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1. OVERVIEW OF THE PENSION SYSTEM

1.1 Description

The public social security pension system is mainly a defined benefit (DB) system, working on a pay-as-you-go (PAYG) financing basis. It incorporates two distinct schemes: the Social Security system and CGA (Caixa Geral de Aposentações subsystem), that covers civil servants who have started working in the public sector until 2005.

Additionally, there is a private pensions system that consists of occupational and personal pension schemes. Occupational pension schemes, which can be of a DB or DC nature, are mainly financed by pension funds (covering 3.6% of the employed population at end- 2019, with an amount of assets corresponding to 9.4% of the Portuguese GDP). DB schemes financed by pension funds represent about 93% of the assets under management, with a total of 78,700 members and 131,000 beneficiaries. On the other hand, DC schemes cover a total of 107,300 members.

Private pension schemes also include occupational schemes funded by group insurance policies (the corresponding amount of technical provisions represented 0.1% of the Portuguese GDP at end-2019) and personal schemes. Personal schemes include individual adhesions to open pension funds and retirement saving schemes (known as PPR – Planos de Poupança Reforma – that can have as insurance contracts, pension funds or investment funds as financing vehicles), and the respective amount of assets represented 10.7% of the Portuguese GDP by the end of 2019.

The Portuguese Social Security system provides social protection through three systems that correspond to different social protection levels: i) the contributory welfare system, designed to replace earnings lost when specific contingencies occur, ii) the social solidarity protection system, which, by definition, covers all Portuguese citizens, iii) and the complementary system, which envisages the sharing of social protection responsibilities by encouraging voluntary complementary schemes (managed by public, private and social economy organizations). At the end of 2019, the welfare contributory regime, that includes new public employees since January 2006, covered 2.7 million pensions and 4.7 million contributors, while the social solidarity protection system (non-contributory regime), financed by the State Budget, covered 323,000 pensions. At the end of 2018 the public complementary system exceed 44 million euro of net assets and 8,400 subscribers.

The CGA had 459,000 contributors and about 644,000 pensions, at the end of 2019. As the latter is a closed sub-system, and the new public employees are enrolled in the Social Security

system since January 2006, the number of contributors will converge to zero in the 2050s, while the number of pensions will decrease until the end of the period, although not at a steady pace.

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

Old-age pension

Qualifying conditions

Under the general contributory regime, an insured person is entitled to an old-age pension if he/she has reached the statutory retirement age (SRA) and fulfilled the required qualifying period (15 years with earnings registration). The SRA increases in the proportion of two thirds of the evolution of life expectancy at the age of 65. Hence, the SRA in 2020 (and 2019) was set to 66 years and 5 months (in 2021 it will reach 66 years and 6 months).

Table 1 | QUALIFYING CONDITIONS FOR RETIRING

			2019	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension	Statutory retirement age - men/women		66y & 5m	67y & 0m	67y & 8m	68y & 3m	68y & 10m	69y & 4m
	Minimum requirements	Contributory period - men/women	40	40	40	40	40	40
		Retirement age - men/women	For each year behond 40y of contributory period is discounted 4 months in the statutory retirement age					
Qualifying condition for retirement without a full pension	Early retirement age - men/women*		>=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	-0.5%/month	-0.5%/month	-0.5%/month	-0.5%/month	-0.5%/month
	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
	Minimum contributory period - men/women		15	15	15	15	15	15
	Minimum residence period - men/women		-	-	-	-	-	-

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 monthly pension's value is calculated by multiplying the reference earnings (RE) by the global accrual rate (GAR):

P = RE * GAR

Reference earnings correspond 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 the others, the pension is obtained as 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.

Table 2 | PENSION BENEFIT FORMULA

Pension Benefit Formula		
20 years or less of contributory period	21 years or more of contributory period	
	RE versus SSI	Formula of pension
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]

Note: SSI - Social Support Index; RE – Reference Earning; LE – Life Expectancy; N – Contributory period.
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, which varies between 2% and 2.3% (Table 2), is applied to certain reference earnings brackets, indexed to the Social Support Index (SSI). The SSI is a reference amount (€435.76 in 2019 and €438.81 in 2020) for payments to the State and benefits granted by the State, which is updated every year with a similar rule to the pensions update rule (Table 3) (i.e. according the real GDP growth and CPI). For example, in 2019, considering that the average annual GDP growth rate of the last two years ending in the 3rd quarter of 2018 was 2.58%[1] and the average change of Consumer Price Index without housing in last 12 months available in December 2018 was 1.03%[2], the SSI was updated by 1.6% (i.e. 1.03%+Min(0.2*2.58%; 1.03%+0.5%)=1.546%, rounded to one decimal place)[3]. If the GDP growth rate was below 2%, the SSI would be updated by 1.03%.

[1] The average annual GDP growth rate of the last two years ending in the 3rd quarter of 2019 was 2.35%.
[2] It was 0.24% in December 2019.
[3] In 2020 the SSI was updated by 0.7%.

Table 3 | 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	CPI + 20% real GDP growth [min.: CPI + 0.5 p.p.]	CPI + 20% real GDP growth

Note: SSI - Social Support Index; CPI –Average change of Consumer Price Index excluding housing over last 12 months available in December; GDP – average annual Gross Domestic Product growth rate in the last two years ending in the 3rd quarter of the previous year; min – minimum.
Source: Instituto da Segurança Social.

Hence the GAR ranges from 30% to 92%, as the minimum contributory period is 15 and the maximum for pension benefit calculation is 40 years.

The automatic annual update of the pension benefit (indexation rule) is done according to the amount of the pension benefit and the GDP real growth, alongside with the CPI (excluding housing), as described in Table 4[4]. For pensions in the first bracket, the update follows the SSI rule.

Table 4 | 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	CPI + 20% real GDP growth [min.: CPI + 0.5 p.p.]	CPI + 20% real GDP growth
2 SSI < Pensions ≤ 6 SSI	CPI – 0.5 p.p.	CPI	CPI + 12.5% real GDP growth
6 SSI < Pensions ≤ 12 SSI	CPI - 0.75 p.p.	CPI - 0.25 p.p.	CPI

Note: SSI - Social Support Index; CPI –Average change of Consumer Price Index excluding housing over last 12 months available in December; GDP – average annual Gross Domestic Product growth rate in the last two years ending in the 3rd quarter of the previous year; min – minimum.
Source: Instituto da Segurança Social.

For example, in 2019, given that the average annual GDP growth rate of the last two years was 2.58% and the average change of CPI without housing in December 2018 was 1.03%, pensions below or equal two times the SSI (2x€435.76=€871.52) were updated by 1.6% (equal to SSI update), pensions above 2 times SSI and below or equal 6 times SSI were updated by 1.03% (equal to CPI) and pensions above 6 times SSI and below or equal 12 times SSI were updated by 0.78% (1.03%-0.25%).

Early retirement pension

Before reaching the statutory retirement age, an early old-age pension may be claimed under certain conditions:

[4] The GDP and inflation follows the same specifications as for SSI.

- Workers with very long careers (i.e. workers with at least 60 years of age and a career length of 48 years or more; or workers with at least 60 years of age with 46 years or more of career, provided they started working and paying contributions at the age of 16 or before)[5];
- Workers under long-term unemployment;
- "Old-flexibility" scheme, if the insured person has at least 40 years of contributory period and 60 years or more of age (but he/she has attained less than 40 years of contribution at the age of 60);
- "New-flexibility" scheme, if the insured person has at least 40 years of contributory period at the age of 60 (except for workers with long careers and workers in a very specific set of arduous jobs)[6].

Sustainability factor, penalty and bonus

A sustainability factor, penalty or bonus may be applied to the value of the accrued pension.

The sustainability factor (SF) is an adjustment feature of the pension system to the demographic evolution, applied exclusively to i) an early old-age pension that falls under the "old flexibility" scheme, that is, in case the contributor has not attained at least 40 years of contributions at the age of 60; ii) early pensions which fall under the long-term unemployment scheme. This sustainability factor is equal to the ratio between the life expectancy at 65 years of age in 2000 and the life expectancy at 65 years of age in the year prior to the pension attribution. The SF in 2019 was 14.7% and 15.2% in 2020.

Early-retirement pensions may also be subject to a pension penalty. The personal retirement age (PRA) is a key concept to compute this penalty. PRA is computed by taking into account the years of the contributory period that exceed the 40 years threshold: for each attained contribution year above 40, PRA is discounted by four months. The pension is then subject to a penalty of 0.5% for each month of anticipation to the PRA. Both the sustainability factor and the pension penalty are applied under the "old-flexibility" scheme. For workers falling under the "new-flexibility" scheme, only the pension penalty (but no sustainability factor) applies.

For those workers who retire after the statutory retirement age, a bonus is applied, which depends on the contributory period calculated up to the age limit of 70. The bonus is obtained

[5] Decree-law no. 73/2018, of September 17, extended the scope of Decree-Law no. 126-B/2017, of October 6, to workers with at least 60 years of age with 46 years or more of career, provided they started working and paying contributions at the age of 16 or before instead of before 15 years old.
[6] This was approved by Decree-Law no. 119/2018, of December 27, and entered into force in 1st January 2019.

by multiplying the bonus rate (Table 5) by number of months completed between the month on which the pension is granted and the month when the person reached the personal retirement age. The pension benefit including bonus cannot be higher than 92% of the highest monthly salary used in the calculation of the reference earning.

Table 5 | BONUS REGIME FOR WHO RETIRE AFTER STATUTORY 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.

For example, someone applying for an old-age pension at age of 67 years with 44 years of contributory period has a bonus: the difference in months between the age of the contributor and the personal retirement age[7] (in 2019, 67 years minus 65 years and 1 months multiplied by 1 as she/he has more than 40 years of contributory period, i.e. 23m x 1%). Examples of pension benefit calculations are given in the annex.

Minimum pensions

Under the general contributory regime, minimum pension amounts are guaranteed according to the pensioner's insurance career. When the pension amount, calculated according to the pension benefit formula, is lower than the guaranteed minimum amount, a "social supplement" is applied: the difference between the guaranteed minimum amount and the statutory pension amount. The social supplement granting is not means-tested. The minimum pension amount depends on the contributory career, as shown in table below, and is not applied to early pensions.

[7] The personal retirement age is obtained by discounted 4 (the number of years of contributory period above 40 years) multiplied by 4 months, that gives 16 months, to the SRA, i.e. 66 years and 5 months minus 16 months gives 65 years and 1 month.

Table 6 | MINIMUM PENSION AMOUNT IN 2019 (AND 2020)

Minimum Pension Amount - SS		Minimum Pension Amount - CGA	
Contributory career (years)	Pension in 2019 (2020)	Contributory career (years)	Pension in 2019 (2020)
< 15	€273.39 (€275.30)	5 - 12	€255.49 (€257.28)
		13 - 18	€266.30 (€268.16)
15 - 20	€286.78 (€288.79)	19 - 24	€284.67 (€286.66)
21 - 30	€316.45 (€318.67)	25 -30	€318.56 (€320.79)
> 30	€395.57 (€398.34)	> 30	€422.09 (€425.04)

Source: Instituto da Segurança Social.

Non-earning related pensions

When a person reaches the statutory retirement age but is not covered by any compulsory social protection scheme, or does not have the required contributory period, he/she may be entitled to a social pension, under the non-contributory regime. Benefits provided by this scheme are means-tested, ensuring that a person's income does not exceed the legally-prescribed pension value: 40% of the SSI for singles (in 2020, the gross monthly income could not exceed €175.52; €174.30 in 2019) - or 60% of SSI if in a couple (€263.29 in 2020, €261.46 in 2019), if in a couple. The basic social pension value is €211.79 in 2020 (€210.32 in 2019). A supplement is added according to the pensioner's age: €18.44 (€18.02 in 2019) for pensioners below 70 years of age, and €36.86 (€38.02 in 2019) for pensioners aged 70 years or more. This pension is indexed to the SSI and is updated according to the lower earning-related pensions rule (Table 3).

There is also a means-tested benefit granted to low income elderly (aged SRA or above), the Solidarity supplement for the elderly (Complemento Solidário para Idosos - CSI). The amount granted depends on household income (including income of the descendants even if not living together) up to maximum annual amount of €5258.63.

Disability pension

Disability pensions have required qualifying periods of 5 years for relative disability cases and 3 years for total disability cases. The disability is deemed as "relative", 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. On the contrary, the disability is considered as "total", when the insured person loses the capacity to work in any profession, in that year, or if it is expected that the person will not recover that capacity until the age of 65.The disability pension benefit formula follows the formula of the old-age pension.

The minimum pension benefit amount, in case of "relative" disability, depends on the contributory period (see Minimum Pension Amount in Table 6) and, in case of "total" disability,

corresponds to a minimum old-age pension benefit, or to a minimum relative disability pension benefit with 40 years of contributory career.

In 2017, a new Social Inclusion Benefit (PSI) was created[8]. The PSI aims to integrate all types of disability benefits into a single one targeting all population up to 56 years old. Most of the social disability pensions were transferred to this new benefit. The PSI is not included in the projections because this benefit covers also other age groups and contingencies. However, a special social disability pension may be granted when some specific diseases (AIDS, Parkinson's disease, Alzheimer's disease, etc.) cause permanent incapacity to work with a prognosis of a rapid evolution towards a situation of loss of autonomy, with a negative impact on the profession.

Survivor pension

Survivor's pension is a benefit paid to a spouse, an ex-spouse, a person with whom the beneficiary was living in a de facto relationship, descendants 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. The amount allocated to each is equal to the social pension times the correspondent percentage (see Table 7).

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.

[8] For more information, see 1.2 Recent reforms of the pension system included in the projections.

Survivor pensions are granted for a period of five years if spouses, ex-spouses and unmarried partner have less than 35 years of age when the beneficiaries died, except in cases of total and permanent incapacity to work. Descendants earn a pension up to turning 18, 25 if they are students, or 27 if enrolled in postgraduate, master degree, doctoral study or its internships, or disable.

Financing of the public pension system

The public social security pension system is financed on a pay-as-you-go (PAYG) basis. The overall rate for the social security system is structured as follows: 11% of gross earnings paid by the employee, and 23.75% paid by the employer[9]. The self-employed pay 21.4% (or 25.2% for those with management functions) and the contracting entities pay 7% or 10% if economic dependence exceeds 80% on taxable income of the previous year. From the total 34.75% of gross earnings paid by the insured person and employer to Social Security, 20.21% finance old-age benefits, 4.29% go to disability benefits, and 2.44% to survivor benefits. In the case of CGA contributors, 73% of the contributions finances old-age and disability and the remaining is allocated to survivor's pensions. The State budget finances the gap between its revenue and expenditure[10].

Even though the system is run on a PAYG basis, in recent years, with the aim of diversifying the sources of funding, an additional tax over property was introduced, as well as earmarked contributions (ranging between 0.5 p.p. and 2 p.p.) of Corporate Income Tax, to Social Security. Between 2017 and 2020, these revenues (1051.6 million euro, 0.5% of 2019 GDP) have been earmarked to the Social Security Trust Fund (FEFSS).

The 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, as well as 2 to 4 p.p. of the employee's contributions, whenever the general contributory regime of Social Security registers a surplus or the economic situation allows. In 2019, FEFSS had 20.4 billion euro of assets (9.6% of 2019 GDP).

Taxation

Pensions are subject to taxation. For pensioners not living in Portugal, the pension benefit with origin in Portugal is subject to personal income tax (PIT), at a withholding rate of 21.5%. When resident in Portugal all income is subject to PIT and the pension income incorporates

[9] See Annex for other special contributory rates.
[10] Article no. 139 of Decree-law no. 498/72, December 9th.

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.

Tax rate on pensions is applied to the annual income starting at €4,104, in 2019. Specific deductions are granted, namely, 150% of trade union fees up to 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.

Special pensions

The main special pensions[11] included in the CGA scheme are pensions provided to security and defence forces that have a different statutory retirement age (6 years early), to ambassadors, plenipotentiary ministers and magistrates, whose pension benefit is calculated by taking into account the last salary and the contributory period length. CGA also pay other special pensions on behalf of the State. These are not earning related pensions, and include disability and survivor pensions paid to military personnel or civil servants working for the Armed Forces, the National Civil Protection Service or the National Fire Service for relevant services rendered to the country. The great majority are pensions paid as a consequence of the colonial war. Special pensions paid to ex-political office-holders are also included. In the current exercise, these pensions paid on behalf of the State have been included in the "Other pensions" category. In the 2018AR, they were included under the old-age and survivor pension categories.

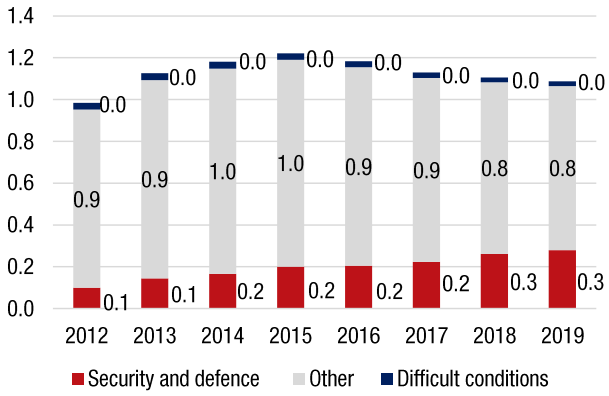
Under the Social Security scheme, there are some special pensions paid to workers with professional activities characterized by difficult conditions, such as workers of merchant navy, mine workers, dancers of classic and contemporary ballet, embroiders from Madeira Island, or specific sectors as security and defence forces, fire workers, air traffic controllers and civil aviation pilots or even to deprived persons as pensions provided to long-term unemployment workers. The no-earning closed Agriculture Social Security pension scheme is also included in the special pensions. Additionally, there are some complementary pensions paid to specific persons, such as war veterans.

