, during the dictatorship, when significant outflows happen), and below 8 million on 2070.

Table 11. Main demographic variables evolution

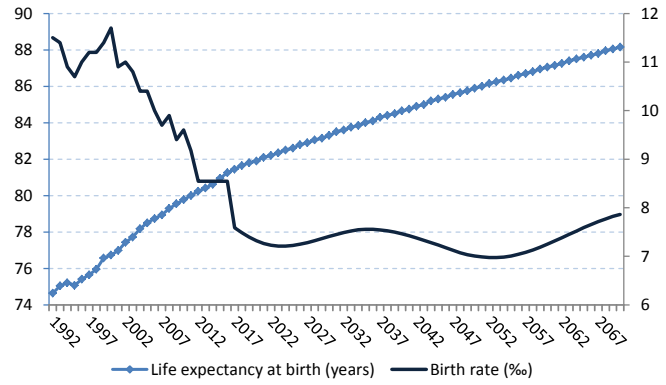
	2016	2020	2030	2040	2050	2060	2070	Peak year*
Population (thousand)	10,325.1	10,192.9	9,864.4	9,535.6	9,089.9	8,523.5	7,984.4	2016
Population growth rate	-0.3	-0.3	-0.3	-0.4	-0.6	-0.7	-0.6	2017
Old-age dependency ratio (pop65/pop15-64)	32.1	34.9	44.2	56.4	65.4	64.9	67.2	2070
Ageing of the aged (pop80+/pop65+)	28.9	29.7	30.7	33.6	38.4	46.5	44.4	2063
Men - Life expectancy at birth	78.2	78.9	80.5	82.0	83.4	84.7	85.9	2070
Men - Life expectancy at 65	18.1	18.6	19.6	20.6	21.5	22.4	23.3	2070
Women - Life expectancy at birth	84.3	84.9	86.1	87.3	88.4	89.4	90.4	2070
Women - Life expectancy at 65	21.8	22.2	23.2	24.1	25.0	25.9	26.7	2070
Men - Survivor rate at 65+	84.6	85.6	87.8	89.7	91.2	92.5	93.7	2070
Men - Survivor rate at 80+	56.6	58.9	64.0	68.5	72.6	76.3	79.5	2070
Women - Survivor rate at 65+	93.3	93.7	94.6	95.3	95.9	96.5	96.9	2070
Women - Survivor rate at 80+	76.3	77.7	80.8	83.4	85.7	87.8	89.5	2070
Net migration	-10.5	2.4	12.8	18.2	15.8	14.6	14.2	2041
Net migration over population change	0.3	-0.1	-0.4	-0.5	-0.3	-0.3	-0.3	2040

* Maximum value of variable over the projection period 2016-2070.

Source: EUROSTAT and Commission Services.

This evolution is mainly explained by persistently low fertility rates, which have been below the replacement level (2.1) since 1980, are currently the lowest in Europe (1.26), and are projected to reach only 1.65 in 2070. This reality can also be seen by the birth rate which steeply deteriorated over the last two decades and is forecasted to remain below 8 ‰ until the end of the period (Graph 1). In turn, one can verify in the same graph that, life expectancy at birth will continue its upturn, significantly increasing from about 82 to 88 years, between 2016 and 2070.

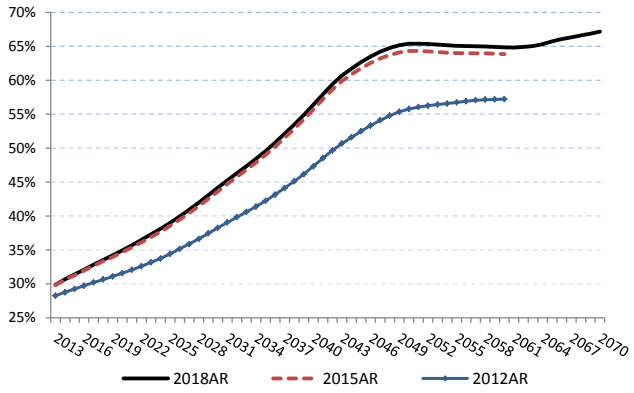
Graph 1. Life expectancy at birth and birth rate



Source: Instituto Nacional de Estatística (INE) and Eurostat.

These developments contribute to the worsening of the old-age dependency ratio (Graph 2). Nowadays, there is about one elderly (+65 years) for every three working age citizens (15-64 years), whereas this relationship is foreseen to more than double by 2070: dependency ratio will surpass 67%. The rising life expectancy, particularly at 65 years of age (which is expected to increase 5 years, on average), also influences the share of elderly with more than 80 years which will substantially grow (15.5 p.p.) during the projection's timespan, reaching its 47% peak in 2063 (cf. Table 11).

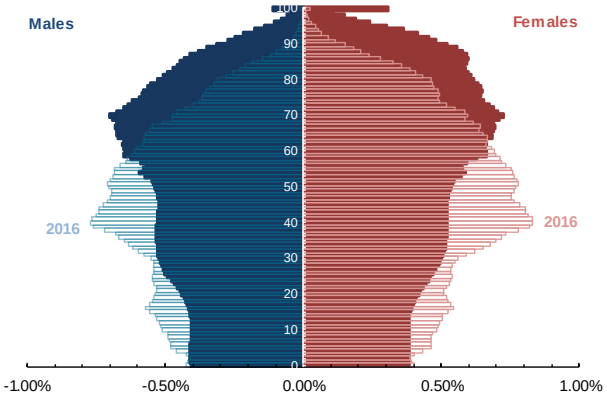
Graph 2. Dependency ratio



Source: Eurostat.

The twofold growth of the dependency ratio can also be visualized in the structural upward shift of the demographic pyramid (Graph 3). Between 2016 and 2070, the pyramid evidences the shrinkage of the share of all cohorts below 60 and the consequent widening of the top, due to the mentioned factors.

Graph 3. Age pyramid comparison: 2016 vs 2070



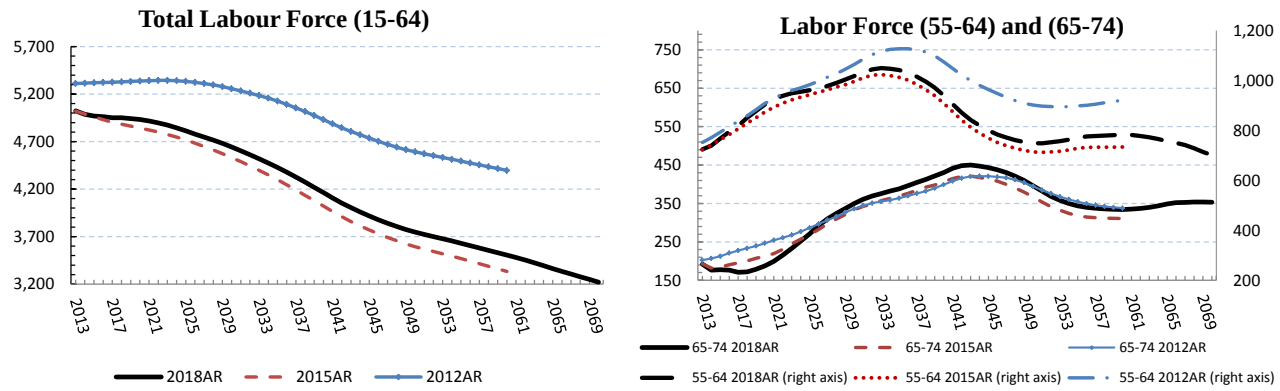
Source: Eurostat and Commission services.

Furthermore, migration flows are also an important feature of population dynamics and demographic structure. As previously stated, Portugal experienced significant net outflows in the 50s and 60s followed by their return, in the 1970s, after the independence of the former colonies. Reversely, during the 1990s, Portugal experienced a substantial intake of migrants from Eastern European countries, Brazil and those former colonies: cumulative net intake of more than 270 thousand, between 1991 and 2000. Moreover, the country experienced positive net migration, contributing to rising total population until it reached its historical maximum number of citizens in 2011. Nevertheless, that was the time when Portugal was hit by the effects of the recession, registering a mass emigration of young qualified professionals, seeking to avoid record high unemployment rates: cumulative net outtake of 146 800. Finally, Eurostat foresees that this trend will only be reversed in 2020, continuing to have relevant impacts on labour force and fertility rates projections.

2.2. Labour forces

Following the Eurostat's projections, Portugal will lose more than a third of its total labour force (15-64), diminishing 35% between 2016 and 2070 – a drop even greater than that of total population. Nevertheless, total labour force projections were revised upwards by around 3% compared to the previous Ageing exercise, after being sharply reduced between 2015 and 2012 exercises (Graph 4). While the same can be said about the labour force among the 55-64 cohorts, the current projections of the labour force aged 65-74 are only higher than those of 2015's Ageing exercise from mid-2020s onwards (Graph 5).

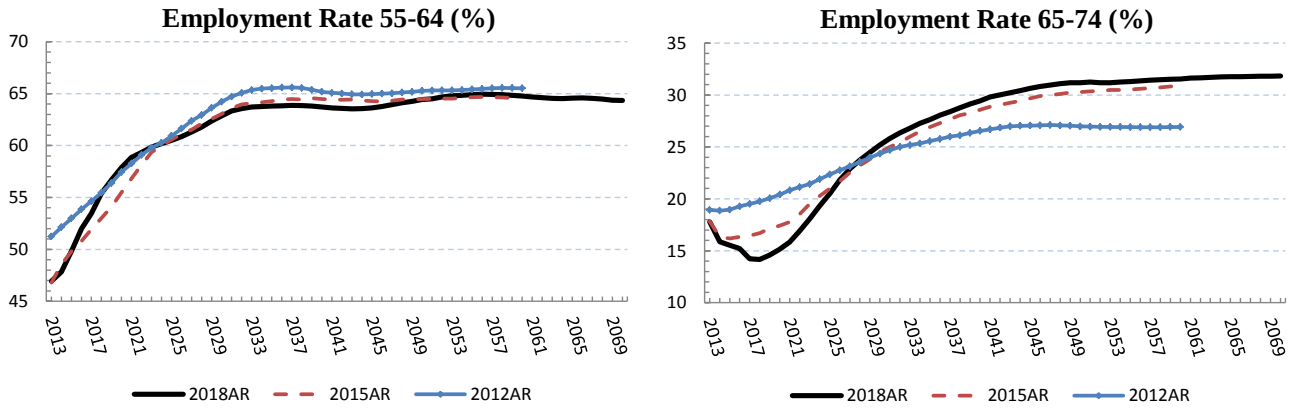
Graph 4. and 5. Labour force (thousands persons)



Source: Eurostat and Commission Services.

Labour force participation rate (LFPR) among those aged 55 to 64 is forecasted to increase from 58.4 to around 70% in 2056, followed by a slight reduction to 69.4 in 2070, after rapidly growing (more than 10 p.p.) between 2016 and 2030. Moreover, employment rate for these cohorts is expected to grow from 52 to 64.3 %, in the projection period, representing a higher upsurge than the former (12.3 compared to 11p.p.) – suggesting that unemployment in these cohorts will grow relatively less than employment (Graph 6). Consequently, the share of workers on labour force aged 55-64 will rise from 89 to 92.8 %, along the projection period.

Graph 6. and 7. Employment rates



Source: Eurostat and Commission Services.

In accordance with the described dependency ratio outburst, the LFPR for people aged 65-74 will more than double during the projection's timespan, increasing from 16 to 32.5%. Similarly, the respective employment rate will also rise by 16.5p.p. Both upsurges are higher than for cohorts 55-64 since the normal retirement age is linked to the increasing life expectancy at 65 and, thus, older cohorts are more affected than younger ones. Furthermore, the share of employed persons under the labour force, within this age group, will slowly increase from about 98 to 98.8%. Although this represents the same increase of 0.9p.p. as it was projected in 2015's Ageing exercise, values after 2030 are now lower due to the mentioned higher labour force aged between 65 and 74.

Table 12. 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	58.4	63.8	68.5	69.1	69.5	69.8	69.4	2056
Employment rate for workers aged 55-64	52.0	57.9	62.9	63.7	64.4	64.8	64.3	2056
Share of workers aged 55-64 on the labour force 55-64	89.0	90.8	91.8	92.2	92.7	92.7	92.8	2065
Labour force participation rate 65-74	16.0	16.0	26.5	30.7	30.5	32.2	32.5	2066
Employment rate for workers aged 65-74	15.6	15.7	26.0	30.2	30.1	31.8	32.1	2066
Share of workers aged 65-74 on the labour force 65-74	97.9	98.1	98.3	98.5	98.8	98.7	98.8	2052
Median age of the labour force	41.0	43.0	45.0	44.0	44.0	45.0	44.0	2029

* Maximum value of variable over the projection period 2016-2070.

Source: Commission Services

Given 2014 pension system reforms such as the increase of the normal retirement age and the application of the sustainability factor to early pensions, the average effective exit age is projected to increase from 64.8 to 66.6 years (+1.8) for men and from 64.1 to 66.3 years (+2.2) for women, between 2017 and 2070. These increases are smaller than those of the normal retirement age (cf. Table 13 and 14) as some individuals are no longer included in the labour force survey statistics and do not have the requirements for claiming an old-age pension.

Between 2017 and 2070, the contributory period is expected to increase from 36.6 to 41.9 years (+5.2) and from 30.1 to 33.5 years (+3.4), for men and women respectively, enlarging the difference between sexes. Therefore, the contributory period for both sexes increases roughly 1.5 to 3 years more than the average effective exit age. This discrepancy can be explained by the fact that the Cohort Simulation Model (CSM) does not incorporated the change in the pensioner's behaviour arising from the 2014 reforms, by taking into account the average of last ten years exits from the labour market. It should be stressed that normal retirement age should increase 3 years throughout the horizon. On the other hand, women live longer and therefore spend more time in retirement. Nevertheless, differences in the duration of retirement are expected to slightly reduce, as they are projected to grow from 18.3 to 21.5 years (+3.2) for men and from 22.8 to 25.7 years (+2.9) for women.

