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Pension Projections Exercise 2021

Country Fiche

Germany

Peer review process on national pension systems and pension projection results

For the attention of the Economic Policy Committees'
Working Group on Ageing Populations and Sustainability

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1. Overview of the pension system

1.1 Description

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.[1]

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 2019. Currently, the general pay-as-you-go (PAYG) earnings-related first pillar statutory pension scheme covers about 85 % of the employed German population whereas the public civil servants scheme protects 5 %. Both systems accounted for pension expenditures of about 10.3 % of GDP in 2019. 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 2019).[2]

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.[3] The system of social assistance is completely tax-financed. The respective expenditures amounted to 0.2 % of GDP in 2019.

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. If not stated otherwise, following statements refer to the statutory pension scheme.

[1] Governmental subsidies for the 3rd pillar *Riester* pensions - excluding tax savings - amounted e.g. to 2.7 billion Euro in 2017. Tax allowances for a *Riester* pension are of EET concept, which means that contributions are tax-free while pensions are taxed.

[2] For further information concerning the farmers and miners systems see box 3.

[3] Those benefits refer to the individual primary needs. Means-tested provision results from the difference between the individual need and the weighted household equivalence income (including pension benefits). The average of these individual needs amounted to 9,756 EUR per capita in 2019 for all, who received means-tested old-age provision. At the end of the year 2019 roughly 0.56 million persons of statutory retirement age or older received such a provision, which are about 3.2 % of the total population within that age interval. For further details see annex.

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 2019, insured employees and their employers each contributed 9.3 % of the employees' gross wages to the statutory pension system. In 2019, total revenues amounted to 321.0 billion EUR while total expenditures aggregated to 319.1 billion EUR.

Old-age pension

The German statutory pension system is oriented towards 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 *formula 1* to *3*.

Since 1992 numerous pension reforms have reacted on 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 legislated the gradual increase of the statutory retirement age from age 65 to age 67 by the year 2029 (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 for an old-age pension before the age of 63.[4]

Under current legislation, the statutory retirement age for men and women has been age 65 and 8 months in 2019. Nevertheless, as seen in *table 1*, early retirement is possible under certain conditions, but in any case of using such an option, individual benefits will be reduced permanently by 0.3 % for each retired month pensioners fall short of the statutory retirement age. On the other hand, postponement of retirement will yield a higher pension accrual of 0.5 % for each month worked after the statutory retirement age, this to be seen as an incentive to work longer.

As stated 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 2030, the maximum permanent deduction will increase to 14.4 %.

[4] Specific exceptions still exist for severely handicapped people.

In addition, there exists a specific exemption for persons with a very long insurance record of at least 45 years. Those persons can temporarily claim old-age pension without deductions currently at the age of 63 and 8 months. To prevent any kind of early retirement e.g. via 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 age 67, the age of 63 for an old-age pension without any penalties (under the requirement of 45 contribution years) will also raise gradually up to the age of 65 by the year 2029.

Table 1 – Qualifying condition for retiring

			2019	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension	Statutory retirement age - men		65/8	67	67	67	67	67
	Statutory retirement age - women		65/8	67	67	67	67	67
	Minimum requirements	Contributory period - men (years)	5	5	5	5	5	5
		Retirement age - men	(63/6)*	(65)*	(65)*	(65)*	(65)*	(65)*
		Contributory period - women (years)	5	5	5	5	5	5
		Retirement age - women	(63/6)*	(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		-9,6%	-13,8%	-14,4%	-14,4%	-14,4%	-14,4%
	Bonus in case of late retirement (per month)		-0,5%	-0,5%	-0,5%	-0,5%	-0,5%	-0,5%
	Minimum contributory period - men (years)		35	35	35	35	35	35
	Minimum contributory period - women (years)		35	35	35	35	35	35
	Minimum residence period - men		:	:	:	:	:	:
	Minimum residence period - women		:	:	:	:	:	:

* 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 years' contribution at the level of average earnings of contributors, which are approximately identical to the National Accounts average wages, results in one pension point. Contributions p.a. and therefore entitlements are levied on annual earnings up to a ceiling of approximately 200 % of the relevant average earnings. From 2021, additionally, individuals with low earnings and at least 33 years of mandatory contributions and certain other pension-relevant periods are granted a pension supplement called "Basic Pension". The supplement is granted only if the average of all of the Earning Points (EP) of months that exceed 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. 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 the German pure point system where contributory periods make for only a part of the accrued claims for pension benefits, the individual pension benefit in year *T+n* (as seen 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 is valid for new and stock 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 fix for the period July 1st in year *t* to June 30th in year *t + 1*.

