Bundesministerium
für Arbeit und Soziales

Economic Policy Committee - Ageing Working Group

2024 Ageing Report

Germany - Country Fiche

December 2023

Federal Ministry of Labour and Social Affairs

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Table of contents

List of tables

List of figures

Introduction

The present country fiche for Germany is part of the 2024 Ageing Report, which provides long-term projections of the economic and budgetary impact of population ageing at unchanged policy. The 2024 edition is the eighth update and covers the period up to 2070.

This fiche was prepared by the Federal Ministry of Labour and Social Affairs in agreement with the *Ageing Working Group* of the *Economic Policy Committee* and based on a common set of assumptions and methodologies. The pension expenditure projections presented in this fiche have been peer reviewed by the other Member States and the European Commission within the *Ageing Working Group*. The projections were finalised in the autumn of 2023 and represent the situation of the pension system on 01/12/2023.

Section 1 provides a general overview of the pension system in Germany. Section 2 describes the demographic and labour market assumptions underlying the pension expenditure projections presented in Section 3, which also discusses the sensitivity scenarios around the baseline. Finally, Section 4 gives an overview of the methodology used to produce the pension projections.

1. Overview of the pension system

1.1. Description of the pension system

The pension system in Germany is in general based on three pillars, where the first pillar with the statutory and the civil servant pension system is mandatory for all employees and civil servants. The occupational (2nd pillar) and the private pension system (3rd pillar) are non-mandatory, but certain elements are of growing importance since future declining public pension benefits shall be compensated by capital formation of the 2nd and 3rd pillar components. Both systems are tax-promoted and subsidised by the government.

The German projections exercise of future pension expenditures comprises the statutory and the civil servants pension schemes. These schemes provided old-age pension as well as survivors and disability pension claims to (more than) 90% of the employed population in 2022. Currently, the general pay-as-you-go (PAYG) earnings-related first pillar statutory pension scheme covers about 87% of the employed German population whereas the public civil servants scheme protects approximately 5%. Both systems accounted for pension expenditures of about 10.2% of GDP in 2022. Not covered by this pension projection exercise are specific pension schemes for miners and farmers with pension expenditures of less than 0.5% of GDP (in 2022).

Means-tested social assistance expenditures for pensioners are projected with a separate model due to the social assistance schemes' substantially different design compared to the public pension systems. Within the concept of minimum income provision, individuals - as of the age of the statutory retirement age - can claim means-tested benefits from social assistance if old-age provision from all income sources is not sufficient. The system of social assistance is completely tax-financed. The respective expenditures amounted to 0.17% of GDP in 2022.

The statutory pension system is operated and administrated by the German Federal Insurance Fund (Deutsche Rentenversicherung). The civil servants pension scheme is operated by the Federal Ministry of the Interior for civil servants at the federal level and by the Länder at the state level. If not stated otherwise, the following statements refer to the statutory pension scheme.

Statutory Pension System

The statutory pension insurance scheme - as a *point system* - comprises pensions for old-age, survivors and disability, provides rehabilitation benefits, but no minimum pensions.

The annual budget volume of the statutory pension system is based on two major sources: the contributions by insured persons and the government subsidies. The latter contribute an amount of about 23% of total receipts. In 2022, insured employees and their employers each contributed 9.3% of the employees' gross wages to the statutory pension system. In 2022, total revenues amounted to 357.5 billion EUR while total expenditures to 353.9 billion EUR.

Old-age pension

The German statutory pension system is based on the principle of contribution equivalence, which basically translates the amount of individual pension-related contributions into similar pension entitlements. A minimum of five years of contributions entitles to benefits. For the calculation of old-age pension benefit, see *Formulas 1* to *3*.

Since 1992 numerous pension reforms have addressed the growing budgetary pressures on the statutory pension schemes due to the demographic development of steadily rising life expectancy and relatively constant fertility rates far below the replacement level. In 2007, a major reform initiated the gradual increase of the statutory retirement age from age 65 to age 67 by the year 2031 (see, *Table 1*). Other pension schemes, like the civil servants' pension scheme, are also affected by that raise of the retirement age. Simultaneously, several pension types within the statutory pension scheme with retirement ages that were originally lower, such as pensions for women or for unemployed, have expired - fully affecting birth cohorts from 1952 onwards. Hence, since 2011 there is in principle no possibility to retire via an old-age pension before the age of 63. Specific exceptions still exist for severely handicapped people.

Under current legislation, the statutory retirement age for men and women has been age 65 and 11 months in 2022/23. Nevertheless, as seen in *Table 1*, early retirement is possible under certain conditions but in any case the use of this option will permanently reduce individual benefits by 0.3% for each retired month pensioners fall short of the statutory retirement age. On the other hand, postponing the retirement will result in a higher pension accrual of 0.5% for each month worked after the statutory retirement age, which can be seen as an incentive to work longer.

As shown in *Table 1*, early retirement is possible at the age of 63 for persons with an insurance record of at least 35 years. However, the pension benefit will be reduced by a permanent deduction of 0.3% for each retired month pensioners fall short of the statutory retirement age. Because the latter is gradually increasing to the age of 67 by 2031, the maximum permanent deduction will increase to 14.4%.

In addition, there is a specific exemption for persons with a very long insurance record of at least 45 years. Those people can temporarily claim an old-age pension without deductions currently at the age of 63 and 10 months. To prevent any kind of early retirement e.g. through planned unemployment at the age of 61 or 62, the pension law includes the rule that periods of short-time unemployment at the age of 61 and 62 will in general not be accounted for in the requirement of 45 years of insurance. Given the raise of the legal retirement age from age 65 to 67, the age of 63 for an old-age pension without any penalties (subject to the requirement of 45 contribution years) will also raise gradually up to the age of 65 by 2029.

TABLE 1 – QUALIFYING CONDITIONS FOR RETIREMENT

			2022	2030	2040	2050	2060	2070
Qualifying condition for retiring **with** a full pension	Statutory retirement age - men		65/11	67	67	67	67	67
	Statutory retirement age - women		65/11	67	67	67	67	67
	Minimum requirements	Contributory period - men	5	5	5	5	5	5
		Retirement age - men	(64)*	(65)*	(65)*	(65)*	(65)*	(65)*
		Contributory period - women	5	5	5	5	5	5
		Retirement age - women	(64)*	(65)*	(65)*	(65)*	(65)*	(65)*
Qualifying condition for retirement **without** a full pension	Early retirement age - men		63	63	63	63	63	63
	Early retirement age - women		63	63	63	63	63	63
	Penalty in case of earliest retirement age		-0.096	-0.138	-0.144	-0.144	-0.144	-0.144
	Bonus in case of late retirement		-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
	Minimum contributory period - men		35	35	35	35	35	35
	Minimum contributory period - women		35	35	35	35	35	35
	Minimum residence period - men		:	:	:	:	:	:
	Minimum residence period - women		:	:	:	:	:	:

* Early retirement before the statutory retirement age with deductions is possible after a qualifying period of 35 years. An old-age pension without deductions before the statutory retirement age requires a very long employment (or child care) record of at least 45 years.

Source: According to the German statutory pension law, SGB VI.

Calculation of old-age pension benefit and indexation of pensions

For each year of contribution an insured person receives *pension points*, which reflect the employees' relative earnings position in year *t* (see *Formula 1*). A year's contribution at the level of the average earnings of contributors, which is approximately identical to the National Accounts average wage, results in one pension point. Yearly contributions and therefore entitlements are levied on annual earnings up to a ceiling of approximately 200% of the relevant average earnings.

From 2021, individuals with low earnings and at least 33 years of mandatory contributions and certain other pension-relevant periods are also granted an individually calculated pension supplement, known as the "basic pension". The supplement is granted only if the average of all of the earning points (EP) of months that are at least 0.3 EP/year is below 0.8 EP/year (thus relating to 80% of the average earnings) and implies the doubling of the average monthly EP value up to that limit. During the transitional period between 33 and 35 years, a cumulative basic pension supplement is calculated.

In the German pure points system where contributory periods only count for part of the accrued claims for pension benefits, the individual pension benefit in year *T+n* (as shown in *Formula 2)* results from the sum of individual pension points multiplied by the specific pension type factor (e.g., 1.0 for old-age pension, 0.55 for a widower's pension) and the *'pension point value'* (measured in EUR) in year *T+n*. The pension point value applies to new and existing pensioners. Irrespective of the year of retirement all pensions are adjusted annually with the current pension point value at mid-year. Hence, the pension point value is set to be fixed for the period from 1 July in year *t* to 30 June in year *t + 1*.

Formula 1:

$$pp_t = e_t / e_t^{\varnothing}, \text{ where}$$

pp_t = individual pension points in year *t,*

e_t = individual earning in year *t,*

$e_t^{\varnothing}$ = average of nation-wide earnings related to contributors in year *t.*

Formula 2:

$$P_{T+n} = \sum_{t=1}^{T} pp_t \times ptf \times ppv_{T+n}, \text{ where}$$

P_{T+n} = individual pension benefit in year *T+n,*

$\sum_{t=1}^{T} pp_t$ = sum of individual pension points,

ptf = pension type factor,

ppv_{T+n} = pension point value in year *T+n.*

Formula 3:

$$ppv_{T+n} = ppv_{T+n-1} \times wf_{T+n-1} \times cf_{T+n-1} \times sf_{T+n-1} \text{, } where$$

ppv_{T+n-1} = pension point value in year $T+n$-1,

wf_{T+n-1} = wage factor in year $T+n$-1,

cf_{T+n-1} = contribution rate factor in year $T+n$-1,

sf_{T+n-1} = sustainability factor in year $T+n$-1.

The pension point value (see *Formula 3*) is adjusted in relation to the gross wage growth (*'wage factor, wf'*) as a starting point. In addition, the *'contribution factor (cf)* accounts for changes in the contribution rate to the statutory pension scheme and to the subsidised (voluntary) private pension schemes. An increase of contribution rates will reduce the adjustment of the pension point value and respectively vice versa. The *'sustainability factor(sf),* that measures the change in the number of standardised contributors in relation to the number of standardised pensioners, links the adjustment of the pension point value to the changes in the statutory pension scheme's dependency ratio, i.e. the ratio of pensioners to contributors[1]. The last two factors in the indexation Formula *3* can change the size of the adjustment, resulting in lower growth of the pension point value in relation to gross wages per capita in the long run. Temporarily, until 2025 a so-called "double boundary" is applicable that sets a pension value, so that a lower limit of 48% for the net pension level before taxation[2] is guaranteed while ensuring an upper limit of 20% for the contribution rate.[3] Thus, when the adjustment of the pension point value (see *Formula 3*) results in a net pension level before taxation below 48%, the pension point value is further increased to guarantee the limit of 48%.

Additionally, *Formula 3* is linked to specific pension assurance laws, which guarantee that none of the three incorporated factors (*wf*, *cf*, *sf*) translate the indexation of the pension point value in year *T+n* into a lower value compared to the previous year *T+n-1*. A theoretically possible decrease of the nominal pension point value e. g., due to a declining wage development (observed in 2009 for Germany), is only "accounted" virtually and then counterbalanced with future increases of the pension point. Therefore, future increases of the pension point value (based on *Formula 3*) will be reduced by 50% until the original trajectory of the pension point value is reached.

Due to the existing differences in per capita income between the Western and the Eastern part of Germany, the average pension-related contributory income levels traditionally differed. For example, the (provisional) average income in 2022 was 38,901 EUR for Germany (west) and 37,333 EUR for Germany (east). Hence, the calculation of the pension point value distinguished between both German

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[1] Changes of the ratio are reduced by an allocation factor, which is set at 0.25. For more details refer to annex.