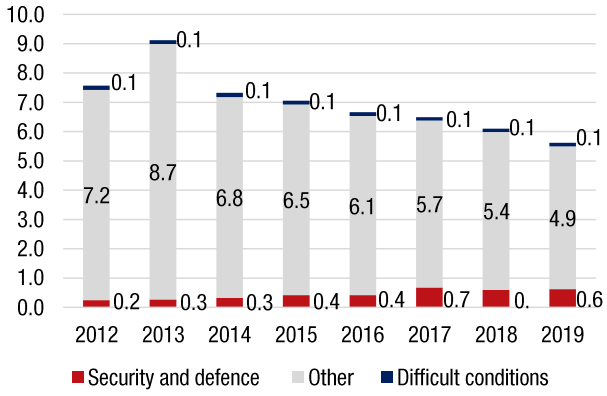
Special pension expenditure has been almost stable fom 2012, reaching 1.1% of GDP in 2019. Special pensions related to security and defence have increased expenditure by 0.2 p.p. of GDP between 2012 and 2019. This increase was almost offset by the decrease of RESSAA pension expenditure included in Other. The share of special pensions in the total number of

[11] For definition of special pensions see Box II.1.2 in 2018 Ageing Report, part II.

pensions has been decreasing (from 7.6% to 5.6%) mainly because some phasing-out as RESSAA.

Figure 1 and 2 | SPECIAL PENSIONS – EXPENDITURE (% GDP) AND NUMBER OF PENSIONS (% TOTAL)





Source: CGA and GEP.

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

There were some minor reforms in the pension system in the period 2018-2020 have been included in this projection exercise:

- In 2019, a new flexibility rule for early retirement entered into force. It exempts from the application of the sustainability factor all workers aged 60 or more, and who have attained a contributory period of at least 40 years at the age of 60[12].

  In the 2018AR exercise, workers could apply for an early old age pension before the statutory retirement age from the age of 60, provided they had attained a contributory period of 40 years. These early pensions were subject to both the sustainability factor and a penalty (see Section 1.1 for details).

- In October 2018, Portugal extended the eligibility for penalty-free early retirement to individuals aged at least 60 with long contributory periods: at least 46 years of contributions, provided they had started working at the age of 16 or before. In the 2018AR, the first phasing-in of the law was reflected, which targeted both workers with very long contributory periods and reparation for early labour (i.e. full pension benefit paid to workers aged at least 60 and who had either at least 48 years of contributions, or at least 46 years of contributions, in case they had started working before the age of 15).

[12] This measure has been phased-in over 2 stages: in January 2019, it applied to contributors with 63 years old or more and at least 40 years of contributory period; in October 2019, it has been extended to contributors with 60 years old and at least 40 years of contributory period. This latest measure is considered in this projection exercise.

- Disability pensions are converted into old-age pensions at the statutory retirement age, rather than at 65 years old.
- A new Social Inclusion Benefit (PSI) was created in October 2017, aimed at integration all types of disability benefits into a single one. This benefit is targeted to all population up to 56 years old with a certified degree of incapacity of 60% or more. This benefit has a base component which aims to compensate expenses incurred by disability promoting autonomy and social inclusion. This component depends on level of disability and income, and it incorporates labour participation incentives. In addition, the PSI benefit includes a component targeted to poverty relief and a bonus to compensate certain expenses concerning disability as the subsidy for special education enrolment. In its first implementation phase, it concerned beneficiaries of the Monthly Lifetime Subsidy (Subsídio Mensal Vitalício) (more than 13,000 members) at October 2017), around 50,500 beneficiaries of Social Security Disability Pension, and about 300 beneficiaries of no-earning related Agriculture Social Security Disability Pension migrated (on January 2018)[13]. In its second implementation phase, that took place in October 2018, the component to relief poverty was introduced. The third implementation phase started in October 2019, with the extension of PSI to children and youth (about 6,300 who were previously holders of the Disability Bonus (Bonificação por Deficiência). PSI benefit is not included in the current projection exercise. However, it has an impact on the amount and the expenditure of non-contributory social disability pensions, since most of pensioners (about 99% of the beneficiaries of Social Security Disability Pension and 10% of the beneficiaries of no-earning related Agriculture Social Security Disability Pension) were transferred to this benefit. The expenditure and beneficiaries of the PSI are presented on the Annex.
- Since 2007, the rules for indexing pensions take into account the evolution of prices and GDP growth. This rule was suspended between 2011 and 2015, when only lower pension were updated. However, from 2017 to 2020, for adequacy reasons, pensions below 1.5 SSI has been subject to a special monthly increase of EUR 10 (limited to EUR 6 for pensioner that had been increased between 2011 and 2015).
- Starting on January 2019, an extraordinary supplement was assigned to the beneficiaries from lower minimum pensions which were not covered by the extraordinary increase of 2017 and 2018.
- In the CGA scheme, in cases of extraordinary public interest or acting as cooperation agents14, the contributors and pensioners are allowed to continue to exercise public

[13] The beneficiaries of the Social Security Disability Pension and of Agriculture Social Security Disability Pension referred above were part of the beneficiaries who were included in the non-earning related disability pensions in the 2018AR and are no longer included in 2021AR projection as they were transferred to this new benefit.
[14] It entered into force at first to cooperation agents (Law no. 114/2017, of 29th December), and then for remaining case in January 2019 (Decree-Law no. 6/2019, of 14th January).

functions after turning 70. These pensioners could accumulate wage with pension benefit up to the amount of the pension.

- Since October 2017, the aggregation of the contributory periods completed under different schemes (CGA, general social security scheme, special scheme, banking sector collective agreements substitutive of the Social Security benefits, foreigner or international social security schemes) is taken into account regarding accrual rate, minimum pensions, bonus and qualifying periods.
- The minimum guaranteed remuneration has been updated: €557 in 2017, € 580 in 2018, € 600 in 2019 and € 635 in 2020.

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

These projections are anchored to 2020 data and rules, assuming "constant policy" then onwards.

In this exercise, the non-contributory pensions (minimum pensions) were updated according to the Portuguese rule of indexation until 2029, but linked to wage growth from 2030 onwards. This follows the agreement of the Ageing Working Group for the 2018 Ageing Report pension projections, according to which minimum pensions should be indexed to CPI for ten years, and should then follow wage growth.

It is also important to stress that the calculation CGA and SS models are based on pensions. However, the number of pensioners is obtained as a proxy of the number of pensioners that have a survivor pension and an old-age/disability pension, and also of pensioners that receive pensions from CGA and SS. The result by cohort is then controlled by population in each cohort. The number of total pensioners is calculated by adding the public pensioners with the private occupational scheme and controlled by population in each cohort.

2. OVERVIEW OF THE DEMOGRAPHIC AND LABOUR FORCE PROJECTIONS

2.1. Demographics developments

According the Eurostat's 2020 population projections, with 2019 as base year, total population is expected to pursue its downward trend, initiated in the beginning of this decade, decreasing by 17.7% between 2019 and 2070. While these projections are slightly more favourable when

compared to the 2018 Ageing Report (where population was projected to shrink by 22% between 2019 and 2070), they nevertheless highlight a worrisome scenario. Total population is expected to fall below 10 million in the beginning of the 2030s (2033), below9 million by the late-2050s, and below 8.5 million in 2070.

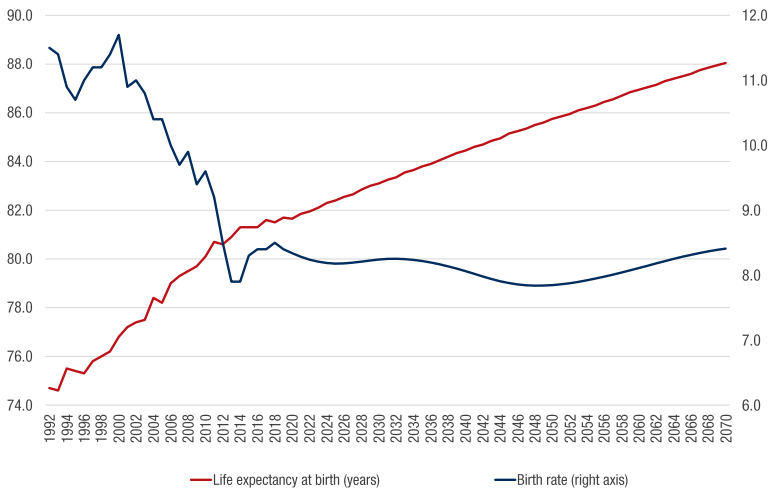
Table 8 | MAIN DEMOGRAPHIC VARIABLES

	2019	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Population (thousand)	10 284	10 076	9 769	9 353	8 888	8 463	10 290	2020	-1 821
Population growth rate	0.0	-0.3	-0.4	-0.5	-0.5	-0.4	0.1	2020	-0.4
Old-age dependency ratio (pop65+/pop20-64)	37.3	47.2	59.6	68.8	67.9	67.3	68.9	2051	30.0
Old-age dependency ratio (pop75+/pop20-74)	15.2	19.3	25.1	31.4	35.2	33.3	35.2	2059	18.2
Ageing of the aged (pop80+/pop65+)	29.5	30.4	33.4	37.9	45.4	44.5	46.2	2063	15.0
Men - Life expectancy at birth	78.6	80.2	81.7	83.2	84.5	85.7	85.7	2070	7.1
Women - Life expectancy at birth	84.8	86.0	87.2	88.3	89.4	90.4	90.4	2070	5.6
Men - Life expectancy at 65	18.4	19.4	20.4	21.4	22.3	23.2	23.2	2070	4.8
Women - Life expectancy at 65	22.2	23.2	24.1	25.0	25.9	26.7	26.7	2070	4.5
Men - Survivor rate at 65+	85.4	87.8	89.7	91.2	92.5	93.7	93.7	2070	8.3
Women - Survivor rate at 65+	93.6	94.6	95.3	95.9	96.5	96.9	96.9	2070	3.3
Men - Survivor rate at 80+	58.4	64.0	68.5	72.6	76.3	79.5	79.5	2070	21.1
Women - Survivor rate at 80+	77.4	80.8	83.4	85.7	87.8	89.5	89.5	2070	12.1
Net migration (thousand)	40.1	9.9	12.3	14.3	16.3	18.6	40.1	2019	-21.5
Net migration over population change	186.5	-0.4	-0.3	-0.3	-0.4	-0.5	186.5	2019	-186.0

Source: EUROSTAT and European Commission.

This evolution is mainly explained by persistently low fertility rates, which have been below the replacement level (2.1) since 1982, and which are currently below EU average (1.42 vs 1.56), only above Finland, Luxembourg, Greece, Cyprus, Italy, Spain, Poland and Malta, and that are projected to reach only 1.59 in 2070. This scenario is also reflected in the birth rate, which steeply deteriorates over the first two decades, to 7.8 ‰ at the end of the 2040's, and then raising again to 8.4‰ until the end of the period (Figure 1). In turn, life expectancy at birth will continue its upward trend, significantly increasing from 82 to 88 years, between 2019 and 2070.

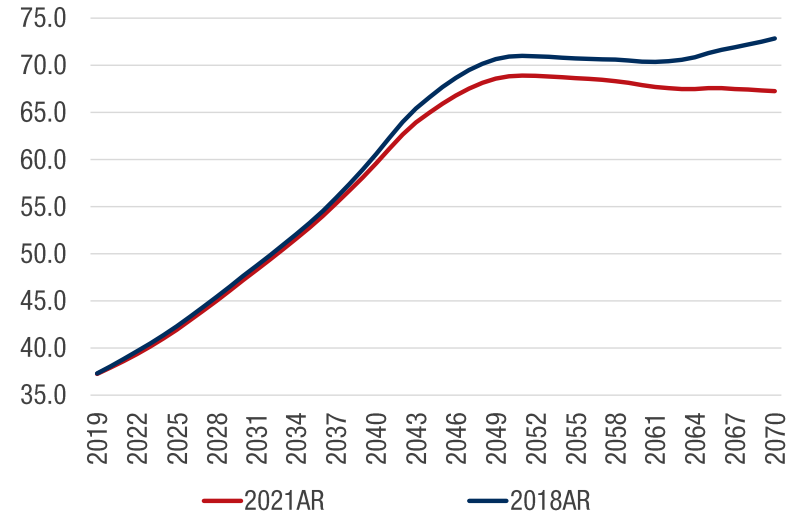
Figure 3 | LIFE EXPECTANCY AT BIRTH AND BIRTH RATES



Source: EUROSTAT and European Commission.

These developments contribute to a worsening of the old-age dependency ratio (Figure 2). In 2019, there was about one elderly (+65 years) for every three working age persons (20-64 years), whereas this relationship is foreseen to increase 30 p.p. by 2070, when the dependency ratio is expected to exceed 67%, but less sharply than in 2018AR (+35.5 p.p.). The rising life expectancy, particularly at 65 years of age (which is expected to increase 4.6 years, on average), also influences the share of elderly with more than 80 years in population ageing 65 or more, which will substantially grow (15 p.p., 14.5 p.p. in 2018AR) during the projection horizon, reaching its peak in 2063 (46%).

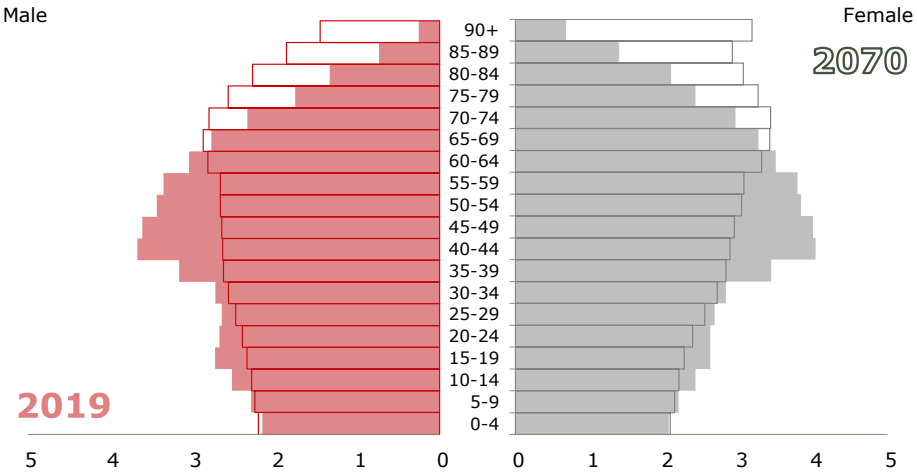
Figure 4 | OLD-AGE DEPENDENCY RATIO



Source: EUROSTAT.

The twofold growth of the dependency ratio can also be visualized in the structural upward shift of the demographic pyramid (Figure 3). Between 2019 and 2070, the pyramid highlights the shrinkage of the share of all cohorts below 60, and the consequent widening of the top, due to the above-mentioned factors.

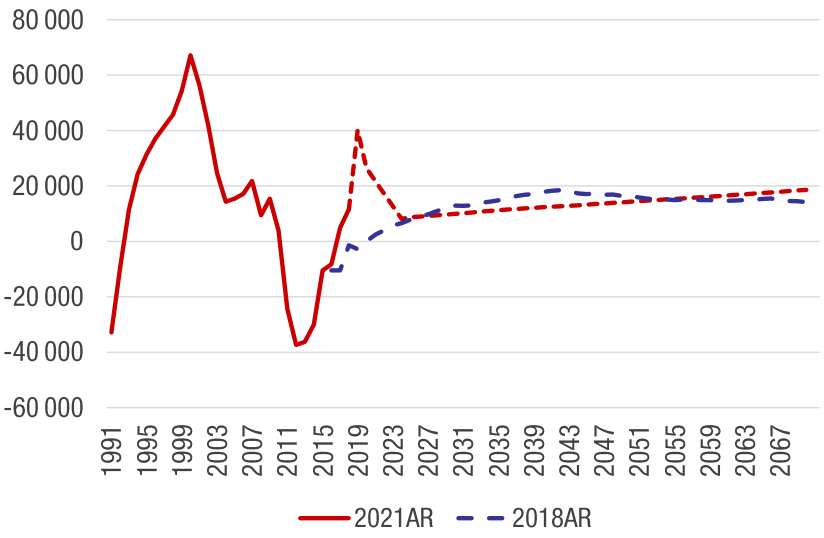
Figure 5 | AGE PYRAMID (AS A SHARE OF TOTAL POPULATION), COMPARISON BETWEEN 2019 AND 2070



Source: EUROSTAT and European Commission.

Furthermore, migration flows are an important feature of population dynamics and of the demographic structure. As previously stated, Portugal experienced a significant net outflows in the 1950s and 60s, followed by their return in the 1970s, after the independence of the former colonies. On the contrary, during the 1990s, Portugal experienced a substantial intake of migrants from Eastern European countries, Brazil and those former colonies: a cumulative net intake of more than 270,000, 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: a cumulative net outtake between 2011 and 2016 of 146,800. Finally, Eurostat foresees that the positive trend which has begun in 2017, will continue to have relevant impacts on labour force and fertility rates projections.

Figure 6 | NET MIGRATION (number of persons)

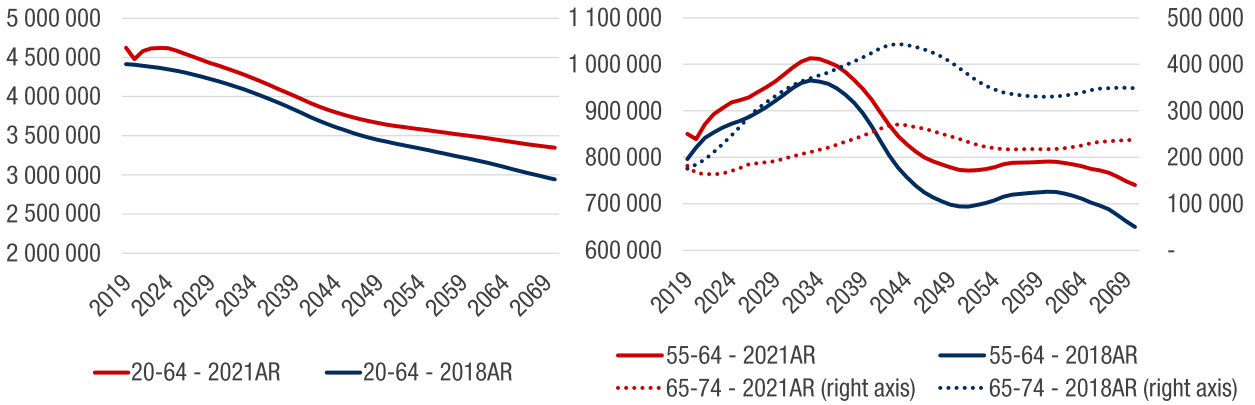


Source: EUROSTAT and European Commission.

2.2. Labour force

Following the Eurostat's projections, Portugal is expected to lose more than a million people of total labour force (20-64), diminishing by 28% between 2019 and 2070 – an even-greater drop than that of total population. Nevertheless, total labour force projections were revised upwards when compared to the previous 2018 Ageing Report (Figure 5). 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 follows an opposite behaviour (Figure 6).