Formula 1: $pp_t = e_t / \breve{e}_t$, *where*

pp_t = individual pension points in year *t*,

e_t = individual earning in year *t,*

$\breve{e}_t$ = average of nation-wide earnings related to contributors in year *t.*

Formula 2: $P_{T+n} = \sum_{t=1}^{T} pp_t \cdot ptf \cdot ppv_{T+n}$, *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: $ppv_{T+n} = ppv_{T+n-1} \cdot wf_{T+n-1} \cdot cf_{T+n-1} \cdot sf_{T+n-1}$, *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 of 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 of the number of standardized contributors in relation to the number of standardized pensioners, links the adjustment of the pension point value to the changes in the statutory pension scheme's dependency ratio, the ratio of pensioners to contributors[5]. The last two factors in the indexation formula *3* can alter the size of adjustment, resulting in lower growth of the pension point value in relation to gross wages per capita in the long run. Temporary, until 2025 a so-called "double boundary" is applicable that sets a pension value, so that a lower limit of 48% for the net

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

pension level before taxation[6] is guaranteed while ensuring an upper limit of 20 % for the contribution rate.[7] 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. When the "double boundary" expires in 2025, a theoretically possible decrease of the nominal pension point value e. g., due to a declining wage development (observed in 2009 for Germany), is kept virtually and is counterbalanced with future increases of the pension point. Respectively, 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 existing differences in per capita income between the Western and the Eastern part of Germany, the pension-related contributory average income levels differ. E.g., the (preliminary) average income in 2020 amounts to 40,551 EUR for Germany (west) and 35,977 EUR for Germany (east). Hence, the calculation of the pension point value distinguishes between both German regions by considering the respective average wages.[8] Consequently, the pension point values are currently[9] set at 34.19 EUR (west) and at 33.23 EUR (east) - regarding pension benefits per month. In 2017 a stepwise harmonization of pension point values was legislated so that there will be a uniform pension legislation for Germany in 2025. From 1 January 2025 onwards there will not be different calculation parameters for calculating pensions.

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

In December 2020 a man/woman wishes to retire exactly two years before the current statutory retirement age of 65 years and 9 month. 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 into a gross pension amount of 1,269.13 € per month (40 · 1.0 · 34.19 € · 0.928) at least until the next pension indexation on 1th July 2021.

[6] 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.
[7] 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.
[8] 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.
[9] Period from 1st July 2020 to 30th June 2021.

Disability pension

Persons with more than five years' 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, disability pension entitlements are an aggregate of already accrued pension points before disability and additional pension points based on a virtual record of contribution.

Individuals will be faced with a maximum deduction of 10.8 % in case of applying for a disability pension before the age of 64 and 6 months (in 2021), rising up to age 65 in 2024. (After that age, pension penalty is reduced by 0.3 % per month.). In general, the disability pension will be converted into an old-age pension (just for statistical reasons) once the respective person has reached the statutory retirement age.

Survivor's pension

Spouses are entitled to a survivor's pension if the deceased fulfilled the minimum condition of five years of contributions to the statutory pension system. A valid entitlement to a "high-rate" widow's pension exists if the surviving spouse is unable to work or is raising an underage child or is at least 45 years old[10]. Otherwise, a "small" widow's pension is paid. While the "high-rate" widow's pension amounts to 55 % of the full pension benefit of the deceased, the "small" widow's pension is only 25 % of that pension and is additionally restricted to two years. In both cases own income over a certain level is taken into account.

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.

[10] This age is increasing to age 47 in line with the increasing statutory retirement age.

1.2 Recent reforms of the pension system included in the projections

Pension reforms since the last AWG projection exercise are incorporated into the 2020 exercise. Please find below a detailed description of all components of the latest pension reforms in year 2020.

- **Pension benefits and contributions:**

  For the net pension level before taxation[11] 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 exceed 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 €2,300, the basic SPI pension supplement will partly be reduced. For a single person the relevant threshold income is €1,600/month. 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 is being introduced. For people

[11] 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.

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 (Regelbedarfsstufe 1), which is currently €216/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. Before the latest pension reform the virtual employment record (please see section 1.1) was gradually increasing from age 63 to age 65. Under the new legislation, this period is further extended to statutory retirement age, reaching age 67 in 2031.

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

As commonly agreed, all recently enacted pension reforms have been taken into account in the German 2020 pension projection exercise. In addition, all AWG assumptions regarding the demographic and macro-economic context have been completely considered.

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 forces projections

2.1 Demographic development

Eurostat's latest population projection (2019) shows a temporary increasing population in Germany over the coming decades. In the long run population growth will nevertheless remain negative. Migration assumptions for Germany are the main driver for the observed increase in population numbers. However, for Germany the natural population growth 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 lately to 1.5 which is still well below the replacement level of approx. 2.1. Hence, the quantity of every new birth cohort is just around two-thirds of its parental cohort. Due to the population momentum and the future assumption of fertility being below replacement level, fertility is the main reason for a decreasing population number in the more distant future, as seen in *table 2*.