Table 13. Labour market exit age, contributory period and expected duration of life spent at retirement - MALE

	2017	2020	2030	2040	2050	2060	2070	Peak year*
Average effective exit age (CSM) (II)	64.8	65.3	66.3	66.5	66.6	66.6	66.6	2052
Contributory period	36.6	38.6	40.8	41.4	41.6	41.7	41.9	2067
Duration of retirement	18.3	18.6	18.8	18.9	19.8	20.7	21.5	2069
Duration of retirement/contributory period	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2070
Percentage of adult life spent at retirement	28.1	28.2	28.0	28.0	28.9	29.9	30.7	2070
Early/late exit	1.6	2.1	0.9	1.0	0.6	1.0	1.6	2016

* Maximum value of variable over the projection period 2016-2070.

Source: Commission Services, GPEARI and GEP.

Table 14. Labour market exit age, contributory period and expected duration of life spent at retirement - FEMALE

	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM) (II)	64.1	65.4	65.9	66.1	66.2	66.2	66.3	2070
Contributory period	30.1	31.7	34.1	34.2	33.3	33.4	33.5	2038
Duration of retirement	22.8	22.2	22.3	23.2	24.1	24.9	25.7	2069
Duration of retirement/contributory period	0.8	0.7	0.7	0.7	0.7	0.7	0.8	2016
Percentage of adult life spent at retirement	33.1	31.9	31.8	32.6	33.3	34.0	34.7	2069
Early/late exit	2.1	2.9	1.1	1.0	0.7	1.0	1.9	2020

* Maximum value of variable over the projection period 2016-2070.

Source: Commission Services, GPEARI and GEP.

PENSION PROJECTION RESULTS

2.3. Extent of the coverage of pension schemes in the projections

The present projections comprise the main Portuguese pension systems: the public system (Social Security and CGA) and the private occupational system implemented through pension funds.

The scope of the public projections differs from Eurostat figures for public pensions (ESSPROS). One of the factors that explain the differences relates to the exclusion in ESSPROS of the Solidarity supplement for the elderly (*Complemento Solidário para Idosos* – CSI). Additionally, pensions paid to bank and to BPN employees transferred to the social security scheme are not considered as pension expenditure for the purpose of this exercise[28].

Table 15. Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
1 Eurostat total pension expenditure	12.2	12.7	13.6	13.7	14.4	14.5	15.7	15.6	15.0
2 Eurostat public pension expenditure	10.8	11.4	12.3	12.5	13.1	13.6	14.7	14.7	14.1
3 Public pension expenditure (AWG)	10.8	11.3	12.2	12.4	13.1	13.2	14.3	14.3	13.8
4 Difference (2) - (3)	0.0	0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.3
5 Expenditure categories not considered in the AWG definition, please specify:									
5.1 Social Security - Elderly pension supplement (Complemento Solidário p/ Idosos)	:	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1
5.2 Social Security - BPN and Banking regime	:	:	:	:	:	0.3	0.3	0.3	0.3

Source: Instituto Nacional de Estatística, GPEARI and GEP.

Private pension schemes include occupational and personal schemes. As mentioned before, the occupational pension schemes financed by pension funds can be separated into three types of pension schemes: banking sector DB, other DB and DC schemes. The projection exercise was separately made for each type of pension scheme, as its different characteristics determine that different assumptions should be used in modelling the cash flows for the future. Private pension schemes also include occupational schemes funded by group insurance policies (the corresponding amount of technical provisions represented 0.2% of the Portuguese GDP by the end of 2016) and personal schemes. Personal schemes are mainly composed by individual adhesions to open pension funds and

[28] This exercise does not consider the payment of pensions or revenue due to transfers of responsibility to the Social Security scheme of pensions of bank and of BPN employees as they are considered neutral from an actuarial point of view, without impact on the long term public finance sustainability analysis.

retirement saving schemes (usually known as PPR – *Planos de Poupança Reforma* – that can have as financing vehicles insurance contracts, pension funds or investment funds), and the respective amount of assets / technical provisions represented 8.9% of the Portuguese GDP by the end of 2016. These schemes have not been included in the projection exercise due to the lack of data with a level of granularity that would be needed to derive assumptions and model cash flows for the future.

2.4. Overview of projection results

Under the assumptions implicit in the AWG baseline scenario, total pension (public and private occupational pensions) is expected to decrease by 2.2p.p. of GDP, from 13.8% in 2016 to 11.7% in 2070, after reaching a peak of 15% of GDP in 2038. This behaviour is due to public pension expenditure, as occupational pension expenditure has a minor role. Occupational pensions spending in terms of GDP is expected to slightly decrease over first decades of the projection horizon (from around 0.3% of GDP in 2016 to 0.2% of GDP in 2050) and then increase again to 0.3% at the end of the projection horizon. This evolution is mainly explained by a downward trend of pension spending relative to DB schemes due to a gradual reduction of the number of beneficiaries. On the other hand, the share of pension spending with regard to DC schemes (which currently have a lower average pension than DB schemes but as time progresses are also expected to become more generous) is expected to significantly increase over the years.

Table 16. Projected gross and net pension spending and contributions (% of GDP)

Expenditure	2016	2020	2030	2040	2050	2060	2070	Peak year*
Gross public pension expenditure	13.5	13.6	14.3	14.7	13.7	12.0	11.4	2038
Private occupational pensions expenditure	0.3	0.3	0.2	0.2	0.2	0.2	0.3	2070
Private individual pensions expenditure	:	:	:	:	:	:	:	:
Mandatory private	:	:	:	:	:	:	:	:
Non-mandatory private	:	:	:	:	:	:	:	:
Gross total pension expenditure	13.8	13.9	14.5	15.0	13.9	12.2	11.7	2038
Net public pension expenditure	12.0	12.1	12.7	13.1	12.2	10.6	10.1	2038
Net total pension expenditure	12.3	12.3	12.9	13.3	12.3	10.8	10.4	2038
Contributions	**2016**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year***
Public pension contributions	13.1	12.8	11.9	11.1	11.0	11.8	12.3	2016
Total pension contributions	13.5	13.2	12.2	11.4	11.4	12.3	12.9	2016

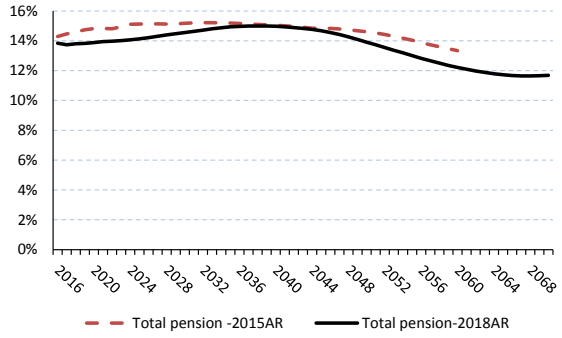
Contributions include State transfers to CGA.
* Maximum value of variable over the projection period 2016-2070.

Source: Commission Services, GPEARI, GEP and ASF.

The public pension system expenditure is expected to decrease by 2.2p.p. of GDP at the end projection period (from 13.5% of GDP in 2016 to 11.4% in 2070 after reaching a peak of 14.8% of GDP in 2038).

Although the evolution is almost the same, in the 2015 Ageing Report (2015 AR) public pension expenditure was projected to be higher in the first 20 years and again after the mid of 40's onwards. However the results are lower than in the 2015 exercise. One explanation for that are the base year inputs. In 2015 the number of new pensions and the average pensions were significantly lower. Since 2014, due to the early age of retirement changes and heavier penalties (sustainability factor reduces twice or more than before, the longer the distance between the retirement age and the normal retirement age the greater is the penalty) the number of new pensions decrease and the pension benefit amount is lower.

Graph 8. Public pension expenditure in 2015 AR and 2018 AR (% of GDP)



Source: GPEARI and GEP.

For the purpose of the projection, the implicit tax rate was calculated based on gross income of pensions and on the assessed withheld tax imputed to pension income of the year. For 2016 and onwards[29], the implicit tax rate (around 11.3%) of 2015 will be kept unchanged along the projection period. It means that net pension expenditures will have the same behaviour as gross pension expenditures.

Table 17. Projected gross public pension spending by scheme

(% of GDP)

Pension scheme	2016	2020	2030	2040	2050	2060	2070	Peak year *
Total public pensions	13.5	13.6	14.3	14.7	13.7	12.0	11.4	2038
of which								
Old age and early pensions:	11.2	11.3	12.1	12.5	11.6	10.1	9.7	2039
Flat component (basic pension)	:	:	:	:	:	:	:	:
Earnings related	10.7	10.9	11.7	12.1	11.1	9.6	9.2	2038
Minimum pensions (non-contributory) i.e. minimum income garantees for people above 65	0.4	0.3	0.3	0.4	0.4	0.5	0.4	2056
Disability pensions	0.7	0.6	0.6	0.5	0.4	0.5	0.5	2016
Survivor	1.7	1.7	1.7	1.7	1.6	1.4	1.2	2021
Other pensions	:	:	:	:	:	:	:	:
of which								
Caixa Geral de Aposentações (CGA)	5.2	4.7	4.2	3.5	2.2	1.0	0.4	2016
Social Security System	8.3	9.0	10.1	11.2	11.5	11.0	10.9	2044

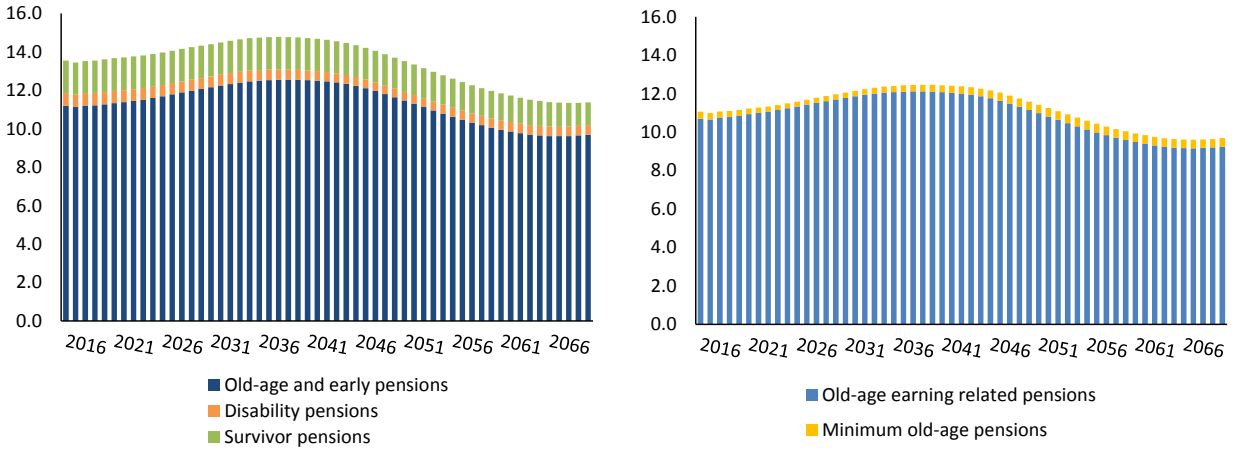
* Maximum value of variable over the projection period 2016-2070.

Source: Commission Services, GPEARI and GEP.

The old-age pension expenditure is the main responsible for the behaviour of total public pension expenditure, Thereby, the old-age pension expenditure is planned to start at 11.2% of GDP, increasing up to 12.5% in 2039 and then starts to decrease until 9.7% by the end of the projection period.

[29] For 2017 and 2018, this implicit tax rate should be lower as was approved and planned to lower the PIT surcharge. Additionally, it is also planned to adjust the lower PIT thresholds aiming that who has lower income pay less taxes.

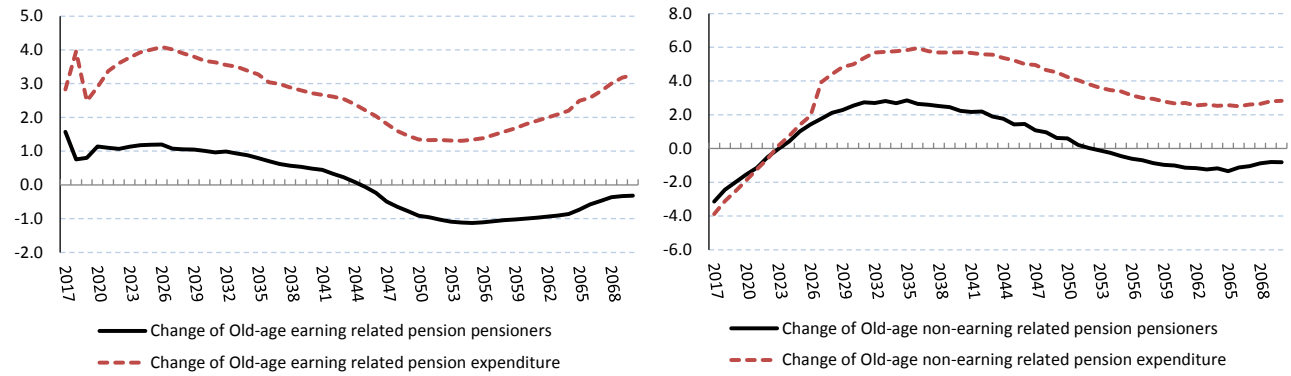
Graph 9. and 10. Public pension expenditure by type (% of GDP)



Source: GPEARI and GEP.

The old-age earning related pension expenditure and the non-earning related pension (minimum pension) expenditure evolve almost in line with the number of pensioners. The average old-age earning related pension grows over the projection, increasing pension expenditure even when the number of pensioners decreases. This is the case between 2020 and 2027. It should be noticed that the pension indexation rule updates mostly the lower pensions. The rise observed in 2027 in old-age non-earning related pension expenditure is explained by the indexation rule for minimum pensions agreed by the Ageing Working Group.