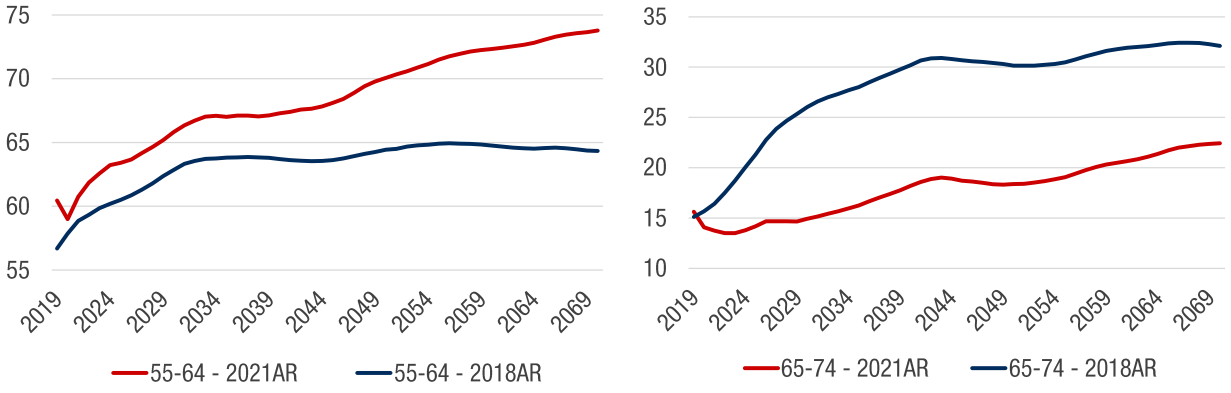
Figure 7 and 8 | LABOUR FORCE (thousands persons)



Source: EUROSTAT and European Commission.

The labour force participation rate among those aged 55 to 64 is forecasted to increase from 64.5% to 78.4% in 2070. Moreover, the employment rate for these cohorts is expected to grow from 60.4% to 73.8 % in the projection period, representing a lower upsurge than the former (13.3 p.p. compared to 14 p.p.), suggesting that unemployment in these cohorts will decrease relatively more than employment (Figure 7). Consequently, the share of workers on labour force aged 55-64 will rise from 93.8% to 94.1 %, over the projection period.

Figure 9 and 10 | EMPLOYMENT RATES



Source: EUROSTAT and European Commission.

In line with the previously described dependency ratio increase, the labour force participation rate for people aged 65-74 will rise over the projection horizon, increasing from 16.1% to 23.1% (15.4% to 32.5% in 2018AR). Similarly, the respective employment rate will also rise by 6.8 p.p. (17 p.p. in 2018AR). Furthermore, the share of employed persons in the labour force, within this age group, is expected to remain almost stable around 97%. This represents an opposite trend to the one projected in the 2018 Ageing Report (where a 0.6 p.p. increase was predicted). The values from 2019 are now lower, due to the above-mentioned higher labour force aged 65 to 74.

Table 9 | PARTICIPATION RATE, EMPLOYMENT RATE AND SHARE OF WORKERS FOR THE AGE GROUPS 20-64, 20-74, 55-64 and 65-74

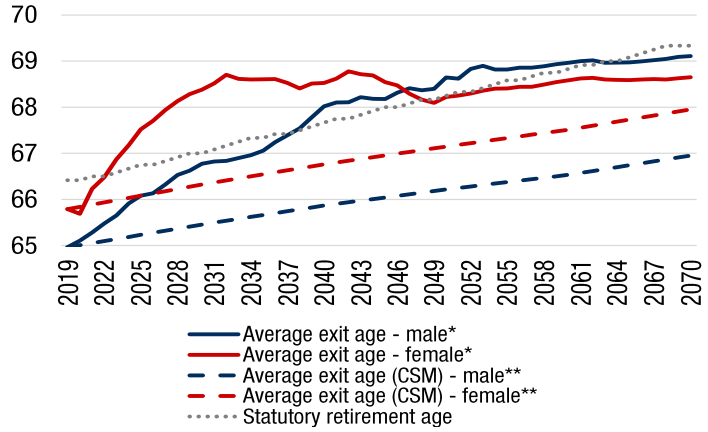
	2019	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Labour force participation rate 20-64	81.4	83.0	83.5	84.8	85.2	85.7	85.7	2070	4.3
Employment rate for workers aged 20-64	76.2	77.8	78.3	79.5	79.9	80.4	80.4	2070	4.2
Share of workers aged 20-64 on the labour force 20-64	93.6	93.8	93.8	93.8	93.8	93.8	94.7	2024	0.2
Labour force participation rate 20-74	70.9	70.1	69.5	70.2	72.7	73.0	73.0	2070	2.1
Employment rate for workers aged 20-74	66.4	65.9	65.3	66.0	68.3	68.6	68.6	2070	2.2
Share of workers aged 20-74 on the labour force 20-74	93.7	93.9	93.9	94.0	94.0	94.0	94.8	2024	0.3
Labour force participation rate 55-64	64.5	69.9	71.6	74.5	76.9	78.4	78.4	2070	14.0
Employment rate for workers aged 55-64	60.4	65.8	67.3	70.1	72.3	73.8	73.8	2070	13.3
Share of workers aged 55-64 on the labour force 55-64	93.8	94.1	94.0	94.1	94.1	94.1	95.0	2024	0.3
Labour force participation rate 65-74	16.1	15.4	18.8	18.9	21.1	23.1	23.1	2070	7.0
Employment rate for workers aged 65-74	15.6	14.9	18.2	18.4	20.5	22.4	22.4	2070	6.8
Share of workers aged 65-74 on the labour force 65-74	97.3	96.9	96.9	97.2	97.1	97.2	97.3	2019	-0.2
Median age of the labour force	42.0	44.0	44.0	44.0	43.0	43.0	44.0	2025	1.0

Source: EUROSTAT and European Commission.

As shown in Tables 10 and 11, women's contributory period is shorter than men's. However, according to administrative data, women's average effective exit age is higher than men's. These is explained by the fact that men start working early than women and because usually are women that take longer leaves from work to take care of children or dependents (e.g. elderly persons).

The average labour market exit age of the Cohort Simulation Model (CSM) increases below the statutory retirement age for both genders. However, when adding to the administrative data the increase of the average labour marked exit age of CSM and the increase of the contributory period, the differences in the end of the projection period are very small for women (68.6 years versus 68 years) but higher for men (69.1 years versus 67 years). This is due the fact that CSM has a lower increase on labour market exit (2 years) than projected by national models and even lower than for women (2.2 years).

Figure 11 | AVERAGE EXIT AGE AND STATUTORY RETIREMENT AGE



* Adding to average effective exit age given by administrative data the increase of contributory period. ** Adding to average effective exit age given by administrative data the increase of average labour market exit of CSM.
Source: European Commission, GPEARI and GEP.

Table 10 | LABOUR MARKET EXIT AGE, EFFECTIVE RETIREMENT AGE AND EXPECTED DURATION OF LIFE SPENT IN RETIREMENT - Male

	2020	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Average effective exit age (administrative data)*	65.0	-	-	-	-	-	-	-	-
Average labour market exit age (CSM)**	64.6	65.1	65.5	65.8	66.1	66.6	66.6	2069	2.0
Contributory period	33.6	35.3	36.5	37.2	37.5	37.6	37.6	2070	4.0
Duration of retirement***	18.4	19.4	20.4	20.5	21.4	21.5	22.1	2068	3.1
Duration of retirement/contributory period	0.5	0.5	0.6	0.6	0.6	0.6	0.6	2068	0.0
Percentage of adult life spent in retirement****	28.3	29.2	30.1	30.0	30.8	30.7	31.3	2068	2.4
Early/late exit*****	0.8	1.6	2.1	1.4	2.2	2.5	2.5	2070	1.8

* The effective retirement age shows the age at which people on average start receiving a pension benefit. It is calculated on the basis of the administrative data for 2019 (see Annex Tables A4a and A4b); ** The labour market exit age as calculated based on Labour Force Survey data for the base year and estimated by the Cohort Simulation Model thereafter; *** 'Duration of retirement' is calculated as the difference between the life expectancy at the average labour market exit age and that exit age itself; **** The 'percentage of adult life spent in retirement' is calculated as the ratio between the duration of retirement and the life expectancy minus 20 years; ***** Early/late exit is the ratio between those who retire and are below the statutory retirement age and those who retire at the statutory retirement age or above.
Source: European Commission, GPEARI and GEP.

Table 11 | LABOUR MARKET EXIT AGE, EFFECTIVE RETIREMENT AGE AND EXPECTED DURATION OF LIFE SPENT IN RETIREMENT - Female

	2020	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Average effective exit age (administrative data)*	65.8	-	-	-	-	-	-	-	-
Average labour market exit age (CSM)**	64.1	64.6	65.0	65.4	65.8	66.2	66.2	2069	2.2
Contributory period	26.8	29.5	29.7	29.4	29.7	29.8	29.9	2042	3.1
Duration of retirement***	23.1	23.2	24.1	25.0	24.9	25.8	25.8	2070	2.7
Duration of retirement/contributory period	0.9	0.8	0.8	0.9	0.8	0.9	0.9	2070	0.0
Percentage of adult life spent in retirement****	33.4	33.2	33.9	34.5	34.3	34.9	34.9	2070	1.5
Early/late exit*****	2.3	1.6	1.9	1.3	2.2	2.4	2.8	2021	0.2

* The effective retirement age shows the age at which people on average start receiving a pension benefit. It is calculated on the basis of the administrative data for 2019 (see Annex Tables A4a and A4b); ** The labour market exit age as calculated based on Labour Force Survey data for the base year and estimated by the Cohort Simulation Model thereafter; *** 'Duration of retirement' is calculated as the difference between the life expectancy at the average labour market exit age and that exit age itself; **** The 'percentage of adult life spent in retirement' is calculated as the ratio between the duration of retirement and the life expectancy minus 20 years; ***** Early/late exit is the ratio between those who retire and are below the statutory retirement age and those who retire at the statutory retirement age or above.
Source: European Commission, GPEARI and GEP.

3. PENSION PROJECTIONS RESULTS

3.1 Extent of the coverage of the pension schemes in the projections

The present projections include the main Portuguese pension systems: the public system (Social Security and CGA) and the private occupational system implemented through pension funds. Other types of private pension schemes have not been included in the projection exercise due to lack of data with a level of granularity that would be needed to derive assumptions and model cash flows for the future.

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), 0.1% of GDP in 2018. Additionally, pensions paid to bank employees transferred to the social security, scheme that represent 0.2% of GDP in 2018, are not considered as pension expenditure for the purpose of this exercise[15].

Table 12 | EUROSTAT (ESSPROS) versus AGEING WORKING GROUP DEFINITION OF PENSION EXPENDITURE (% GDP)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Change 2009-2018
Eurostat total pension expenditure	13.6	13.7	14.4	14.5	15.7	15.6	14.9	14.6	14.2	13.8	0.2
Eurostat public pension expenditure (A)	12.3	12.5	13.1	13.6	14.7	14.7	14.1	13.7	13.3	13.0	0.7
Public pension expenditure (AWG outcome) (B)	12.8	12.6	13.3	13.4	14.3	14.3	13.7	13.5	13.0	12.8	-0.1
Difference EUROSTAT/AWG: (A) - (B)	-0.6	-0.1	-0.1	0.2	0.4	0.4	0.3	0.3	0.3	0.2	0.8

Source: EUROSTAT, European Commission, INE, GPEARI and GEP.

3.2 Overview of the projection results

Under the assumptions implicit in the AWG baseline scenario, total pension (public and private occupational pensions) is expected to decrease by 3.3 p.p. of GDP, from 13% in 2019 to 9.7% in 2070, after reaching a peak of 14.9% of GDP in 2035. This behaviour is due to public pension expenditure, as occupational pension expenditure plays a minor role.

Occupational pensions spending in terms of GDP is expected to slightly decrease over the whole projection horizon (from around 0.3% of GDP in 2019 to 0.2% of GDP in 2070). This

[15] 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.

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.

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 2019 and onwards, the implicit tax rate (around 8.3%) of 2018 will be kept unchanged along the projection period. It means that net pension expenditures will have the same behaviour as gross pension expenditures.

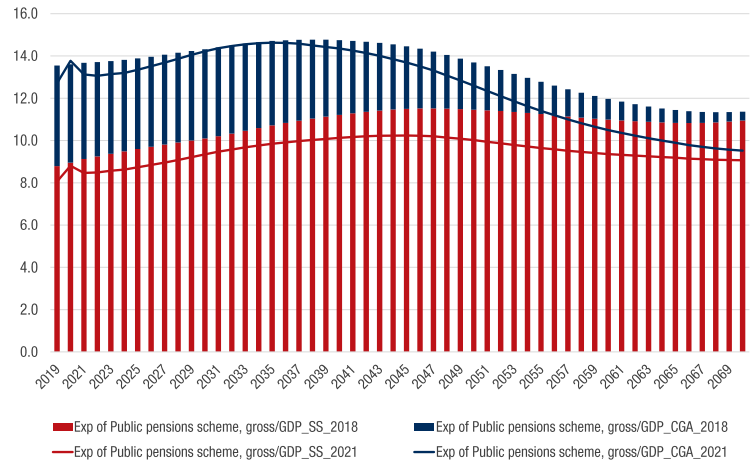
Table 13 | PROJECTED GROSS AND NET PENSION SPENDING AND CONTRIBUTIONS (% GDP)

Expenditure	2019	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Gross public pension expenditure	12.7	14.2	14.4	12.6	10.5	9.5	14.6	2035	-3.2
Private occupational pensions	0.3	0.3	0.2	0.2	0.2	0.2	0.3	2020	-0.1
Private individual mandatory pensions	-	-	-	-	-	-	-	-	-
Private individual non-mandatory pensions	-	-	-	-	-	-	-	-	-
Gross total pension expenditure	13.0	14.5	14.6	12.8	10.7	9.7	14.9	2035	-3.3
Net public pension expenditure*	11.7	13.0	13.2	11.6	9.6	8.7	13.4	2035	-2.9
Net total pension expenditure*	12.0	13.3	13.4	11.8	9.8	8.9	13.6	2035	-3.1
Contributions	**2019**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak value**	**Peak year**	**Change 2019-2070**
Public pension contributions	13.3	14.1	13.3	11.6	10.2	9.6	14.7	2020	-3.7
Total pension contributions	13.9	14.3	13.5	11.8	10.4	9.7	15.0	2020	-4.1

* Net pension expenditure excludes taxes on pensions and compulsory social security contributions paid by beneficiaries.
Source: European Commission.

The public pension system expenditure is expected to decrease by 3.2 p.p. of GDP up to the end of the projection period (from 12.7% of GDP in 2019 to 9.5% in 2070 after reaching a peak of 14.6% of GDP in 2035).

Figure 12 | PUBLIC PENSION EXPENDITURE (% GDP)



Source: GPEARI and GEP.

This behaviour is mainly explained by the CGA scheme, whose pension expenditure increases from 4.7% of GDP in 2019 till 2032 to 4.9% of GDP in 2032, then gradually falling to 0.5% of GDP by the end of projection, as it is a closed scheme. At same time, the pension expenditure of the Social Security scheme shows a steadily rise up to 2045 (totalling 2.2 p.p.), reversing then on up to 2070 (1.2 p.p. of GDP).

Table 14 | PROJECTED GROSS PUBLIC PENSION SPENDING BY SCHEME (% GDP)

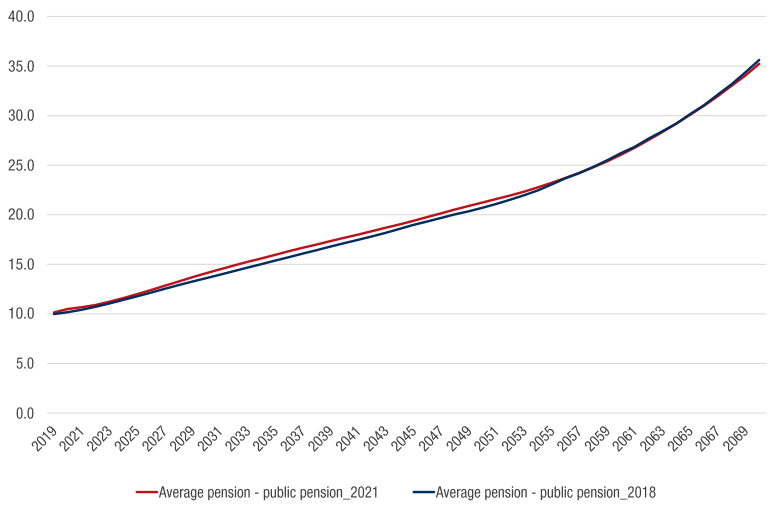
Pension scheme	2019	2030	2040	2050	2060	2070	Peak value	Peak year	Change 2019-2070
Total public pensions	12.7	14.2	14.4	12.6	10.5	9.5	14.6	2035	-3.2
Old age and early pensions:	10.4	11.7	11.7	10.2	8.4	7.8	12.0	2035	-2.7
Flat component	-	-	-	-	-	-	-	-	-
Earnings related	10.1	11.4	11.4	9.8	8.0	7.4	11.7	2035	-2.7
Minimum pensions (non-contributory) i.e. minimum income garantees for people above	0.3	0.2	0.3	0.4	0.4	0.4	0.4	2057	0.1
Disability pensions	0.5	0.5	0.6	0.5	0.5	0.6	0.6	2070	0.1
Survivor	1.6	1.8	1.9	1.8	1.5	1.1	1.9	2039	-0.5
Other pensions	0.2	0.2	0.2	0.1	0.1	0.0	0.2	2036	-0.1
Country-specific schemes	**2019**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak value**	**Peak year**	**Change 2019-2070**
Social Security System	8.1	9.3	10.1	10.0	9.4	9.1	10.2	2045	1.0
Caixa Geral de Aposentações (CGA)	4.7	4.9	4.2	2.6	1.1	0.5	5.0	2020	-4.2

* Net pension expenditure excludes taxes on pensions and compulsory social security contributions paid by beneficiaries.
Source: European Commission, GPEARI and GEP.