Table 2 – Main demographic variables evolution

	2019	2030	2040	2050	2060	2070	peak value	peak year*	change 2019-2070
Population (thousand)	83.077	83.442	83.163	82.631	81.812	81.711	83.492	2026	-1.367
Population grow th rate	0,2	0,0	0,0	-0,1	-0,1	0,0	0,2	2019	-0,2
Old-age dependency ratio (pop65+/pop20-64)	36,1	46,4	52,2	52,8	54,3	54,6	54,7	2066	18,5
Old-age dependency ratio (pop75+/pop20-74)	16,3	17,8	23,6	26,2	25,6	27,4	27,4	2070	11,0
Ageing of the aged (pop 80+ / pop 65+)	30,8	28,9	33,0	42,4	39,2	42,0	42,5	2051	11,3
Men - Life expectancy at birth	79,1	80,6	82,1	83,5	84,8	86,0	86,0	2070	6,9
Women - Life expectancy at birth	83,7	85,1	86,4	87,7	88,9	89,9	89,9	2070	6,2
Men - Life expectancy at 65	18,4	19,5	20,5	21,5	22,5	23,4	23,4	2070	5,0
Women - Life expectancy at 65	21,4	22,5	23,6	24,6	25,5	26,4	26,4	2070	5,0
Men - Survivor rate at 65+	86,6	88,8	90,4	91,8	93,0	94,1	94,1	2070	7,5
Women - Survivor rate at 65+	92,5	93,7	94,6	95,4	96,1	96,6	96,6	2070	4,1
Men - Survivor rate at 80+	58,8	64,4	68,9	73,0	76,6	79,7	79,7	2070	20,9
Women - Survivor rate at 80+	74,6	78,6	81,7	84,4	86,7	88,7	88,7	2070	14,0
Net migration (thousand)	277,4	248,2	240,7	227,0	221,4	214,2	316,1	2020	-63,2
Net migration over population change	1,6	-11,8	-7,9	-3,0	-3,4	7,9	47,5	2026	6,2

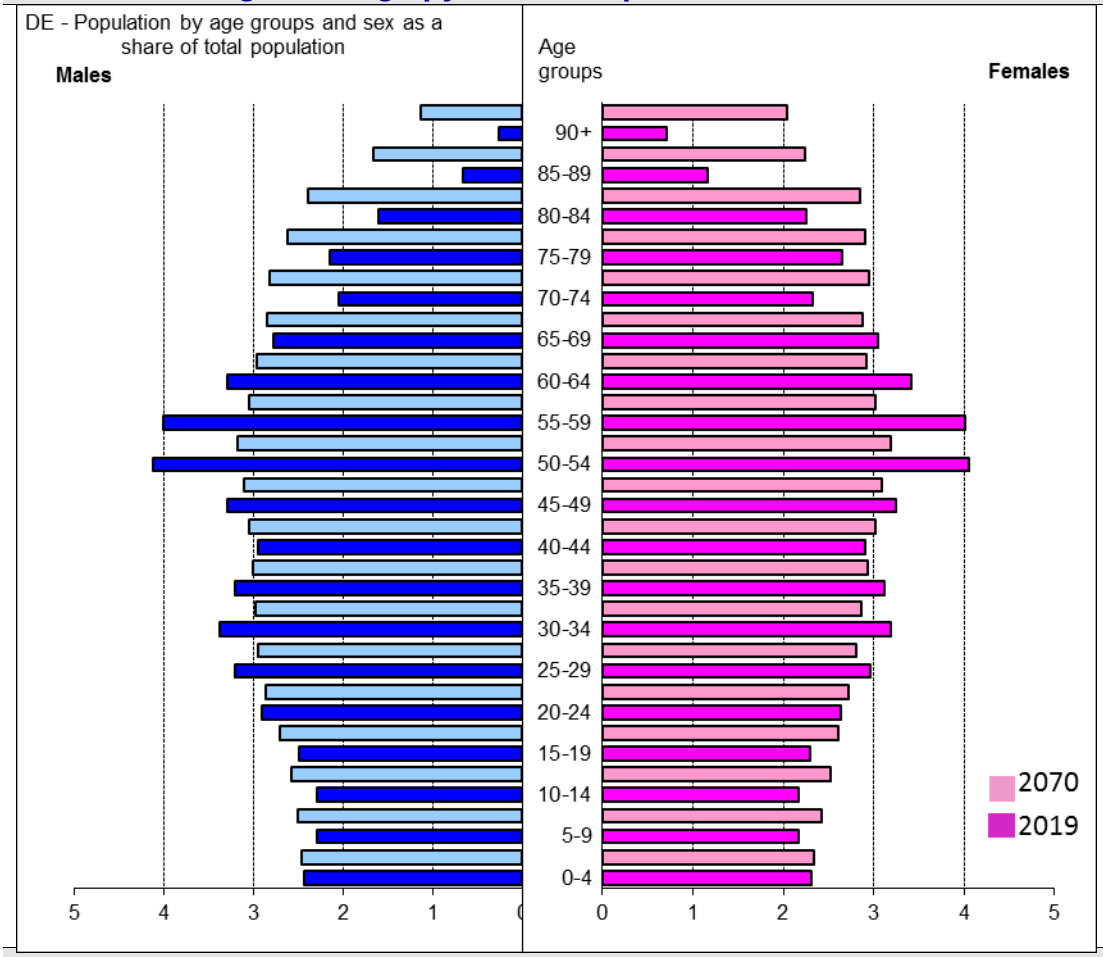
* This column represents the peak year, in which the respective variable reaches its max. over the period 2019-2070.