[2] Ratio of the standard pension (with 45 earnings points) to the average earnings of employees insured in the SPI, both reduced by the average of social contributions for health and long-term care insurance.

[3] However, it is enacted in law, that up to the year 2030 the pre-tax replacement rate must not fall below 43 %. This level is not to be understood as target figure, but as the lowest limit for the replacement rate. Whenever there is a risk that this limit cannot be upheld, the legislator is required to act.

regions by considering the respective average wages.[4] Consequently, the pension point values in 2022 were set at 36.02 EUR (west) and at 35.52 EUR (east) - regarding pension benefits per month. In 2017, a stepwise harmonisation of pension point values was legislated so that there will be a uniform pension legislation for Germany by 2025. From 1 January 2025 onwards there will be no more different calculation parameters for pensions. This harmonisation has already been achieved for the current[5], with a Germany-wide pension value of 37.6 EUR.

Box 2: Example for Calculation of Old-age Pension Benefit

In December 2022 a man/woman wants to retire exactly two years before the current statutory retirement age of 65 years and 11 months. He/she has a contribution record of 40 years just based on average income p.a., which results into 40 pension points. This sum of pension points is multiplied by the pension-type factor of 1.0 for old-age pensions and the current pension point value. Because of the two years' earlier retirement, a permanent deduction of 7.2 % results in a gross pension amount of 1,337.06 € per month (40× 1.0 × 36.02 € × 0.928) at least until the next pension indexation on 1th July 2023.

Disability pension

Persons with more than five years of pension contributions are entitled to receive a disability pension. Disability pensions are a replacement income for people below the statutory retirement age, who are partially or completely, temporarily or permanently unable to work. Work capability of less than three hours a day qualifies for a full disability pension with a pension type factor of 1.0, whereas work capability of three to six hours per day results in a partial disability pension with a pension type factor of 0.5.

The disability pension benefit is based on the assumption that the respective person would have worked virtually up to the statutory retirement age with an earned income p.a., which relates to the individual average wage p.a. based on the working period prior to disability status. Additionally, an examination takes place whether the last four years of earned income p.a. before the disability status will decrease the virtually assumed earned income for the period from the occurrence of disability up to the statutory retirement age. In case of negative influence, these respective years will be discounted. In total, the disability pension entitlements is the sum of the pension points already accrued before the disability and the additional pension points based on a virtual record of contribution.

Individuals will face a maximum deduction of 10.8% if they claim a disability pension before the age of 64 and 10 months (in 2023), rising up to age 65 in 2024. After this age, the regular pension penalty applies and the pension is reduced by 0.3% per month. The age limit of 63 years of age without reduction of pension remains for insured persons with 35 compulsory contribution years, and as of 2024 with 40 compulsory contribution years. In general, the disability pension is converted into an old-age pension (just for statistical reasons) once the respective person reaches the statutory retirement age.

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[4] This transitional treatment of eastern German pension entitlements is based in regulations legislated during the reunification negotiations. It was implemented to ensure that lower income levels in Germany (east) will not result in permanently lower pension entitlements. The system has been adjusted so that converging income levels will automatically result into converging pension point values. Thus, both - stock and new - pensioners in Germany (east) profit from a declining income gap.

[5] Period from 1st July 2023 to 30th June 2024.

Survivor's pension

Spouses are entitled to a survivor's pension if the deceased met the minimum condition of five years of contributions to the statutory pension system. The qualifying period may be deemed fulfilled if the insured person deceased e.g. as a consequence of an employment injury or a short time after education/training. In principle, the marriage must have lasted for at least one year. Widowed persons aged 47 years or more, persons with reduced capacity to work, and persons caring for child up to the age of 18 years (no limit in the case of disabled children unable to maintain themselves) are entitled to the so-called "major" "widow'" or widowers pension. Otherwise, there is entitlement to the so-called "minor" widow's or widower's pension. Since 2012, the retirement age for the "major" widows or widowers pension in the case of death of the insured person is increasing incrementally from the former age of 45 to 47 years. The age threshold for all cases of death from 2029 will then be 47 years. Men and women are treated equally. Income over and above a defined allowance will be deducted pro rata.

Marriage after 31/12/2001 or both spouses born after 1/1/1962:

The major widows or widowers pension amounts to 55% of the old-age pension for which the deceased spouse would have been eligible, including Supplementary periods. Survivors having raised children receive a dynamic supplement. In other cases, the minor widow's or widower's pension is payable for a maximum period of 24 months to the amount of 25% of the old-age pension for which the deceased spouse would have been eligible.

Marriage before 1/1/2002 or at least one spouse born before 2/1/1962 or decease before 1/1/2002:

The minor widows or widowers pension amounts to 25% of the pension for which the deceased spouse would have been eligible and is payable without limited duration.

The major widows or widowers pension amounts to 60% of the pension for which the deceased spouse would have been eligible. No supplement for child raising. Income from property is not taken into account. The same benefits are granted in the case of survivors of a registered civil union.

Orphan's pension is generally paid until the age of 18. Exemptions exist up to the age of 27. The amount of an orphan's pension is also related to the full pension benefit of the deceased, with one-tenth for half-orphans and one-fifth for double orphans.

Receiving an old-age or disability pension plus a survivor's pension results in a reduction of the latter by a specific relative value which is related to the difference between the amount of the old-age or disability pension and an individualized (income-related) exemption.

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

Pension reforms since the last AWG projection exercise are incorporated into the 2022 exercise. Please find below a detailed description of all components of the latest pension reforms in 2022.

Pension benefits and contributions:

The re-introduction of the so-called catch-up factor will ensure that a pension reduction that was not applied in the previous year is offset against the pension increase, so that the pension adjustment

follows actual wage developments.[6] For the net pension level before taxation a lower limit of 48% and for the contribution rate an upper limit of 20% was introduced. This so-called "double boundary" is applicable until 2025. Additionally, until 2025 the lower limit for the contribution rate is set at 18.6%.

The earnings points (EPs) for children born before 1992 are raised from 2.0 to 2.5, which means further convergence towards the 3.0 EPs that mothers or fathers receive for children born after 1992.

Old-age pension:

Entering into force on 1 January 2021, a pension supplement called "basic pension" for individuals with at least 33 years of mandatory contributions (stemming in particular from working periods, initial child-care periods and periods of providing nonpaid care to a close or related person), depending on their contributions and a proof of income is granted. The supplement is granted only if the average of all of the earning points (EP) of months that are at least 0.3 EP/year is below 0.8 EP/year (thus relating to 80% of the average earnings). It consists in doubling the average monthly EP value up to that limit. Different upper limits for the calculated average monthly EP value apply to creditable careers of 35 years or more, and to careers of 33 to (just before) 35 years. If the creditable period is at least 35 years, the upper limit is 0.0667 EP/month. If the creditable period is between 33 and 35 years, the upper limit is 0.0334 EP/month at 33 years and for each additional month up to 35 years will increase by 0.001389 EP/month. In order to correspond to the principle of equivalence of benefits and contributions, the value of the EP is then multiplied by 0.875 and by the number of monthly periods for a basic SPI pension, up to but not exceeding 420 months (35 years).

The basic pension will be income-tested. For people who are married or living in a registered partnership, the income of the partner will also be taken into account. If the couple's monthly taxable income is above €2424 (for a single person €1,686/month), the basic SPI pension supplement will be offset. In parallel, an allowance for people with a high number of creditable periods and in receipt of a benefit under the 'basic social assistance in old age and in the event of reduced earning capacity' scheme was introduced. For people with a minimum of 33 years of mandatory contributions (or other compulsory old age pension) the allowance is €100/month and additionally 30% of the statutory pension. The allowance is subject to a cap of 50% of the minimum subsistence level 1, which is currently €251/month.

Disability pension:

In total, disability pension entitlements are an aggregate of already accrued pension points before and additional pension points after the occurrence of disability. Latter pension points are based on a virtual record of contribution. Since 2020, the virtual employment record for new pensioners is gradually increasing in line with the statutory retirement age, reaching age 67 in 2031.

As of July 1, 2024, the disability pensions will be increased by a supplement for pension entries between 2001 and 2018. The amount of the supplement is based on the earning points on which the current pension is based and on the start date of the reduced earning capacity pension. This reform aims to reduce a discrepancy between new pension entries and existing pensioners.

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[6] The catch-up factor is one component of the so-called safeguard clause included in the pension adjustment formula, and works in conjunction with the state pension guarantee, under which pension cuts are prohibited by law. It ensures that prior to the annual pension adjustment, consideration is first given to whether pension cuts that were actually necessary in the past but not implemented are to be included retrospectively, as, in principle, pensions track wages. The decision was taken in 2018 to suspend the catch-up factor up to and including 2025, but the new Federal Government committed itself to reactivating the catch-up factor.

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

As commonly agreed, all recently enacted pension reforms have been taken into account in the German 2023 pension projection exercise. In addition, all AWG assumptions regarding the demographic and macro-economic context have been fully taken into acount.

It is worthwhile to note that alternative assumptions for the demographic and labour market scenarios influence the projection results on pension expenditures.

2. Overview of the demographic and labour force projections[7]

Part 2 describes the main demographic changes implied by EUROPOP2023 and the changes in the labour force as projected by the cohort simulation model.

2.1. Demographic projections

Eurostat's latest population projection (2023) shows a temporary increase in Germany's population over the coming decades, before a decline sets in. The total population in 2070 will still be higher than in 2022. Migration assumptions for Germany are the main driver for the observed increase in the population. However, natural population growth in Germany has been negative for almost 40 years. Since the mid-1970s, the total fertility rate of 1.4 has been relatively stable over time and increased only recently to 1.5 which is still well below the replacement level of approximately 2.1. This means that the size of each new birth cohort is only about two-thirds of the size of its parent cohort. Due to the population dynamics and the assumption that fertility will remain below replacement level in the future, fertility is the main reason for a decreasing population in the more distant future, as can be seen in *Table 2*.

TABLE 2 – MAIN DEMOGRAPHIC VARIABLES

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Population (thousand)	83,895	85,274	85,173	84,788	84,314	84,237	85,338	2027	342
Population grow th rate	0.8%	0.0%	0.0%	-0.1%	0.0%	0.0%	1.1%	2023	-0.8%
Old-age dependency ratio (pop 65+ / pop 20-64)	37.4	44.4	49.5	49.9	52.7	55.0	55.0	2070	17.6
Old-age dependency ratio (pop 75+ / pop 20-74)	15.8	16.8	22.2	24.5	24.1	26.9	26.9	2070	11.2
Ageing of the aged (pop 80+ / pop 65+)	33.0	28.0	32.0	41.5	37.5	40.7	41.5	2051	7.7
Men - Life expectancy at birth	79.0	80.1	81.8	83.3	84.7	86.0	86.0	2070	7.0
Women - Life expectancy at birth	83.8	84.7	86.2	87.6	88.8	90.0	90.0	2070	6.2
Men - Life expectancy at 65	18.3	19.1	20.2	21.3	22.3	23.3	23.3	2070	5.0
Women - Life expectancy at 65	21.5	22.3	23.4	24.4	25.4	26.4	26.4	2070	4.9
Men - Survivor rate at 65+	86.2	87.7	89.6	91.3	92.6	93.8	93.8	2070	7.5
Women - Survivor rate at 65+	92.4	93.1	94.2	95.0	95.8	96.4	96.4	2070	4.1
Men - Survivor rate at 80+	56.2	60.2	65.4	70.2	74.4	78.0	78.0	2070	21.8
Women - Survivor rate at 80+	72.4	75.2	79.0	82.3	85.1	87.5	87.5	2070	15.1
Net migration (thousand)	1631.3	249.6	263.0	266.2	253.6	235.7	1631.3	2022	-1395.5
Net migration (% population previous year)	2.0%	0.3%	0.3%	0.3%	0.3%	0.3%	2.0%	2022	-1.7%

Source: Eurostat, European Commission.