The old-age pension expenditure is the main factor underlying the revision in total public pension expenditure: it increases from 10.4% of GDP in 2019 to 12% in 2035, and then starts to decrease until 7.8% by the end of the projection period. The expenditure evolves almost

in line with the number of pensioners. However, when comparing with the 2018AR, the average pension is higher up to 2057, evolving in line till 2065, to then start diverging. This result could be explained by the link of minimum pensions to wage growth from 2030 onwards, as it is higher than in 2018AR, and by the phasing-out of the CGA scheme after 2055.

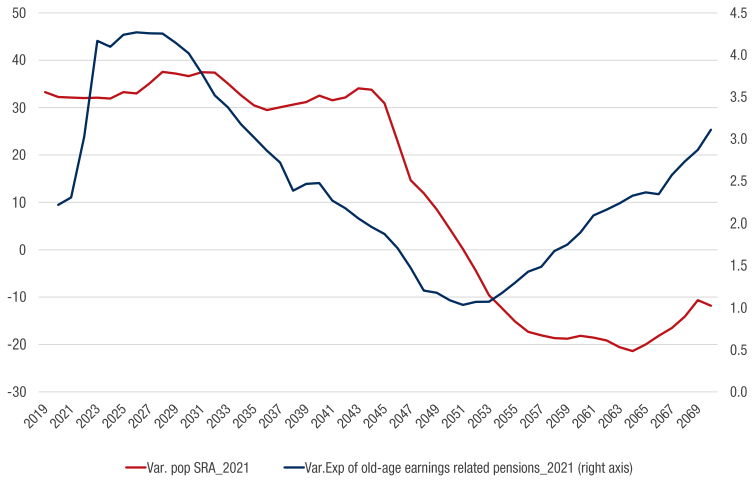
Figure 13 | AVERAGE PUBLIC PENSION



Source: European Commission, GPEARI and GEP.

Concerning the old-age earning related pension, the behaviour of expenditure in percentage of GDP is related with various factors. In the first 30 years, the increase of population with statutory retirement age (which increase in a sustainable manner until 2045) explains the increase of expenditure until the mid-2030s, when real GDP growth starts to show an upward trend and CGA scheme starts to have a decrease of expenditure. Although there is a growth in real GDP, it is below 2% meaning that the impact is only in the denominator as pensions are updated in line or below inflation.

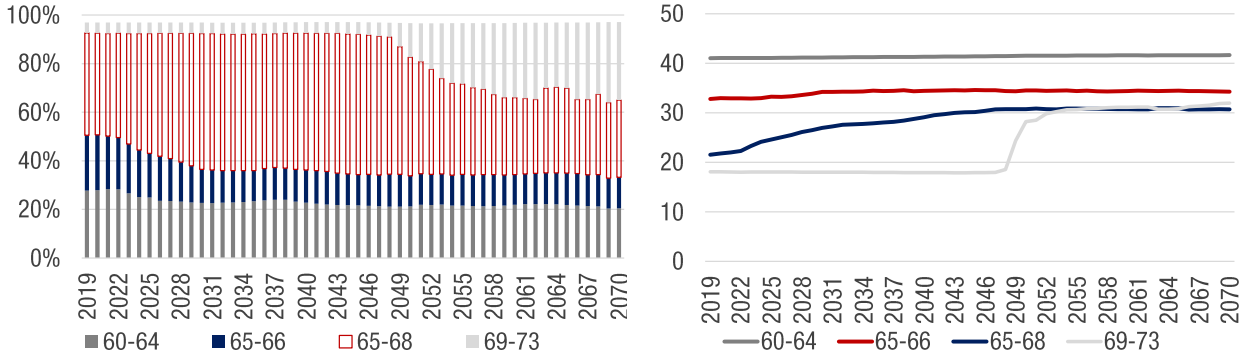
Figure 14 | VARIATION OF OLD-AGE EARNING-RELATED PENSION EXPENDITURE AND SRA POPULATION



Source: European Commission, GPEARI and GEP.

Additionally, the profile of new pensioners has a negative contribution on expenditure. Even though, on average, they have higher contributory periods, they will have progressively fewer career bonus and more penalties, as the statutory retirement age increases. As shown in figures 13 and 14, as SRA increases the weight of older cohort increases (69-73; light grey bars of Figure 13). At same time these older cohorts have a career shift assuming the contributory period of the age group (65-68) that has more probability of retirement. This double-effect causes on average lower new pensions.

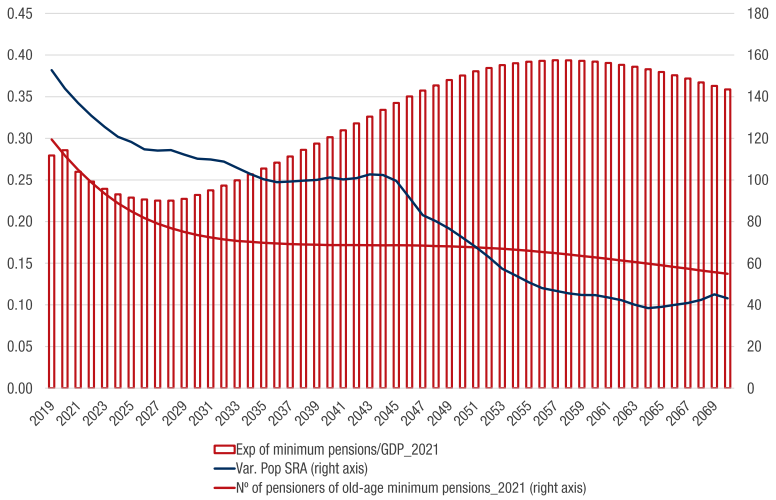
Figure 15 and 16 | PROFILE OF AGE GROUPS OF NEW PENSIONS – WEIGHT AND CONTRIBUTORY PERIOD



Source: European Commission, GPEARI and GEP.

Concerning minimum (non-earning related) old-age pension, in the first 10 years of the projections, the expenditure in percentage of GDP increases due to a decline in population with the statutory retirement age, and due to an increase in labour market participation rates.. Between 2030 and 2057, there is a sustained increase of expenditure, driven by the indexation rule for minimum pensions agreed by the Ageing Working Group (linked to wage growth). This upward trend reverses towards the end of projection, following a sharp decline in the number of pensioners.

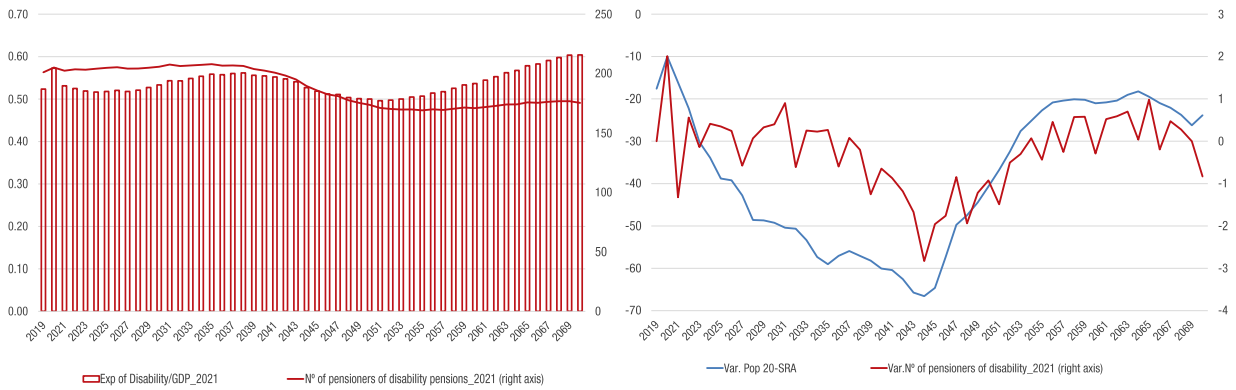
Figure 17 | MINIMUM PENSION EXPENDITURE (% GDP) AND PENSIONERS (1000 PERSONS)



Source: European Commission, GPEARI and GEP.

The disability expenditure in percentage of GDP increases by 0.1 p.p. between 2019 and 2070. In particular, it increases until 2037, starts decreasing up to 2051, and then rises again. This trend results from the fact that, in the current exercise, disability pensions are converted into old-age pension at the time the pensioner reaches the SRA (rather than at the age of 65). It means that the change of the number of disability pensions follows the evolution of population aged between 20 years and the SRA. In addition, the migration of some beneficiaries of certain social disability pensions (non-contributory) to the Social Inclusion Benefit (PSI) has also some impact on disability pension expenditure.

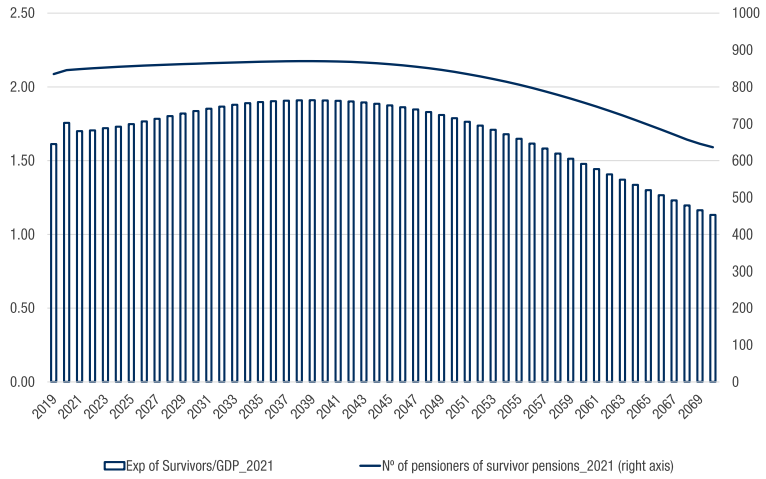
Figure 18 and 19 | DISABILITY PENSION EXPENDITURE (% GDP) AND PENSIONERS (1000 PERSONS) AND VARIATION OF PENSIONERS AND POPULATION BETWEEN 20 YEARS OLD AND SRA



Source: European Commission, GPEARI and GEP.

The survivor pension expenditure in percentage of GDP follows a convex-shaped trend. It increases from 1.6% of GDP in 2019 to 2039, reaching a peak of 1.9% of GDP, and starts to decrease until the end of the projection period to 1.1% of GDP. The rise can be explained by slightly increase in the number of pensioners due to the higher number of deaths of people aged 20 years or more. As population shrinks and life expectancy increases survivor pension expenditure decreases.

Figure 20 and 21 SURVIVOR PENSION EXPENDITURE (% GDP) AND PENSIONERS (1000 PERSONS)



Source: European Commission, GPEARI and GEP.

Other pension expenditure has a residual importance and shows a sustainable decline, following the population trend.

3.3 Description of main driving forces behind the projection results and their implications

The main factor driving the evolution of public pension expenditure is the ageing population (Figure 20). Therefore, the dependency ratio[16] is the only component that generates pension expenditure pressure in the first 30 years of the projection period (+8.8 p.p.). In fact, in line with the demographic projections given by the baseline scenario, the dependency ratio is expected to almost double between 2019 and 2070 (from more than 37 people aged 65 or more for each 100 between 20-64 years old in 2019, to over 73 elderly people for each 100 in that age group in 2070).

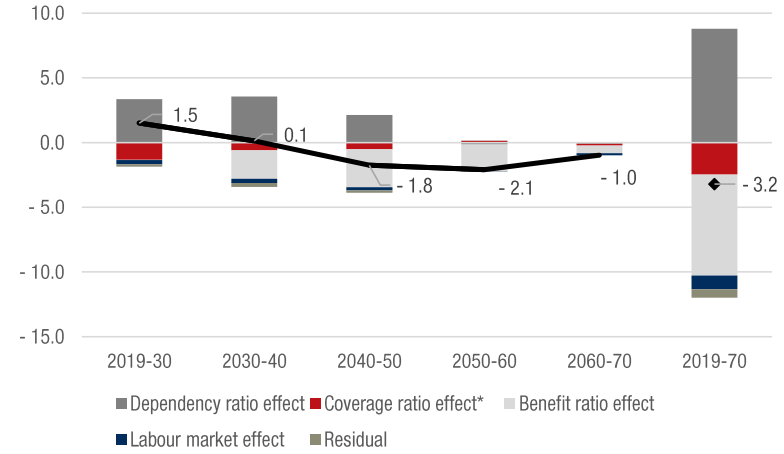
Despite this demographic pressure on pension expenditure, the effect is offset by the other components, in particular, by the benefit ratio[17] (-7.8 p.p.) and coverage ratio[18] (-2.5 p.p.) effects.

[16] Dependency ratio is the population with 65 years or more over population between 20 and 64 years.

[17] 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).

[18] The coverage ratio is the ratio between the number of pensioners over the population with 65 years or more.

Figure 22 | FACTORS BEHIND THE CHANGE IN PUBLIC EXPENDITURE (p.p. of GDP)



Source: European Commission, GPEARI and GEP.

The analysis by decades reveals that demographic pressures have an impact up to 2050. From 2050 on, the impact of the ageing population is totally offset by other drivers, and particularly by the benefit ratio effect. This shows the relevance of the pensions update rule in controlling the increase of pension expenditure, as the stock of pension expenditure grows in line or below inflation and, consequently, below the nominal GDP growth.

The coverage ratio effect also has a negative contribution on pension expenditure throughout all the projection horizon, except during the 2050s, when the old-age coverage ratio[19] is expected to become positive (as pensioners aged 65 or more decrease less than population with 65 or over), and the early-age coverage ratio[20] and cohort effect[21] offset each other.

The labour market effect[22] has a negative contribution throughout the projection period given that the labour intensity effect[23] is not sufficient to offset the employment ratio effect and the career shift effect.

[19] 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.
[20] 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.
[21] The cohort effect is given by the population in 50-64 cohorts over the population with 65 years or more.
[22] The labour market 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.
[23] The labour intensity effect is given by the ratio of the population employed between 20 and 64 years over the hours worked by the same cohorts.

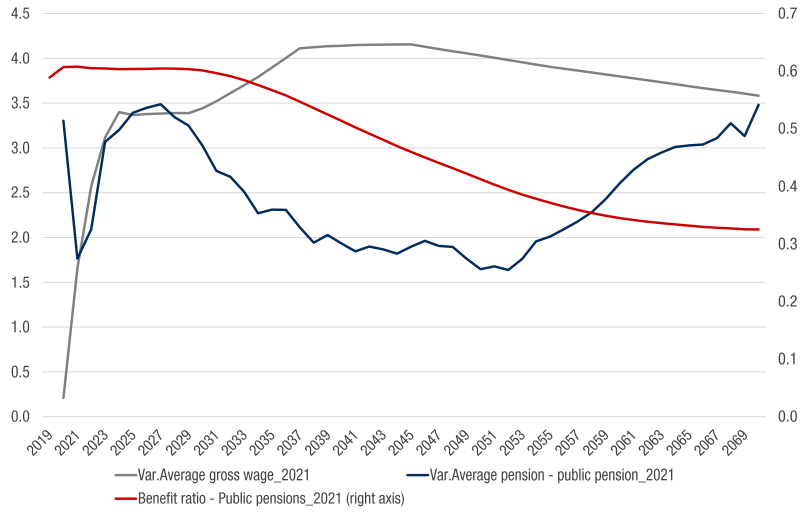
Table 15 | FACTORS BEHIND THE CHANGE IN PUBLIC PENSION EXPENDITURE BETWEEN 2019 AND 2070 (p.p. of GDP) - Pensioners

	2019-30	2030-40	2040-50	2050-60	2060-70	2019-70
Public pensions to GDP	1.5	0.1	-1.8	-2.1	-1.0	-3.2
Dependency ratio effect	3.4	3.6	2.1	-0.2	-0.1	8.8
Coverage ratio effect*	-1.3	-0.6	-0.5	0.1	-0.1	-2.5
Old-age coverage ratio	-0.6	-0.3	-0.2	0.1	-0.1	-1.0
Early-age coverage ratio	-3.9	0.2	-1.7	-0.4	-0.2	-6.1
Cohort effect	-1.6	-3.6	-2.7	0.4	-0.3	-7.8
Benefit ratio effect	0.0	-2.2	-2.9	-2.1	-0.6	-7.8
Labour market effect	-0.3	-0.3	-0.2	0.0	-0.2	-1.1
Employment ratio effect	-0.3	-0.1	-0.2	-0.1	-0.1	-0.7
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.1	-0.3	0.0	0.0	-0.1	-0.4
Residual	-0.2	-0.3	-0.2	0.0	0.0	-0.7

* Sub components of the coverage ratio effect do not add up necessarily.
Source: European Commission.

The benefit ratio of public pensions remains stable until the end of the 1930s, when a downward trend begins, falling from 58.9% to 32.5% between 2019 and 2070. This is explained by the reduction of the average public pensions between 2027 and 2052 and at same time by the increase of the average gross wage. As explained before, the update of public pensions is in line or below inflation, while wage growth also incorporates productivity growth. Moreover, the phasing-out of the CGA scheme also has impact of on average public pension because has higher average pensions. Usually, contributors of CGA have on average higher wages and contributory periods.

Figure 23 | BENEFIT RATIO AND VARIATION OF AVERAGE GROSS WAGE AND AVERAGE PUBLIC PENSION (%)



Source: European Commission, GPEARI and GEP.

Table 16 | BENEFIT RATIO (BR), REPLACEMENT RATE AT RETIREMENT (RR) AND COVERAGE BY PENSION SCHEME (in %)

	2019	2030	2040	2050	2060	2070	Change 2019-2070
Public scheme (BR)	58.9	60.1	51.4	41.2	34.5	32.5	-26.4
Coverage	98.4	98.7	98.6	97.9	98.4	98.0	-0.4
Public scheme old-age earnings related (BR)	54.3	52.7	45.3	37.0	32.1	30.8	-23.5
Public scheme old-age earnings related (RR)	74.0	81.1	54.5	43.5	43.0	41.4	-32.7
Coverage	85.0	90.5	89.0	84.9	80.7	80.3	-4.8
Private occupational scheme (BR)	30.0	23.1	18.0	14.0	11.5	10.3	-19.7
Private occupational scheme (RR)	25.4	24.0	21.7	17.4	16.2	16.0	-9.4
Coverage	4.9	4.7	4.8	5.0	5.3	5.7	0.9
Total benefir ratio	59.4	60.4	51.5	41.1	34.6	32.4	-27.0
Total replacement rate	72.2	79.5	53.5	42.2	41.5	39.9	-32.2

Coverage of each pension scheme is calculated as a ratio of the number of pensioners within the scheme and the total number of pensioners in the country. In case data on pensioners are not available, the calculation is based on the number of pensions.
Source: European Commission.