Graph 11. and 12. Old-age public pension expenditure versus pensioners (change in %)

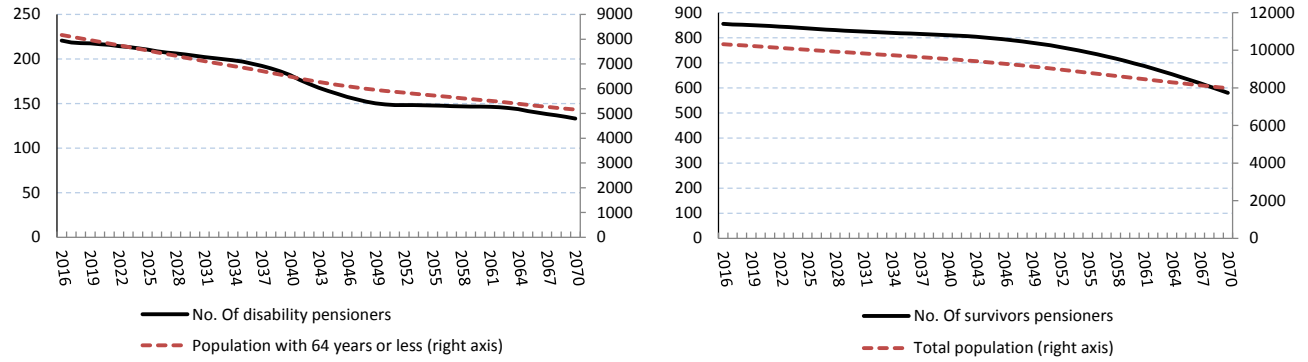


Source: GPEARI and GEP.

Survivors and disability[30] pension expenditures decrease by 0.5p.p. and 0.2p.p. of GDP, respectively, as population shows a downward trend.

[30] CGA disability pensions are enclosed in old-age pensions.

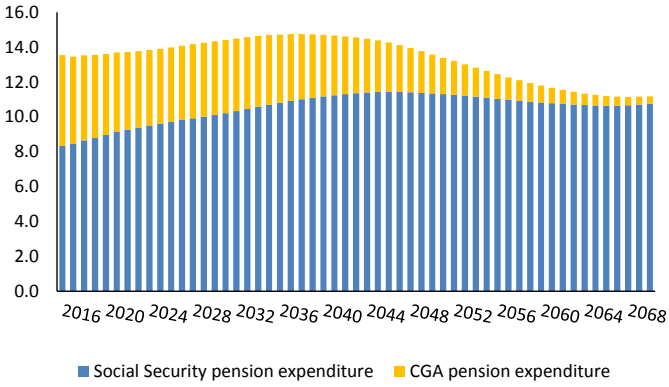
Graph 13. and 14. Disability and survivor public pensioners versus population (1000 persons)



Source: GPEARI and GEP.

On what concerns **Social Security system** pensions' expenditure, simulation results suggest that until 2070 social security pensions are expected to raise 2.4p.p. of GDP. However, between 2016 and 2047, expenditure increases 3.1p.p. and, for the rest of the projection, there is a downward trend, decreasing 0.7p.p.

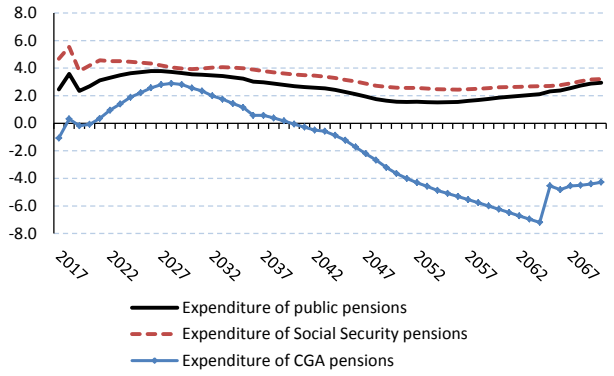
Graph 15. Expenditure of Social Security and CGA (% GDP)

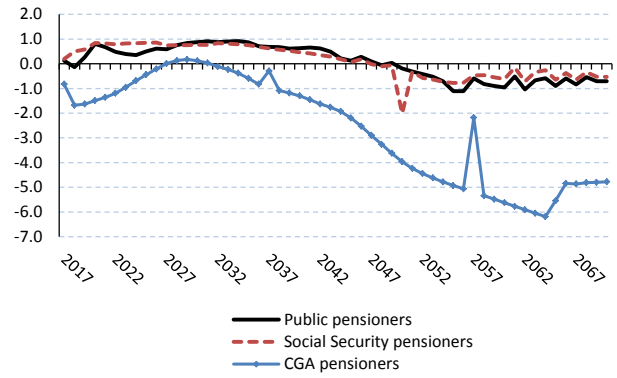


Source: GPEARI and GEP.

Regarding **CGA** pension expenditure, 2016 presents an expenditure of 5.2% of GDP and, as it is a closed system, the expenditure is foreseen to decrease along the projection period, until 0.4% of GDP by 2070.

Graph 16. and 17. Change of expenditure and pensioners of Social Security and CGA (change in %)





Source: GPEARI and GEP.

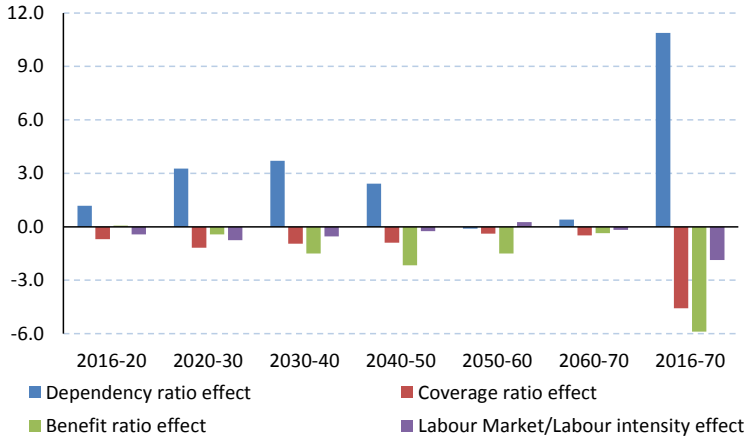
2.5. Description of main driving forces behind the projection results and their implications for main items from a pension questionnaire

The main factor driving the evolution of public pension expenditure is the ageing population. Therefore, the dependency ratio[31] is the only component that generates pension expenditure pressure throughout the projection period (+10.9p.p.). In fact, in line with the demographic projections given by the baseline scenario, the dependency ratio is expected to almost double between 2016 and 2070 (from more than 37 aged 65 or more for each 100 persons between 20-64 years old in 2016, to almost 73 elderly for each 100 persons in that age group in 2070).

Despite this demographic pressure on pension expenditure, from 2040 onwards this effect is offset by almost the other components, in particular, by the benefit ratio[32] and coverage ratio[33] effects.

[31] Dependency ratio is the population with 65 years or more over population between 20 and 64 years.
[32] The benefit ratio is given by the average pension over GDP on the total number of hours worked (labour productivity per hour worked for employees between 20 and 74 years).
[33] The coverage ratio is the ratio between the number of pensioners over the population with 65 years or more.

Graph 18. Drivers of public pension expenditure according the number of pensions



Source: Commission Services, GPEARI and GEP.

The analysis by decades reveals a similar picture as for the whole projection period except for 2050-60, when the dependency ratio effect and the labour market/labour intensity effect[34] change signs. At this time the population with 65 years start to decrease and population between 20 and 64 drops but less sharply than in the years before. These demographic changes will also have impacts on the employment ratio, as population and working populations aged 20-64 have almost the same behavior, and on career shifts.

It should also be noticed that, in the first years of the projection, the benefit ratio effect is positive (0.1p.p.). This is explained by the extraordinary increase of pensions in 2017 and 2018[35].

The coverage ratio effect can be broken down into three components: the old-age coverage ratio[36], the early-age coverage ratio[37] and a cohort effect[38]. The cohort effect shows the most negative contribution (-8.6p.p.between 2016 and 2070) as population +65 increases more than the population in cohort 50-64. This is followed by the early-age coverage ratio (-6.4p.p.), explained by the decrease of the number of orphans that have survivor pension, and, by the evolution of the old-age coverage ratio (-3.1p.p.), which reflects the rise on the normal retirement age.

The labour market/labour intensity effect is also subdivided in three effects: the employment ratio effect[39], the labour intensity effect[40] and the career shift effect[41]. The employment ratio effect and the career shift ratio have a negative contribution (1p.p.). In the first case, this is because, the population

[34] The labour market/labour intensity effect is given by the ratio of the population aged between 20 and 64 over the hours worked by employees between 20 and 74 years old.
[35] These policy measures will have effect till 2019, as they enter in force in August of 2017 and 2018.
[36] The old-age coverage ratio is given by the number of pensions of pensioners with 65 years or more over the population with 65 years or more.
[37] The early-age coverage ratio is given by the number of pensions of pensioners with less than 65 years over the population in 50-64 cohorts.
[38] The cohort effect is given by the population in 50-64 cohorts over the population with 65 years or more.
[39] The employment ratio effect is given by the population in 20-64 cohorts over the working people in the same cohort.
[40] The labour intensity effect is given by the working people in 20-64 cohorts over the hours worked by the same cohort.
[41] The career shift effect is given by the number of hours worked by people in 20-64 cohorts over the hours worked by people in 20-74 cohorts.

in 20-64 cohort shows a higher fall, mainly in the three first decades of the projection. In the case of the career shift ratio is due to the extension of contributory career as a consequence of the increase in the normal retirement age.

Table 18. Factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) – pensions

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.1	0.7	0.4	-1.1	-1.7	-0.6	-2.2	-0.04
Dependency ratio effect	1.2	3.3	3.7	2.4	-0.1	0.4	10.9	0.20
Coverage ratio effect	-0.7	-1.2	-1.0	-0.9	-0.4	-0.5	-4.6	-0.09
Coverage ratio old-age*	-0.3	-0.6	-0.6	-0.6	-0.5	-0.5	-3.1	-0.06
Coverage ratio early-age*	-2.1	-3.0	0.5	-1.3	-0.5	0.2	-6.4	-0.12
Cohort effect*	-0.5	-1.6	-3.9	-2.6	1.0	-0.9	-8.6	-0.17
Benefit ratio effect	0.1	-0.4	-1.5	-2.2	-1.5	-0.4	-5.9	-0.11
Labour Market/Labour intensity effect	-0.4	-0.8	-0.5	-0.2	0.3	-0.2	-1.9	-0.04
Employment ratio effect	-0.4	-0.3	-0.2	-0.2	0.1	0.0	-1.0	-0.02
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.00
Career shift effect	0.0	-0.5	-0.4	0.0	0.1	-0.2	-1.0	-0.02
Residual	-0.1	-0.2	-0.3	-0.2	0.0	0.0	-0.7	0.00

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

Source: Commission Services, GPEARI and GEP.

The evolution according to the pensioners closely follows the behaviour concerning pensions. The main differences (are the coverage ratio effect and the benefit ratio effect (which almost offset each other) as the number of pensions is higher than the number of pensioners because some pensioners receive old-age and survivor pensions and other receive old-age pensions from two different subsystem (Social Security and CGA or from a pension fund).

Table 19. Factors behind the change in public pension expenditures between 2016 and 2070 (in percentage points of GDP) – pensioners

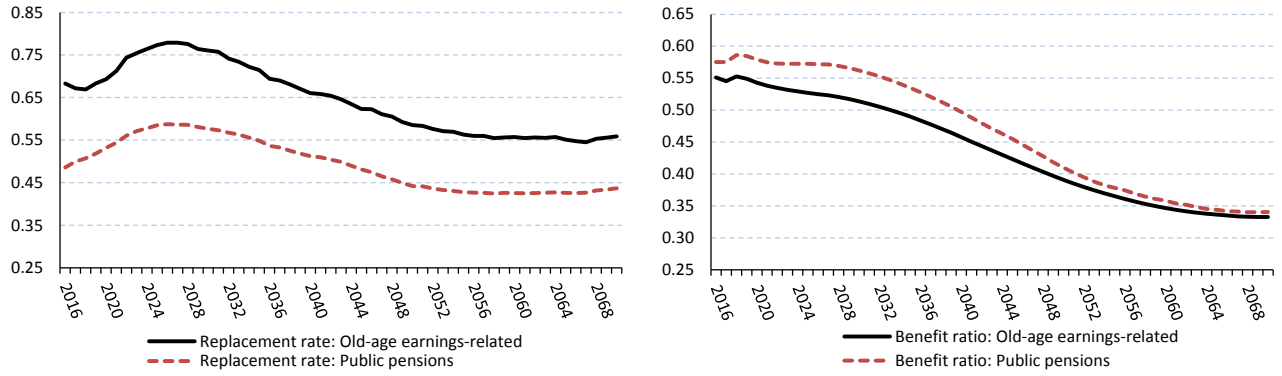
	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	0.1	0.7	0.4	-1.1	-1.7	-0.6	-2.2	-0.04
Dependency ratio effect	1.2	3.3	3.7	2.4	-0.1	0.4	10.9	0.19
Coverage ratio effect	-0.7	-1.3	-0.7	-0.3	-0.1	-0.2	-3.3	-0.06
Coverage ratio old-age*	-0.2	-0.6	-0.3	0.1	-0.2	-0.2	-1.3	-0.02
Coverage ratio early-age*	-2.0	-2.9	0.5	-1.2	-0.5	0.2	-5.8	-0.11
Cohort effect*	-0.5	-1.6	-3.9	-2.6	1.0	-0.9	-8.6	-0.17
Benefit ratio effect	0.1	-0.3	-1.7	-2.7	-1.8	-0.6	-7.1	-0.13
Labour Market/Labour intensity effect	-0.4	-0.8	-0.5	-0.2	0.3	-0.2	-1.9	-0.04
Employment ratio effect	-0.4	-0.3	-0.2	-0.2	0.1	0.0	-1.0	-0.02
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.00
Career shift effect	0.0	-0.5	-0.4	0.0	0.1	-0.2	-1.0	-0.02
Residual	-0.1	-0.2	-0.3	-0.2	0.0	0.0	-0.8	0.00

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

Source: Commission Services, GPEARI and GEP.