Source: Eurostat (2019) and Commission Services.

In addition to low fertility, decreasing mortality rates - with the consequence of increasing life expectancy - accelerate the demographic ageing of the German society being the main driving force for the pension expenditure evolution in Germany. Since 1960 the life

expectancy at birth has increased from 66.5 to 79.1 years for males and from 71.7 to 83.7 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 18.4 years for males and 21.4 years for females. *Table 2* displays a further - almost steady - increase for both indicators in future.

Figure 1: Age pyramid comparison: 2019 vs. 2070



Source: Eurostat (2019) and Commission Services.

Migration flows - as the third component which affects population growth - are however, extremely difficult to predict. Decisions to migrate depend primarily on current political, economic and demographical developments in the sending and destination countries. Eurostat models a steadily decreasing net migration starting from a level of 277,400 in 2019.

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 36.1% (2019) to 54.7 % in 2070.

2.2 Labour forces

In the near future Germany will be faced with a radical societal change based on demographic development. There will be a strong increase in the absolute number of people at age 65 or older and simultaneously the overall population number is decreasing in the long run. In the future, the working age population is shrinking. 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 counterbalance this development partially, the statutory retirement age is increasing from age 65 (in year 2011) to age 67 by the year 2029. The relatively long transition period ensures the adjustment of working conditions to an older work-force in demographical terms. This task has to be accomplished by companies, social partners and policymakers together.

Table 3 – Participation rate, employment rate and share of workers for the age groups 55-64 and 65-74

	2019	2030	2040	2050	2060	2070	peak value*	peak year*	change 2019-2070
Labour force participation rate 20-64	83,2	83,4	84,0	83,9	84,1	84,2	84,2	2066	1,0
Employment rate of workers aged 20-64	80,6	80,0	80,6	80,4	80,7	80,7	80,8	2066	0,2
Share of workers aged 20-64 in the labour force 20-64	96,9	96,0	95,9	95,9	95,9	95,9	96,9	2019	-1,0
Labour force participation rate 20-74	73,1	70,7	71,4	72,6	71,9	72,6	73,1	2019	-0,5
Employment rate of workers aged 20-74	70,9	67,9	68,6	69,7	69,1	69,7	70,9	2019	-1,1
Share of workers aged 20-74 in the labour force 20-74	96,9	96,1	96,0	96,0	96,0	96,0	96,9	2019	-0,9
Labour force participation rate 55-64	74,6	73,9	75,7	75,3	75,6	76,0	76,0	2070	1,4
Employment rate of workers aged 55-64	72,6	71,3	73,1	72,7	73,0	73,4	73,4	2070	0,7
Share of workers aged 55-64 in the labour force 55-64	97,3	96,5	96,5	96,5	96,5	96,5	97,3	2019	-0,8
Labour force participation rate 65-74	13,9	18,3	17,1	19,0	18,3	18,5	19,3	2048	4,6
Employment rate of workers aged 65-74	13,7	18,0	16,9	18,8	18,1	18,3	19,0	2048	4,5
Share of workers aged 65-74 in the labour force 65-74	99,1	98,7	98,8	98,7	98,8	98,7	99,1	2019	-0,3
Median age of the labour force	43,0	42,0	42,0	42,0	42,0	42,0	43,0	2019	-1,0

* This column represents the peak year, in which the respective variable reaches its max. over the period 2019-2070.

Source: Commission services.

Apart from demography, labour force development is strongly affected by age-specific participation rates. For more than a decade Germany experienced substantial progress in raising the employment and participation rates, especially of 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 age group 55-64 almost doubled from 37.4 % to 70.2 %. While the employment rate for the age group 60-64 was at just 19.6 % in the year 2000 the value tripled to 58.6 % in 2017. Hence, more and more older employees experience the fact that there is an increasing demand by employers for the practical, technical and theoretical expertise of older people.

Table 3 displays the participation and employment rates projected by the European Commission Service. The future results from the underlying cohort simulation model depend crucially on the used assumptions on the effects of legislated policy reforms - e.g. the increase of statutory retirement ages. Overall, the employment rate for workers aged 55-64 is projected to increase from 72.6 % in 2019 to 73.4 % in 2070. Given the observed labour market trends this seems to be rather conservative expected development.

Due to the definition of the constant policy scenario no meaningful further increase of labour market age-specific participation rates is expected after 2031, the year the statutory retirement age will finally converge to age 67 based on current law (see *tables 4a, 4b*).