The benefit ratio of old-age earning-related pensions follows the same trend as the benefit ratio of public pensions, however it is lower because the CSI, a means-tested complement, is included on minimum pensions expenditure.

The replacement ratio of old-age earning-related pensions exhibits an increase in the first years of the projection until early 2030s, due to the projected new pensions of the CGA scheme. After that, with the decrease of the new CGA pensions, the ratio decreases sharply until 2050, when it assumes the profile of the Social Security scheme. Although, at the beginning, the behaviour of the replacement ratio is influenced by the phasing-out of the new CGA pensions, its behaviour is closely related to the increase of the denominator (the average gross wage at retirement), since the average pension of Social Security increases, though at a slower pace. It should be noted that the average gross wage at retirement used to compute the ratio was the average gross wage for all the economy provided by the European Commission.

The coverage ratio of public pensions remains almost stable, even if it decreases slightly. The coverage of old-age earning-related pensions decreases from 85% to 80.3% between 2019 and 2070, due to the fact that statutory retirement age is linked to life expectancy.

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

Before analysing any kind of indicators based on pensioners, it should be noted that the number of pensioners is not an output of the models. For that reason, and for the purpose of

this exercise, the number of pensioners was estimated from the number of pensions by deducting the number of pensioners that receive two type of pensions (an old-age/disability pension and a survivor pension), and controlling that for the population in each cohort.

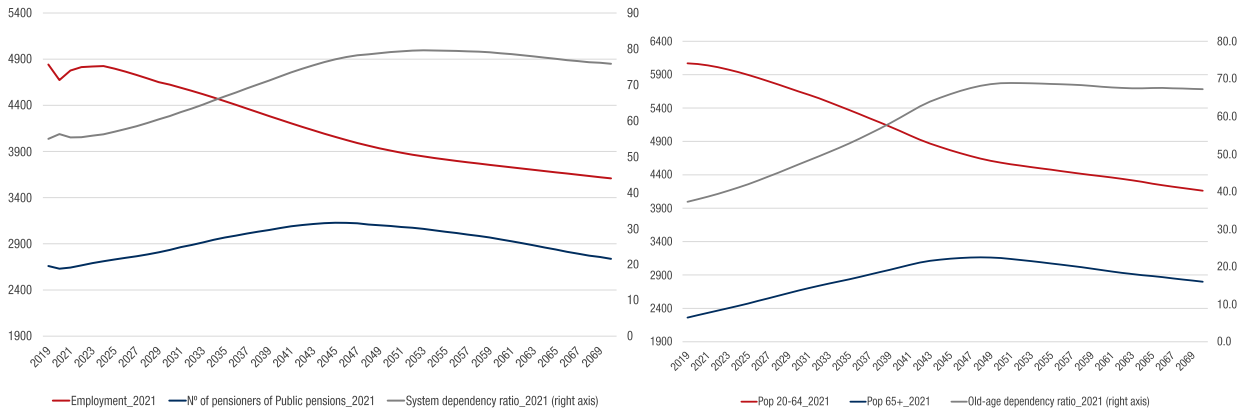
Table 17 | SYSTEM DEPENDENCY RATIO AND OLD-AGE DEPENDENCY RATIO

	2019	2030	2040	2050	2060	2070	Change 2019-2070
Number of public pensioners (thousand) (I)	2 659	2 834	3 070	3 093	2 947	2 737	78
Employment (thousand) (II)	4 841	4 624	4 244	3 909	3 741	3 609	-1 233
Pension System Dependency Ratio (SDR) (I)/(II)	54.9	61.3	72.3	79.1	78.8	75.9	20.9
Number of people aged 65+ (thousand) (III)	2 262	2 667	3 014	3 153	2 973	2 799	537
Working age population 20 - 64 (thousand) (IV)	6 070	5 648	5 058	4 581	4 379	4 162	-1 908
Old-age Dependency Ratio (OADR) (III)/(IV)	37.3	47.2	59.6	68.8	67.9	67.3	30.0
System efficiency (SDR/OADR)	1.5	1.3	1.2	1.1	1.2	1.1	-0.3

Source: European Commission.

The pension system dependency ratio increases from 54.9% in 2019 to 79.1% in 2050, because the number of pensioner grows until 2046 and at same time the number of employed decreases. After that the ratio has a small improvement, as the number of pensioners falls more than the number of employed. Because the old-age dependency ratio shows a higher growth until 2050 than the system dependency ratio, the system efficiency faces a great reduction in this period. Over the remainder of the projection period, system efficiency shows some improvement, as the system dependency ratio decreases more than the old-age dependency ratio.

Figure 24 and 25 | PENSION SYSTEM DEPENDENCY AND SYSTEM EFFICIENCY



Source: European Commission, GPEARI and GEP.

Concerning the public data, the number of pensioners is planned to increase between 2019 and 2045, and then starts to decrease. The inactive population has the same behaviour, although it shows a lesser slope until 2045 and a sharper drop up to 2070. This explain why the pensioner ratios of age groups 64 fall until the middle of 2050s to then increase again. The age groups 65-69 continue to exhibit a lower ratio until the early 2050s, and then start

to increase as the statutory retirement age approaches the age of 69. The evolution of age group 70-74 is also influenced by the SRA. However, in 2050s this age group's ratio is influenced by a lower career due to the crises of 2009/2010. The age groups 65-69 and 70-74 exhibit ratios above 100 (Table 18) that could be explained by the fact that some pensioners can accumulate pension benefits with income from work. A pensioners that continue to work and pay contributions could obtain pension benefits increments up to the age of 70.

Table 18 | PENSIONERS (PUBLIC SCHEME) TO INACTIVE POPULATION RATIO BY AGE GROUP (%)

	2019	2030	2040	2050	2060	2070
Age group -54	3.5	3.1	2.1	1.9	1.7	1.5
Age group 55-59	44.1	46.3	50.5	55.1	56.4	59.9
Age group 60-64	80.0	62.9	65.6	66.1	71.1	75.2
Age group 65-69	122.2	103.7	99.4	94.1	94.2	96.5
Age group 70-74	110.1	104.4	105.8	99.3	103.3	102.7
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0

Source: European Commission.

The pensioner-based ratios on total population (Table 19) show the same behaviour, which the same reasoning.

Table 19 | PENSIONERS (PUBLIC SCHEME) TO TOTAL POPULATION RATIO BY AGE GROUP (%)

	2019	2030	2040	2050	2060	2070
Age group -54	1.3	1.2	0.8	0.7	0.7	0.6
Age group 55-59	10.3	8.7	8.2	7.7	7.2	6.9
Age group 60-64	39.0	26.6	25.8	24.4	23.8	23.3
Age group 65-69	95.2	77.4	68.8	63.2	61.0	59.4
Age group 70-74	100.0	100.0	100.0	93.0	96.3	94.9
Age group 75+	100.0	100.0	100.0	100.0	100.0	100.0

Source: European Commission.

Concerning gender, the percentage of women pensioners (Table 20 and Table 21) follows almost the same behaviour, although they generally have lower rates, as women tend to have shorter careers.

Table 20 | PENSIONERS (PUBLIC SCHEME) TO INACTIVE POPULATION RATIO BY AGE GROUP (%) - Female

	2019	2030	2040	2050	2060	2070
Age group -54	3.1	2.7	2.0	1.8	1.6	1.4
Age group 55-59	29.9	35.1	38.0	44.9	45.6	47.5
Age group 60-64	63.8	49.1	50.3	52.0	56.6	57.8
Age group 65-69	104.5	92.1	89.0	83.5	83.1	84.9
Age group 70-74	101.9	104.3	105.8	93.1	96.5	95.2
Age group 75+	100.0	100.0	100.0	100.0	100.0	97.2

Source: European Commission.

Table 21 | PENSIONERS (PUBLIC SCHEME) TO TOTAL POPULATION RATIO BY AGE GROUP (%) - Female

	2019	2030	2040	2050	2060	2070
Age group -54	1.2	1.0	0.8	0.7	0.6	0.5
Age group 55-59	9.0	8.1	7.3	7.3	6.8	6.4
Age group 60-64	34.1	23.1	21.9	21.2	20.6	19.9
Age group 65-69	87.3	70.7	63.2	57.5	54.9	53.0
Age group 70-74	100.0	100.0	100.0	87.3	90.1	87.7
Age group 75+	100.0	100.0	100.0	100.0	100.0	97.2

Source: European Commission.

The number of new old-age earning-related pensions (Table 22) is projected to closely follow the change in population with the statutory retirement age or more. It means that there are more contributors claiming for a pension until 2035, starting to decrease up to end of 2050's, and stabilizing thereafter. However, the impact on expenditure is boosted in the first 15 years because part of these pensioners belongs to the CGA scheme. CGA pensioners have on average higher wages (and consequently higher pensionable earnings) and longer contributory periods. Nevertheless, as the new flexibility early-pension regime is also applicable on this scheme, contributors can claim for a pension compensating the penalty through higher career.

Table 22 | DISAGGREGATION OF NEW PUBLIC PENSION EXPENDITURE (OLD-AGE AND EARLY EARNING-RELATED PENSIONS) - Total

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)	697.6	1 296.2	1 223.8	1 006.9	1 356.0	1 893.4
I. Number of new pensions (1000)	98.2	113.8	107.1	78.9	74.3	75.2
II. Average contributory period (years)	30.3	32.3	32.9	33.2	33.6	33.7
III. Average accrual rate (%)	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
IV. Monthly average pensionable earnings (1000)	1.3	1.5	1.7	2.3	3.3	4.8
V. Sustainability/Adjustment factor	1.1	1.2	1.1	0.9	0.9	0.9
VI. Average number of months paid the first year	7.8	8.4	8.5	8.0	7.9	7.9
Monthly average pensionable earnings/Monthly economy-wide average wage	89%	78%	59%	53%	52%	53%

New pension expenditure equals the product of I, II, III, IV, V and VI.
Source: European Commission.

The contributory period is expected to increase over time (3.4 years between 2019 and 2070). However, it is lower than the number of years needed for a full pension benefit and, at same time, SRA increases, although at a slower pace (from 66 years and 5 months in 2019 to 69 years and 4 months in 2070). Taking into account that contributors with longer careers are going to phase out as time goes by, the bonuses will lower and the penalties increase. The interaction of these factors results in lower average new pensions. At same time, the average gross wage (of all the economy) grows, consequently, the replacement rate falls over time.

Table 23 | DISAGGREGATION OF NEW PUBLIC PENSION EXPENDITURE (OLD-AGE AND EARLY EARNING-RELATED PENSIONS) - Male

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	441.4	710.7	651.3	577.5	811.1	1 129.8
I. Number of new pensions (1000)	50.6	54.2	50.8	38.6	37.3	37.9
II. Average contributory period (years)	33.5	35.3	36.5	37.2	37.5	37.6
III. Average accrual rate (%)	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
IV. Monthly average pensionable earnings (1000)	1.4	1.6	1.8	2.5	3.6	5.2
V. Sustainability/Adjustment factor	1.1	1.4	1.0	0.9	0.9	0.9
VI. Average number of months paid the first year	7.7	7.7	8.4	8.0	7.9	7.9
Monthly average pensionable earnings/Monthly economy-wide average wage	97%	82%	64%	57%	57%	57%

New pension expenditure equals the product of I, II, III, IV, V and VI.
Source: European Commission.

Usually women have lower wages and shorter contributory periods. These two factors have effects on their pension benefit (Table 24).

Table 24 | DISAGGREGATION OF NEW PUBLIC PENSION EXPENDITURE (OLD-AGE AND EARLY EARNING-RELATED PENSIONS) - Female

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	256.3	585.5	572.5	429.4	544.8	763.6
I. Number of new pensions (1000)	47.6	59.6	56.3	40.4	37.0	37.3
II. Average contributory period (years)	26.9	29.5	29.7	29.4	29.7	29.8
III. Average accrual rate (%)	2.2%	2.2%	2.3%	2.3%	2.2%	2.2%
IV. Monthly average pensionable earnings (1000)	1.2	1.5	1.6	2.0	2.9	4.3
V. Sustainability/Adjustment factor	1.0	1.2	1.1	1.0	1.0	0.9
VI. Average number of months paid the first year	7.9	8.9	8.5	7.8	7.9	7.9
Monthly average pensionable earnings/Monthly economy-wide average wage	81%	74%	55%	48%	47%	48%

New pension expenditure equals the product of I, II, III, IV, V and VI.
Source: European Commission.

3.4 Financing of the pension system

Overall, contributions (from employers and employees) are expected to decrease 3.7 p.p. of GDP from 13.3% in 2019 to 9.6 in 2070. Public contributions reached 11% of GDP in 2019 and are estimated to decrease to 9.2% in 2070. They are driven, throughout the projection period, by the employment trend, which decreases 25.5% in throughout the projection period and labour productivity evolution, which increases until 2045 and then reverses until 2070. From 2019 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.

As mentioned above, FEFSS was created to ensure the coverage of foreseeable pension expenditure for a minimum period of two years. Since 2017 it is earmarked to FEFSS revenue from a new tax (AIMI) and between 0.5 and 2.5% of PIT revenue.

Table 25 | FINANCING OF THE PUBLIC PENSION SYSTEM

	Public employees	Private employees**	Self-employed
Contribution base	Any kind of compensation for work	Any kind of compensation for work	70% of income or 1/12 of taxable income
Contribution rate/contribution			
Employer	23.75%	23.75%	
Employee	11.00%	11.00%	21.4% or 25.2%[1]
State*	the deficit of the subsystem	the non-contributory regime	7% or 10%[2]
Other revenues*	gains from financial investments	the sale of public assets and gains from financial investments and earmarked of AIMI and 0.5-2.5 of PIT	:
Maximum contribution	:	:	29.6% x 12 x SSI
Minimum contribution	:	:	29.6% x SSI

* Only legislated contributions are reported. There are some specific rate for some groups of workers as household assistance, professional sportsmen, short-term contract workers, etc. (see Annex). [1] Entrepreneurs and their spouses pay 25.2%. [2] The contribution rate depends is 10% when there is an economic dependency is higher than 80%. AIMI - Additional tax over property.
Source: European Commission.

The number of public contributors is projected to evolve in line with employment. The number of private occupational contributors is estimated to increase 34%.

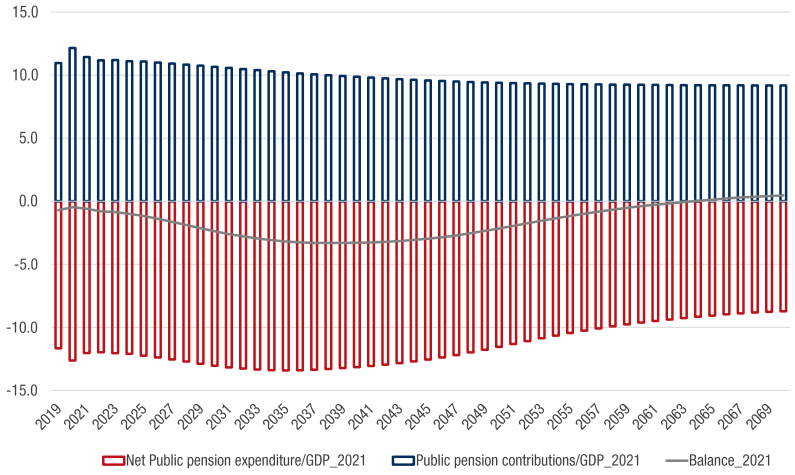
Table 26 | REVENUE FROM CONTRIBUTIONS (% GDP), NUMBER OF CONTRIBUTORS IN THE PUBLIC SCHEME, TOTAL EMPLOYMENT AND RELATED RATIOS

	2019	2030	2040	2050	2060	2070	Change 2019-2070
Public contribution (% GDP)	13.3	14.1	13.3	11.6	10.2	9.6	-3.7
Employer contribution	7.6	7.4	6.9	6.5	6.3	6.3	-1.3
Employee contribution	3.3	3.2	3.0	2.9	2.9	2.9	-0.4
State contribution*	-	-	-	-	-	-	-
Other revenues*	2.3	3.4	3.5	2.3	1.0	0.4	-1.9
Number of contributors (1000) (I)	5 072.2	4 766.6	4 256.3	3 884.9	3 717.1	3 585.7	-1 486.5
Employment (1000) (II)	4 841.4	4 624.0	4 244.4	3 909.4	3 740.7	3 608.5	-1 232.9
Ratio of (I)/(II)	104.8	103.08	100.28	99.37	99.37	99.37	-5.4

*Only legislated contributions are reported.
Source: European Commission.

According the current projections, the public system deficit increases up to 2038, to then gradually start improving, until it reaches a surplus in 2064 (Figure 24).

Figure 26 | BALANCE OF PUBLIC PENSION SYSTEM



Source: European Commission, GPEARI and GEP.

3.5 Pension assets and return on assets

Over the period 2009 to 2018, the financial performance of pension funds has been positive is most years, exceeding in some periods an average annual return of 5%. For the projections, the assumptions on long-term interest rates were considered.

Table 27 | PENSION ASSETS AND RESERVES (% GDP) AND RETURN ON ASSETS (%)

	Average 1999-2008	Average 2009-2018	2019	2030	2040	2050	2060	2070	Average 2019-2070
Public pension scheme*									
Assets and reserves[1,2]	-	7.4	8.2	-	-	-	-	-	-
Average return[1,2]	-	5.6	-0.09	-	-	-	-	-	-
Private occupational schemes									
Assets and reserves[2]	-	9.1	9.4	8.2	7.7	7.4	7.5	7.9	7.8
Average return	-	3.4	8.4	2.3	3.2	4.0	4.0	4.0	3.3

* It concerns to FEFSS. [1] In column 2019 the figures refer to 2018. [2] Average for years 2013 to 2018.
Source: European Commission.