The public replacement ratio is expected to increase in the first years of the projection period from 49% in 2016 to 59% in 2026 and then decrease up to the end of the projection period when reaches 44%. The old-age earning-related replacement rate has a similar behaviour, although even more accentuated (it falls 11p.p. in all period). It should be stressed that pension benefits are calculated according to past wages of the entire contributory career, to a maximum of 40 years, updated with the price index. It means that the replacement rate compares an average of past wages with the current one.

Graph 19. and 20. Replacement rate at retirement and benefit ratio of public pensions and old-age earning-related public pensions



Note: The replacement rate was calculated in proportion of the months paid of pension benefit in the first year (8 months in average).

Source: GPEARI and GEP.

The public benefit ratio is estimated to stay almost constant by the middle of 2020's, when starts decrease till 2070. This evolution is mainly a consequence of pension indexation, as real GDP growth is below 2% in almost the whole projection period, pensions are updated in line with inflation (pensions under 2 times the SSI) or less (pensions between 2 and 6 times SSI are updated at inflation rate minus 0.5p.p. and pensions above 6 times SSI are updated at inflation rate minus 0.75p.p.). The hike of the benefit ration in the first years (2017 to 2019) is explained by the extraordinary increase of lower pensions in 2017 and 2018. The public benefit ratio is higher than the old-age earning related benefit ratio because pensioners usually receive more than one pension.

In relation to occupational schemes, benefit ratio are expected to decrease over time due to a progressively larger proportion of DC schemes and the fact that the average pension is lower for these cases, in comparison to DB schemes.

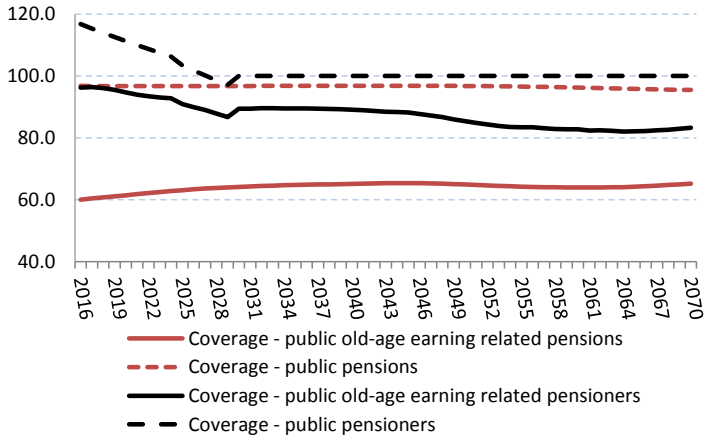
Table 20. Replacement rate at retirement (RR) and coverage by public pension scheme
(in %)

	2016	2020	2030	2040	2050	2060	2070
Public scheme (BR)	57.5	57.9	56.2	49.7	41.0	35.8	34.0
Public scheme (RR)	48.6	53.2	57.7	51.2	44.2	42.6	43.7
Coverage	116.8	111.3	100.0	100.0	100.0	100.0	100.0
Public scheme old-age earnings related (BR)	55.1	54.3	51.4	45.8	39.1	34.7	33.3
Public scheme old-age earnings related (RR)	68.3	69.3	76.0	66.0	58.6	55.7	55.9
Coverage	96.2	94.7	89.4	89.1	85.4	82.7	83.3
Private occupational scheme (BR)	27.8	25.6	20.3	17.0	15.0	15.2	16.4
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	5.2	5.0	4.5	4.3	4.3	4.9	5.8
Private individual scheme (BR)	:	:	:	:	:	:	:
Private individual scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Total (BR)	68.6	65.7	57.1	50.5	41.6	36.6	35.0
Total (RR)	:	:	:	:	:	:	:

Source: Commission Services, GPEARI and GEP.

Before analysing any kind of indicators based on pensioners, it should be noted that, as explained, the number of pensioners is not available in the Portuguese statistics on pensions' schemes. For that reason, for the purpose of this exercise, that number of pensioners was estimated from the number of tax payers that received two or more pensions and on the administrative data of pensions in payment (see item 1.3 1.3. Description of the actual "constant policy" assumptions used in the projection).

Graph 21. Coverage ratio of public old-age earning related and public pensions (using pensions and pensioners)

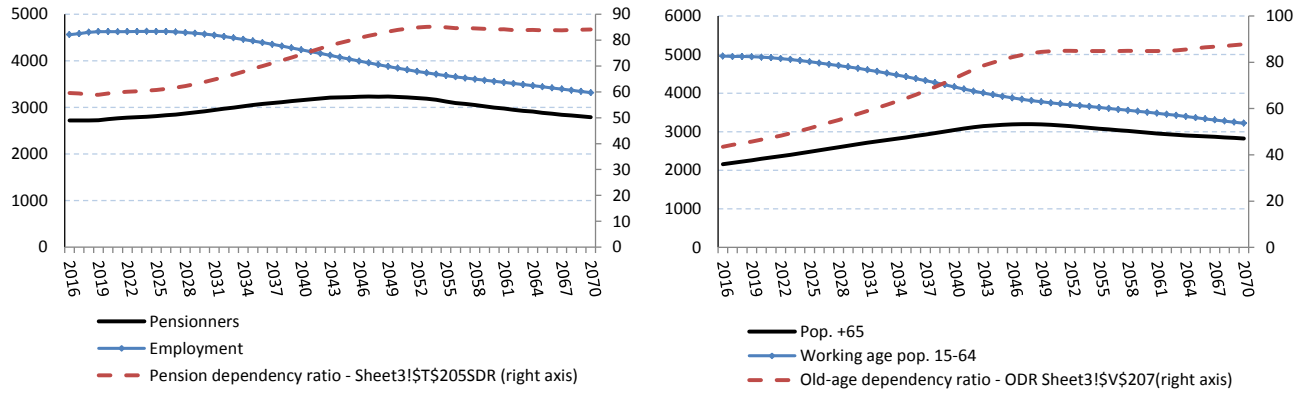


Source: GPEARI and GEP.

The coverage by public pension scheme shows figures above one hundred per cent in the first years. This is explained by the fact that some pensioners receive both old-age and survivor pensions or receive old-age pension paid by different entities. This fact is clearly showed in the coverage of the public pensions as the number of civil servants that also worked for private is increasing.

The public old-age earning related and public coverage ratios show a decrease along the projection horizon. However, if these ratios are computed taking into account the number of pensions they show a slight increase (public old-age earning related pensions) or are almost stable.

Graph 22. and 23. Efficiency of the system



Source: GPEARI and GEP.

The public system efficiency decreases over the years from 1.6 in 2016 to 1.3 in 2070, as the pension system dependency (SDR) grow less than the old-age dependency ratio (ODR) – 65% and 109% respectively.. This evolution is more marked in the first half of the projection as population aged 65 or more grows more than the pensioners and working age population, facing a higher significant downturn.

The linkage of the normal retirement age to life expectancy (higher than 65 years for the entire projection period), combined with the use of the sustainability factor and penalties, results in a moderate growth of pensioners when comparing to the population with 65 years or more.

Table 21. System dependency ratio and old-age Dependency Ratio

	2016	2020	2030	2040	2050	2060	2070
Number of public pensioners (thousand) (I)	2,328.0	2,468.9	2,918.5	3,153.5	3,225.9	2,993.3	2,787.7
Employment (15 -74) (thousand) (II)	4,562.8	4,627.7	4,573.2	4,237.3	3,843.5	3,559.1	3,315.8
Pension System Dependency Ratio (SDR) (I)/(II)	51.0	53.4	63.8	74.4	83.9	84.1	84.1
Number of people aged 65+ (thousand) (III)	2,157.9	2,296.8	2,679.6	3,042.2	3,179.2	2,974.5	2,826.7
Working age population 15 - 64 (thousand) (IV)	6,723.5	6,572.1	6,065.3	5,395.0	4,862.1	4,586.8	4,208.2
Old-age Dependency Ratio (ODR) (III)/(IV)	32.1	34.9	44.2	56.4	65.4	64.9	67.2
System efficiency (SDR/ODR)	1.6	1.5	1.4	1.3	1.3	1.3	1.3

Source: Commission Services, GPEARI and GEP.

Concerning the public data, the number of pensioners is planned to increase between 2016 and 2049, then starting to decrease, following the evolution of the inactive population except in the initial period when inactive population decrease.

Generally, the proportion of total pensioners into inactive population in all cohorts shows a downward trend except for 70 and plus. However, there are some particular behaviours. The 55-59 cohort decreases around 8p.p.from 2016 to 2021. This can be explained by the fact that the contributors with long careers can apply to the old-age pension if they have 60 years. This measure will gradually lose relevance as contributors with this type of career are retiring

The next cohorts (60-64) also shows a decrease throughout the projection as contributors with long careers will gradually lose relevance and expected penalties are heavy (the longer the distance of the age from the normal age of retirement, the greater the penalty). As expected, pensioners between 65 and 69 present a constant downward trend that follows the growth of the normal retirement age. It should also be stressed that for ages higher than 65 and in some years there are more pensioners than inactive population. This fact could be explained by survivors' pension as widows can still be active.

Concerning gender, the percentage of female pensioners follows almost the same behaviour, however they have generally lower rates except on ages under 55 years because there are more widows than widowers. In the 55-59 and 60-64 cohorts, the behaviour on early years is not as marked as women have lower careers.

The total pensioners to population ratios have similar paths to the ratio to inactive population, albeit they are lower for cohorts below 70 years[42]..

Table 22. Pensioners (public scheme) to inactive population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	7.1	6.9	6.7	5.9	5.9	5.9	5.4
Age group 55-59	58.1	47.7	47.8	47.7	44.1	42.2	41.0
Age group 60-64	78.5	81.2	70.5	70.8	66.8	64.7	63.4
Age group 65-69	117.9	114.5	115.6	110.3	103.4	88.5	83.5
Age group 70-74	113.1	110.2	117.6	122.3	123.7	123.6	124.0
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Commission Services, GPEARI and GEP.

[42] See 1.3 Description of the actual "constant policy" assumptions used in the projection.

Table 23. Pensioners (public scheme) to population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	2.8	2.6	2.4	2.2	2.2	2.3	2.1
Age group 55-59	16.5	13.5	11.6	11.3	10.3	9.9	9.7
Age group 60-64	44.0	36.4	27.7	26.2	25.1	23.9	23.5
Age group 65-69	94.7	89.5	73.2	64.2	58.6	48.8	45.7
Age group 70-74	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Commission Services, GPEARI and GEP.

Table 24. Female pensioners (public schemes) to inactive population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	7.4	7.1	6.9	6.2	6.2	6.1	5.5
Age group 55-59	49.8	43.5	43.8	46.1	45.2	42.6	40.4
Age group 60-64	68.6	67.8	63.3	63.7	62.1	59.6	57.2
Age group 65-69	103.7	104.6	103.6	97.9	92.1	62.9	69.8
Age group 70-74	107.7	106.0	114.7	119.8	121.3	121.6	123.0
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Commission Services, GPEARI and GEP.

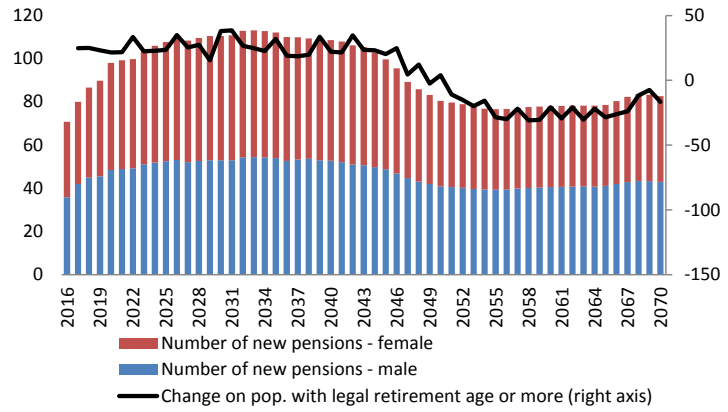
Table 25. Female pensioners (public schemes) to population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	2.9	2.7	2.5	2.3	2.3	2.3	2.2
Age group 55-59	17.8	14.7	12.2	11.6	10.9	10.3	9.8
Age group 60-64	43.6	35.4	27.0	25.0	24.1	22.6	21.8
Age group 65-69	89.6	85.9	69.7	60.6	54.5	35.7	39.1
Age group 70-74	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Commission Services, GPEARI and GEP.

The number of new old-age earning related pensions is projected to closely follow the change in population with the normal retirement age or more. It means that there are more contributors claiming for a pension until 2034, starting to decrease up to end of 2050's, and stabilize thereafter. This has an impact on the total expenditure. However, this impact (on expenditure) is boosted as part of these pensioners belongs to CGA.

Graph 24. Number of new old-age and early earnings-related pensions and change of population with normal retirement age or more

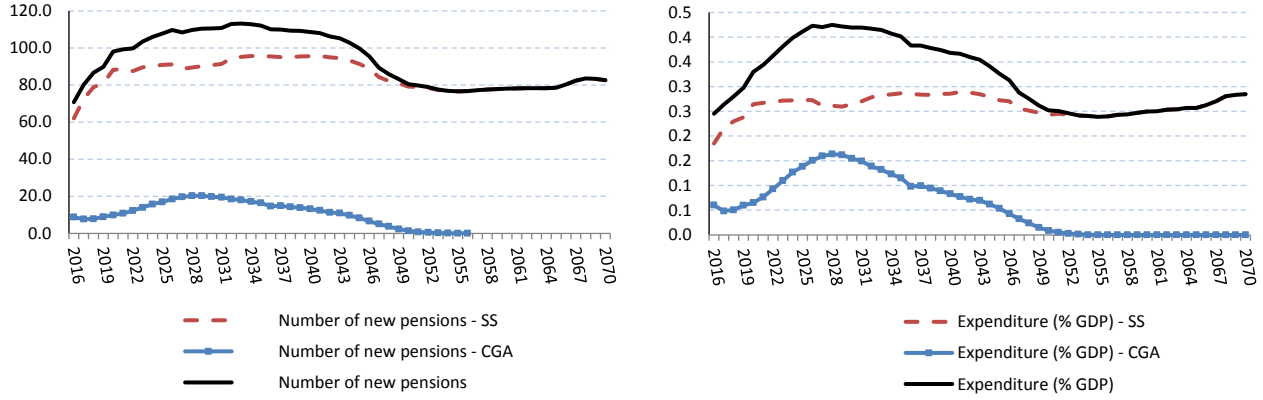


Source: Eurostat, GPEARI and GEP.