In addition to low fertility rates, decreasing mortality rates - with the consequence of increasing life expectancy – are accelerating the demographic ageing of the German society. This is the main driving force for the pension expenditure evolution in Germany. Since 1960, the life expectancy at birth has increased from 66.5 to 79 years for males and from 71.7 to 83.8 years for females according to Eurostat. That implies an increase of more than 12 years within 60 years for both sexes. Even the remaining life expectancy at age 65 has been increasing during that period to 18.3 years for males and 21.5 years for females. *Table 2* shows a further - almost steady - increase for both indicators in the future.

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[7] For more details, see European Commission and EPC (2023), *'2024 Ageing Report: Underlying assumptions and projection methodologies'*, European Economy, Institutional Paper 257.

FIGURE 1 – AGE STRUCTURE: 2022 VS 2070
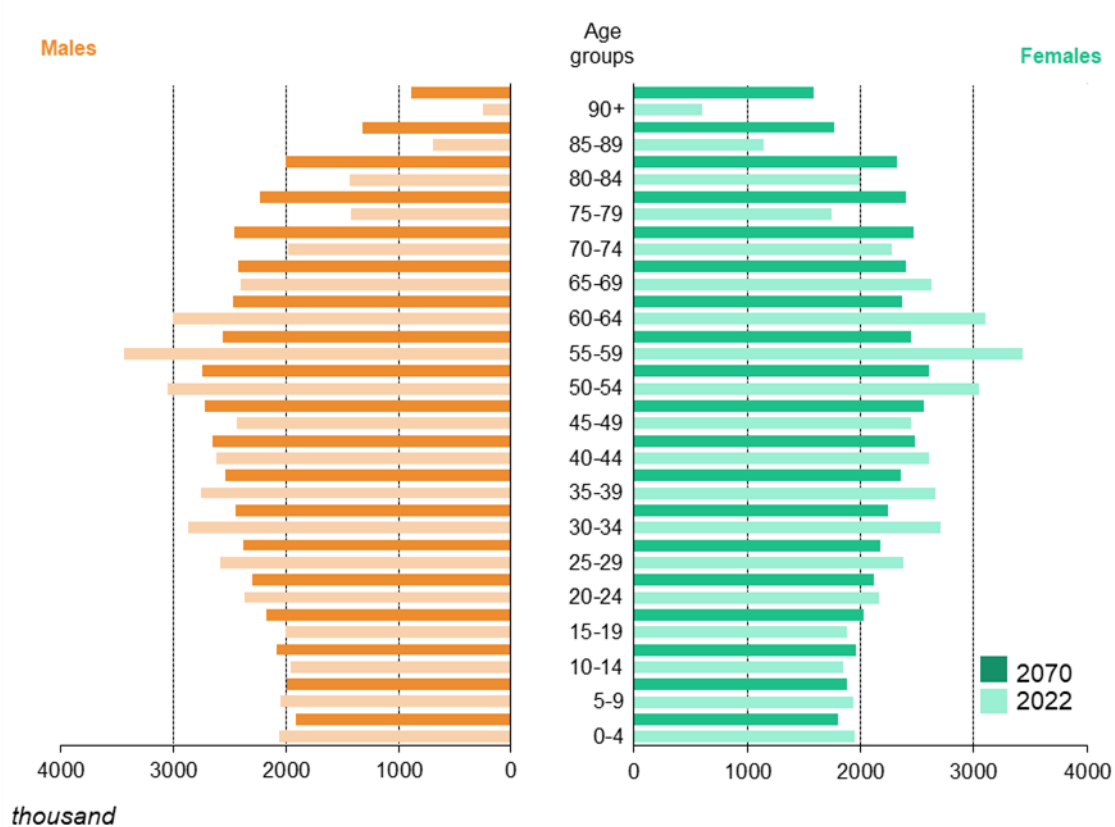
Source: Eurostat, European Commission.

Migration flows are the third component which affect population growth, but they are extremely difficult to predict. Decisions to migrate depend primarily on current political, economic and demographical developments in the countries of origin and destination. Eurostat models a positive albeit steadily decreasing net migration starting from a level of 1.46 million. in 2022, which is substantially higher than in previous years due to the migratory impact of the war in Ukraine.

As a consequence of the past fertility and mortality conditions and assumptions on migration, the old-age dependency ratio (number of people age 65 and above in relation to the number of people aged 15 to 64) will rise from 34.7% (2022) to 50.2% in 2070.

2.2. Labour force projections

In the near future, Germany will face a substantial societal change as a result of demographic developments. There will be a strong increase in the absolute number of people aged 65 or older, while the total population is expected to decrease after 2050. In the future, the working-age population will shrink. That will result in a situation where the so-called baby-boomers will leave the labour market and will become pension-beneficiaries (in technical terms) whereas the number of contributors will decrease accordingly.

To partially offset this development, the statutory retirement age will be raised from age 65 (in 2011) to age 67 by 2031. The relatively long transition period ensures that the working conditions are

adapted to an older workforce. This is a task for companies, social partners and policymakers to tackle together.

Apart from demography, labour force developments are strongly affected by age-specific participation rates. For more than a decade, Germany has made substantial progress in raising the employment and participation rates, especially for the age groups 55-64 and 65-74. Important experiences have been made and essential priorities have been identified for transforming workplaces progressively in line with changing demography patterns.

Since 2000, the employment rate for the age group 55-64 has almost doubled from 37.4% to 73.3%. While the employment rate for the age group 60-64 was at just 19.6% in 2000, it tripled to 61.1% in 2021. Hence, more and more older employees are findings that there is an increasing demand from employers for the practical, technical and theoretical expertise of older people.

The labour force is projected by the Commission on the basis of the demographic projections by ESTAT described in the previous section and the participation rates as projected by means of the cohort simulation model. Key variables are shown in Tables 3 and 4.

TABLE 3 – PARTICIPATION RATE, EMPLOYMENT RATE AND SHARE OF WORKERS

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Labour force participation rate 20-64	83.3	83.3	84.5	84.5	85.0	85.2	85.2	2070	1.9
Employment rate of workers aged 20-64	80.7	80.4	81.3	81.2	81.7	81.9	81.9	2070	1.2
Share of workers aged 20-64 in the labour force 20-64	96.9	96.5	96.2	96.2	96.2	96.2	97.1	2024	-0.8
Labour force participation rate 20-74	72.4	69.9	71.4	72.7	71.8	72.6	73.1	2047	0.2
Employment rate of workers aged 20-74	70.3	67.4	68.7	70.0	69.1	69.9	70.4	2047	-0.4
Share of workers aged 20-74 in the labour force 20-74	97.0	96.5	96.2	96.2	96.2	96.3	97.1	2024	-0.7
Labour force participation rate 55-64	75.3	72.9	76.3	76.0	77.0	77.9	77.9	2070	2.6
Employment rate of workers aged 55-64	73.3	70.6	73.8	73.4	74.4	75.2	75.2	2070	2.0
Share of workers aged 55-64 in the labour force 55-64	97.3	96.9	96.7	96.6	96.6	96.6	97.4	2024	-0.7
Labour force participation rate 65-74	14.5	13.0	12.7	15.0	14.9	15.6	15.6	2070	1.2
Employment rate of workers aged 65-74	14.3	12.8	12.5	14.8	14.7	15.4	15.4	2070	1.1
Share of workers aged 65-74 in the labour force 65-74	98.8	98.5	98.5	98.4	98.5	98.5	98.8	2022	-0.4
Median age of the labour force	42.0	41.0	42.0	42.0	41.0	42.0	42.0	2022	0.0

Source: European Commission.

Table 3 shows the expected changes in the employment and participation rates for the total population of working age (20-64 and 20-74) and for those age groups (55-64 and 65-74) that are the most affected by any pension reforms that shift retirement ages (either early or statutory) or by active labour market policies that aim at prolonging the working life. The future results from the underlying cohort simulation model depend crucially on the assumptions on the effects of legislated policy reforms - e.g. the increase of statutory retirement ages. Overall, the employment rate of workers aged 55-64 is projected to increase from 73.3% in 2022 to 75.2% in 2070. Given the observed labour market trends this seems to be a rather conservative estimate.

Due to the definition of the constant policy scenario, no significant further increase in labour market age-specific participation rates is expected after 2031, the year the statutory retirement age will finally converge to age 67 under current legislation (see *Table 4*).

TABLE 4 – LABOUR MARKET EXIT BEHAVIOUR

TOTAL	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	63.5								
Average labour market exit age (CSM)**	64.2	64.9	65.1	65.2	65.4	65.5	65.5	2070	1.2
Contributory period	45.9	47.0	47.0	47.0	47.0	47.0	47.0	2029	1.1
Duration of retirement***	18.3	20.7	21.8	22.9	23.9	24.9	24.9	2070	6.6
Duration of retirement/contributory period	40%	44%	46%	49%	51%	53%	53%	2070	13%
Percentage of adult life spent in retirement****	32%	32%	33%	34%	34%	35%	35%	2070	3%
Early/late exit*****	2.2	3.2	2.2	2.6	2.2	2.7	3.6	2028	0.5

MEN	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	63.5								
Average labour market exit age (CSM)**	64.4	65.1	65.2	65.3	65.4	65.5	65.5	2070	1.1
Contributory period	45.9	47.0	47.0	47.0	47.0	47.0	47.0	2029	1.1
Duration of retirement***	16.8	19.1	20.2	21.3	22.3	23.3	23.3	2070	6.5
Duration of retirement/contributory period	37%	41%	43%	45%	47%	50%	50%	2070	13%
Percentage of adult life spent in retirement****	30%	30%	31%	32%	33%	34%	34%	2070	4%
Early/late exit*****	1.8	2.8	2.1	2.4	2.1	2.6	3.2	2028	0.8

WOMEN	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	63.5								
Average labour market exit age (CSM)**	64.0	64.8	65.1	65.2	65.3	65.5	65.5	2070	1.4
Contributory period	45.9	47.0	47.0	47.0	47.0	47.0	47.0	2029	1.1
Duration of retirement***	19.8	22.3	23.4	24.4	25.4	26.4	26.4	2070	6.6
Duration of retirement/contributory period	43%	47%	50%	52%	54%	56%	56%	2070	13%
Percentage of adult life spent in retirement****	34%	33%	34%	35%	36%	37%	37%	2070	3%
Early/late exit*****	2.6	3.6	2.4	2.7	2.3	2.9	4.1	2028	0.3

*The 'average effective retirement age' is the age at which people start receiving a pension benefit (old-age, early or disability). It is calculated on the basis of the administrative data on new pensioners for 2022. ** 'Average labour market exit age (Cohort Simulation Model)' refers to 2023 instead of 2022. *** 'Duration of retirement' is the remaining life expectancy at the average labour market exit age. **** 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 exit the labour market before reaching the statutory retirement age and those who exit at or beyond the statutory retirement age. For 2022, the value refers to 2023.*

Source: European Commission.