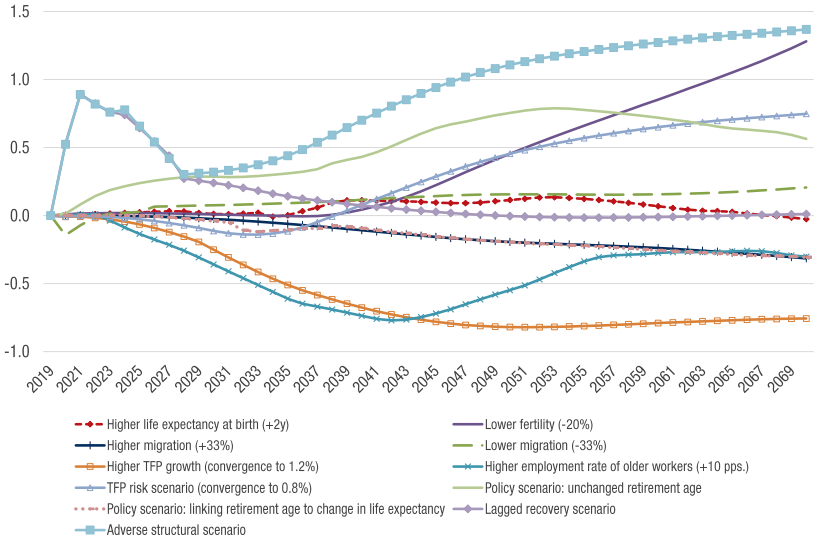
3.6 Sensitivity analysis

The overview of the sensitivity of pension expenditure projections to changes in the underlying assumptions is provided in Table 28 and Figure 25 below. The results of the sensitivity analysis are coherent with the different scenarios.

Analysing the average change of each scenario vis-à-vis the baseline assumptions over the whole period, it is worth noticing the policy scenario that offsets the decline of the benefit ratio. This scenario assumes that policy measures are taken if earning-related public pension benefit decreases below 90% of its level in the base year which happens 2031 onwards. The

expenditure increases over time, reaching+5.6 p.p. in 2070 than in the baseline scenario. These results highlight the importance of the update rule of pensions on expenditure control.

Figure 27 | SENSIVITY SCENARIOS OF PUBLIC PENSION SYSTEM – DIFFERENCES TO BASELINE SCENARIO



Note: Not include the policy scenario that offset the decline of the benefit ratio.
Source: European Commission, GPEARI and GEP.

The second policy scenario, which assumes maintaining the retirement age at 2019 level, also illustrate the impact of the indexation of the retirement age to life expectancy. This scenario leads to a higher expenditure in GDP (+0.6 p.p. in 2070) because a smaller labour force reduces GDP and pensioners increase, particularly in the 2040s when the population aged 65 or more peaks. On the opposite side, the scenario that links retirement age to life expectancy reduces public expenditure by 0.3 p.p. of GDP at the end of the projection period because after 2041 population with or above SRA is permanently lower than in the baseline scenario.

In the wake of the pandemic crisis, two alternatives scenarios were considered to capture the impact of COVID-19 pandemic on the economy: i) the lagged recovery scenario that assumes a relatively limited impact on potential growth but a much more pronounced cyclical downturn and a longer recovery phase, and ii) on top of the stronger cyclical downturn designed in the lagged recovery scenario, the adverse structural scenario additionally assumes that the potential growth would be lower over the next decade and in the longer run will be permanently lower than in the baseline scenario. The adverse structural scenario highlights the relevance of economic growth on pension systems as pension expenditure to GDP keeps on growing towards the end of the projection horizon (+1.4 p.p. than in baseline scenario). On the other hand, the lagged recovery scenario has a higher negative impact in the first years (+0.5 p.p. and +0.9 p.p. in 2020 and 2021, respectively) gradually disappearing up to 2042.

Although not symmetric, TFP risk scenario, that assumes a converge to 0.8% in 2070, instead of 1%, and higher TFP growth scenario, that assumes a convergence to 1.2% in 2070, have almost the same opposite effects, the first has a higher impact on expenditure over GDP of +0.7 p.p. in 2070, and the second a lower expenditure of 0.8 p.p. in 2070.

Concerning the demographic scenarios, net migration scenarios assume that flows are 33% higher/lower over the entire projection horizon than in baseline scenario. Higher migration scenario decreases pension expenditure by 0.3 p.p. of GDP and lower migration has an almost symmetric effect on expenditure (+0.2 p.p. in 2070). Higher employment rate of older workers considers, through a reduction in the inactive population, that the employment rate of older workers (55 to 74) is increased by 10 p.p. for the remainder of the projection period. This scenario reduces expenditure substantially between 2020 and 2055 (between -0.4 p.p. and -0.8 p.p. of GDP). The rise in GDP and an increase in labour force more than offsets the accrued pension benefits (for example through higher contributory periods).

In the higher life expectancy scenario that assumes an increase in life expectancy at birth of two years by 2070 compared to the baseline scenario, pension expenditure over GDP slightly increases (0.1 p.p.) between 2037 and 2061. Despite the increase of the population with SRA and over in comparison to the baseline scenario, at the end of the projection period the GDP effect completely offsets the rise in expenditure level. In the 2018AR, this scenario had a stronger impact on pension expenditure (above 1 p.p. of GDP in 2036-2057) because the employment rate differential between the scenarios (higher life expectancy scenario and baseline scenario) was substantially lower.

A lower fertility rate (20%) over the projection horizon than in baseline scenario does not affect the population with or above SRA in the entire horizon. It means that the main impact on expenditure comes from survivor pension expenditure. However, it has influence on the labour market after 2035 and consequently on GDP level. The outcome is a higher share of expenditure in GDP, starting in 2041 (+0.1 p.p.), which accumulates over time, reaching 1.3 p.p. in 2070.

The total pension expenditure under different scenarios is not significantly affected by the sensitivity analysis on occupational schemes, due to the low share of the latter in terms of the total pension expenditure over the GDP.

Table 28 | PUBLIC AND TOTAL PENSION EXPENDITURE UNDER DIFFERENT SCENARIOS (p.p. deviation from the baseline)

Public pension expenditure	2019	2030	2040	2050	2060	2070	Change 2019-2070
Baseline (% GDP)	12.7	14.2	14.4	12.6	10.5	9.5	-3.2
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Higher migration (+33%)	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.3
Lower migration (-33%)	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Lower fertility (-20%)	0.0	0.0	0.0	0.5	0.9	1.3	1.3
Higher emp. of older workers (+10 p.p.)	0.0	-0.4	-0.7	-0.5	-0.3	-0.3	-0.3
Higher TFP growth (convergence to 1.2%)	0.0	-0.3	-0.7	-0.8	-0.8	-0.8	-0.8
TFP risk scenario (convergence to 0.8%	0.0	-0.1	0.1	0.5	0.7	0.7	0.7
Policy scenario: linking retirement age to change in life expectancy	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.3
Policy scenario: unchanged retirement age	0.0	0.3	0.4	0.8	0.7	0.6	0.6
Policy scenario: offset declining pension benefit ratio	0.0	0.0	1.0	3.7	5.2	5.6	5.6
Lagged recovery scenario	0.0	0.2	0.1	0.0	0.0	0.0	0.0
Adverse structural scenario	0.0	0.3	0.7	1.1	1.3	1.4	1.4
Total Pension Expenditure	**2019**	**2030**	**2040**	**2050**	**2060**	**2070**	**Change 2019-2070**
Baseline (% GDP)	13.0	14.5	14.6	12.8	10.7	9.7	-3.3
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Higher migration (+33%)	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.3
Lower migration (-33%)	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Lower fertility (-20%)	0.0	0.0	0.0	0.5	0.9	1.3	1.3
Higher emp. of older workers (+10 pps.)	0.0	-0.4	-0.8	-0.6	-0.3	-0.3	-0.3
Higher TFP growth (convergence to 1.2%)	0.0	-0.3	-0.7	-0.8	-0.8	-0.8	-0.8
TFP risk scenario (convergence to 0.8%	0.0	-0.1	0.1	0.5	0.7	0.8	0.8
Policy scenario: linking retirement age to change in life expectancy	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.3
Policy scenario: unchanged retirement age	0.0	0.3	0.4	0.8	0.7	0.6	0.6
Policy scenario: offset declining pension benefit ratio	0.0	0.0	1.0	3.7	5.2	5.6	5.6
Lagged recovery scenario	0.0	0.2	0.1	0.0	0.0	0.0	0.0
Adverse structural scenario	0.0	0.3	0.7	1.1	1.3	1.4	1.4

Source: European Commission.

3.7 Description of the changes in comparison with the 2006, 2009, 2012, 2015 and 2018 projections

Comparing the different projection exercises, we can see that the pressure on public spending due to pension system has improved, in particular in 2009AR as a result of the reform of the system that took place in 2007. This reform introduced the main parameters of the current system: the pension update rule, the introduction of the sustainability factor in the pension benefit formula, which considers the whole contributory career, differentiation of the accrual rate according to the reference earnings, introduction of ceilings on pension benefit, penalties on early pensions or bonus for retiring after the statutory retirement age. The subsequent

exercises incorporated temporary measures according to the budgetary position or some fine-tuning measures to make the system more equal. Examples of the first type of measures were the wage cuts or freezing of the indexation rule included in 2012AR or an extraordinary solidarity contribution on pensions (2015AR) or extraordinary updates of lower pension benefit with effect on 2018AR and 2021AR projections. The faster convergence of CGA scheme to Social Security scheme, the link of SRA to life expectancy, the change of base year of the sustainability factor (all them with effect on 2015AR) and the new flexibility rule for early-pensions (2021AR) are examples of the second type of measures.

The dependency ratio is the one factor that drives to an increase in expenditure, while the remaining factors exert an expenditure-decreasing impact (Table 29). The increase of life expectancy consistently assumed over time and of the statutory retirement age in parallel with the increase in participation rates has resulted in negative coverage ratio effects and, in particular, on early-age coverage ratio. On the other hand, changes on the macroeconomic situation on the base year or on the assumptions influences the benefit ratio effect and the labour market effect.

In the specific case of 2021AR exercise, the benefit ratio effect drags down the pension expenditure even more than in the 2018AR due a higher GDP per worker and a lower average pensions in the projection. By contrast, the coverage ratio effect is less negative in the new projections due to the cohort effect as old-age ratio effect and early-age ratio effect offset each another.

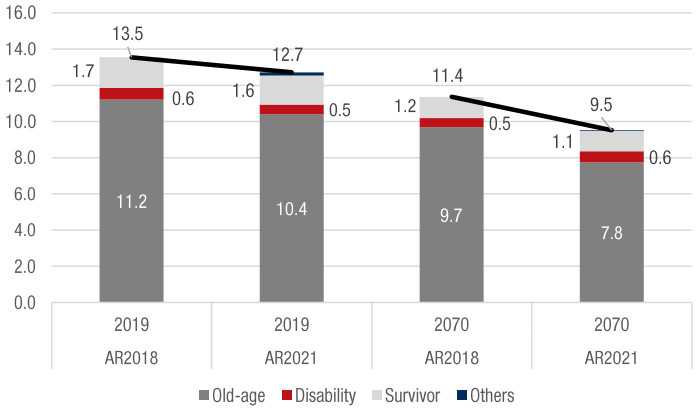
Table 29 | OVERALL CHANGE IN PUBLIC PENSION EXPENDITURE TO GDP UNDER THE 2006, 2009, 2012, 2015 AND 2018 PROJECTION EXERCISES

	Public pensions to GDP	Dependency ratio	Coverage ratio	Benefit ratio	Labour market effect	Residual (incl. Interaction effect)
2006 Ageing Report (2004-2050)	9.3	13.7	-0.9	-3.0	-0.2	-0.4
2009 Ageing Report (2007-2060)	2.1	9.8	-1.7	-4.5	-0.6	-0.9
2012 Ageing Report (2010-2060)	0.2	10.4	-2.5	-5.5	-1.0	-1.1
2015 Ageing Report (2013-2060)	-0.7	11.7	-3.1	-5.9	-2.6	-0.9
2018 Ageing Report (2016-2070)	-2.2	10.9	-3.3	-7.1	-1.9	-0.8
2021 Ageing Report (2019-2070)	-3.2	8.8	-2.5	-7.8	-1.1	-0.7

* The projection horizon has been extended over consecutive Ageing Reports, limiting comparability over time.
Source: European Commission.

Compared to the 2018AR, the current projections starts from a lower value (12.7% of GDP in 2019 versus 13.5% in AR2018) (Figure 26), reach the peak faster (14.6% in 2035 versus 14.8% in 2038), and then start to decrease until the end of the projection horizon.

Figure 28 | PUBLIC PENSION EXPENDITURE BY TYPE OF PENSION (% GDP)



Source: European Commission, GPEARI and GEP.

The behaviour of the first 15 years is explained by expenditure on new old-age pensions of the CGA scheme. In particular, in this closed scheme more than 60% of contributors have more than 50 years old and long careers paths. The end of application of the sustainability factor under the new regime of early-pensions (at least 60 years of age and at least 40 years of contributory period attained at the age of 60) is the main factor for the anticipation on the expenditure.

The introduction of the new flexibility early-retirement scheme allows more contributors to apply for a pension before reaching the SRA. In the 2018 Ageing Report exercise, the sustainability factor and penalties were applied to all early pensions, except for pensioners with a very long career (at least 60 years old and career lengths of 48 years or more, or at least 60 years of age with 46 years of career and started working, and paying contributions, before the age of 15). The application of the sustainability factor led to a decision to postpone the pension claim and, consequently, to an increase in the contribution period. In this exercise, the sustainability factor is only applied to early pensions that don't fulfil the requirement of having 60 years and 40 years of career at the age of 60 (e.g. someone with 63 years and 42 years of career, i.e. that has only 39 years of career at age of 60). This measure changed the characteristics of contributors. The new early pensioners will have lower average contribution periods and this factor, combined with the increase of the SRA, implies a greater number of pensioners who will be penalised or who will have no pension bonus. Relatively to 2018AR, the legislative changes over the early-retirement have an impact of -0.01 p.p. of GDP in 2017 and -0.03 p.p. of GDP in 2018 (Table 30). Over the projection period, the new flexibility rule increases expenditure between 0.16 p.p. in 2019 and 0.6 p.p. in 2070 when compared with 2018AR (Table 31).

The new PSI benefit also has an impact on pension expenditure, as part of the non-earning related disability pensioners (50.5 thousands of a stock of 55 thousands beneficiaries in the end of 2017) were transferred to the other benefit (PSI) thus reducing pension expenditure

in average by 0.08 p.p. of GDP in 2018 and 2019 (coverage of projections line in Table 30) and by 0.13 p.p. in the remaining projection period (Table 31).

The extraordinary increases of lower pensions also have some impact on historical values (0.08 p.p. of GDP in 2018 and 0.16 p.p. Of GDP in 2019).

However, the change in macroeconomic assumptions, in particular the GDP growth[24], and the update of population projections are the main drivers of the changes between the current projection and the 2018AR projection as shown in Table 30 and 31. The change on pensioners structure (i.e., the share of each age cohort or average contributory period) in the base year is also imputed to changes in assumptions.

Table 30 | BREAKDOWN OF THE DIFFERENCE BETWEEN THE 2018 PROJECTIONS AND OUTCOME FIGURES (% GDP)

	2016	2017	2018	2019
Ageing report 2018 projections	13.5	13.4	13.5	13.5
Assumptions (p.p. of GDP)	-0.1	-0.4	-0.7	-0.9
Coverage of projections (p.p. of GDP)	-	0.0	-0.1	-0.1
Constant policy impact (p.p. of GDP)	-	-	-	-
Policy-related impact (p.p. of GDP)	-	0.0	0.1	0.2
Actual public pension expenditure	13.5	13.0	12.8	12.7

Source: European Commission.

Table 31 | BREAKDOWN OF THE DIFFERENCE BETWEEN THE 2018 AND THE NEW PUBLIC PENSION PROJECTION (% GDP)

	2019	2030	2040	2050	2060	2070
Ageing report 2018	13.5	14.3	14.7	13.7	12.0	11.4
Assumptions (p.p. of GDP)	-0.9	-0.3	-0.6	-1.3	-1.8	-2.3
Coverage of projections (p.p. of GDP)	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Constant policy impact (p.p. of GDP)	-	-	-	-	-	-
Policy-related impact (p.p. of GDP)	0.2	0.3	0.3	0.4	0.5	0.6
Actual public pension expenditure	12.7	14.2	14.4	12.6	10.5	9.5

Source: European Commission.

Concerning occupational schemes, in the current projections, pension expenditure in terms of GDP is expected to be slightly higher than the ratio projected in the 2018 exercise, up until approximately 2050. This is due to the fact that the actual amount of pension expenditure observed between 2017 and 2019 was higher than the values foreseen in the 2018 exercise, leading to an upward shift of the starting point of the current projections.

[24] In the current projection average real GDP growth is 1.1% that compares with 0.9% in 2018AR. As it is below 2%, the stock of pensions is update in line or below the inflation.

From 2050 onwards, the difference in the results is mainly explained by a more moderate increase of the amount of pension expenditure in relation to DC schemes in the current projections, following a downward revision of the level of the average salary use as the starting point for these projections (i.e. historical data has been revised in order to eliminate some outliers and enhance the quality of this assumption).

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

4.1 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.

4.2 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 2018 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 7,868 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.

It is applied the sustainability factor (FS) only to retirement after long term unemployment and to part of the individuals that apply for the old age pension before the normal age pension, the flexibility early retirement regime.

The early related disability pensions had passed to convert into old-age pensions when pensioner reaches the normal retirement age but the social pensions lost pensioners to the new benefit Social Inclusion Benefit.

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:

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

where,

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

$\text{TotalPens}_{t,i,g}$- 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 survivor, 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 survivor 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 survivor pension is indexed to the wage growth and to the average old-age pension growth.

4.3 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 2018AR 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 October 2020 and were adjusted to those observed in the end of 2019.

Reforms incorporated in the model

The last pension measures in Portugal are included in the present projections. The most relevant was new flexibility rule for early retirement that entered into force in 2019.

The contributors and pensioners are allowed to continue to exercise public functions after 70 years old in cases of extraordinary public interest or acting as cooperation agents. These pensioners could accumulate wage with pension benefit up to the amount of the pension.

Since October 2017, the aggregation of the contributory periods completed under different schemes follows equal rules. However, this change doesn't have impact on the model as database doesn´t include this information.

The extraordinary update of lower pensions was also incorporated.

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).

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 75. 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

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

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 2020 contained average values for remunerations of the subscribers by age and gender strata. The actualized and adjusted average remuneration is:

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

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 60% of the average old age pensions.

4.4 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.