CGA' pensioners have on average higher wages (and consequently higher pensionable earnings) and contributory careers. On the other hand, as early pension is allowed with 55 years and 30

contributory years, contributors can claim for a pension compensating the penalty and the sustainability factor.

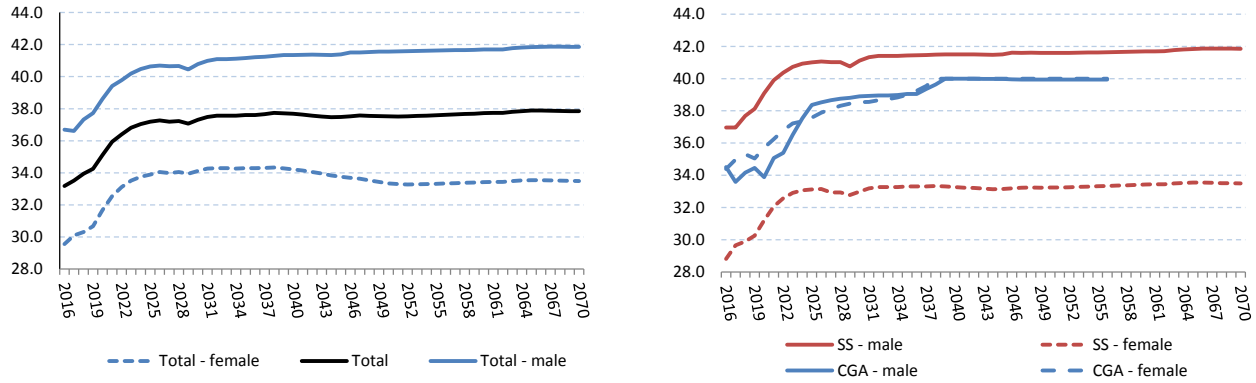
Graph 25. and 26. Number and expenditure of new public pensions (% GDP) by scheme



Source: GPEARI and GEP.

In particular, in the first ten years, the sharp rise of the contributory career projected is a result of to give the same probabilities of retirement to the cohorts around the normal retirement age. It means that cohorts younger and older than those aged the normal retirement age have lower probability to retire, increasing as it come closer to normal retirement age. The cohorts with higher probability move when normal retirement age changes.

Graph 27. and 28. Average contributory period by gender and scheme

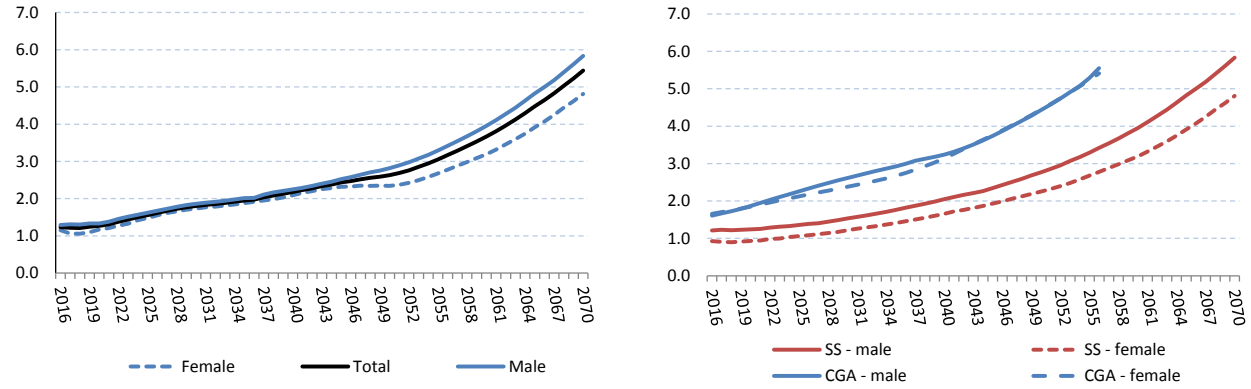


Source: GPEARI and GEP.

For both sexes a higher growth of the contributory career is planned up to 2025 and then increase slightly for men while for women marginally decreases as CGA fades out.

The loss of importance of CGA has also impact on the monthly average pensionable earnings after 2044, with higher effect on female as CGA has more female contributors than male and their contributory career is higher than female contributory careers on Social Security.

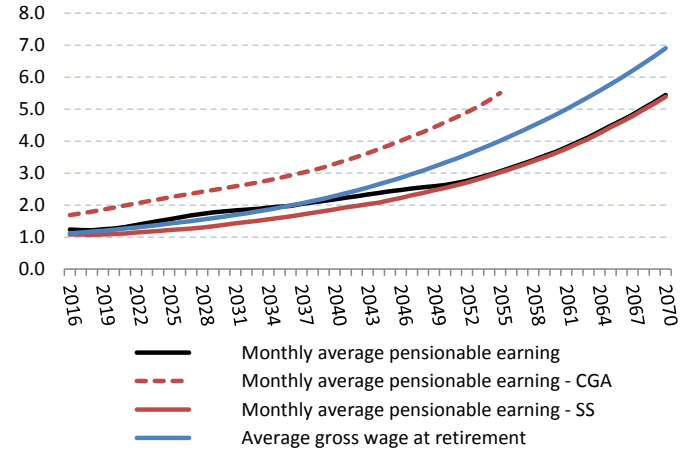
Graph 29. and 30. Monthly average pensionable earning by gender and scheme



Source: GPEARI and GEP.

Concerning the ratio of monthly average pensionable earnings on the monthly economy-wide average, it was computed take into account that usually is paid 14 months of salary and around 8 months paid at the first year to new pensioners. These ratios behavior are also affected by the reduction of new CGA pensions which starts by 2030. It should be highlight that in last years the entrance of new civil servants was frozen and this fact has effects on the base year and also on new pension expenditure throughout all the projection.

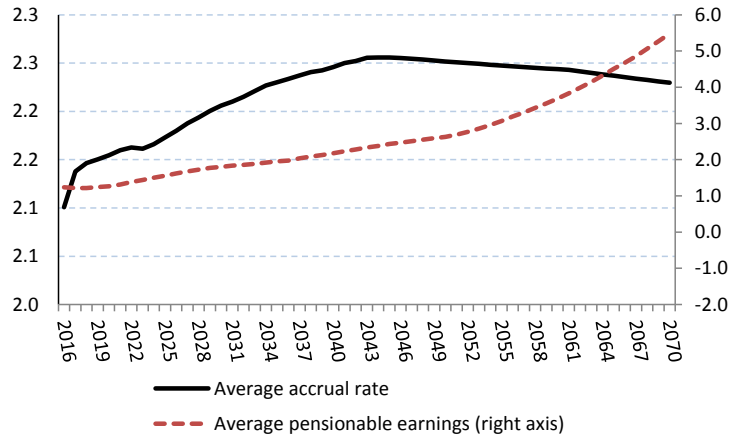
Graph 31. Monthly average pensionable earnings and monthly average retirement wage (thousand euro)



Source: GPEARI and GEP.

Concerning accrual rates, and according to the benefit pension formula, their behavior is a function of the reference earnings. Thus, the lower the reference earnings are, the higher the accrual rate.

Graph 32. Accrual rates (%) and average pensionable earnings (thousand euro)



Source: GPEARI and GEP.

Table 26. Projected and disaggregated new pension expenditure (old-age and early earnings-related pensions) – TOTAL

	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	453.6	677.1	1,162.5	1,349.9	1,228.3	1,635.3	2,486.7
II. Average contributory period	33.2	35.1	37.3	37.7	37.5	37.7	37.8
III. Monthly average pensionable earnings ('000)	1.235	1.267	1.803	2.180	2.630	3.666	5.442
IV. Average accrual rates	2.1	2.2	2.2	2.2	2.3	2.2	2.2
V. Sustainability/Adjustment factor	0.89	0.89	0.84	0.82	0.88	0.87	0.84
VI. Number of new pensions ('000)	70.769	98.1	110.5	108.7	80.5	78.1	82.6
VII. Average number of months paid the first year	8.4	8.1	8.4	8.2	7.8	7.8	7.8
Monthly average pensionable earnings/Monthly economy-wide average wage	1.1	1.0	1.0	0.9	0.7	0.7	0.7

Note: The ratios of monthly average pensionable earnings on the monthly economy-wide average wage are different from the ones computed by Commission as in Portugal usually is payed 14 months of salary.

Source: Commission Services, GPEARI and GEP.

Table 27. Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - MALE

	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	271.1	397.2	630.3	752.6	744.2	1,015.8	1,536.4
II. Average contributory period	36.7	38.6	40.8	41.4	41.6	41.7	41.9
III. Monthly average pensionable earnings ('000)	1.292	1.337	1.863	2.250	2.816	3.953	5.831
IV. Average accrual rates	2.09	2.14	2.18	2.23	2.25	2.24	2.22
V. Sustainability/Adjustment factor	0.902	0.902	0.859	0.834	0.874	0.862	0.838
VI. Number of new pensions ('000)	35.892	48.467	52.996	52.762	40.874	40.605	43.015
VII. Average number of months paid the first year	8.5	8.2	8.4	8.2	7.9	7.9	7.9
Monthly average pensionable earnings/Monthly economy-wide average wage	1.1	1.1	1.1	0.9	0.8	0.8	0.8

Note: The ratio of monthly average pensionable earnings on the monthly economy-wide average wage is different from the ones computed by Commission as in Portugal usually is payed 14 months of salary.

Source: Commission Services, GPEARI and GEP.

Table 28. Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - FEMALE

	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	182.5	280.0	532.3	597.3	484.1	619.5	950.4
II. Average contributory period	29.6	31.7	34.1	34.2	33.3	33.4	33.5
III. Monthly average pensionable earnings ('000)	1.152	1.167	1.732	2.091	2.344	3.195	4.813
IV. Average accrual rates	2.11	2.17	2.23	2.26	2.26	2.25	2.24
V. Sustainability/Adjustment factor	0.864	0.872	0.821	0.797	0.881	0.874	0.844
VI. Number of new pensions ('000)	34.877	49.628	57.506	55.894	39.622	37.512	39.629
VII. Average number of months paid the first year	8.4	8.1	8.5	8.3	7.9	7.9	7.9
Monthly average pensionable earnings/Monthly economy-wide average wage	1.0	0.9	1.0	0.8	0.6	0.6	0.6

Note: The ratio of monthly average pensionable earnings on the monthly economy-wide average wage is different from the ones computed by Commission as in Portugal usually is payed 14 months of salary.

Source: Commission Services, GPEARI and GEP.

The average number of months paid in the first year is 7.9 for Social Security based on the effective entries in 2016. This number is constant for entire projection but is adjusted with the CGA projection that assumes that new pensions are initiated at the beginning of the year, so that every new pensioner receives a full year payment (14 months).

Table 29. Projected and disaggregated data by subsystem (million euro and 1,000 persons)

	2016	2020	2030	2040	2050	2060	2070
Pension expenditure							
SS	15,400.8	18,389.9	28,003.9	41,092.6	55,912.3	72,042.5	95,644.8
CGA	9,652.9	9,554.5	11,693.5	12,952.3	10,911.4	6,413.4	3,660.9
Of which new old-age earning related							
SS	342.4	18,389.9	28,003.9	41,092.6	55,912.3	72,042.5	95,644.8
CGA	111.2	133.8	429.1	304.0	42.6	0.0	0.0
Number of pensioners							
SS	2,529.3	18,389.9	28,003.9	41,092.6	55,912.3	72,042.5	95,644.8
CGA	620.0	585.8	560.4	527.8	408.6	253.2	146.0
Of which new pensions							
SS	62.0	88.3	90.7	95.5	79.2	78.1	82.6
CGA	8.7	9.8	19.8	13.1	1.3	0.0	0.0
Replacement rate of old-age earning related pensions							
SS	0.67	0.68	0.65	0.61	0.57	0.55	0.55
CGA	0.56	0.52	0.63	0.52	0.51	0.00	0.00
Number of contributors							
SS	3,540.3	3,588.6	3,700.6	3,576.5	3,312.4	3,069.3	2,859.5
CGA	468.7	424.6	243.3	77.7	2.1	0.0	0.0
Contributions revenue							
SS	14,778.2	16,793.5	21,270.6	27,683.9	42,912.4	70,763.8	103,978.2
CGA	4,835.9	4,845.1	3,559.5	1,956.7	977.5	501.8	236.0

Note: In CGA old-age pensions include disability pensions.

Source: GPEARI and GEP.

2.6. Financing of the pension system

Overall contributions (from employers and employees) are expected to increase 1.6 p.p. of GDP from 11% in 2016 to 12.5% in 2070. Public contributions reached 10.6% of GDP in 2016 and are

estimated to increase to 11.9% in 2070. They are driven, throughout the projection period, by the employment trend, which decreases 27% for employees between 15 and 74 years old in all projection period, and labour productivity evolution, which increases until 2045 and then reverses until 2070. For 2016 and onwards, the implicit contribution rate of 2016 will be kept unchanged along the projection period, as well as the proportion between employer and employee. The non-contributory regime of Social Security is financed by State transfers. However that revenue was not taken into account. The deficit balance of CGA, being a closed system, was imputed to the State. In 2016 the extraordinary solidarity contribution was considered as revenue in CGA. In Social Security this revenue was deducted from pension expenditure.