3. Pension projection results

3.1. Coverage of the pension projections

The German projections exercise comprises the statutory and the civil servants pension scheme. Both schemes are projected separately. Furthermore, projections are separated into the three components of 'old-age and early pensions', 'disability pensions' and 'survivor's pensions'.

Occupational and private pension schemes have become widespread as a consequence of government incentives and tax treatment. The number of occupational pension entitlements (of active employees) increased from 14.6 million in 2001 to about 21.2 million in 2021 and the number of "Riester"-contracts in place reached a level of 15.9 million by 2022. It can be assumed that in 2019 about 66% of all employees aged 25 to 65 who are subject to social insurance contributions will be entitled to a supplementary occupational pension or a "Riester"-pension.

Box 3: Pension schemes for miners and farmers

As mentioned above, pension schemes for miners and farmers are not part of the pension expenditure projection exercise. Currently, pension expenditures related to miners amount to about 0.3% of GDP, while farmers' pension expenditures account for 0.07% of GDP. Within the concept of a collective of assured people, the share of pensioners has substantially increased during the last decades for both systems, while the share of contributors decreased due to structural changes of these economic sectors. Beside individual pension contributions the main part of expenditures is currently financed by state-subsidies.

At present, there are no sophisticated projection models exist for projecting the expenditure development of these two systems. Since, it is expected that the future number of pensioners within these two schemes will continue to decline significantly, the respective pension expenditures will also decrease substantially. Against this background, there will be no demographic pressure on these systems.

Table 5 provides an overview of the pension expenditures between 2009 and 2021 with an additional comparison of ESSPROS and AWG data. *Table 5* illustrates that the scope of the German EPC-AWG public pension projections differs from the Eurostat figures (ESSPROS). Differences are primarily due to the fact that the current German projection exercise does not include pension schemes for miners and farmers as well as specific non-cash benefits. Occupational and private pensions explain the small difference between Eurostat's total and public pension expenditures, which are expected to level off in the future.

TABLE 5 – ESSPROS AND AWG DEFINITION OF PENSION EXPENDITURE (%GDP)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	change 2013- last available year
Eurostat total pension expenditure	11.8	11.7	11.8	11.8	11.7	11.8	11.9	12.7	12.2	0.4
Eurostat public pension expenditure (A)	10.6	10.5	10.6	10.6	10.6	10.6	10.7	11.5	:	0.9
Public pension expenditure (AWG: outcome) (B)	10.0	9.9	10.0	10.1	10.0	10.0	10.2	10.9	10.5	0.5
Difference Eurostat/AWG: (A)-(B)	0.6	0.6	0.6	0.6	0.5	0.6	0.5	0.6	:	0.0

Source: Eurostat, European Commission.

3.2. Overview of projection results

As shown in *Table 6*, in the baseline scenario overall public pension expenditures are projected to increase - as a share of GDP - by 1.2 percentage points from 10.2% in 2022 to 11.4% in 2070. Due to the current favourable economic and demographic conditions - with regard to the relative age distribution - and past pension reforms, the 2022 rate is the lowest value over the projection horizon. In the coming years, the larger post-war baby-boomer cohorts will reach retirement age and the expenditure ratio will increase steeply until the mid-2030s. Given the decline of demographic pressure starting from the mid-2030s, the further increase of pension expenditure (as share of GDP) will be decelerated thereafter.

TABLE 6 – PROJECTED GROSS AND NET PENSION SPENDING AND CONTRIBUTIONS (%GDP)

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Expenditure									
Gross public pension expenditure	**10.2**	**10.8**	**11.1**	**11.0**	**11.2**	**11.4**	**11.4**	**2070**	**1.2**
Private occupational pensions	:	:	:	:	:	:	:	:	:
Private individual mandatory pensions	:	:	:	:	:	:	:	:	:
Private individual non-mandatory pensions	:	:	:	:	:	:	:	:	:
Gross total pension expenditure	10.2	10.8	11.1	11.0	11.2	11.4	11.4	2070	1.2
Net public pension expenditure*	9.2	9.6	9.7	9.6	9.7	9.9	9.9	2070	0.7
Net total pension expenditure*	9.2	9.6	9.7	9.6	9.7	9.9	9.9	2070	0.7
Contributions									
Public pension contributions	9.9	10.3	10.6	10.5	10.6	10.8	10.8	2069	0.9
Total pension contributions	9.9	10.3	10.6	10.5	10.6	10.8	10.8	2069	0.9
Balance of the public pension system (%GDP)**	-0.3%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.7%	2025	-0.3%

*Net pension expenditure excludes taxes on pensions and compulsory social security contributions paid by beneficiaries. **Public pension contributions - gross public pension expenditure (peak value/year shows most negative value).*

Source: European Commission, EPC.

Net public pension expenditure in *Table 6* increases at a lower rate than total expenditure. However, the actual level is lower as it is adjusted by pensioners' social security contributions to health and long-term care as well as by the projected average relative amount of taxes paid by this group. As far as personal income tax is concerned, Germany is in the process of changing the tax regime relating to contributions and pensions.[8] Therefore, the taxation of pensions from the statutory pension schemes is gradually changing from a system with partial taxation of contributions and practically no taxation of pension benefits into an opposite system. Pension contributions will be completely exempted from tax by 2025 and pension benefits will be completely taxed by 2040. For this projection, a linear increase up to the final respective year is assumed.[9]

Contributions (as a percentage of GDP) in *Table 6* increase almost proportionally to total expenditure, but on a higher level. Contributions include without limitation contributions by employers and employees, other social sub-systems, as well as state subsidies. An essential factor for explaining the difference to gross pension expenditures are the contributions for health insurance for pensioners, which are classified as expenditures of the statutory pension fund. During working life, statutory healthcare contributions are almost equally financed by employers and employees. Starting with retirement, the pension fund pays the contributions that were formerly financed by the employer. Contributions of the pension fund to health insurance for pensioners are not part of the individual

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[8] Legislated by the *Old-Age-Income-Act* (Alterseinkünftegesetz) in 2005.

[9] For detailed explanation see annex.

gross pension benefits. Nevertheless, those contributions are additional expenditures and hence part of overall pension expenditure of the statutory pension system.

Contributions of the pension fund to the statutory healthcare system account for about 0.7% of GDP in 2022 and rise to 0.8% of GDP in 2070. That is slightly more than the difference between the relative amount of contributions and total expenditures in *Table 6*, but since parts of pension benefits for civil servants are financed from appropriate reserve funds, contributions and expenditures are not necessarily identical, especially in the long run. Nevertheless, the parallel development of contributions and expenditures results from interaction of the contribution rate and the annual pension indexation. Both components ensure automatically the financial sustainability of the public pension system, as seen in the ratio of public pension expenditure and contributions to GDP in *Table 6*.

TABLE 7 – GROSS PUBLIC PENSION SPENDING BY SCHEME (% GDP)

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Total public pensions	10.2	10.8	11.1	11.0	11.2	11.4	11.4	2070	1.2
Old-age and early pensions	8.2	8.7	9.2	9.2	9.5	9.9	9.9	2070	1.7
Flat component	:	:	:	:	:	:	:	:	:
Earnings-related	8.2	8.7	9.2	9.2	9.5	9.9	9.9	2070	1.7
Minimum pensions (non-contributory)	:	:	:	:	:	:	:	:	:
Disability pensions	0.6	0.7	0.6	0.6	0.6	0.5	0.7	2031	0.0
Survivor pensions	1.5	1.4	1.3	1.2	1.1	1.0	1.5	2025	-0.5
Other pensions	:	:	:	:	:	:	:	:	:

Source: European Commission, EPC.

Table 7 shows how the overall evolution of pension expenditure within the projection horizon 2022-2070 is split among the three components '*old-age and early pensions*', '*disability pensions*' and '*survivor pensions*'. 'Old-age and early pensions' represent the largest category of total expenditure (as share of GDP) and are projected to increase by about 1.7 percentage points within the projection horizon. However, in the same time expenditures for survivor pensions will decrease by about 0.5 percentage point. The future decline of survivor pension expenditures stems from the fact that the probabilities of marriage are significantly lower for younger than for older cohorts and that male death rates are approaching those of women. Hence, the number of pensioners who receive a survivor's pension is projected to decrease with corresponding consequences for this type of pension expenditure. Furthermore, this pension is income-tested such that reductions in the income gap between genders also lead to a decrease in expenditure. Expenditure for disability pensions is expected to remain relatively stable over the projection horizon.

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

This part provides more details about the development of public pension expenditures (Table 8). It uses a standard arithmetic disaggregation of the pension expenditures-to-GDP ratio into the dependency ratio, coverage ratio, benefit ratio and a labour market effect (Figure 2, first equation). Two further sub-decompositions have been agreed in the past. First, the coverage ratio can be split to look into the take-up ratios for old-age pensions and early pensions (second equation in Figure 2). Second, the labour market indicator is further disaggregated according to the third equation in Figure 2. In order to identify more clearly the driving forces behind the above mentioned development of

public pension expenditure in the baseline variant, *Table 8* displays the decomposed factors of the pension expenditure to GDP ratio.

$$\frac{pension\ expenditure}{GDP} = \underset{dependency\ ratio}{\frac{population\ 65+}{population\ 20-64}} \times \underset{coverage\ ratio}{\frac{number\ of\ pensioners}{population\ 65+}} \times \underset{benefit\ ratio}{\frac{average\ pension\ income}{\frac{GDP}{hours\ worked\ 20-74}}} \times \underset{labour\ market\ effect}{\frac{population\ 20-64}{hours\ worked\ 20-74}} \qquad [1]$$

$$\frac{number\ of\ pensioners}{population\ 65+} = \underset{coverage\ ratio\ old\text{-}age}{\frac{number\ of\ pensioners\ 65+}{population\ 65+}} + \left(\underset{coverage\ ratio\ early\text{-}age}{\frac{number\ of\ pensioners\ \leq65}{population\ 50-64}} \times \underset{cohort\ effect}{\frac{population\ 50-64}{population\ 65+}} \right) \qquad [2]$$

$$\frac{population\ 20-64}{hours\ worked\ 20-74} = \underset{1/employment\ rate}{\frac{population\ 20-64}{employed\ people\ 20-64}} \times \underset{1/labour\ intensity}{\frac{employed\ people\ 20-64}{hours\ worked\ by\ people\ 20-64}} \times \underset{1/career\ shift}{\frac{hours\ worked\ by\ people\ 20-64}{hours\ worked\ by\ people\ 20-74}} \qquad [3]$$

Source: European Commission, EPC.

As highlighted with the *dependency ratio*, the demographics remains the main driving force related to the pension expenditure development over time. Following the retirement of the baby-boomer cohorts, the dependency ratio will steeply increase until the mid-2030s. Afterwards, the population's age distribution is projected to be more balanced between the number of pensioners and contributors. The coverage ratio, the inverted employment rate, the benefit ratio as well as the residual factor act as counterbalancing components compared to the demographic-related expenditure.

The increase in the statutory retirement age results in postponing the effective retirement age for future pensioners. This will reduce the *coverage ratio*, which contains the population aged 65+ in the denominator. In addition, the further reduction of the gender gap regarding life expectancy, combined with reduced probabilities of marriage in future pensioners' cohorts, will reduce the number of survivor pensions. Nevertheless, the effect of an increasing retirement age will start to level off after 2031, when the standard pension age of 67 will apply to all new pensioners. From then on, the contribution of the coverage ratio to decelerate the increase of pension expenditures becomes less important, and during the 2030s and 2040s even accelerates pension expenditure.

In the given decomposition, the *labour market effect* contributes overall to decelerating the pension expenditure. This effect is driven by the employment ratio effect. As expected, the incorporated *labour intensity effect* has no impact on the pension expenditure/GDP ratio.