Table 4a – Labour market effective exit age and expected duration of life spent at retirement - MEN

	2020	2030	2040	2050	2060	2070	peak value	peak year	change 2020-2070
Average effective retirement age (administrative data)*	64,0								
Average labour market exit age (CSM)**	64,7	65,7	65,7	65,7	65,7	65,7	65,7	2029	1,0
Duration of retirement***	18,4	18,7	19,7	20,7	21,6	22,5	22,5	2070	4,1
Duration of retirement/contributory period	0,4	0,4	0,4	0,4	0,5	0,5	0,5	2070	0,1
Percentage of adult life spent in retirement****	28,3	28,2	29,2	30,3	31,2	32,1	32,1	2070	3,8
Early/late exit*****	2,3	1,1	0,9	1,0	0,9	1,0	2,3	2020	-1,3

* The effective retirement age shows the age at which people on average start receiving an old-age pension benefit. It is calculated on the basis of the administrative data for 2019 (see Annex Tables A4a and A4b); ** The labour market exit age as calculated based on Labour Force Survey data for the base year and estimated by the Cohort Simulation Model thereafter; *** 'Duration of retirement' is calculated as the difference between the life expectancy at the average labour market exit age and that exit age itself; **** The 'percentage of adult life spent in retirement' is calculated as the ratio between the duration of retirement and the life expectancy minus 18 years; ***** Early/late exit is the ratio between those who retire and are below the statutory retirement age and those who retire at the statutory retirement age or above.

Source: Commission Services.

Table 4b – Labour market effective exit age and expected duration of life spent at retirement - WOMEN

	2020	2030	2040	2050	2060	2070	peak value	peak year	change 2020-2070
Average effective retirement age (administrative data)*	64,4								
Average labour market exit age (CSM)**	64,5	65,3	65,3	65,3	65,3	65,3	65,3	2033	0,7
Duration of retirement***	21,4	22,5	23,6	24,6	25,5	26,4	26,4	2070	5,0
Duration of retirement/contributory period	0,5	0,5	0,5	0,5	0,5	0,6	0,6	2070	0,1
Percentage of adult life spent in retirement****	31,5	32,3	33,3	34,2	35,0	35,8	35,8	2070	4,3
Early/late exit*****	2,6	1,2	1,0	1,2	1,0	1,2	2,6	2020	-1,4

* The effective retirement age shows the age at which people on average start receiving an old-age pension benefit. It is calculated on the basis of the administrative data for 2019 (see Annex Tables A4a and A4b); ** The labour market exit age as calculated based on Labour Force Survey data for the base year and estimated by the Cohort Simulation Model thereafter; *** 'Duration of retirement' is calculated as the difference between the life expectancy at the average labour market exit age and that exit age itself; **** The 'percentage of adult life spent in retirement' is calculated as the ratio between the duration of retirement and the life expectancy minus 18 years; ***** Early/late exit is the ratio between those who retire and are below the statutory retirement age and those who retire at the statutory retirement age or above.

Source: Commission Services.

3. Pension projection results

3.1 Extent of the coverage of pension schemes in the projections

The German projections exercise comprises the statutory and the civil servants pension scheme. Both systems 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 gained widespread acceptance as a consequence of governmental promotion and tax treatment. The number of occupational pension entitlements (of active employees) increased from 14.6 million in 2001 to about 21.0 million and the number of "Riester"-contracts in place reached a level of 16.4 million by the end of June 2020. It can be assumed that about 66 % of all employees between ages 25 to 65 with compulsory social insurance coverage are entitled to a supplementary occupational pension or a "Riester"-pension.

Box 3: Pension Schemes for Miners and Farmers

As mentioned earlier, 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 0.1 % 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, 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 decrease also substantially. Against that background, no demographic pressure will be posed on these systems.

As a general information concerning the farmers' pension system in the year 2016, this scheme was responsible for 596,000 pensions compared to 210,000 contributors and an overall budget of 2.8 billion Euro. The miners system covers about 45,300 contributors and 975,400 pensions in 2019 while the overall expenditures amounts to approx. 8.6 billion Euro.

Table 5 provides an overview of the pension expenditures between 2009 and 2017 with an additional comparison of ESSPROS and AWG data. *Table 5* illustrates that the scope of the German EPC-AWG public pension projections differs of 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 marginal difference between Eurostat's total and public pension expenditures which are expected to level out in the future.

Table 5 – Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	change 2009-2017
Eurostat total pension expenditure	12,9	12,5	12,0	12,0	11,9	11,8	11,8	11,9	11,9	-1,0
Eurostat public pension expenditure (A)	11,6	11,3	10,8	10,8	10,7	10,6	10,6	10,7	10,7	-0,9
Public pension expenditure (AWG: outcome) (B)	:	:	:	:	:	:	:	:	:	:
Difference Eurostat/AWG: (A)-(B)	:	:	:	:	:	:	:	:	:	:

Source: Commission Services.

3.2 Overview of projection results

As can be seen from *table 6*, in the baseline scenario overall public pension expenditures are projected to increase - as a share of GDP - by 2.1 percentage points from 10.3 % in 2019 to 12.4 % in 2070. Due to currently favourable economic and demographic conditions - with regard to the relative age distribution - and past pension reforms, the 2019 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 until the temporary peak is reached in the year 2065. During the remaining projection horizon the pension expenditure (as share of GDP) will slightly decrease.