As mentioned above, FEFSS was created to ensure the coverage of foreseeable pension expenditure for a minimum period of two years. The 2017 State Budget created a top-up tax on the municipal tax on real estate consigned to FEFSS[43].

Table 30. Financing of the system

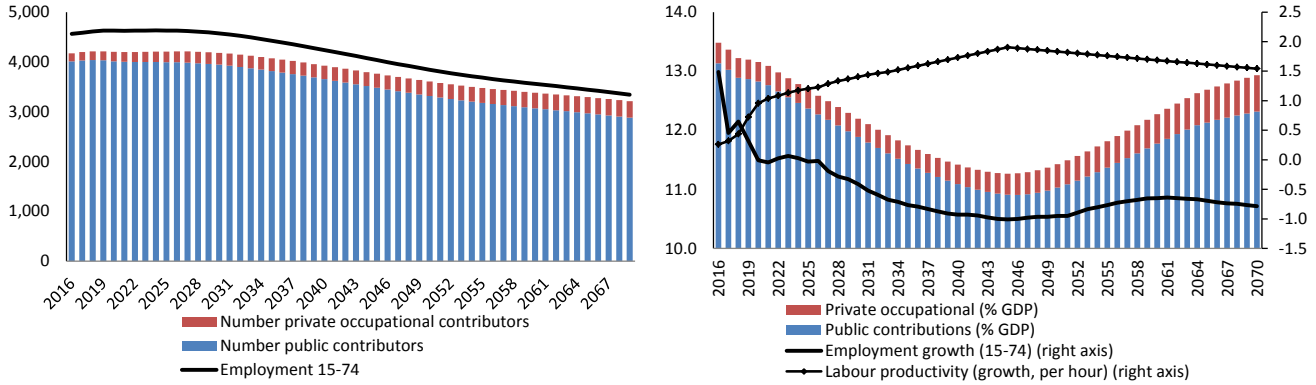
	Public employees	Private employees*	Self-employed**
Contribution base	Any kind of compensation for work	Any kind of compensation for work	standard pay defined according SSI (between 1 to 12 SSI)
Contribution rate/contribution Employer	23.75%	23.75%	
employee	11%	11%	29.6% or 34.75%
State	the deficit of the subsystem	the non-contributory regime	:
Other revenues	gains from financial investments	the sale of public assets and gains from financial investments	:
Maximum contribution	:	:	29.6% x 12 x SSI
Minimum contribution	:	:	29.6% x SSI

* There are some specific rate for some groups of workers as household assistance, professional sportmens, short-term contract workers, etc. ** Agricultural self-employees pay 28.3% and self-employed entrepreneurs pay 34.75%. times the SSI – Social Support Index.

Source: Commission Services, GPEARI and GEP.

[43] The amount of this tax revenue is estimated in €130 million.

Graph 33. and 34. Contributions, contributors, employment, employment growth and labour productivity



Source: GPEARI, GEP and ASF.

The number of public contributors is projected to evolve in line with the employment and, consequently, is expected to increase moderately between 2016 and 2018 and, then, starting to decrease until 2070. The number of private occupational contributors is estimated to duplicate. This projection was made on the basis that the coverage ratio would evolve from around 4% of the employed population to 10% in 2070.

Table 31. 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	24,290.1	26,348.0	32,964.0	40,636.1	53,823.8	77,177.2	107,639.0
Employer contribution	13,656.2	15,043.9	17,300.5	20,634.3	30,304.3	48,865.5	71,300.2
Employee contribution	5,957.9	6,594.8	7,529.6	9,006.4	13,585.5	22,400.1	32,913.9
State contribution	4,663.3	4,709.3	8,133.9	10,995.5	9,934.0	5,911.6	3,424.9
Other revenues, i.e. pension funds, nuisance charges	12.7	0.0	0.0	0.0	0.0	0.0	0.0
Number of contributors (I)	4,009.0	4,013.2	3,943.9	3,654.2	3,314.5	3,069.3	2,859.5
Employment (15 -74) (II)	4,562.8	4,627.7	4,573.2	4,237.3	3,843.5	3,559.1	3,315.8
Ratio of (I)/(II)	0.9	0.9	0.9	0.9	0.9	0.9	0.9

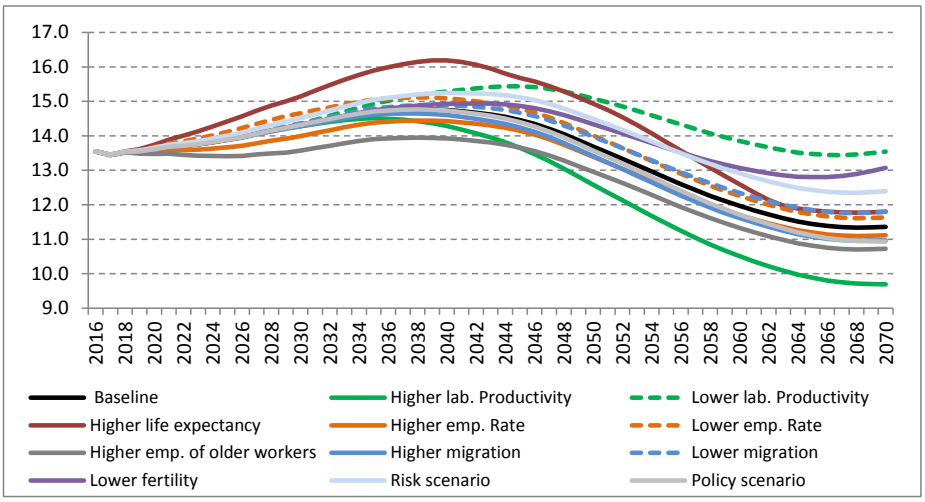
* There are some specific rates for some groups of workers as household assistance, professional sportmen, short-term contract workers, etc. ** Agricultural self-employees pay 28.3% and self-employed entrepreneurs pay 34.75%. times the SSI – Social Support Index.

Source: Commission Services, GPEARI and GEP.

2.7. Sensitivity analysis

The overview of the sensitivity of pension expenditure projections to changes in the underlying assumptions is provided in Table 32 and Graph 35. The results of the sensitivity analysis are coherent with the different scenarios.

Graph 35. Public expenditure (% of GDP) under different scenarios



Source: GPEARI and GEP.

Analysing the average change of each scenario vis-à-vis the baseline assumptions over the whole period, one can see that projections are primarily exposed to labour productivity (including the risk scenario), life expectancy, older workers employment and fertility deviations.

Changes in productivity levels have greater impacts in the long-term (i.e. from 2040 onwards). On average, higher labour productivity diminishes pension expenditures (-0.7p.p.) while the symmetric scenario increases them (+0.9p.p.).

The scenario where life expectancy grows 2 years by 2070, pension expenditures increases on average 0.7p.p. with larger effects in 2030 onwards. The latter has an implied expansion of the population over 65 years which increases the number of pensioners despite the fact that it leads to higher normal retirement ages – inducing longer contributory periods. In a demographic perspective this scenario reveals a sooner impact (alongside other scenarios that change the employment rate), starting in 2020 with a difference of 0.1p.p.

Concerning the scenario in which fertility is lower and the risk scenario, both tend to increase pension expenditures as time goes by (0.5p.p. on average).

Higher employment rates among older reduce expenditure on average by 0.5p.p. as it raises with the evolution of GDP and postpone the claim of old-age pensions as, at the same time, increase the pensions entitlements from longer carriers. The effects are clearer between 2030 and 2050 as older population reach the maximum.

More generally, changes in employment as well as in migration flows have a smaller effect (0.2p.p.) in expenditure on average. Although this minor result changes in employment rate and in employment rate among the elder have earlier impacts than other scenarios.

Policy scenario has the minor impact as it results mainly from a higher GDP. It should be mentioned that the Portuguese public pension system has the legal retirement and the pension benefit linked to life expectancy.

Finally, total pension expenditure under different scenarios is not significantly affected by the sensibility analysis on occupational schemes due to the low share of the latter in terms of the total pension expenditure over GDP. Note also, that our projections already incorporate the intended effect from the policy scenario, as the normal retirement age is linked to changes in life expectancy by law.

Table 32. Public and total pension expenditures (% GDP) under different scenarios (deviation from the baseline in p.p.)

	2016	2020	2030	2040	2050	2060	2070
Public Pension Expenditure							
Baseline	13.5	13.6	14.3	14.7	13.7	12.0	11.4
Higher life expectancy (2 extra years)	0.0	0.1	0.8	1.4	1.2	0.6	0.4
Higher lab. productivity (+0.25 pp.)	0.0	0.0	0.0	-0.5	-1.1	-1.5	-1.7
Lower lab. productivity (-0.25 pp.)	0.0	0.0	0.0	0.5	1.4	1.9	2.2
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.3	-0.3	-0.3	-0.3	-0.2
Lower emp. rate (-2 pp.)	0.0	0.1	0.3	0.3	0.3	0.3	0.3
Higher emp. of older workers (+10	0.0	-0.1	-0.7	-0.8	-0.7	-0.6	-0.6
Higher migration (+20%)	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.4
Lower migration (-20%)	0.0	0.0	0.0	0.1	0.3	0.4	0.4
Lower fertility	0.0	0.0	0.0	0.2	0.6	1.1	1.7
Risk scenario	0.0	0.0	0.2	0.5	0.8	0.9	1.0
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.4
Total Pension Expenditure							
Baseline	13.8	13.9	14.5	15.0	13.9	12.2	11.7
Higher life expectancy (2 extra years)	0.0	0.1	0.8	1.4	1.2	0.6	0.4
Higher lab. productivity (+0.25 pp.)	0.0	0.0	0.0	-0.5	-1.1	-1.5	-1.7
Lower lab. productivity (-0.25 pp.)	0.0	0.0	0.0	0.5	1.4	1.9	2.2
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.3	-0.3	-0.3	-0.3	-0.2
Lower emp. rate (-2 pp.)	0.0	0.1	0.3	0.3	0.3	0.3	0.3
Higher emp. of older workers (+10	0.0	-0.1	-0.8	-0.8	-0.7	-0.6	-0.6
Higher migration (+20%)	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.4
Lower migration (-20%)	0.0	0.0	0.0	0.1	0.3	0.4	0.4
Lower fertility	0.0	0.0	0.0	0.2	0.7	1.1	1.7
Risk scenario	0.0	0.0	0.2	0.5	0.8	1.0	1.0
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.4

Source: Commission Services, GPEARI, GEP and ASF.

2.8. Description of the changes in comparison with the 2006, 2009, 2012 and 2015 projections

Comparing the current exercise with the former ones, the change of expenditure in percentage of GDP between the base year and the last year of each projection is improving as in the 2006, 2009 and 2012 an increase of expenditure was projected. In the last exercise and in the current one a decrease of expenditure is projected. The dependency ratio is the only factor that drives to an increase of expenditure. Other factors (mainly the coverage ratio, the benefit ratio and the employment effect) have an opposite effect. It should be stressed that the coverage ratio has been increasing its effect and the benefit ratio has been the most important one.

Table 33. Average annual change in public pension expenditure to GDP during the projection period under the 2006, 2009, 2012, 2015 and 2018 projection exercises

	Public pensions to GDP	Dependency ratio	Coverage ratio	Employment effect	Benefit ratio	Labour intensity	Residual (incl. Interaction effect)
2006 *	9.3	13.7	-0.9	-0.2	-3.0	:	-0.4
2009 **	2.1	9.8	-1.7	-0.6	-4.5	:	-0.9
2012 ***	0.2	10.4	-2.5	-1.0	-5.5	0.0	-1.1
2015****	-0.7	11.7	-4.2	-1.9	-4.8	0.0	-1.6
2018*****	-2.2	10.9	-4.6	-1.0	-5.9	0.1	-1.7

* 2004-2050; ** 2007-2060; *** 2010-2060; **** 2013-2060; *****2016-2070

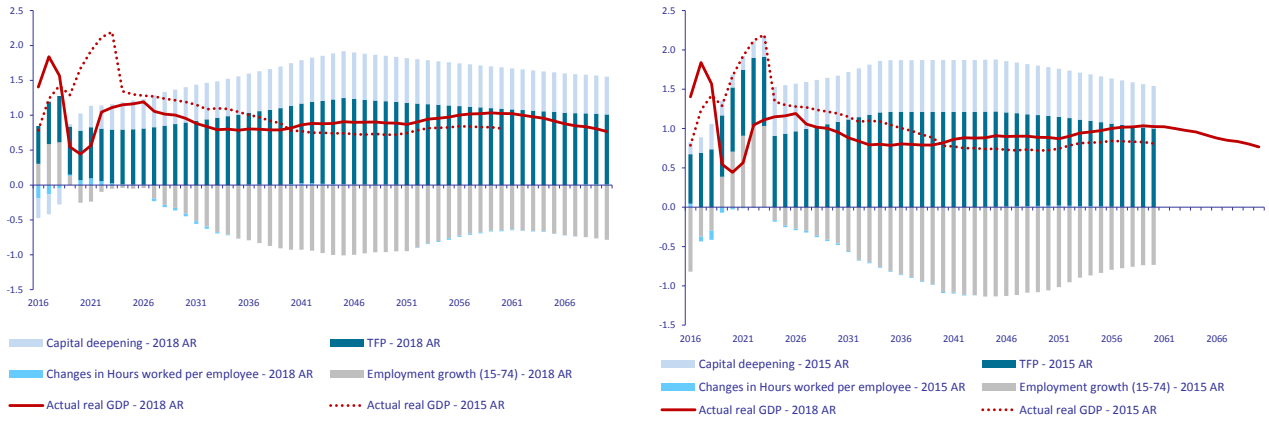
Source: Commission Services, GPEARI and GEP.

In the present exercise, public pension expenditure decreases by 2.2p.p. of GDP between 2016 and 2060, when in the 2015 exercise it was projected to decline by 0.9p.p.

However, there are some changes both in the demographic and in the macroeconomic baseline scenarios.