The *benefit ratio* mitigates the increase of pension expenditures compared to GDP substantially. The initial decline in the benefit ratio's impact is due to the sustainability factor (accounting for changes in the ratio between pensioners and contributors) and the contribution rate factor (lowering pension

increases when the contribution rate was raised before) in the German pension formula. Therefore, it is expected that pensions will rise more slowly than wages.

	2022-30	2030-40	2040-50	2050-60	2060-70	2022-70
Public pensions to GDP	0.6	0.3	-0.1	0.2	0.2	1.2
Dependency ratio effect	1.9	1.2	0.1	0.6	0.5	4.3
Coverage ratio effect*	-0.6	0.3	0.3	0.0	-0.2	-0.2
Coverage ratio old-age	-0.4	0.5	0.3	0.1	-0.2	0.4
Coverage ratio early-age	0.6	-1.1	-0.1	0.1	-0.7	-1.2
Cohort effect	-2.7	-1.0	0.3	-1.1	-0.3	-4.9
Benefit ratio effect	-0.6	-1.1	-0.5	-0.3	0.0	-2.4
Labour market effect	0.0	-0.1	0.0	-0.1	0.0	-0.2
Employment ratio effect	0.0	-0.1	0.0	-0.1	0.0	-0.2
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	0.0	0.0	0.0	0.0	0.0	-0.1
Residual	-0.1	-0.1	0.0	0.0	0.0	-0.2

Source: European Commission, EPC.

As the penalty deductions for early retirement - introduced in the late 1990s - will increasingly unfold their full impact, average new pensions will decline compared to stock-pensions. Although unemployment still generates pension accruals, long periods of unemployment have a negative impact on future pension benefits. However, there is a partial counterbalancing effect caused by the growing female labour participation rates and the postponement of the effective retirement age, which will result in increased pension entitlements and a favourable ratio of contributors to pensioner. A positive impact of the *benefit ratio* (in the sense of reducing the pension expenditures) will remain over the whole projection horizon, but it will be less effective starting in the mid-2040s as a result of a more stable ratio of pensioners to labour force population.

As for the replacement rate at retirement in the statutory pension scheme, this value is calculated on the assumption that the average wage at retirement is five percentage points higher than the national average wage (over all ages) for the entire projection period. For further clarification, please see annex. As shown in Table 9, the replacement rate at retirement is expected to decrease from approximately 37% to 35% over the projection horizon. This development is a consequence of the sustainability factor in the pension indexation formula. This specific component of the pension indexation formula reflects the strong increase in the absolute number of people aged 65 or older while simultaneously the working age population is shrinking. This leads to a situation where the so-called baby-boomers will leave the labour market and will become pension-beneficiaries (in technical terms), whereas the number of contributors will decrease accordingly. Furthermore, this development is intensified by the fact, that - in absolute numbers - the very old post-war cohorts are much smaller than the baby-boomer cohorts.

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[10] For the disaggregation based on the number of *pensions*, see Table A3 in the methodological annex.

	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Public scheme (BR)	43%	42%	38%	36%	35%	35%	-8%
Coverage	100%	100%	100%	100%	100%	100%	0%
Public scheme: old-age earnings related (BR)	41%	40%	37%	35%	34%	34%	-6%
Public scheme: old-age earnings related (RR)	37%	37%	35%	35%	35%	35%	-2%
Coverage	85%	83%	86%	86%	87%	88%	4%
Private occupational scheme (BR)							
Private occupational scheme (RR)							
Coverage	:	:	:	:	:	:	:
Private individual schemes (BR)							
Private individual schemes (RR)							
Coverage	:	:	:	:	:	:	:
Total benefit ratio	43%	42%	38%	36%	35%	35%	-8%
Total replacement rate (earnings-related benefits)	:	:	:	:	:	:	:

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, EPC.

TABLE 10 – SYSTEM DEPENDENCY RATIO AND OLD-AGE DEPENDENCY RATIO

	2022	2030	2040	2050	2060	2070	change 2022-2070
Number of pensioners (thousand) (I)	23,083	24,813	27,544	28,501	29,206	29,455	6,372
Employment (thousand) (II)	42,501	40,819	40,023	39,981	39,206	38,814	-3,688
Pension system dependency ratio (SDR) (I)/(II)	0.5	0.6	0.7	0.7	0.7	0.8	0.2
Number of people aged 65+ (thousand) (III)	18,554	21,116	22,841	22,978	23,599	24,264	5,710
Working-age population 20-64 (thousand) (IV)	49,652	47,586	46,174	46,089	44,767	44,141	-5,511
Old-age dependency ratio (OADR) (III)/(IV)	0.4	0.4	0.5	0.5	0.5	0.5	0.2
System efficiency (SDR/OADR)	1.5	1.4	1.4	1.4	1.4	1.4	-0.1

Source: European Commission, EPC.

As stated above, the demographic ageing of the German population is the main driving force of the future development of pension expenditure in relation to GDP. *Table 10* illustrates that compared to the 2022 the number of pensioners will increase by 27.6% until 2070. The number of people aged 65+ will even increase by approximately 30.8% within the same period. Simultaneously, the number of employed individuals will decline by just under 9% by 2070.

The figures display that the increase of the statutory retirement age - combined with the withdrawal of early retirement incentives - will lead to an increase of the number of pensioners that grows at a much lower pace than the number of people aged 65+. Additionally, the working age population decreases stronger than the number of employed people. Nevertheless, the ratio of contributors to pensioners will decline strongly when baby-boomer cohorts enter retirement ages in the upcoming years.

Tables 11 to 12 show the ratio of pensioners to total population and to the inactive population, respectively, by age groups and gender (overall and female only). The latter is by definition the total population minus labour force (including employees and unemployed).

Ratios above 100% occur as the current projection also depicts foreign pensions and pensioners (pensions abroad). Additionally, a person can receive pension benefits from both the public civil

servants' scheme and the statutory pension system simultaneously. Due to model restrictions, it is not possible to match these two benefits to one person.

TABLE 11 – PUBLIC PENSIONERS TO (INACTIVE) POPULATION BY AGE GROUP (%)

pensioners / inactive population	2022	2030	2040	2050	2060	2070
Age group -54	3.5	3.2	3.3	3.1	2.9	3.0
Age group 55-59	52.3	57.3	57.6	57.3	60.7	57.5
Age group 60-64	69.1	60.4	67.2	64.4	66.6	65.9
Age group 65-69	121.8	111.2	133.7	129.4	129.0	128.4
Age group 70-74	120.7	112.8	121.0	126.7	121.7	121.9
Age group 75+	115.7	115.3	111.8	118.2	121.6	118.9

pensioners / total population	2022	2030	2040	2050	2060	2070
Age group -54	1.3	1.2	1.2	1.1	1.1	1.1
Age group 55-59	8.3	9.3	8.9	8.6	8.4	7.9
Age group 60-64	24.0	21.7	22.1	21.0	21.1	20.4
Age group 65-69	97.9	90.1	105.7	100.3	99.1	97.1
Age group 70-74	110.6	106.6	114.0	118.6	113.5	113.3
Age group 75+	115.7	115.3	111.8	118.2	121.6	118.9

Source: European Commission, EPC.

TABLE 12 – FEMALE PENSIONERS TO (INACTIVE) POPULATION BY AGE GROUP (%)

female pensioners / inactive population	2022	2030	2040	2050	2060	2070
Age group -54	3.8	3.4	3.6	3.4	3.1	3.3
Age group 55-59	47.2	53.8	54.1	58.7	63.8	61.5
Age group 60-64	64.8	58.4	64.4	63.2	68.0	67.9
Age group 65-69	119.3	109.8	127.3	120.1	120.9	122.6
Age group 70-74	118.2	114.6	120.4	121.1	115.6	118.5
Age group 75+	117.3	118.5	116.1	120.4	121.0	117.0

female pensioners / total population	2022	2030	2040	2050	2060	2070
Age group -54	1.5	1.4	1.4	1.3	1.3	1.3
Age group 55-59	9.3	10.4	9.7	9.5	9.4	8.8
Age group 60-64	25.3	22.9	22.8	21.4	22.0	21.3
Age group 65-69	99.9	91.6	103.2	95.5	94.7	94.3
Age group 70-74	111.6	108.8	114.0	113.9	108.4	110.9
Age group 75+	117.3	118.5	116.1	120.4	121.0	117.0

Source: European Commission, EPC.

Overall, the ratios in *Table 11* and *Table 12* are strongly influenced by labour market dynamics. A proper description of the ratios' development over time should be able to extract these effects, which is rather complicated. Therefore, a ratio of pensioners to the total population for the same age groups, is also calculated. Especially for the age groups 60-64 and 65-69 the declining ratios in the next 10 years reflect quite clearly the effect of postponing the retirement age due to the increase of the statutory retirement until 2031.

Individual pension benefits accrued in the German statutory pension scheme are based on the number of individual pension points accrued during working life. The quantity of pension points *p.a.* depends in general on the proportion of individual gross wage to economy-wide average wage. Furthermore,

credits for specific periods raise the individual pension entitlements. Hence, the number of pension points is not necessarily comparable to the length of the working career. In addition, there is no direct link between the cost of pension points and the number of pension points. The absolute costs of a pension point *p.a.* depend on the level of the contribution rate and the individual gross wage in that specific year as limited by the corresponding earnings ceiling.

Table 13 shows the main driving forces behind the future development of expenditure for new pensions by gender. Despite the increase of the statutory retirement age, the number of new old-age and early pensions will increase within the next two decades, as the baby-boomers will reach retirement ages. After the baby-boomers have retired by the mid-2030s, the number of new retirees will decline and reach a lower level in 2070 than the initial level in 2022. The pension point value will increase - according to the pension indexation formula - on a lower level than wages. A future increase of the average number of individual pension points can mainly be explained by an extended working lifetime and the projected higher labour market participation, especially of women and older people. However, differences between cohorts emerge due to varying pension claims already accrued in the base year. In *Table 13*, the value for the category "sustainability/adjustment factors" is constantly declared to be 1.0. That declaration is necessary to obtain a transparent and consistent correlation between the projected new pension expenditures and the categories "number of new pensions", "total pension points at retirement" and "point value". That definition does not mean that the German statutory pension system has no sustainability elements implemented. It clarifies that the pension point value in year *t* for new pensioners in year *t* contains already all previous adjustments by the sustainability factor before the year *t*. Furthermore, the pension point value is equal for stock and new pensions. Hence, the current pension point value in year *t* reflects the adjustment by the sustainability factor for stock and new pensions.

TOTAL	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	6,589	9,006	10,060	15,966	21,448	26,927
I. Number of new pensions (1000)	857.0	871.0	736.2	827.0	793.5	728.6
II. Point value (EUR/month)	35.0	44.6	58.6	82.5	113.4	154.5
III. Average accrual rate (points/year) (IV/V)	0.8	0.8	0.8	0.8	0.8	0.8
IV. Total pension points at retirement	37	39	39	39	40	40
V. Average contributory period (years)	46	47	47	47	47	47
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

MEN	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	4,067	5,730	6,559	10,570	14,094	17,371
I. Number of new pensions (1000)	405.3	426.3	373.9	432.9	416.9	377.5
II. Point value (EUR/month)	35.0	44.6	58.6	82.5	113.4	154.5
III. Average accrual rate (points/year) (IV/V)	1.0	1.1	1.1	1.0	1.1	1.1
IV. Total pension points at retirement	48	50	50	49	50	50
V. Average contributory period (years)	46	47	47	47	47	47
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

WOMEN	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	2,522	3,276	3,501	5,396	7,354	9,556
I. Number of new pensions (1000)	451.8	444.7	362.3	394.2	376.6	351.1
II. Point value (EUR/month)	35.0	44.6	58.6	82.5	113.4	154.5
III. Average accrual rate (points/year) (IV/V)	0.6	0.6	0.6	0.6	0.6	0.6
IV. Total pension points at retirement	27	28	27	28	29	29
V. Average contributory period (years)	46	47	47	47	47	47
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

*New pension expenditure equals the product of I, II, IV, VI, VII & VIII.