Table 6 - Projected gross and net pension spending and contributions (% of GDP)

Expenditure	2019	2030	2040	2050	2060	2070	peak value	peak year	change 2019-2070
Gross public pension expenditure	10,3	11,5	12,0	12,2	12,5	12,4	12,5	2065	2,1
Private occupational pensions	:	:	:	:	:	:	:	:	:
Private individual mandatory pensions	:	:	:	:	:	:	:	:	:
Private individual non-mandatory pensions	:	:	:	:	:	:	:	:	:
Gross total pension expenditure	10,3	11,5	12,0	12,2	12,5	12,4	12,5	2065	2,1
Net public pension expenditure*	8,5	9,3	9,6	9,7	9,9	9,9	10,0	2065	1,4
Net total pension expenditure*	8,5	9,3	9,6	9,7	9,9	9,9	10,0	2065	1,4
Contributions	2019	2030	2040	2050	2060	2070	peak value	peak year	change 2019-2070
Public pension contributions	10,1	11,1	11,7	11,8	12,1	12,2	12,2	2065	2,0
Total pension contributions	10,1	11,1	11,7	11,8	12,1	12,2	12,2	2065	2,0

* This column represents the peak year, in which the respective variable reaches its max. over the period 2019-2070.

Source: EPC-AWG projection, baseline scenario.

The net public pension expenditure in *table 6* is increasing sub-proportionally to the total expenditure. However, the respective level is lower, being adjusted by pensioners' social security contributions to health and long term care as well as by the projected average relative tax amount paid by this group. 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 taxation 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. For this projection, a linear increase up to the final respective year is assumed.[13]

Contributions (in terms of GDP) in *table 6* increase almost proportionally to the 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 gross pension benefits. Nevertheless, those contributions are additional expenditures and hence part of overall pension expenditure of the statutory pension system.

[12] Legislated by the *Old-Age-Income-Act* (Alterseinkünftegesetz) in 2005.
[13] For detailed explanation see annex.

Contributions of the pension fund to the statutory healthcare system account for about 0.6 % of GDP in 2019 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 systems, as seen in the ratio of public pension expenditure and contributions to GDP in *table 6*.

Table 7 - Projected gross public pension spending by scheme (% of GDP)

Pension scheme	2019	2030	2040	2050	2060	2070	peak value	peak year	change 2019-2070
Total public pensions	10,3	11,5	12,0	12,2	12,5	12,4	12,5	2065	2,1
Old-age and early pensions	8,1	9,4	10,1	10,3	10,6	10,7	10,7	2066	2,6
Flat component	:	:	:	:	:	:	:	:	:
Earnings-related	8,1	9,4	10,1	10,3	10,6	10,7	10,7	2066	2,6
Minimum pensions (non-contributory) i.e. minimum	:	:	:	:	:	:	:	:	:
Disability pensions	0,67	0,63	0,60	0,62	0,62	0,61	0,7	2020	-0,1
Survivors' pensions	1,54	1,48	1,34	1,29	1,24	1,12	1,66	2020	-0,4
Other pensions	:	:	:	:	:	:	:	:	:

* This column represents the peak year, in which the respective variable reaches its max. over the period 2019-2070.

Source: EPC-AWG projection, baseline scenario.

Table 7 displays how the overall evolution of pension expenditure within the projection horizon 2019-2070 is split among the three components '*old-age and early pensions'*, *'disability pensions'* and '*survivor pensions*'. Thus, 'old-age and early pensions' represent the largest category of total expenditure (as share of GDP) and are projected to increase by about 2.6 percentage points within the projection horizon. However, in the same time expenditures for survivor and disability pensions respectively will decrease by about 0.4 and 0.1 percentage points. The latter decline results predominantly from a combined situation of an expected future decrease of the labour force (which reduced the potential of individuals that can get disabled) in absolute numbers and in relative terms to the number of pensioners as well as declining probabilities of getting disabled. The future decline of survivor pension expenditures stems from the facts that the probabilities of marriage are significantly lower for younger than for older cohorts and that male death rates are converging to the one's of females. Hence, the number of pensioners who receive a survivor's pension is projected to decrease with corresponding consequences for this type of pension expenditure.

3.3 Description of main driving forces behind the projection results and their implication for main items from a pension questionnaire

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, generated with *formulas 4 to 6*.

Formula 4:

$$\frac{\text{Pension Exp.}}{\text{GDP}} = \overbrace{\frac{\text{Population 65 +}}{\text{Population 20 - 64}}}^{\text{Dependency Ratio}} \cdot \overbrace{\frac{\text{Number of Pensioners}}{\text{Population 65 +}}}^{\text{Coverage Ratio}} \cdot \overbrace{\frac{\text{Population 20 - 64}}{\text{Working People 20 - 74}}}^{\text{Labour Market/Labour Intensity}} \cdot \overbrace{\frac{\text{Average Pension}}{\frac{\text{GDP}}{\text{HoursWorked 20 - 74}}}}^{\text{Benefit Ratio}}$$

As agreed in the AWG for the pension projections exercise 2014, the 'coverage ratio' is further decomposed to show up the single effects of early-age pensions and old-age pensions, see *formula 5*.