On one hand, total population suffered a revision: under the 2015 projections population was expected to decrease 20.4% between 2016 and 2060 and under the 2018 demographic projections total population is expected to decrease 17.4% in that same period. However, the dependency ratio gets worse. This effect combined with the increase on participation rate, a decrease on TFP and despite a higher base value of GDP, the growth of real GDP is lower in the current exercise, although the nominal value of GDP are higher up to 2021.

Graph 36. and 37. Macro assumptions in 2015 and 2018 exercise



Source: Commission Services, GPEARI and GEP.

These pure demographic and macroeconomic impacts explain lesser expenditure in the first years and higher up to 2070. However, the changes on assumptions input to the base year, related to physical data and the average pension benefit, more than compensate these effects, reducing the expenditure about 3p.p. after 2040. Although in the last exercise the linkage of normal retirement age to life expectancy and the application and increasing of the sustainability factor to early pensions were incorporated in the projections, these changes only entered in force in 2014 and, as the base year data was 2013, the projections did not incorporated these changes on the base year.

The effect of the measures has bigger effect by 2020 (0.5p.p.), decreasing over the remaining projection. The changes on the modeling also have a negative impact, raising expenditure

Table 34. Decomposition of the difference between 2012 and the new public pension projection (% of GDP)

	2016	2020	2030	2040	2050	2060	2070
Ageing report 2015	14.0	14.6	15.0	14.8	14.4	13.1	:
Change in assumptions	-0.7	-1.5	-2.3	-2.4	-2.6	-2.9	:
of which:							
Demographic and macroeconomic	-0.1	0.1	0.4	0.7	0.5	0.3	:
Physical data	-0.2	-0.9	-1.0	-0.6	-0.3	-0.4	:
Average pension benefit	-0.5	-0.7	-1.7	-2.5	-2.9	-2.8	:
Improvement in the coverage or in the modelling	0.3	0.1	1.3	2.1	1.7	1.6	:
Change in the interpretation of constant policy	:	:	:	:	:	:	:
Policy related changes	0.0	0.5	0.3	0.2	0.2	0.2	:
New projection	13.5	13.6	14.3	14.7	13.7	12.0	11.4

Source: Commission Services, GPEARI and GEP.

3. DESCRIPTION OF THE PENSION PROJECTION MODELS AND THEIR BASE DATA

Institutional context in which those projections are made

The projections now presented were obtained by using three models:

- The model for the contributory welfare system and the social solidarity system (the social security pension model);
- The public sector employees model – CGA model;
- The private occupational pensions' model;

The social security pensions' model was developed and is ran by the Cabinet for Strategy and Planning of the Portuguese Ministry of Labour, Solidarity and Social Security (GEP/MTSSS) while the CGA model was developed and is ran by the Office for Economic Policy and International Affairs of the Ministry of Finance (GPEARI/MF). The model for occupational pensions was developed by the Insurance and Pension Funds Supervisory Authority – *Autoridade de Supervisão de Seguros e Fundos de Pensões* (ASF). GPEARI also coordinates the projection exercise and discusses with the other two institutions (GEP and ASF) the respective results.

The three models will be described separately, as follows.

A. Social Security Pensions Model

Assumptions and methodologies applied

The model used in the present exercise/calculations as well as the methodology is the same that was used in 2015 Ageing Report. The model has four main modules: the first one projects the number of

pensions, the second one pension expenditure, the third one the dynamics of contributors and contributions and the last one estimates the number of pensioners. Modules one, two and four are stratified by age (from 0 to 100+), gender and type of pension (old-age and early-retirement, disability and survivorship).

The social security pensions model takes into account, separately, three different schemes within the social security system: the general regime, the non-contributory regime and the special regime for farmers. The last one mentioned has a non-contributory nature and is a closed regime.

For each year and for all schemes, the total number of pensions is derived by the stock of pensions of the previous year, discounted of mortality and cessations and added with new pensions. It is assumed that new pensions receives 7 months in the first year and after that receives a full year payment (14 months).

For each type of pension the model takes into account the stock of pensions and the number of new pensions in the base year in percentage of the total population of each stratum. In 2015 exercise it was assume that these ratios (by age and gender) remained constant over the period of projection. However after the increase of the retirement age for 66 in 2014 and the automatic process of linkage to the evolution of life expectancy, since 2015 the way as new pensions are computed changed substantially. From now on, the ratio (new pensions in percentage of the total population) of each stratum varies, year by year, according to the retirement age evolution.

Under these assumptions and according to the demographic and macroeconomic scenarios defined exogenously, projections are made assuming that the fundamental relations of the social security system will remain constant.

Data used to run the model

The input data refers to 2016 and is provided by two different bodies within the Portuguese Ministry of Labour Solidarity and Social Security (Informatics Institute and Institute of Financial Management of the Social Security). Furthermore it is also used the data provided by the Commission, concerning demographic and macroeconomic variables/projections.

Reforms incorporated in the model

This model was constructed based in the 2007 system reform, as reflected in the Basic Law of the Solidarity and Social Security System.

According with recent legislation (December 2013) the normal age of retirement rose to 66 and ceased to be fixed, now evolving every year depending on the evolution of life expectancy.

The automatic annual update of the pension amount already in payment (indexation rule) it was replaced in 2016 but the lower SSI bracket was changed from 1.5 to 2 times the SSI.

An extraordinary increase of €10 has been paid in 2017 (and will be in 2018) for pensioners who receive a total amount of pensions (per month) equal or less than 1.5 times the SSI.

It is applied the sustainability factor (FS) to the individuals that apply for the old age pension before the normal age pension and, since 2018 it was eliminated for disability pensions in the date of the respective conversion into old-age pensions (65 years).

Early retirement (at the ages of 55-64) was frozen between 2012 and 2014 (not the retirement after long term unemployment – this modality was never suspended). In 2015, the partial unfreezing allowed people to retire at the ages of 60 or later, as long as having at least 40 years of recorded earnings.

Since 2018, it was eliminated any penalty for workers with career lengths of 48 years or more and for those who started working (and paying contributions) before the age of 15 and who retire with at least 60 years of age with a 46 year long career.

General description of the model

New pensions by age and gender are determined by assuming a different proportion year by year, based on the evolution of retirement age. The cohort in year t+1, age i, will decrease proportionally to the number of months that retirement age advances, and the same proportional will be added in the cohort i+1 in the same year.

Similar methodology is made for the contributory career projection. The characteristics of cohort with age i move to the cohort age i+1 in next year, proportionally to the number of months that retirement age advances.

Each year, new pensions will be added to the stock of pensions, such that the number of total pensions can be written in the following way:

$$\mathrm{TotalPens}_{t,i,g} = \mathrm{NewPens}_{t,i,g} + \mathrm{TotalPens}_{(t-1),(i-1),g} \times (1 - \mu - c)$$

Where,

$\mathrm{NewPens}_{t,i,g}$ - New pensions in year t, for age i and gender g

$\mathrm{TotalPens}_{t,i,g}$- Total pensions in year t, for age i and gender g

μ - Mortality rate given by the demographic scenario

c - Cessation rate given by the administrative data

Average old age and disability pensions for new pensioners are calculated according to age, gender, the average contributory career of the new pensions in the base year (for each age and gender) and a theoretical wage history. This theoretical wage history is derived by applying to the average wage of the economy (in 2016) a retrospective matrix of the average wage growth in the Portuguese economy until 1960. The theoretical wage history is only differentiated by gender (which means that it is equal for every age).

Contributions grow bases in employment growth rate and productivity. So, total contributions can be derived by the following formula:

$$\text{Contrib}_t = \text{Contrib}_{t-1} \times (1 + w_t) \times (1 + \theta_t)$$

Where,

Contrib_t - Contributions in year t

w_t- Productivity growth rate in year t

θ_t - Employment growth rate in year t

For the pension expenditure, the model attempts to replicate as much as possible the rules of calculation for new pensions and the pensions updates based on a macroeconomic scenario that is set exogenously to the model.

The average pension is determined by:

$$P_{t,i,g} = \frac{S_{t,i,g} \times Ps_{t,i,g} + N_{t,i,g} \times Pn_{t,i,g}}{Pt_{t,i,g}}$$

Where,

P – Average pension;

S – Number of pensions carried over from last year;

Ps – Average of pension carried over from last year;

N – Number of new pensions;

Pn – Average of new pensions;

Pt – Number of pensions;

i –age; g – gender; t –year

The new pensions are calculated according to the rules described in DL No. 187/2007 of 10 May.

Pension expenditures and contributions projections (that are based upon monthly input data) are then calibrated, according to the Social Security's balance sheet of the base year.

The number of pensioners is derived from the analysis of administrative microdata.

Additional features of the projection model

Survivors' pensions

For survivorship, the base year ratios of new pensions are calculated over the number of deaths in the previous year that may originate survivorship pensions for widows or survivorship pensions for dependent children.

For survivorship pensions it is also considered a depreciation rate (constant over the projection period) that expresses the number of pensions that ceased for other motives than the death of the entitled person. These ratios were calculated, by age and gender, based upon administrative data.

Average survivorship pension is indexed to the wage growth and to the average old-age pension growth.

B. CGA model

Institutional context in which those projections are made

The pension model used for the CGA projections is the same that was used in the 2015 AWG exercise on the Portuguese pension projections. It is an accounting/actuarial model that allows a detailed parameterization of the system, including the simulation of different demography or macroeconomic assumptions and changes in the reform parameters. However, as it is not a general equilibrium model it does not permit endogenous analysis of the changes in supply and demand and in the consumption and investment decisions of economic agents stemming from their adjustment, for example, to the reforms in social security that were enacted.

Assumptions and methodologies applied

The model has four main modules: the first one relates to input data (including macroeconomic and demography data), the second one comprises the dynamics for contributors and number of pensions, the third one refers to the dynamics of contributions and pensions and the last one provides the outputs. Modules two and three are structured by age and gender strata in order to allow more precise results.

Data used to run the model

The input data was provided by CGA. The figures used were extracted from the database in April 2017 and were adjusted to those observed in the end of 2016.

Reforms incorporated in the model

The last pension measures in Portugal are included in the present projections. The most relevant were the linkage of normal retirement age to life expectancy at the age 65 years and the application of the sustainability factor in the calculation of the pension benefit. Both entered in force in 2014. In 2014 also was legislated the application of the sustainability factor to disability pensions benefit when the pensioner has 65 or more and pensions have been paid by 20 or more years. In 2017 this measure was reversed.

In 2017, the indexation rule of pensions already in payment was resumed and the first threshold value of the rule changed from 1.5 to 2 times the SSI. It was also incorporated the extraordinary updated of pensions below 1.5 times the SSI in 2017 and 2018.

The law that protects very long careers and reparation of early labour was not taken into account as the model works with averages.

General description of the model

Module for contributors and pensioners dynamics

Due to the fact of CGA being a closed system, the dynamics of contributors is quite simple: the number of contributors decreases each year due to mortality and to other motives like moving to the private sector or exoneration. The number of CGA contributors at the end of year is given by:

$$C_{t,a,g} = C_{t-1,a-1,g} \times \left(1 - \mu_{t,a,g} - \pi_{t,a,g}\right) - np_{t,a,g}$$

where,

$C_{t,a,g}$ - Number of CGA contributors in year t, for age a and gender g

$\mu_{t,a,g}$ - Mortality rate in year t, for age a (for those who would complete age a during year t) and gender g

$\pi_{t,a,g}$ - Contributors rate of exoneration in year t, for age a and gender g

$np_{t,a,g}$ - Number of new pensioners (includes old-age pensioners and disability pensioners) in year t, for age a and gender g.

The dynamics of number of pensions is done for old age and disability pensions together and for survivors separately. The stock of pensioners increases with new pensioners and decreases according to pensioners' mortality. In this model, survivor pensioners also depend on a "depreciation rate" that applies mainly to descendants when conclude their studies.

Old age and disability pensioners

New pensioners (and pensions) are computed according to the legal regime that applies to each type of contributors: regime of Estatuto de Aposentação (that applies to public employees registered in the CGA until August 1993) and social security regime that applies to public employees registered in CGA between September 1993 and December 2005. For each legal regime, new pensioners are projected with a breakdown by motive: disability, old age (including early retirement) or age limit (at 70 years old).

New pensioners are computed by using "retirement probabilities". The later are defined as the base year ratios of new pensioners over contributors, for those who are aged less than 70. This means that new pensions are not determined only as a function of the legal criteria.

Number of new old-age pensioners:

$$op_{t,a,g} = op_{t-1,g,a-1} \times \frac{C_{t-1,g,a-1}}{C_{t-2,g,a-1}}$$

where,

$op_{g,a}(t)$ - Number of new old-age pensioners during year t for age a and gender g

In the case of old age, including early pensioners, the above mentioned ratios move along normal retirement age..

It was assumed that the retirement probabilities for disabled do not change with the above mentioned increase in the normal retirement age.

The number of CGA new disability pensioners is given by:

$$dp_{t,a,g} = dp_{t-1,a,g} \times \frac{C_{t-1,a-1,g}}{C_{t-2,a-1,g}}$$

where,

$dp_{t,a,g}$ - Number of new disability pensioners in year t, for age a and gender g

The dynamics for the number of old-age and disability pensioners at the end of year t is given by:

$$Op_{t,a,g} = Op_{t-1,a-1,g} \times \left(1 - \mu_{t,a,g}\right) + op_{t,a,g} + dp_{t,a,g}$$

where,

$Op_{t,a,g}$ - Number of old-age and disability pensioners at the end of year t for age a and gender g

Survivor pensioners

New pensioners are a function of old age and disability pensioner's mortality. In the past, on average, 80 per cent of pensioners who die had a survivor entitled to a pension, but this percentage is expected to decrease (to near 60%), as spouses beneficiaries tend to have their own wage/ pension and would not be eligible to a survivor pension and the number of children tend to decrease as well. Having the estimate for total new survivors' pensioners, the age and gender distribution is the same of base year.