Assumptions and methodologies applied

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 (retirement and other exists) and assumptions on new entries 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, average pension and contribution rate, from which the cash flows relating to benefits paid and contributions were determined.
- The amount of assets under management was projected considering these cash flows and a rate of return in line with the interest rate assumption defined in the Ageing Working Group.

The projections of the financial variables were made upon assumptions of how these variables are expected to behave in the future. Some of these assumptions were based on past experience and knowledge of the market. In other words, they 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.

Reforms on the 1st pillar DB schemes of the banking sector

The most representative changes that have occurred in the occupational pension system, namely in relation to 1st pillar DB schemes of the banking sector, 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, closed 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.

Data used to run the model

To run the model, the ASF used the data provided by pension fund management entities in the regular reporting of quantitative information.

General description of the model

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 member 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 no. 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:

$$beneficiaries_{t,i} = beneficiaries_{t-1,i-1} - beneficiaries\ exits_{t,i} + new\ beneficiaries_{t,i}$$

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, up until 2018, 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 decumulation 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

$$average\ pension_t = \frac{\left(\begin{array}{l} current\ beneficiaries\ average\ pension_{t-1} \times \\ \times \left(total\ beneficiaries_{t-1} - new\ beneficiaries_{t-1}\right) + \\ + new\ entrants\ average\ pension_{t-1} \times new\ beneficiaries_{t-1} \end{array}\right)}{total\ beneficiaries_{t-1}} \times$$

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

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

New entrants

$$benefits\ payed_t = new\ entrants\ average\ pension_t \times new\ beneficiaries_t$$

Current beneficiaries

$$\begin{array}{l} benefits\ payed_t = current\ beneficiaries\ average\ pension_t \times \\ \times \left(total\ beneficiaries_t - new\ beneficiaries_t\right) \end{array}$$

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:

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

The amount of assets was determined assuming that cash-in and out flows would occur in the middle of the year:

$$assets_t = assets_{t-1} \times (1+r) + contributions_t \times (1+r)^{\frac{1}{2}} - benefits\,paid_t \times (1+r)^{\frac{1}{2}}$$

ANNEX

I - Special contributory rates

Social Security contribution rate			
	Employer	**Employee**	**Total**
Sportmens	22,3%	11%	33,3%
Disability workers with work capacity below 80%	12%	11%	23%
Very short-term contracts' workers	26%	-	26%
Workers under intermittent regime work	23.75%	11%	34.75%
Local inshore fishermen and shellfish gatherers	21%	8%	29%
Domestic workers			
- with unemployment protection	22.3%	11%	33.3%
- without unemployment protection	18.9%	9.40%	28.3%
Members of churches or religious denominations or associations			
- with old-age and disability protection	16.2%	7.6%	23.8%
- with old-age and disability, parental, disease, occupational disease protection	19.7%	8.6%	28.3%
Young people workers during school vacations	26.1%	-	26.1%
Workers at home	20.3%	9.3%	29.6%
Members of statutory governing bodies			
- in general	20.3%	9.3%	29.6%
- performing management fuctions	23.75%	11.00%	34.75%
Workers of pre-retirement age with work suspension	18.3%	8.6%	26.9%
Workers with 65 years old and 40 years of contributory period	17.3%	8.0%	25.3%
Disability pensioners with active activity	19.3%	8.9%	28.2%
Old-age pensioners with active activity	16.4%	7.5%	23.9%
Disability pensioners exercising public functions	20.4%	9.2%	29.6%
Old-age pensioners exercising public functions	17.5%	7.8%	25.3%
Agricultural workers	22.3%	11%	33.3%
Workers of Particular Institutions of Social Solidarity and of non-profit institutions	22.3%	11%	33.3%
Workers who carry out public functions			
- with contract	23.75%	11%	34.75%
- with nomination	18.6%	11%	29.6%

Source: Instituto da Segurança Social.

II - Beneficiaries and expenditure of Social Inclusion Benefit (PSI)

Beneficiares of PSI by age group			
	2017	2018	2019
25-	510	4 841	6 712
25-29	1 415	6 546	7 021
30-39	5 532	21 184	18 751
40-49	3 909	17 461	30 199
50-54	6 597	26 462	18 238
55+	3 353	15 107	25 646
Total	**21 316**	**91 601**	**106 567**

Source: Instituto Nacional de Estatítica.

Expenditure of PSI		
	M€	% of GDP
2017	15.0	0.01
2018	261.6	0.13
2019	344.8	0.16

Source: Instituto Nacional de Estatítica.

III – Examples of pension benefit calculation

Example 1

Pension benefit calculation for someone that started work before 2002:

The pension benefit of this person is calculated take into account a transitory rule as he/she started work before the 2007 reform. It follows the following rule: the pension benefit results of 2 parts, the first one computed according the best 10 years of last 15 years of contributory period and another that take into account all the contributory period with a ceiling of 40 years.

P = (P1 * C3 + P2 * C4)/C
P1 = RE1 x 2% x N1
RE1 = TRE10/15/140, if n < 10 years, RE1=TRE<10 / (14 x N1)
P2 = TRE/(N2*14)
Where:
C - total contributory period
C3 – contributory period up to 31st December 2001
C4 - contributory period after 1st January 2002
P1 – Pension computed take into account of the best 10 years of the last 15 years of contributory period up to 2002
P2 - Pension computed take into account all contributory period after 2001 up to 40 years
P1 only could be higher than 12 times SSI (€5265.75 in 2020), if P2>P1 or P1 >P2 and P1, P2 > 12 x SSI, P = P2
TRE10/15 = Total earnings (best 10 years of last 15 years of contributory period)
TRE = total earnings at a maximum of 40
N1 - contributory period (minimum of 15 years and maximum of 40 years),
N2 – total contributory period (minimum of 15 years and maximum of 40 years)

Contributory period	Years	Monthly wage	Annual wage	Revaluation coefficient for P1	Revaluation coefficient for P2	Annual wage revalued	Reference earnings computed according	
							Best 10 years of last 15 years	All contributory period
1	1976	20.00	280	25.0431	25.0431	7 012.07		
2	1977	22.40	314	19.6572	19.6572	6 164.50		
3	1978	28.40	398	16.0991	16.0991	6 401.00		
4	1979	37.40	524	12.9624	12.9624	6 787.11		
5	1980	44.90	629	11.117	11.1170	6 988.15		
6	1981	53.40	748	9.264	9.2640	6 925.77		
7	1982	53.40	748	7.5686	7.5686	5 658.29		
8	1983	64.80	907	6.0307	6.0307	5 471.05		
9	1984	77.80	1 089	4.6641	4.6641	5 080.14		
10	1985	95.80	1 341	3.9095	3.9095	5 243.42		
11	1986	112.20	1 571	3.5001	3.5001	5 497.96		
12	1987	125.70	1 760	3.1993	3.1993	5 630.13		
13	1988	135.70	1 900	2.9190	2.9190	5 545.52		
14	1989	149.60	2 094	2.5926	2.5926	5 429.94		
15	1990	174.60	2 444	2.2862	2.2862	5 588.39		
16	1991	200.00	2 800	2.0521	2.0521	5 745.88		
17	1992	222.00	3 108	1.8844	1.8844	5 856.72	5 856.72	
18	1993	236.40	3 310	1.7695	1.7695	5 856.34	5 856.34	
19	1994	245.90	3 443	1.6819	1.6819	5 790.11	5 790.11	
20	1995	259.40	3 632	1.6157	1.6157	5 867.58	5 867.58	
21	1996	272.30	3 812	1.5671	1.5671	5 974.10	5 974.10	
22	1997	282.80	3 959	1.5335	1.5335	6 071.43	6 071.43	
23	1998	293.80	4 113	1.4931	1.4931	6 141.42	6 141.42	
24	1999	305.80	4 281	1.4595	1.4595	6 248.41	6 248.41	
25	2000	318.20	4 455	1.4197	1.4197	6 324.48	6 324.48	
26	2001	334.20	4 679	1.3602	1.3602	6 364.10	6 364.10	
27	2002	348.00	4 872	1.3141	1.3678	6 663.92		6 663.92
28	2003	356.60	4 992	1.2721	1.3182	6 580.98		6 580.98
29	2004	365.60	5 118	1.2434	1.2844	6 574.07		6 574.07
30	2005	374.70	5 246	1.2167	1.2518	6 566.69		6 566.69
31	2006	385.90	5 403	1.1800	1.2126	6 551.19		6 551.19
32	2007	403.00	5 642	1.1524	1.1808	6 662.07		6 662.07
33	2008	426.00	5 964	1.1231	1.1461	6 835.34		6 835.34
34	2009	450.00	6 300	1.1231	1.1461	7 220.43		7 220.43
35	2010	475.00	6 650	1.1076	1.1257	7 485.91		7 485.91
36	2011	485.00	6 790	1.0679	1.0854	7 369.87		7 369.87
37	2012	485.00	6 790	1.0389	1.0558	7 168.88		7 168.88
38	2013	485.00	6 790	1.0362	1.0481	7 116.60		7 116.60
39	2014	485.00	6 790	1.0362	1.0481	7 116.60		7 116.60
40	2015	505.00	7 070	1.0315	1.0429	7 373.30		7 373.30
41	2016	530.00	7 420	1.0257	1.0349	7 678.96		7 678.96
42	2017	557.00	7 798	1.0022	1.0202	7 955.52		7 955.52
43	2018	580.00	8 120	1.0000	1.0072	8 178.46		8 178.46
44	2019	600.00	8 400	1.0000	1.0000	8 400.00		8 400.00
TR10/15							**60 495**	
RE1							**432.10**	
C3							**26**	
N1							**10**	
P1 = RE1 x 2% x C3							**224.69**	
TRE								**129 498.80**
RE2 = TRE / (N2 x 14)								**513.88**
N2								**18**
C4								**18**
P2								**472.15**
C = C3 + C4							**44**	
P = (P1 x C3 + P2 x C4) / C							**325.93**	

P2 and accrued rates for P2	Accrual rate	Pension benefit	Note
RE <= 1.1 SSI (1.1 x €438.81 = €482.69)	2.30%	444.08	Reference earning below €482.69 (1.1 x SSI)
1.1 SSI < RE <= 2 SSI (€482.69 < RE <= €877.62)	2.25%	28.07	Part of the reference earning above €482.69 (1.1 x SSI) and below €877.62 (2 x SSI)
2 SSI < RE <= 4 SSI (€877.62 < RE <= €1755.24)	2.20%	0.00	Part of the reference earning above €877.62 (2 x SSI) and below €1755.24 (4 x SSI)
4 SSI < RE <= 8 SSI (€1755.24 < RE <= €3510.48)	2.10%	0.00	Part of the reference earning above €1755.24 (4 x SSI) and below €3510.48 (8 x SSI)
RE > 8 SSI (RE > €3510.48)	2.00%	0.00	Part of the reference earning above €3510.48 (8 x SSI)
P2		**472.15**	

SSI in 2020	**438.81**
Statutory retirement age (SRA)	**66y & 5m**
Age of contributor	**67y**
Contributory period	**44y**
Personal retirement age (PRA) (= SRA - (44y - 40y) x 4m)	**65y & 1m**
Penalty	**0.0%**
Bonus ((contributor's age (67y) - PRA (65y1m)) x 1%/m)	**23.0%**
Sustainability factor	**-**
Pension benefit (P x [1 or (1 + bonus) or (1 - penalty)] x (1-SF))	**400.89**
92% of the highest monthly salary	**552.00**
Minimum pension (> 30 years of contributory period)	**398.34**
Pension benefit paid *	**400.89**

* Pension benefit paid couldn't be higher than 92% of the highest monthly salary and if P1 is higher P2, P1 has a cap of 12 times SSI, except if both P1 and P2 are higher than 12 times SSI.

Source: GPEARI and GEP.

Example 2

Pension benefit calculation according all career (for someone that starts after 31 December 2001):

The pension benefit of this person is calculated as P2:
P2 = TRE/(N2*14)
Where:
P2 - Pension computed take into account all contributory period after 2001 up to 40 years
TRE = total earnings at a maximum of 40 (for a contributory period below 21 years, the accrual rate is 2%)
N2 – total contributory period (minimum of 15 years and maximum of 40 years)

This person only could has **18 years of contributory period** and, hypothetically, **67 years old**.

Contributory period	Years	Monthly wage	Annual wage	Revaluation coefficient for P2	Annual wage revalued	Reference earnings computed according
						All contributory period
1	2002	348.00	4 872	1.3678	6 663.92	6 663.92
2	2003	356.60	4 992	1.3182	6 580.98	6 580.98
3	2004	365.60	5 118	1.2844	6 574.07	6 574.07
4	2005	374.70	5 246	1.2518	6 566.69	6 566.69
5	2006	385.90	5 403	1.2126	6 551.19	6 551.19
6	2007	403.00	5 642	1.1808	6 662.07	6 662.07
7	2008	426.00	5 964	1.1461	6 835.34	6 835.34
8	2009	450.00	6 300	1.1461	7 220.43	7 220.43
9	2010	475.00	6 650	1.1257	7 485.91	7 485.91
10	2011	485.00	6 790	1.0854	7 369.87	7 369.87
11	2012	485.00	6 790	1.0558	7 168.88	7 168.88
12	2013	485.00	6 790	1.0481	7 116.60	7 116.60
13	2014	485.00	6 790	1.0481	7 116.60	7 116.60
14	2015	505.00	7 070	1.0429	7 373.30	7 373.30
15	2016	530.00	7 420	1.0349	7 678.96	7 678.96
16	2017	557.00	7 798	1.0202	7 955.52	7 955.52
17	2018	580.00	8 120	1.0072	8 178.46	8 178.46
18	2019	600.00	8 400	1.0000	8 400.00	8 400.00
TRE						**129 498.80**
RE2 = TRE / (N2 x 14)						**513.88**
N2						**18**
C4						**18**
P2						**185.00**
C = C4						**18**
P = RE2 x GAR						**185.00**

P2 and accrued rates for P2	Accrual rate	Pension benefit
20 years or less of contributory period	2.00%	185.00
P2		**185.00**
SSI in 2020		**438.81**
Statutory retirement age (SRA)		**66y & 5m**
Age of contributor		**67y**
Contributory period		**18y**
Personal retirement age (PRA) (= SRA - (44y - 40y) x 4m)		**66y & 5m**
Penalty		**0.0%**
Bonus ((67y - SRA) x 0.33%/m)		**2.3%**
Sustainability factor		**-**
Pension benefit (P x [1 or (1 + bonus) or (1 - penalty)] x (1-SF))		**189.27**
Minimum pension (15-20 years of contributory period)		**288.79**
Social complement (Minimum pension minus Pension benefit)		**99.52**
Pension benefit paid *		**288.79**

* Pension benefit according the pension benefit formula is below the minimum pension paid to a pensioner with a 15-20 years of contributory period.
Source: GPEARI and GEP.

Example 3

Pension benefit calculation according all career (It is a hypothetical example for purposes of comparation, as it will only occur for contributors who started working after 31 December 2001 which is not the case of the example):

The pension benefit of this person is calculated as P2:
P2 = TRE/(N2*14)
Where:
P2 - Pension computed take into account all contributory period after 2001 up to 40 years
TRE = total earnings at a maximum of 40
N2 – total contributory period (minimum of 15 years and maximum of 40 years)

This person has **44 years of contributory period** and, hypothetically, **67 years old**.

Contributory period	Years	Monthly wage	Annual wage	Revaluation coefficient for P2	Annual wage revalued	Reference earnings computed according
						All contributory period
1	1976	20.00	280	25.0431	7 012.07	7 012.07
2	1977	22.40	314	19.6572	6 164.50	6 164.50
3	1978	28.40	398	16.0991	6 401.00	6 401.00
4	1979	37.40	524	12.9624	6 787.11	6 787.11
5	1980	44.90	629	11.1170	6 988.15	6 988.15
6	1981	53.40	748	9.2640	6 925.77	6 925.77
7	1982	53.40	748	7.5686	5 658.29	5 658.29
8	1983	64.80	907	6.0307	5 471.05	
9	1984	77.80	1 089	4.6641	5 080.14	
10	1985	95.80	1 341	3.9095	5 243.42	
11	1986	112.20	1 571	3.5001	5 497.96	5 497.96
12	1987	125.70	1 760	3.1993	5 630.13	5 630.13
13	1988	135.70	1 900	2.9190	5 545.52	5 545.52
14	1989	149.60	2 094	2.5926	5 429.94	
15	1990	174.60	2 444	2.2862	5 588.39	5 588.39
16	1991	200.00	2 800	2.0521	5 745.88	5 745.88
17	1992	222.00	3 108	1.8844	5 856.72	5 856.72
18	1993	236.40	3 310	1.7695	5 856.34	5 856.34
19	1994	245.90	3 443	1.6819	5 790.11	5 790.11
20	1995	259.40	3 632	1.6157	5 867.58	5 867.58
21	1996	272.30	3 812	1.5671	5 974.10	5 974.10
22	1997	282.80	3 959	1.5335	6 071.43	6 071.43
23	1998	293.80	4 113	1.4931	6 141.42	6 141.42
24	1999	305.80	4 281	1.4595	6 248.41	6 248.41
25	2000	318.20	4 455	1.4197	6 324.48	6 324.48
26	2001	334.20	4 679	1.3602	6 364.10	6 364.10
27	2002	348.00	4 872	1.3678	6 663.92	6 663.92
28	2003	356.60	4 992	1.3182	6 580.98	6 580.98
29	2004	365.60	5 118	1.2844	6 574.07	6 574.07
30	2005	374.70	5 246	1.2518	6 566.69	6 566.69
31	2006	385.90	5 403	1.2126	6 551.19	6 551.19
32	2007	403.00	5 642	1.1808	6 662.07	6 662.07
33	2008	426.00	5 964	1.1461	6 835.34	6 835.34
34	2009	450.00	6 300	1.1461	7 220.43	7 220.43
35	2010	475.00	6 650	1.1257	7 485.91	7 485.91
36	2011	485.00	6 790	1.0854	7 369.87	7 369.87
37	2012	485.00	6 790	1.0558	7 168.88	7 168.88
38	2013	485.00	6 790	1.0481	7 116.60	7 116.60
39	2014	485.00	6 790	1.0481	7 116.60	7 116.60
40	2015	505.00	7 070	1.0429	7 373.30	7 373.30
41	2016	530.00	7 420	1.0349	7 678.96	7 678.96
42	2017	557.00	7 798	1.0202	7 955.52	7 955.52
43	2018	580.00	8 120	1.0072	8 178.46	8 178.46
44	2019	600.00	8 400	1.0000	8 400.00	8 400.00
TRE						**263 938.23**
RE2 = TRE / (N2 x 14)						**471.32**
N2						**40**
C4						**40**
P2						**444.08**
C = C4						**40**
P = RE2 x GAR						**444.08**

P2 and accrued rates for P2	Accrual rate	Pension benefit	Note
RE <= 1.1 SSI (1.1 x €438.81 = €482.69)	2.30%	444.08	Reference earning below €482.69 (1.1 x SSI)☐
1.1 SSI < RE <= 2 SSI (€482.69 < RE <= €877.62)	2.25%	0.00	Part of the reference earning above €482.69 (1.1 x SSI) and below €877.62 (2 x SSI)
2 SSI < RE <= 4 SSI (€877.62 < RE <= €1755.24)	2.20%	0.00	Part of the reference earning above €877.62 (2 x SSI) and below €1755.24 (4 x SSI)
4 SSI < RE <= 8 SSI (€1755.24 < RE <= €3510.48)	2.10%	0.00	Part of the reference earning above €1755.24 (4 x SSI) and below €3510.48 (8 x SSI)
RE > 8 SSI (RE > €3510.48)	2.00%	0.00	Part of the reference earning above €3510.48 (8 x SSI)
P2		**444.08**	

SSI in 2020	**438.81**
Statutory retirement age (SRA)	**66y & 5m**
Age of contributor	**67y**
Contributory period	**44y**
Personal retirement age (PRA) (= (SRA - (44y - 40Y)) x 4m)	**65y & 1m**
Penalty	**0.0%**
Bonus ((contributor's age (67y) - PRA (65y1m)) x 1%/m)	**23.0%**
Sustainability factor	**-**
92% of the highest monthly salary	**552.00**
Pension benefit (P x [1 or (1 + bonus) or (1 - penalty)] x (1-SF))	**546.21**
92% of the highest monthly salary	**552.00**
Minimum pension (> 30 years of contributory period)	**398.34**
Pension benefit paid	**546.21**

Source: GPEARI and GEP.