Formula 5:

$$\overbrace{\frac{\text{Number of Pensioners}}{\text{Population 65 +}}}^{\text{Coverage Ratio}} = \overbrace{\frac{\text{Number of Pensioners 65 +}}{\text{Population 65 +}}}^{\text{Coverage Ratio Old-Age}} + \left(\overbrace{\frac{\text{Number of Pensioners £65}}{\text{Population 50 - 64}}}^{\text{Coverage Ratio Early -Age}} \cdot \overbrace{\frac{\text{Population 50 - 64}}{\text{Population 65 +}}}^{\text{Cohort Effect}} \right)$$

Formula 6 decomposes the labour market indicator as following:

Formula 6:

$$\overbrace{\frac{\text{Population 20 - 64}}{\text{Working People 20 - 74}}}^{\text{Labour Market/Labour Intensity}} = \overbrace{\frac{\text{Population 20 - 64}}{\text{Working People 20 - 64}}}^{\text{1/Employment Rate}} \cdot \overbrace{\frac{\text{Working People 20 - 64}}{\text{Hours Worked 20 - 64}}}^{\text{1/Labour intensity}} \cdot \overbrace{\frac{\text{Hours Worked 20 - 64}}{\text{Hours Worked 20 - 74}}}^{\text{1/Career shift}}$$

As highlighted with the *dependency ratio*, the demographic setting remains the main driving force related to the pension expenditure development over time. With 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. For the last decade of the projection it decreases pension expenditures. 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 of the statutory retirement age results in postponing the effective retirement age for future pensioners. This will lower 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 in the year 2031, when the standard pension age of 67 will apply to all new pensioners. After 2040, the contribution of the coverage ratio to decelerate the increase of pension expenditures becomes less important.

In the given decomposition, the *employment ratio* reduces its positive impact on decelerating pension expenditure increase until the mid-2030s as the assumed increase of older workers' labour participation will enlarge the workforce over age 64 as can be seen by the career shift effect. Although the increase of the statutory retirement age will start in the year 2012, it is assumed that the working population will adjust to longer working careers substantially earlier. For the remaining projection horizon the influence of the *inverse employment rate* is marginal.

Table 8 - Factors behind the change in public pension expenditures between 2019 and 2070 using pension data (in percentage points of GDP) - pensioners

	2019-30	2030-40	2040-50	2050-60	2060-70	2019-70
Public pensions to GDP	1,2	0,5	0,2	0,3	0,0	2,1
Dependency ratio effect	2,9	1,4	0,1	0,3	0,1	4,9
Coverage ratio effect*	-0,6	-0,2	0,0	-0,1	0,0	-0,9
Coverage ratio old-age	-0,3	0,0	-0,1	0,0	0,0	-0,3
Coverage ratio early-age	0,8	-1,0	0,6	0,2	-0,5	0,1
Cohort effect	-3,3	-1,4	-0,1	-0,9	0,1	-5,5
Benefit ratio effect	-0,8	-0,6	0,0	0,0	-0,1	-1,4
Labour market effect	-0,2	0,0	0,0	-0,1	0,0	-0,2
Employment ratio effect	0,1	-0,1	0,0	0,0	0,0	0,0
Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0
Career shift effect	-0,3	0,1	0,0	0,0	0,0	-0,2
Residual	-0,2	-0,1	0,0	0,0	0,0	-0,3

Source: EPC-AWG projection, baseline scenario.

As a consequence of *formula 3*, the *benefit ratio* mitigates the increase of pension expenditures compared to GDP substantially. Basically, the sustainability factor, which accounts for the ratio of pensioners to contributors, will decelerate the future nominal increase of the pension point value as compared to an adjustment based on wage growth solely. In addition, as the penalty deductions for early retirement - introduced in the late 1990s - will increasingly unfold theirs 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. On the other hand, there is a partially 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 pensioners (see, *formula 3*). 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 much more favourable ratio of pensioners to labour force population. Due to the "new" demographic situation the negative impact of the sustainability factor in *formula 3* will be reduced.

Additionally, the effect of longer contribution records will also have an impact on the reverse impact of the benefit ratio.

As expected, the incorporated *labour intensity effect* has no impact on the pension expenditure/GDP ratio.

Table 9 - Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme (in %)

	2019	2030	2040	2050	2060	2070	change 2019-2070 (pps)
Public scheme (BR)	42%	40%	39%	39%	39%	39%	-3%
Coverage	100,0	100,0	100,0	100,0	100,0	100,0	0,0
Public scheme: old-age earnings related	39%	39%	38%	38%	38%	38%	-1%
Public scheme: old-age earnings related	40%	38%	37%	37%	37%	37%	-3%
Coverage	83,6	85,5	87,0	87,1	87,7	88,2	4,5
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Private individual schemes (BR)	:	:	:	:	:	:	:
Private individual schemes (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Total benefit ratio	42%	40%	39%	39%	39%	39%	-3%
Total replacement rate	40%	38%	37%	37%	37%	37%	-3%

Source: EPC-AWG projection, baseline scenario.

Regarding the replacement rate at retirement in the public pension scheme, this value is calculated with the assumption that the average wage at retirement is five percentage points above the nationwide average wage (over all ages) for the entire projection period. For further clarification, please see annex.