Source: European Commission, EPC.

3.4. Financing of the pension system

Table 14 gives an overview of the financing of the system.

TABLE 14 – FINANCING OF THE PUBLIC PENSION SYSTEM

	Public employees	Private employees	Self-employed
Contribution base	38,901	38,901	38,901
Contribution rate/contribution			
Employer	9.3%	9.3%	18.6%
Employee	9.3%	9.3%	
State*	-	-	-
Other revenues*	State subsidies with annual indexation. "Sustainability fund" fluctuating between 0.2 and 1.5 of monthly pension expenditures. Contribution rate is set to meet this requirement.	State subsidies with annual indexation. "Sustainability fund" fluctuating between 0.2 and 1.5 of monthly pension expenditures. Contribution rate is set to meet this requirement.	State subsidies with annual indexation. "Sustainability fund" fluctuating between 0.2 and 1.5 of monthly pension expenditures. Contribution rate is set to meet this requirement.
Maximum contribution	7,868	7,868	15,736
Minimum contribution	0	0	0

*Only legislated contributions are reported.

Source: European Commission, EPC.

Table 15 shows the breakdown of public pension schemes' revenues. Contributions to the statutory pension scheme - except the state contributions - are financed equally by employees and employers as a percentage (the contribution rate) of gross wage up to the respective income ceiling. State contributions contain contributions to the civil servants' pension scheme and the statutory pension scheme. The civil servants pension scheme is completely tax-financed. In contrast, state subsidies to the statutory pension scheme compensate the intra-social policy components of the pension system. These refer to benefits, which are not geared to cover the risk of longevity, in particular disability benefits based on the virtual employment career (see explanation in *chapter 1.1*) and survivor benefits. Furthermore, state contribution refers to child-bearing benefits and liabilities related to German reunification and World War II. State subsidies are adjusted annually. The indexation is generally in line with gross wage and contribution rate development. In consequence, an almost constant ratio of state contribution related to GDP is guaranteed.

TABLE 15 – REVENUE FROM CONTRIBUTIONS AND NUMBER OF CONTRIBUTORS IN THE PUBLIC SCHEME

	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Public pension contributions (%GDP)	9.9	10.3	10.6	10.5	10.6	10.8	0.9
Employer contributions	*3.0*	*3.1*	*3.2*	*3.2*	*3.2*	*3.3*	*0.3*
Employee contributions	*3.0*	*3.1*	*3.2*	*3.2*	*3.2*	*3.3*	*0.3*
State contribution*	*3.9*	*4.2*	*4.2*	*4.1*	*4.2*	*4.2*	*0.4*
Other revenues*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Number of contributors (I) (1000)	37037	35400	34311	34276	33613	33277	-3759
Employment (II) (1000)	42501	40819	40023	39981	39206	38814	-3688
(I) / (II)	0.87	0.87	0.86	0.86	0.86	0.86	0.0

*Includes only legislated contributions.

Source: European Commission, EPC.

3.5. Public pension funds

The reported assets only refer to the pre-funded elements of the public pensions accruing to civil servants, which form a particular sub-group of public-sector employees that is covered outside the Statutory Pension Scheme. Civil servants' pensions are basically financed from current budgets of responsible bodies, with small amounts of partial (and temporary) pre-funding for future expenditure. The build-up (mainly from reduced adjustments to civil servants' salaries) and decumulation of assets is projected in accordance with the provisions currently in force for the federal government. The build-up of the stock of assets will continue until 2031, while the reduction is scheduled to start in 2032. Between 2000 and 2021 the assets' annual returns were on a downward trend, yielding on average a nominal return of 3.2% and reaching 1.1% in 2022. In the upcoming years annual nominal returns are projected to rise again to 2.6% by 2032 and then in the long-term to 4.0%. Returns in T+10 (and beyond) are based on the interest-rate assumptions included in the macroeconomic assumptions for Germany. Due to the fact that the assets only refer to the public pensions accruing to civil servants but not in general to the statutory pension system, there is no link to Tables 14 and 15.

TABLE 16 – PENSION FUNDS' POSITION AND RESERVES (%GDP) AND RETURN ON ASSETS (%)

	average 2012-2021	2022	2030	2040	2050	2060	2070	average 2022-2070
Stock of assets (end-of-year; %GDP)	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.1
Fund balance (million EUR)		388.7	217.3	-463.5	-74.5	0.0	0.0	
Fund expenditure		0.0	0.0	661.2	77.3	0.0	0.0	
Disbursements (to pension scheme)		0.0	0.0	661.2	77.3	0.0	0.0	
Other expenditure (incl. administrative costs)		0.0	0.0	0.0	0.0	0.0	0.0	
Fund revenues		388.7	217.3	197.7	2.9	0.0	0.0	
Return on assets		72.8	217.3	197.7	2.9	0.0	0.0	
Other income (incl. pension contributions)		315.9	0.0	0.0	0.0	0.0	0.0	
Nominal rate of return (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in asset valuation (million EUR)		0.0	0.0	0.0	0.0	0.0	0.0	

Source: European Commission, EPC.

3.6. Sensitivity analysis

In order to analyse the validity of the assumption-setting in the baseline variant, eight additional sensitivity scenarios were calculated. The results are presented in *Table 17*. By interpreting each of the following variants it should be kept in mind that, due to the specific impacts of certain components of the pension point value indexation (see *Formula 3*), none of the eight sensitivity scenarios demonstrates an isolated effect of e.g. higher life expectancy, lower migration, etc. solely. Each variation leads to changes in the development of the pension contribution rate and the pension indexation, which again result in an impact on the statutory pension system's revenues and expenditure.

Public pension expenditure	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Baseline (%GDP)	10.2	10.8	11.1	11.0	11.2	11.4	1.2
Higher life expectancy at birth (+2y)	0.0	0.0	0.1	0.1	0.2	0.3	0.3
Higher migration (+33%)	0.0	-0.1	-0.3	-0.5	-0.5	-0.6	-0.6
Lower migration (-33%)	0.0	0.1	0.3	0.5	0.6	0.6	0.6
Lower fertility (-20%)	0.0	0.0	0.0	0.2	0.4	0.6	0.6
Higher inflation scenario (2% by 2052)	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
Higher employment rate of older workers (+10 pps)	0.0	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2
Higher productivity (TFP converges to 1%)	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Lower productivity (TFP converges to 0.6%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Policy scenario: link retirement age to longevity	0.0	0.0	-0.2	-0.4	-0.6	-0.9	-0.9
Policy scenario: constant retirement age	0.0	0.2	0.3	0.3	0.4	0.4	0.4
Policy scenario: constant benefit ratio	0.0	0.0	0.1	0.4	0.7	0.7	0.7

Source: European Commission, EPC.

- *Higher life expectancy (2 extra years)*

Because higher life expectancy alters the number of pensioners when all other variables remain constant, an increase of pension expenditure - compared to the baseline scenario - can be observed.

- *Higher/Lower migration (+/- 33%)*

The different age structure of immigrants and emigrants and the total effect of the population size explain most of the observed results: Higher (lower) migration, due to more (fewer) immigrants, increases (reduces) labour supply and employment and hence GDP, but decreases (increases) the pension entitlements due to more (fewer) emigrants on the other hand, the pension expenditure/GDP ratio will decrease (increase) compared to the baseline scenario.

- *Lower fertility (- 20%)*

In comparison to the baseline scenario a lower fertility reduces the number of contributors while wages are not affected. Together with a lower GDP the pension expenditures in relation to GDP increase over the projection horizon.

- *Higher inflation scenario*

Because pension benefits basically are indexed in line with nominal wages (as a starting point), a change in inflation has only minor effects on the results of these scenarios compared to the baseline variant.

- *Higher employment of older workers (+10pp.)*

Because higher (lower) employment rates do not only result in a higher (lower) GDP, but also increase the pension entitlements, only a minor reduction in expenditures is observed. The fact, that the

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[11] For more information on the design of the sensitivity scenarios, see Chapter 5 of Part I in European Commission and EPC (2023), '*2024 Ageing Report: Underlying assumptions and projection methodologies*', European Economy, Institutional Paper 257.

increase of additional pension entitlements is weighted by the sustainability factor, explains the minor effect.

- *Higher/Lower TFP growth*

Because pension benefits are basically indexed in line with nominal wages (as a starting point), a change in labour productivity has only a minor effect on the results of these scenarios compared to the baseline variant.

- *Linking statutory retirement age to increase in life expectancy*

This scenario was included in the sensitivity test to discuss the question whether a further increase of the statutory retirement age is needed to guarantee financial sustainability of public pension systems. The present approach keeps the current pension payment period constant. A review of the question whether the coming gains in life expectancy will be one to one gains of life in good health and therefore working time - as the assumptions implicate - has not been considered. Furthermore, there is abstraction from adequate reaction of the labour market. Assumptions regarding future employability of older people are not considered. In addition, probabilities for entering into a disability pension are kept as constant. Hence, results of this artificial scenario calculation should be interpreted carefully.

- *Unchanged retirement age*

This scenario assumes that the main eligibility requirements (early and statutory retirement age, career requirement) are unchanged over the projection horizon from the starting point. As a consequence, there is an increase in pension expenditures.

- *Offset declining pension benefit ratio*

This scenario assumes policy measures are taken once the (earnings-related) public pension benefit ratio would decrease by 10% relative to the base year. As a consequence, there is an increase in pension expenditures.

3.7. Changes in comparison with previous Ageing Report projections

Table 18 represents the changing impact of the main items concerning the decomposition of pension expenditures since the 2006 AWG-projection exercise. Before interpreting each variable over time, it should be kept in mind that none of these values is comparable over time precisely, due to different projection horizons and varying assumptions.

However, the pension expenditures as share of GDP are projected to increase in the current exercise by 1.2 percentage points from 2022 to 2070. That is less than in the earlier projections because of more favourable demographic and economic assumptions.

Due to distinct differences between the latest Eurostat population projection (2023) and the previous projection in 2021 for Germany, the dependency ratio declines in the 2024 projection exercises. The coverage ratio is affected by various demographic components (e.g., increasing life expectancy, decreasing probabilities of marriage). Nevertheless, the lower coverage ratio effect (compared to the 2021 exercise) is also influenced by the projected increase of female labour force participation rates and therefore longer contribution periods. The impact of the benefit ratio is more mitigating than in the last projection exercise. In contrast to that, labour market effects only play a marginal role.