Example 4

Pension benefit calculation according all career (It is a hypothetical example for purposes of comparation, as it will only occur for contributors who started working after 31 December 2001):

The pension benefit of this person is calculated as P2:
P2 = TRE/(N2*14)
Where:
P2 - Pension computed take into account all contributory period after 2001 up to 40 years
TRE = total earnings at a maximum of 40
N2 – total contributory period (minimum of 15 years and maximum of 40 years)

This person has **42 years of contributory period** and **63 years old**.

Contributory period	Years	Monthly wage	Annual wage	Revaluation coefficient for P2	Annual wage revalued	Reference earnings computed according
						All contributory period
1	1976	20.00	280	25.0431	7 012.07	7 012.07
2	1977	22.40	314	19.6572	6 164.50	6 164.50
3	1978	28.40	398	16.0991	6 401.00	6 401.00
4	1979	37.40	524	12.9624	6 787.11	6 787.11
5	1980	44.90	629	11.1170	6 988.15	6 988.15
6	1981	53.40	748	9.2640	6 925.77	6 925.77
7	1982	53.40	748	7.5686	5 658.29	5 658.29
	1983	0.00	0	6.0307	-	
	1984	0.00	0	4.6641	-	
8	1985	95.80	1 341	3.9095	5 243.42	
9	1986	112.20	1 571	3.5001	5 497.96	5 497.96
10	1987	125.70	1 760	3.1993	5 630.13	5 630.13
11	1988	135.70	1 900	2.9190	5 545.52	5 545.52
12	1989	149.60	2 094	2.5926	5 429.94	
13	1990	174.60	2 444	2.2862	5 588.39	5 588.39
14	1991	200.00	2 800	2.0521	5 745.88	5 745.88
15	1992	222.00	3 108	1.8844	5 856.72	5 856.72
16	1993	236.40	3 310	1.7695	5 856.34	5 856.34
17	1994	245.90	3 443	1.6819	5 790.11	5 790.11
18	1995	259.40	3 632	1.6157	5 867.58	5 867.58
19	1996	272.30	3 812	1.5671	5 974.10	5 974.10
20	1997	282.80	3 959	1.5335	6 071.43	6 071.43
21	1998	293.80	4 113	1.4931	6 141.42	6 141.42
22	1999	305.80	4 281	1.4595	6 248.41	6 248.41
23	2000	318.20	4 455	1.4197	6 324.48	6 324.48
24	2001	334.20	4 679	1.3602	6 364.10	6 364.10
25	2002	348.00	4 872	1.3678	6 663.92	6 663.92
26	2003	356.60	4 992	1.3182	6 580.98	6 580.98
27	2004	365.60	5 118	1.2844	6 574.07	6 574.07
28	2005	374.70	5 246	1.2518	6 566.69	6 566.69
29	2006	385.90	5 403	1.2126	6 551.19	6 551.19
30	2007	403.00	5 642	1.1808	6 662.07	6 662.07
31	2008	426.00	5 964	1.1461	6 835.34	6 835.34
32	2009	450.00	6 300	1.1461	7 220.43	7 220.43
33	2010	475.00	6 650	1.1257	7 485.91	7 485.91
34	2011	485.00	6 790	1.0854	7 369.87	7 369.87
35	2012	485.00	6 790	1.0558	7 168.88	7 168.88
36	2013	485.00	6 790	1.0481	7 116.60	7 116.60
37	2014	485.00	6 790	1.0481	7 116.60	7 116.60
38	2015	505.00	7 070	1.0429	7 373.30	7 373.30
39	2016	530.00	7 420	1.0349	7 678.96	7 678.96
40	2017	557.00	7 798	1.0202	7 955.52	7 955.52
41	2018	580.00	8 120	1.0072	8 178.46	8 178.46
42	2019	600.00	8 400	1.0000	8 400.00	8 400.00
TRE						**263 938.23**
RE2 = TRE / (N2 x 14)						**471.32**
N2						**40**
C4						**40**
P2						**444.08**
C = C4						**40**
P = RE2 x GAR						**444.08**

P2 and accrued rates for P2	Accrual rate	Pension benefit	Note
RE <= 1.1 SSI (1.1 x €438.81 = €482.69)	2.30%	444.08	Reference earning below €482.69 (1.1 x SSI)
1.1 SSI < RE <= 2 SSI (€482.69 < RE <= €877.62)	2.25%	0.00	Part of the reference earning above €482.69 (1.1 x SSI) and below €877.62 (2 x SSI)
2 SSI < RE <= 4 SSI (€877.62 < RE <= €1755.24)	2.20%	0.00	Part of the reference earning above €877.62 (2 x SSI) and below €1755.24 (4 x SSI)
4 SSI < RE <= 8 SSI (€1755.24 < RE <= €3510.48)	2.10%	0.00	Part of the reference earning above €1755.24 (4 x SSI) and below €3510.48 (8 x SSI)
RE > 8 SSI (RE > €3510.48)	2.00%	0.00	Part of the reference earning above €3510.48 (8 x SSI)
P2		**444.08**	
SSI in 2020		**438.81**	
Statutory retirement age (SRA)		**66y & 5m**	
Age of contributor		**63y**	
Contributory period		**42y**	
Personal retirement age (PRA) (= (SRA - (42y - 40y)) x 4m)		**65y & 9m**	
Penalty ((PRA - 63y - (42y - 40y)) x 0.5%/m = 25m x 0.5%/m)		**12.5%**	
Bonus		**-**	
Sustainability factor (if age < SRA and at 60y has less than 40y of contributory peri		**15.2%**	
Pension benefit (P x [1 or (1 + bonus) or (1 - penalty)] x (1-SF))		**329.50**	
92% of the highest monthly salary		**552.00**	
Minimum pension (> 30 years of contributory period)		**398.34**	
Social complement		**68.84**	
Pension benefit paid *		**398.34**	

* Pension benefit according the pension benefit formula is below the minimum pension paid to a pensioner with more than 30 years of contributory period.

Source: GPEARI and GEP.

Example 5

Pension benefit calculation according all career (It is a hypothetical example for purposes of comparation, as it will only occur for contributors who started working after 31 December 2001.):

The pension benefit of this person is calculated as P2:
P2 = TRE/(N2*14)
Where:
P2 - Pension computed take into account all contributory period after 2001 up to 40 years
TRE = total earnings at a maximum of 40
N2 – total contributory period (minimum of 15 years and maximum of 40 years)

This person has **42 years of contributory period** and **62 years old**.

Contributory period	Years	Monthly wage	Annual wage	Revaluation coefficient for P2	Annual wage revalued	Reference earnings computed according
						All contributory period
1	1976	20.00	280	25.0431	7 012.07	7 012.07
2	1977	22.40	314	19.6572	6 164.50	6 164.50
3	1978	28.40	398	16.0991	6 401.00	6 401.00
4	1979	37.40	524	12.9624	6 787.11	6 787.11
5	1980	44.90	629	11.1170	6 988.15	6 988.15
6	1981	53.40	748	9.2640	6 925.77	6 925.77
7	1982	53.40	748	7.5686	5 658.29	5 658.29
	1983	0.00	0	6.0307	-	
	1984	0.00	0	4.6641	-	
8	1985	95.80	1 341	3.9095	5 243.42	
9	1986	112.20	1 571	3.5001	5 497.96	5 497.96
10	1987	125.70	1 760	3.1993	5 630.13	5 630.13
11	1988	135.70	1 900	2.9190	5 545.52	5 545.52
12	1989	149.60	2 094	2.5926	5 429.94	
13	1990	174.60	2 444	2.2862	5 588.39	5 588.39
14	1991	200.00	2 800	2.0521	5 745.88	5 745.88
15	1992	222.00	3 108	1.8844	5 856.72	5 856.72
16	1993	236.40	3 310	1.7695	5 856.34	5 856.34
17	1994	245.90	3 443	1.6819	5 790.11	5 790.11
18	1995	259.40	3 632	1.6157	5 867.58	5 867.58
19	1996	272.30	3 812	1.5671	5 974.10	5 974.10
20	1997	282.80	3 959	1.5335	6 071.43	6 071.43
21	1998	293.80	4 113	1.4931	6 141.42	6 141.42
22	1999	305.80	4 281	1.4595	6 248.41	6 248.41
23	2000	318.20	4 455	1.4197	6 324.48	6 324.48
24	2001	334.20	4 679	1.3602	6 364.10	6 364.10
25	2002	348.00	4 872	1.3678	6 663.92	6 663.92
26	2003	356.60	4 992	1.3182	6 580.98	6 580.98
27	2004	365.60	5 118	1.2844	6 574.07	6 574.07
28	2005	374.70	5 246	1.2518	6 566.69	6 566.69
29	2006	385.90	5 403	1.2126	6 551.19	6 551.19
30	2007	403.00	5 642	1.1808	6 662.07	6 662.07
31	2008	426.00	5 964	1.1461	6 835.34	6 835.34
32	2009	450.00	6 300	1.1461	7 220.43	7 220.43
33	2010	475.00	6 650	1.1257	7 485.91	7 485.91
34	2011	485.00	6 790	1.0854	7 369.87	7 369.87
35	2012	485.00	6 790	1.0558	7 168.88	7 168.88
36	2013	485.00	6 790	1.0481	7 116.60	7 116.60
37	2014	485.00	6 790	1.0481	7 116.60	7 116.60
38	2015	505.00	7 070	1.0429	7 373.30	7 373.30
39	2016	530.00	7 420	1.0349	7 678.96	7 678.96
40	2017	557.00	7 798	1.0202	7 955.52	7 955.52
41	2018	580.00	8 120	1.0072	8 178.46	8 178.46
42	2019	600.00	8 400	1.0000	8 400.00	8 400.00
TRE						**263 938.23**
RE2 = TRE / (N2 x 14)						**471.32**
N2						**40**
C4						**40**
P2						**444.08**
C = C4						**40**
P = RE2 x GAR						**444.08**

P2 and accrued rates for P2	Accrual rate	Pension benefit	Note
RE <= 1.1 SSI (1.1 x €438.81 = €482.69)	2.30%	444.08	Reference earning below €482.69 (1.1 x SSI)☐
1.1 SSI < RE <= 2 SSI (€482.69 < RE <= €877.62)	2.25%	0.00	Part of the reference earning above €482.69 (1.1 x SSI) and below €877.62 (2 x SSI)
2 SSI < RE <= 4 SSI (€877.62 < RE <= €1755.24)	2.20%	0.00	Part of the reference earning above €877.62 (2 x SSI) and below €1755.24 (4 x SSI)
4 SSI < RE <= 8 SSI (€1755.24 < RE <= €3510.48)	2.10%	0.00	Part of the reference earning above €1755.24 (4 x SSI) and below €3510.48 (8 x SSI)
RE > 8 SSI (RE > €3510.48)	2.00%	0.00	Part of the reference earning above €3510.48 (8 x SSI)
P2		**444.08**	

SSI in 2020	**438.81**
Statutory retirement age (SRA)	**66y & 5m**
Age of contributor	**62y**
Contributory period	**42y**
Personal retirement age (PRA) (= (SRA - (42y - 40y)) x 4m)	**65y & 9m**
Penalty ((PRA - 62y - (42y - 40y)) x 0.5%/m = 25m * 0.5%/m)	**12.5%**
Bonus	**-**
Sustainability factor (if age < SRA and at 60y has less than 40y of contributory peri	**-**
Pension benefit (P x [1 or (1 + bonus) or (1 - penalty)] x (1-SF))	**388.57**
92% of the highest monthly salary	**552.00**
Minimum pension (> 30 years of contributory period)	**398.34**
Social complement	**9.77**
Pension benefit paid *	**398.34**

* Pension benefit according the pension benefit formula is below the minimum pension paid to a pensioner with more than 30 years of contributory period.

Source: GPEARI and GEP.

IV - Additional reporting tables

Table A1 | Economy-wide average wage at retirement (1000 EUR)

	2019	2030	2040	2050	2060	2070	Change 2019-2070
Average gross wage at retirement*	17.2	23.5	34.4	51.5	75.5	108.4	528.6
Average gross wage	17.2	23.5	34.4	51.5	75.5	108.4	528.6

* This data is not available and the average gross wage was therefore been taken into account in the calculation of the gross average replacement rate.
Source: European Commission.

Table A3 | Factors behind the change in public pension expenditure between 2019 and 2070 (%GDP) – Pensions

	2019-30	2030-40	2040-50	2050-60	2060-70	2019-70
Public pensions to GDP	1.5	0.1	-1.8	-2.1	-1.0	-3.2
Dependency ratio effect	3.4	3.6	2.1	-0.2	-0.1	8.8
Coverage ratio effect*	-1.0	-0.9	-0.9	-0.3	-0.3	-3.5
Coverage ratio old-age	-0.4	-0.6	-0.6	-0.4	-0.3	-2.3
Coverage ratio early-age	-3.4	0.2	-1.1	-0.5	-0.2	-4.9
Cohort effect	-1.6	-3.6	-2.7	0.4	-0.3	-7.8
Benefit ratio effect	-0.4	-1.9	-2.6	-1.6	-0.4	-6.9
Labour Market effect	-0.3	-0.3	-0.2	0.0	-0.2	-1.1
Employment ratio effect	-0.3	-0.1	-0.2	-0.1	-0.1	-0.7
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.1	-0.3	0.0	0.0	-0.1	-0.4
Residual	-0.2	-0.3	-0.2	0.0	0.0	-0.6

* Sub components of the coverage ratio effect do not add up necessarily.
Source: European Commission.

Table A4A | Number of new pensioners by age group in 2019 (administrative data) – Male

	All	Old-age and early	Disability	Survivor	Other (including minimum)
Age group 0-14	1 126.0	0.0	0.0	1 126.0	-
Age group 15-49	3 367.0	27.0	1 289.0	2 051.0	-
Age group 50-54	2 232.0	261.0	1 409.0	562.0	-
Age group 55-59	5 832.0	2 043.0	3 079.0	710.0	-
Age group 60-64	21 715.0	17 094.0	3 662.0	959.0	-
Age group 65-69	32 797.0	30 979.0	715.0	1 103.0	-
Age group 70-74	3 079.0	1 540.0	33.0	1 506.0	-
Age group 75+	8 181.0	491.0	16.0	7 674.0	-

Note: It was add a 0 - 14 years cohort. Includes earning-related and non-earning related schemes. Includes pensioners receiving both old-age and survivor's pensions.
Source: CGA and GEP.

Table A4B | Number of new pensioners by age group in 2019 (administrative data) – Female

	All	Old-age and early	Disability	Survivor	Other (including minimum)
Age group 0-14	1 182.0	0.0	0.0	1 182.0	-
Age group 15-49	4 361.0	4.0	1 082.0	3 275.0	-
Age group 50-54	2 851.0	14.0	1 280.0	1 557.0	-
Age group 55-59	6 179.0	1 106.0	2 481.0	2 592.0	-
Age group 60-64	17 344.0	10 478.0	3 418.0	3 448.0	-
Age group 65-69	39 845.0	34 430.0	884.0	4 531.0	-
Age group 70-74	7 454.0	1 608.0	5.0	5 841.0	-
Age group 75+	18 996.0	557.0	0.0	18 439.0	-

Note: It was add a 0 - 14 years cohort. Includes earning-related and non-earning related schemes. Includes pensioners receiving both old-age and survivor's pensions.
Source: CGA and GEP.

Table A4C | Number of new pensioners by age group in 2019 (administrative data) – Total

	All	Old-age and early	Disability	Survivor	Other (including minimum)
Age group 0-14	2 308.0	0.0	0.0	2 308.0	-
Age group 15-49	7 728.0	31.0	2 371.0	5 326.0	-
Age group 50-54	5 083.0	275.0	2 689.0	2 119.0	-
Age group 55-59	12 011.0	3 149.0	5 560.0	3 302.0	-
Age group 60-64	39 059.0	27 572.0	7 080.0	4 407.0	-
Age group 65-69	72 642.0	65 409.0	1 599.0	5 634.0	-
Age group 70-74	10 533.0	3 148.0	38.0	7 347.0	-
Age group 75+	27 177.0	1 048.0	16.0	26 113.0	-

Note: It was add a 0 - 14 years cohort. Includes earning-related and non-earning related schemes. Includes pensioners receiving both old-age and survivor's pensions.
Source: CGA and GEP.