It is also considered that the stock of survivor pensioners depend on a "depreciation rate" that applies mainly to descendants when conclude their studies. So it is necessary to divide the age strata into the following:

- 18<a<27

$$Sp_{t,a,g} = Sp_{t-1,a-1,g} \times \left(1 - \mu_{t,a,g} - \chi_{t,a,g}\right) + sp_{t,a,g}$$

- Other a

$$Sp_{t,a,g} = Sp_{t-1,a-1,g} \times (1 - \mu_{t,a,g}) + sp_{t,a,g}$$

where,

$Sp_{t,a,g}$ - Number of survivor pensioners in year t, for age a and gender g

$sp_{t,a,g}$ - Number of new survivor pensioners in year t, for age a and gender g

$\chi_{t,a,g}$ - Depreciation rate of the survivor pensioners stock, unrelated to the death of the beneficiary in year t, for age a and gender g

The CGA database records pensions, not pensioners. However it has a field that gives information on pensioners that also have a survivor pensions paid by CGA. The percentage of pensioners that receive both a survivor and an old-age pension paid by CGA (3.6%) is kept constant over the projection horizon.

Module for contributions and pension's dynamics

Contributions to CGA are a fixed percentage of employees remuneration (11% supported by employees and 23.75% by the employer. Therefore, the contributions dynamics depends on the remunerations evolution. The data available for 2016 contained average values for remunerations of the subscribers by age and gender strata. The actualized and adjusted average remuneration is:

$$W_{t,a,g} = \max(W_{t-1,a,g} \times (1+\gamma_t); W_{t-1,a-1,g} \times (1+\gamma_t))$$

where,

γ_t is the annual update rate for public sector wage scale.

Contributions in each year are given by:

$$Cont_{t,a,g} = \tau_t \times W_{t,a,g} \times C_{t,a,g}$$

where,

τ_t is the CGA's contributory rate

The average old-age pension is determined by:

$$Pens_{t,a,g} = \frac{\left[(Op_{t,a,g} - op_{t,a,g}) \times Pens_{t-1,a-1,g} \times (1+\alpha_t) + op_{t,a,g} \times npens_{t,a,g}\right]}{Op_{t,a,g}}$$

where,

αt represents annual pension update and n pens tag is the new old-age pension in year t, for age a and gender g.

Total old-age and disability pensions' expenditure is given by:

$$TE_{t,a,g} = pens_{t,a,g} \times (Op_{t,a,g})$$

The dynamics of survivor's pensions follows the old-age pension's one:

$$SurvPens_{t,a,g} = \frac{\left[(Sp_{t,a,g} - sp_{t,a,g}) \times SurvPens_{t-1,a-1,g} \times (1+\alpha_t) + sp_{t,a,g} \times nsurvpens_{t,a,g}\right]}{Sp_{t,a,g}}$$

where

αt represents annual pension update (the same of old age pensions) and nsurvpenstag is the new survivors pension in year t, for age a and gender g.

Each new survivor's pension, according to the law, is equivalent to 50% of the old age pension that originate it. In the model, it was assumed the average new survivors pensions to be around 40% of the average old age pensions.

C. Occupational pensions' model

Institutional context in which those projections are made

The Portuguese occupational pension system financed by pension funds can be separated into three types of pension schemes:

- Banking sector DB schemes under the banking sector collective agreement (traditionally the benefits promised were substitutive of the Social Security benefits but, as described below, several changes have occurred).
- other DB schemes.
- DC schemes.

The projection exercise was separately made for each type of pension scheme, as its different characteristics determine that different assumptions should be used in modelling the cash flows for the future.

Recent reforms reflected in the projections

The most representative changes that have occurred in the occupational pension system, namely in relation to 1st pillar DB schemes of the banking sector, considered in this exercise are:

- The Decree-Law no. 54/2009, of March 2, which established the enrolment of the banking sector' new employees into the Social Security system, closing these schemes to new entrants.
- The Decree-Law no. 1-A/2011, of January 3, according to which the remaining banking sector employees were inscribed in the Social Security system for the purpose of future service regarding retirement benefit. Current banking sector employees began to pay contributions to the Social Security although maintaining the collective agreements benefits. In practice, this means that their pensions will be financed both from the Social Security (for the working period between 2011 and their retirement year) and from the

pension fund, since the pension fund will now be responsible for the payment of the complement between the total benefits promised in the collective agreement less the Social Security pension (the type of plan changed from being an independent plan to an integrated with the Social Security plan). Nevertheless, banking sector' funds are still fully responsible for the liabilities concerning illness, disability, death and survivorship benefits.

- The Decree-Law no. 127/2011, of December 31, which established the enrolment of most banking entities' current beneficiaries into the Social Security system (following which the pension funds' liabilities related to pensions in payment and the corresponding assets were transferred to the Social Security system). Nevertheless, banking sector' funds are still fully responsible for future pension indexation, as well as medical post-retirement expenses and post-retirement benefits.

General description of the model

The model for the occupational pension system was based on current market statistics, relationships between fundamental economic and demographic variables and on assumptions that were made on the future behaviour of those variables. In brief, the projection exercise can be described as follows:

- The pension fund members were modelled taking into account the current population, the normal decrements (disability, survival, retirement and other exists) and an assumption regarding the coverage ratio of the pension population out of the total employed population. This coverage ratio allows projecting the total number of members for each year.
- The beneficiaries population was modelled by taking the current population, applying the mortality rates defined in the Ageing Working Group assumptions for Portugal to determine the exiting population and adding the new beneficiaries for each year.
- Taking the current market statistics and trends from the last couple of years, the per capita financial values were computed in order to project the financial cash flows. Main financial variables determined and projected were pensionable salary, benefit ratio, average pension and contribution rate, from which the cash flows benefits paid and contributions were determined.

The projections of the financial variables were made upon assumptions of how these variables are expected to behave in the future. Some of these relevant assumptions, for example benefit ratios in the future, were based on past experience and knowledge of the market. In other words, some of the assumptions are based on expectations and are not determined from any scientific formula. It is important to emphasize that some of the assumptions on the variables' behaviour and modelling formulas have indeed a substantial effect on the final results. Therefore, sensitivity analysis plays an important role on the projection exercise.

Despite presenting only the aggregated figures for occupational pensions, the entire projection exercise was made separately for three pension schemes: banking sector DB schemes, other DB schemes and DC schemes.

Pension fund population modelling:

The current pension fund population coverage ratio (number of pension fund members over total employed population) was determined and an assumption was made on how this coverage ratio would evolve until 2070.

Having the total employed population projections enabled the projection of the total members population:

$$total\ members_t = total\ employed\ \ population_t \times$$
$$\times\ pension\ \ fund\ \ coverage\ ratio_t$$

For each year, the number of members for the DB schemes was determined considering the population in the year before and the variation occurred in that year (i.e., plus new entrants and minus the exiting population).

Due to the enrolment of the banking sector' new employees into the Social Security system (Decree-Law n.º 54/2009, of March 2), which closed these schemes to new entrants, for 1st pillar DB schemes the projected number of new entrants is equal to zero. Still, for the banking sector DB schemes as a whole, a low percentage of new entrants was considered, reflecting new employees with access to complementary benefits.

It was established that the number of new entrants for other DB schemes was equal to a percentage of the number of participants in the year before. The idea underneath this assumption is that the number of new DB schemes will be very small and one only expects some population refreshment for the existent schemes, therefore assuming a fixed low percentage of new entrants for the DB scheme.

For DC schemes, the number of new entrants was determined as a difference between the population in that year minus the population in the year before and plus exits in that year.

For all types of pension schemes, a distribution of new entrants by age was created to allocate the number of new entrants to each age. This distribution was determined based fully on an expectation basis.

The vectors of population decrements for each type of scheme were determined with the help of some statistics for the ages 15 - 75 and assumptions based on coherent expectation.

For each year and age, the number of members was determined in the following way:

$$members_{t,i} = members_{t-1,i-1} - members\ exits_{t,i} + new\ members_{t,i}$$

In a similar way, the number of beneficiaries for each year and age was calculated as:

$$beneficiar\ ies_{t,i} = beneficiar\ ies_{t-1,i-1} - beneficiar\ ies\ \ exits_{t,i} + new\ beneficiar\ ies_{t,i}$$

Financial variables modelling:

The pensionable salary was projected taking into account the statistics available and assumptions given about future salary growth.

Per capita pensionable salary:

$$pensionable\ salary_t = pensionable\ salary_{t-1} \times (1 + average\ salary\ growth_t)$$

The benefit ratios for the DB schemes were calculated from statistical analysis, namely the average pension benefit amount received by the beneficiaries over the average salary of the members. Assumptions were made on what these benefit ratios are expected to be in the future.

Due to legal reasons, the payment of benefits in the DC schemes has to be made through a life insurance annuity, at least 2/3 of the accumulated amount. As the pension dissimulation phase is transferred to the insurance market (by buying the life annuities), available pension fund statistics only capture the total outflows from the DC funds, instead of regular pension payments. In order to maintain the same modelling approach as for the DB schemes, the total accumulated amounts were converted into annual payments by using an annuity conversion factor.

For all schemes, the average benefit paid each year was divided into two segments, the first one being the average benefit for the new entrants and the second one the average benefit for the remaining beneficiaries. The reasoning for this was the fact that the benefits for the new entrants will be different (according to the behaviour of the benefit ratio defined as an assumption) from the remaining beneficiaries, for which the average pension will increase with a pre-determined assumption. The average pension for the new entrants is determined from the corresponding average pensionable salary and the benefit ratio. For the current beneficiaries, the average pension is determined by weighting (using population numbers) the average pension of current beneficiaries with the average pension of the new entrants.

Per capita average pension:

New entrants

$$average\ pension_t = pensionable\ salary_t \times benefit\ \ ratio_t$$

Current beneficiaries

$$average\ pension_t = \frac{\begin{pmatrix} current\ beneficiar\ ies\ average\ pension_{t-1} \times \\ \times (total\ \ beneficiar\ ies_{t-1} - new\ beneficiar\ ies_{t-1}) + \\ + new\ entrants\ \ average\ \ pension_{t-1} \times new\ beneficiar\ ies_{t-1} \end{pmatrix}}{total\ \ beneficiar\ ies_{t-1}} \times$$

$$\times (1 + pension\ \ growth\ rate_t)$$

The benefits paid are just the beneficiaries' population (both current beneficiaries and new entrants) times the corresponding average pension for each year:

New entrants

$$benefits\ \ payed_t = new\ entrants\ \ average\ \ pension_t \times new\ beneficiar\ ies_t$$

Current beneficiaries

$$benefits\ \ payed_t = current\ beneficiaries\ average\ pension_t \times$$
$$\times (total\ \ beneficiaries_t - new\ beneficiaries_t)$$

The current contribution rate was determined from the statistics available, dividing current contributions by the gross salaries. An assumption was made on how this variable would evolve in the future considering its relation to the benefit ratio.

Contributions cash flows were determined by multiplying the average per capita pensionable salary by the contribution rate times the members' population for each type of scheme:

$$contributions_t = contribution\ rate_t \times pensionable\ salary_t \times total\ \ members_t$$

Annex

Table A1. Factors behind the change in public pension expenditures between 2016 and 2070 using pension data (in percentage points of GDP) - pensions

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Public pensions to GDP	0.1	0.7	0.4	-1.1	-1.7	-0.6	-2.2
Dependency ratio effect	1.2	3.3	3.7	2.4	-0.1	0.4	10.9
Coverage ratio effect	-0.7	-1.2	-1.0	-0.9	-0.4	-0.5	-4.6
Coverage ratio old-age*	-0.3	-0.6	-0.6	-0.6	-0.5	-0.5	-3.1
Coverage ratio early-age*	-2.1	-3.0	0.5	-1.3	-0.5	0.2	-6.4
Cohort effect*	-0.5	-1.6	-3.9	-2.6	1.0	-0.9	-8.6
Benefit ratio effect	0.1	-0.4	-1.5	-2.2	-1.5	-0.4	-5.9
Labour Market/Labour intensity effect	-0.4	-0.8	-0.5	-0.2	0.3	-0.2	-1.9
Employment ratio effect	-0.4	-0.3	-0.2	-0.2	0.1	0.0	-1.0
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Career shift effect	0.0	-0.5	-0.4	0.0	0.1	-0.2	-1.0
Residual	-0.1	-0.2	-0.3	-0.2	0.0	0.0	-0.7

Source: Commission Services, GPEARI and GEP.

Table A2. Factors behind the change in public pension expenditures between 2016 and 2070 using pensioners data (in percentage points of GDP) - pensioners

	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Public pensions to GDP	0.1	0.7	0.4	-1.1	-1.7	-0.6	-2.2
Dependency ratio effect	1.2	3.3	3.7	2.4	-0.1	0.4	10.9
Coverage ratio effect	-0.7	-1.3	-0.7	-0.3	-0.1	-0.2	-3.3
Coverage ratio old-age*	-0.2	-0.6	-0.3	0.1	-0.2	-0.2	-1.3
Coverage ratio early-age*	-2.0	-2.9	0.5	-1.2	-0.5	0.2	-5.8
Cohort effect*	-0.5	-1.6	-3.9	-2.6	1.0	-0.9	-8.6
Benefit ratio effect	0.1	-0.3	-1.7	-2.7	-1.8	-0.6	-7.1
Labour Market/Labour intensity effect	-0.4	-0.8	-0.5	-0.2	0.3	-0.2	-1.9
Employment ratio effect	-0.4	-0.3	-0.2	-0.2	0.1	0.0	-1.0
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Career shift effect	0.0	-0.5	-0.4	0.0	0.1	-0.2	-1.0
Residual	-0.1	-0.2	-0.3	-0.2	0.0	0.0	-0.8

Source: Commission Services, GPEARI and GEP.

Table A3. Factors behind the change in public pension expenditures between 2016 and 2070 using pensioners data (in percentage points of GDP) - pensioners

New pension	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	:	:	:	:	:	:	:
II. Number of new pensions ('000)	:	:	:	:	:	:	:
III Average new pension	:	:	:	:	:	:	:

Source: Commission Services.