TABLE 18 – DISAGGREGATION OF THE CHANGE IN THE PUBLIC PENSION EXPENDITURE-TO-GDP RATIO IN CONSECUTIVE AGEING REPORTS (PPS OF GDP)

	Public pension expenditure	Dependency ratio effect	Coverage ratio effect	Benefit ratio effect	Labour market effect	Residual (incl. interaction effect)
2006 Ageing Report (2004-2050)	**1.9**	7.5	-0.6	-3.5	-1.1	-0.4
2009 Ageing Report (2007-2060)	**2.3**	7.9	-1.9	-2.2	-0.8	-0.8
2012 Ageing Report (2010-2060)	**2.6**	7.9	-1.8	-2.2	-0.4	-0.9
2015 Ageing Report (2013-2060)	**2.7**	7.3	-1.3	-2.2	-0.7	-0.4
2018 Ageing Report (2016-2070)	**2.4**	6.6	-1.3	-2.4	-0.3	-0.3
2021 Ageing Report (2019-2070)	**2.1**	4.9	-0.9	-1.4	-0.2	-0.3
2024 Ageing Report (2022-2070)	**1.2**	4.3	-0.2	-2.4	-0.2	-0.2

- The disaggregation for 2006/2009/2012 is on the basis of the number of pensions; for the other vintages it is on the basis of pensioners.
- The projection horizon has been extended over consecutive Ageing Reports, limiting comparability over time.

Source: European Commission, EPC.

Tables 19 and 20 display an overview of the decomposition of the difference between the projection exercise in 2021 and 2024.

TABLE 19 – DISAGGREGATION OF THE DIFFERENCE BETWEEN THE 2021 PROJECTIONS AND ACTUAL PUBLIC PENSION EXPENDITURE IN 2019-2022 (%GDP)

	2019	2020	2021	2022
Ageing Report 2021 projections (%GDP)	10.3	11.2	10.8	10.8
Assumptions (pps of GDP)	-0.1	-0.3	-0.3	-0.6
Coverage of projections (pps of GDP)	0.0	0.0	0.0	0.0
Constant policy impact (pps of GDP)	0.0	0.0	0.0	0.0
Policy-related impact (pps of GDP)	0.0	0.0	0.0	0.0
Actual public pension expenditure (%GDP)	10.2	10.9	10.5	10.2

Source: European Commission, EPC.

TABLE 20 – DISAGGREGATION OF THE DIFFERENCE BETWEEN THE 2021 AND THE NEW PUBLIC PENSION PROJECTIONS (%GDP)

	2022	2030	2040	2050	2060	2070
Ageing Report 2021 projections	10.8	11.5	12.0	12.2	12.5	12.4
Change in assumptions (pps of GDP)	-0.6	-0.7	-0.9	-1.2	-1.3	-1.0
Improvement in the coverage or in the modelling (pps of GDP)	0.0	0.0	0.0	0.0	0.0	0.0
Change in the interpretation of constant policy (pps of GDP)	0.0	0.0	0.0	0.0	0.0	0.0
Policy-related changes (pps of GDP)	0.0	0.0	0.0	0.0	0.0	0.0
New projections	10.2	10.8	11.1	11.0	11.2	11.4

Source: European Commission, EPC.

4. Description of the pension projection model and the base data

4.1. Institutional context in which the projections are made

The pension model for the statutory pension scheme is operated jointly by the Federal Ministry of Labour and Social Affairs and the German Federal Insurance Fund (Deutsche Rentenversicherung). A joint working group with experts of both institutions project the financial development of the statutory pension scheme. Meetings are scheduled at least four times a year. The projected results are used for indexation of the pension point value, the fixation of the contribution rate and the assessment of pension reforms and long-term planning.

4.2. Data used to run the model

The models incorporate data from numerous sources. Most data relating to pensions is provided by the official statistics of the *German statutory pension insurance scheme*. Population data is provided by the *Federal Statistical Office* (Statistisches Bundesamt). The set of long-term demographic and macroeconomic assumptions is set by the governmental committee on "Achieving financial sustainability for the social security system" and supplemented by short- and medium-term economic forecasts of the government. However, this projection exercise is based on the commonly agreed (AWG) assumptions. Fertility rates, mortality rates and migration assumptions are in line with the assumptions of the latest population projection of Eurostat (2023). For future employment growth as well as for the future participation rates the AWG pre-settings are used. AWG labour productivity assumptions are applied to model real wage growth. The following data sets are included:

- number of pensions (DRV),
- average pension benefit of the persons already retired (DRV),
- new pensions (DRV),
- average pension benefit of new pensions (DRV),
- population projection, mortality and fertility rates (Eurostat scenarios),
- labour market (AWG scenarios),
- gross wages (AWG scenario).

4.3. Reforms incorporated in the model

All originally model components with national focus are calibrated in order to fully comply with the *Ageing Working Group* (AWG) assumptions.

4.4. General description of the model(s)

Basically, the pension model consists of two sub-models: a cohort model for the projection of the demographic components on pension expenditures (demographic cohort pension model) and a model for the calculation of the dynamic financial development regarding the pension adjustment and the contribution rate (financial pension model). As already noticed, the model distinguishes between the Western and Eastern part of Germany.

4.5.1 The demographic cohort pension model

The demographic pension model is based on a cohort approach. In general, the number of stock pensions in year *t*+1 for a specific cohort *y* results from the number of pensions in year *t,y* plus new pensions minus pensions expiring due to death. Because of the possibility to receive pensions from more than one pension scheme simultaneously (e. g. old age pension and a survivor's pension), the original model runs with the number of pensions and not with the number of pensioners. The number of expired pensions in each projection year is equal to the number of pensions in year *t* multiplied by the mortality rates given the AWG population scenario. Conditional on age and gender-specific marriage probabilities, spouses of the deceased retirees will be granted survivor pensions. Newly granted old-age and disability pensions are calculated with probabilities of pension entry, estimated on the basis of past trends, while also taking into account the legislated increase of the statutory retirement age. *Figure 3* illustrates the main interdependencies of this model for Western Germany.

Figure 3:   The demographic cohort pension model
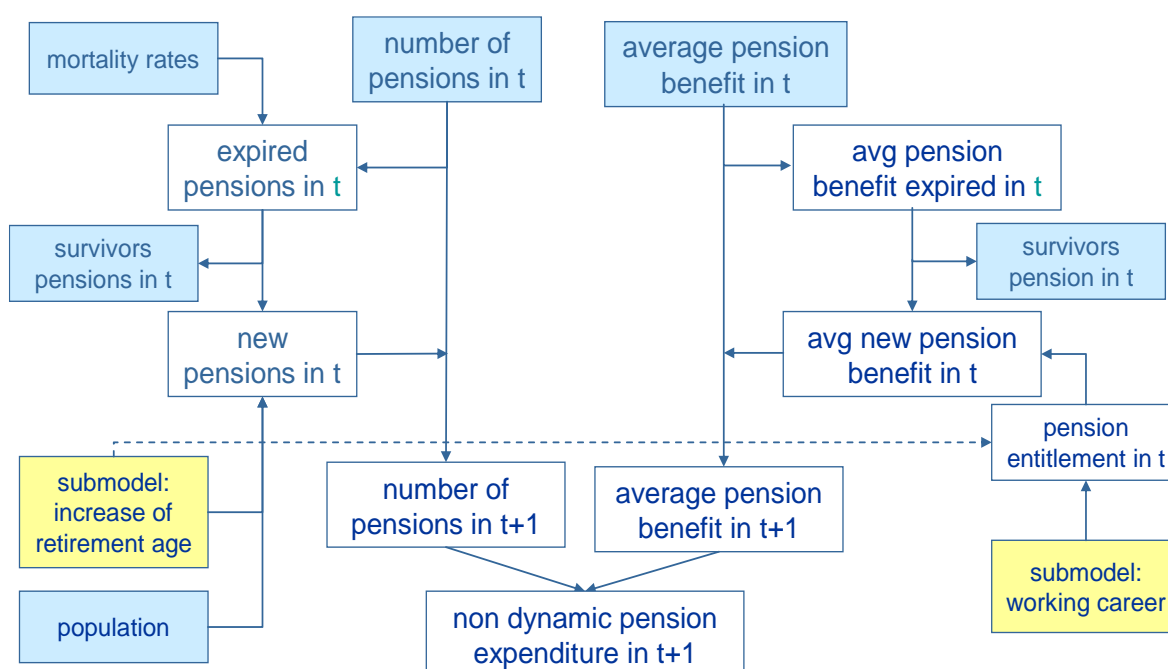
The projection of the average pension benefits is similar to the calculation of the number of pensions (see, *figure 3*). In addition, the impacts of changing labour market conditions (e. g. unemployment and participation rates) are taken into account for projecting pension entitlements. Likewise, the deduction on pensions in the case of early retirement is considered.

Multiplying the number of pensions by the average pension benefit yields *non-dynamic* pension expenditures. Up to this stage no pension-indexation is taken into account and *non-dynamic* expenditures capture therefore demographic and labour market trends as well as projected employment biographies of future pensioners solely.

The model is slightly modified for the projection of pension expenditures in the Eastern part of Germany to account for differences in per capita income, probabilities of pension entry and pension benefits. However, it is assumed that the share of insured persons in the statutory pension scheme and average income levels in both parts of Germany will converge.

4.5.2 The financial pension model

The financial pension model aims to project *dynamic* pension expenditures. The main difference between *non-dynamic* and *dynamic* pension expenditures is the indexation of pension benefits by calculating and applying the pension point value (see *Figure 4*). Moreover, within this model the contribution rate for the statutory pension scheme is calculated on the condition that revenues and expenditures have to be in balance in every year. As stated in chapter 1, there is no adjustment of the contribution rate as long as the 'sustainability fund' of the German statutory pension insurance scheme holds an amount between 0.2 and 1.5 of monthly pension expenditures.

Considering the pension point value, the model demonstrates the evolution of dynamic pension expenditure taking into account other expenditure items (e. g. rehabilitation or administrative costs). As seen in *formula 3*, the indexation of the pension point value depends on the development of gross wages, changes in the contribution rate and the sustainability factor.

The revenues of the pension system stem from pension contributions and governmental subsidies. Revenues from the federal budget are adjusted on wage growth and the change of the contribution rate. The corresponding mechanism follows rules encoded into law. Contributions depend on the number of employees, the number of unemployed - as the *Federal Employment Agency* (Bundesanstalt für Arbeit) is transferring contributions for this group -, the development of wages (AWG scenario) and the level of the contribution rate.

Figure 4: The financial pension model
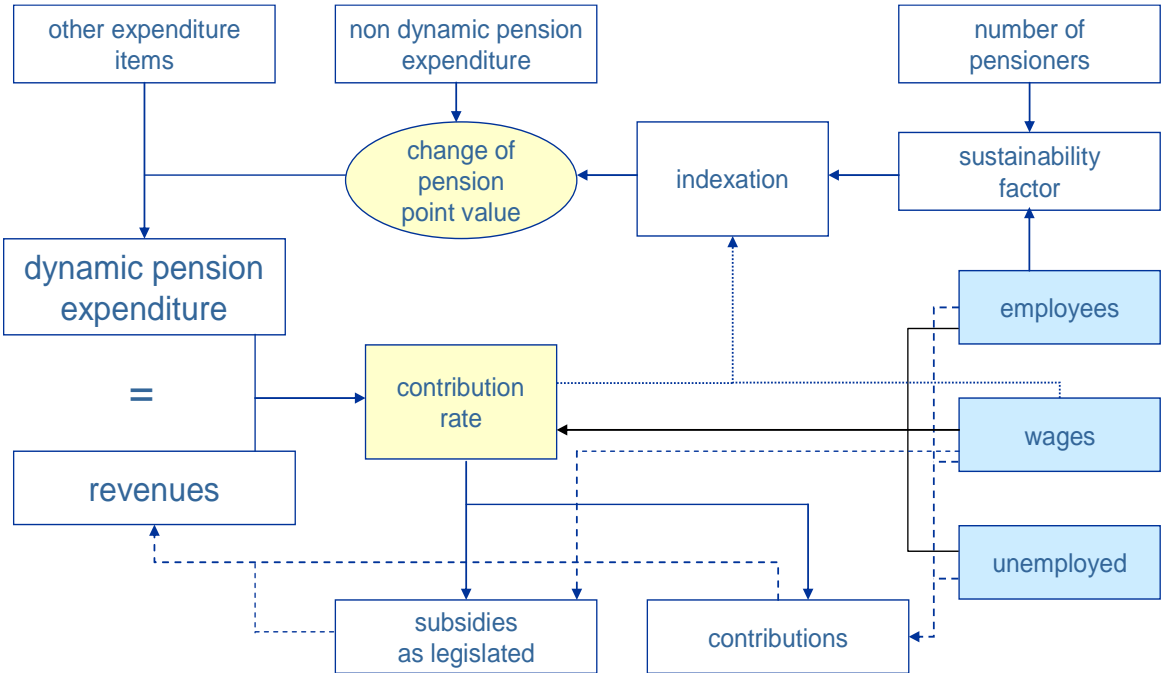
Methodological annex

The indexation formula

Pensions are adjusted annually on 1st of July. *Formula 4* displays the indexation of the pension point value for year *t*.

Formula 4: $\quad ppv_t = ppv_{t-1} \times \dfrac{ae_{t-1}}{ae_{t-2}^{\bullet}} \times \dfrac{100 - rf_{t-1} - cr_{t-1}}{100 - rf_{t-2} - cr_{t-2}} \times \left(\left(1 - \dfrac{pc_{t-1}}{pc_{t-2}} \right) \times \alpha + 1 \right)$, where

$$ppv_t = ppv_{t-1} \times \underset{\text{factor}}{\text{wage}} \times \underset{\text{factor}}{\text{contribution}} \times \underset{\text{factor}}{\text{sustainability}}$$

$\quad ppv \;=\;$ pension point value,
$\quad ae \;\;=\;$ average wage based on National Accounts,
$\quad ae^{\bullet} \;=\;$ adjusted average wage,
$\quad rf \;\;=\;$ contribution rate to subsidised private pension scheme,
$\quad cr \;\;=\;$ contribution rate to statutory pension scheme,
$\quad pc \;\;=\;$ equivalent pensioners/contributors ratio,
$\quad \alpha \;\;\;=\;$ allocation factor = 0.25.

Formula 4 is equivalent to the more general *formula 3*. The pension point value is adjusted in line with the growth of average earnings and the change of the contribution and the sustainability factor as well. However, due to specific safeguard laws the adjustment of the pension point value must not be lower than zero.

Regarding the calculation of the *wage-factor*, National Accounts data is used as basis. Taking into account different trends of average wages based on National Accounts and based on contributors to the statutory pension scheme, a correction factor ($ae_{t-2}^{\bullet}$) is integrated in *formula 4*: Due to statistical specifics the time lag of this factor reaches to *t* - 3. A lower increase of contributors' average wages compared to the corresponding National Accounts' data reduces the adjustment and vice versa (see, *formula 5*).

Formula 5: $\quad ae_{t-2}^{\bullet} = ae_{t-2} * \dfrac{ae_{t-2}/ae_{t-3}}{ae_{t-2}^{ps}/ae_{t-3}^{ps}}$, where

$\quad ae^{\bullet} \;=\;$ adjusted average wages,
$\quad ae \;\;=\;$ average wages based on National Accounts,
$\quad ae^{ps} \;=\;$ average wages of contributors to statutory pension scheme.

The *contribution-factor* leads to a reduction of the adjustment if the contribution rate to the statutory pension scheme has increased in the previous year.

In order to maintain the long-term financial sustainability of the statutory pension scheme, the *sustainability-factor* is included in the indexation formula. This factor causes a reduction of the adjustment if the number of those financing the pension system (contributors) decreases and/or if the number of pensioners increases. Therefore, the sustainability factor takes account of the fluctuation of the pensioner/contributor ratio. There is the hypothesis that a decrease in mortality rates by 10% would result in an increase of the number of pensioners by 10% and respectively to an increase of pension expenditures by 10%: The mechanism of the sustainability factor would decelerate the originally expected upward-movement of expenditures, explicitly relieving the financial burden of contributors. The same mechanism operates vice versa regarding the number of contributors. Hence, the impact of the sustainability factor depends on the demographic and economic development.

As changes in part-time/full-time work should be eliminated, the number of pensioners and contributors are calculated on the basis of specific equivalent values, which are defined differently for Western and Eastern Germany (see, *formula 6*). The number of equivalent pensioners (*ePen*) is calculated as displayed in *formula 7*. The standard pension is a pension based on 45 pension points multiplied by the current pension point value (e.g. 36.02 € for Western Germany, 2023). By dividing the pension expenditures by the amount of this standard pension the number of equivalent pensioners is obtained. A similar approach is used for calculating the equivalent contributors (*eCon*): Total contributions are divided by a "standard"-contribution, which has to be paid for earning one pension point, to receive the number of equivalent contributors.

Formula 6: $\quad pc = \dfrac{ePen_W + ePen_E}{eCon_W + eCon_E}$, where

$$
\begin{array}{lll}
pc & = & \text{pensioner/contributor ratio,} \\
ePen & = & \text{number of equivalent-pensioners,} \\
eCon & = & \text{number of equivalent-contributors,} \\
W, E & = & \text{Western, Eastern Germany.}
\end{array}
$$

Formula 7: $\quad ePen = \dfrac{PE}{sp}$, where

$$
\begin{array}{lll}
PE & = & \text{total pension expenditure,} \\
sp & = & \text{standard pension.}
\end{array}
$$

Formula 8: $\quad eCon = \dfrac{CR}{sc}$, where

$$
\begin{array}{lll}
CR & = & \text{contribution paid by employees and the unemployed,} \\
sc & = & \text{standard contribution.}
\end{array}
$$

Economy-wide average wage at retirement

A reasonable approach about future age-specific wage development is currently not feasible. At this time, there exist no valid empirical findings about:

a) the development of productivity at older ages compared to the average,

b) if the shortage of skilled labour forces leads e.g. to a large upgrading of workplace health management or to a higher payment for older workers to commit those skilled workers to companies.

Hence, for this exercise we focus on the current weak empirical evidence, which documents 5% higher wages on average for workers at age 60-64 compared to the economy-wide average wage.

TABLE A1 – ECONOMY-WIDE AVERAGE WAGE AT RETIREMENT (1000 EUR)

	2022	2030	2040	2050	2060	2070
Economy-wide average gross wage at retirement	41.7	56.0	77.8	109.4	152.3	210.5
Economy-wide average gross wage	39.8	53.4	74.1	104.2	145.1	200.5

Source: European Commission, EPC.

Pensioners vs. Pension

As stated in section 1.3, all AWG assumptions regarding the demographic and macro-economic context have been considered in the national pension projection model. In general, a pensioner in the statutory pension scheme is entitled to just one pension type. Differences between the numbers of pensions and pensioners result by drawing additional retirement benefits on survivor's pensions solely. In addition, it is not possible to isolate pensioners who receive pension benefits from both, the statutory pension scheme and the civil servant scheme. Hence, double counting for this case is observed.

Pension taxation

Regarding individual income taxes, Germany is currently undergoing a change in the tax regime relating to contributions and pensions.[12] Therefore, the taxation of pensions from the statutory pension schemes is gradually changing from a system with partial taxations of contributions and practically no taxation of pension benefits into an opposite system. Pension contributions will be completely exempted from tax by the year 2025 and pension benefits will be completely taxed by the year 2040.

Beside this, it should be noted that the effective tax rate depends on household income, which includes more than the income source of old-age pensions. Due to the ongoing rearrangement of taxation of public pension benefits, we assumed a linear increase of the tax burden from 7,5% in 2022 to 10% in 2070 for this projection round.

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[12] Legislated by the *Old-Age-Income-Act* (Alterseinkünftegesetz) in year 2005.

Survivors pension

The projection considers single age-sex specific probabilities to marriage within the age-cohort model in combination with single age-sex specific mortality rates. Furthermore, the model adopts the current age gap between spouses with the assumption of no future change for the projection horizon.

Non-earnings related "minimum pension" (means-tested basic social assistance in old age)

The eligibility criteria for means-tested benefits from basic social assistance for older people (not a "minimum pension" in terms of the Statutory pension insurance scheme) is just the fact of reaching the statutory retirement age. There exists no other request e. g., for specific minimum years of contributions.

The amount of means-tested benefit consists of two parts:

a) *social assistance benefits*, and

b) *housing allowances*.

Social assistance benefits secure the recipients' livelihood (covers e. g., the demand for food, personal care, household goods, etc.). It includes a lump-sum for non-recurring and recurring needs. Regarding the social assistance benefit amount, there exist different social assistance categories. Social assistance benefits are indexed by an aggregate of 70% CPI for the low income group and 30% of economy-wide average net wage.

Housing allowances depend on the local rental market. Reasonable housing costs are determined according to the circumstances of each individual, particularly family size, age, sex and state of health of the family members. Based on this individual information concerning the beneficiary and his/her relatives, the number of living rooms, the local rent level and the conditions of the local housing market is to be evaluated.

Hence, the individual maximum gross amount of means-tested benefits depends on the household structure and the condition of the local rental market. However, individual net-benefits and therefore the gross expenditures for the means-tested benefits from the social assistance system are calculated as the difference between gross individual needs and individual income from all sources.

For this projection round the means-tested social benefit model is based on an age-cohort approach with configurations for the development of demography, wage and inflation. Furthermore, the change p.a. of past stock information is considered. Information regarding in- and outflows are not available and the projection is, thus, based on stock information with a distinction of relevant sex-specific expenditure items and state of housing.

The results - as presented in *table 8* - are mainly influenced by demographic development, and the specific underlining assumptions regarding the commonly agreed wage and price development, where CPI is assumed to increase at a lower level over the projection horizon than wage. Additionally, gross needs are primarily indexed by CPI whereas pensions - as the main individual income source of older people - are indexed (- due to the sustainability factor -) to a somewhat lower level than wage development. This specific setting results into a more or less parallel development of gross needs and means-tested incomes (mainly pensions), with an almost constant ratio of expenditures related to GDP.

Alternative pension spending disaggregation

Table A2 is similar to Table 8 but provides a disaggregation of the change in pension expenditure based on the number of pensions as compared to the number of pensioners in Table 8.

	2022-30	2030-40	2040-50	2050-60	2060-70	2022-70
Public pensions to GDP	0.6	0.3	-0.1	0.2	0.2	1.2
Dependency ratio effect	1.8	1.2	0.1	0.6	0.5	4.2
Coverage ratio effect*	-0.6	0.1	0.3	-0.1	-0.3	-0.7
Coverage ratio old-age	-0.4	0.4	0.4	0.0	-0.3	0.1
Coverage ratio early-age	0.7	-1.1	-0.3	-0.2	-0.8	-1.8
Cohort effect	-2.5	-1.0	0.3	-1.1	-0.3	-4.7
Benefit ratio effect	-0.4	-0.9	-0.4	-0.2	0.1	-1.9
Labour market effect	0.0	-0.1	0.0	-0.1	0.0	-0.3
Employment ratio effect	0.0	-0.1	0.0	-0.1	0.0	-0.2
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.1	0.0	0.0	0.0	0.0	-0.1
Residual	-0.1	-0.1	0.0	0.0	0.0	-0.2

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

Source: European Commission, EPC.