As stated in *table 9*, the replacement rate at retirement is expected to decrease from 40 % to 37 % over the projection horizon.[14] This development is a consequence of the sustainability factor performance in the pension indexation *formula 3*. This specific component of the pension indexation formula reflects the strong increase in the absolute number of people at age 65 or older while simultaneously the overall population number is decreasing in the transition period. The latter fact relates primarily to the shrinking working age population in the future. This results into 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.[15]

[14] The calculation of benefit ratio and replacement rate includes pensions abroad. When ascribing total pension costs to the number of national pensioners only, the calculated ratios are higher.
[15] See page 24 for further details on the impact of the different factors of the indexation formula.

Table 10 - System dependency ratio and old-age dependency ratio

	2019	2030	2040	2050	2060	2070	change 2019-2070
Number of pensioners (thousand) (I)	22890	25821	27388	27338	27178	27156	4266
Employment (thousand) (II)	42375	39964	38646	38120	37286	37126	-5249
Pension system dependency ratio (SDR) (I)/(II)	54,0	64,6	70,9	71,7	72,9	73,1	19,1
Number of people aged 65+ (thousand) (III)	17988	21383	23168	23181	23185	23229	5241
Working age population 20-64 (thousand) (IV)	49766	46080	44388	43883	42675	42536	-7230
Old-age dependency ratio (OADR) (III)/(IV)	36,1	46,4	52,2	52,8	54,3	54,6	18,5
System efficiency (SDR/OADR)	1,5	1,4	1,4	1,4	1,3	1,3	-0,2

Source: EPC-AWG projection, baseline scenario, data concerning people in 1,000.

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 year 2019 the number of pensioners will increase by 19 % by 2070. The number of people aged 65+ will even increase by 29 % within the same period. Simultaneously, the number of employed individuals will decline by more than 14 % by 2070.

The figures display that the increase of the statutory retirement age - combined with the withdrawal of early retirement incentives - will affect the increase of the number of pensioners 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 from contributors to pensioners will decline strongly when baby boomer cohorts enter retirement ages around the year 2030.

Tables 11a to 12b show the ratio of pensioners to the overall population, respectively to the inactive population 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 11a - Pensioners (public scheme) to inactive population ratio by age group (%)

	2019	2030	2040	2050	2060	2070
Age group -54	4,4	3,8	4,0	3,8	3,7	3,7
Age group 55-59	60,0	63,3	62,4	66,1	66,5	65,0
Age group 60-64	78,4	73,7	75,0	75,4	77,7	76,3
Age group 65-69	128,0	127,7	129,8	130,0	131,1	128,8
Age group 70-74	120,1	117,0	115,7	117,0	117,1	119,2
Age group 75+	112,7	115,8	113,1	111,6	111,1	110,7

Source: AWG projection, baseline scenario.

Table 11b - Pensioners (public schemes) to total population ratio by age group (%)

	2019	2030	2040	2050	2060	2070
Age group -54	1,6	1,5	1,5	1,5	1,4	1,5
Age group 55-59	9,7	9,6	9,5	9,7	9,7	9,4
Age group 60-64	28,5	25,8	25,5	25,8	26,4	25,8
Age group 65-69	104,8	93,1	93,5	92,7	93,6	91,5
Age group 70-74	110,2	108,3	106,5	107,5	107,6	109,5
Age group 75+	112,7	115,8	113,1	111,6	111,1	110,7

Source: AWG projection, baseline scenario.

Table 12a – Female pensioners (public scheme) to inactive population ratio by age group (%)

	2019	2030	2040	2050	2060	2070
Age group -54	4,5	3,9	4,1	3,8	3,7	3,8
Age group 55-59	50,6	56,7	59,9	64,2	64,7	63,0
Age group 60-64	73,2	73,9	77,3	79,1	81,1	79,7
Age group 65-69	121,1	121,5	125,6	125,9	126,9	124,0
Age group 70-74	116,1	114,6	113,3	115,1	115,3	116,3
Age group 75+	115,1	118,4	115,5	114,4	114,2	113,4

Source: AWG projection, baseline scenario.

Table 12b – Female pensioners (public scheme) to total population ratio by age group (%)

	2019	2030	2040	2050	2060	2070
Age group -54	1,8	1,6	1,7	1,6	1,5	1,6
Age group 55-59	10,3	10,4	10,2	10,4	10,2	9,9
Age group 60-64	30,3	28,0	27,8	28,1	28,4	27,8
Age group 65-69	103,9	91,9	93,5	92,4	93,1	90,5
Age group 70-74	109,6	108,1	106,6	108,0	108,1	109,1
Age group 75+	115,1	118,4	115,5	114,4	114,2	113,4

Source: AWG projection, baseline scenario.

Overall, the ratios in *table 11a* and *table 12a* are strongly influenced by labour market dynamics. A proper description of the ratios' development over time should be able to extract these effects, what is rather complicated. Therefore, a ratio of pensioners to population for the same age groups, as shown in *table 11b* and *table 12b* is calculated. Especially for the age groups 60-64 and 65-69 the declining ratios in the next 20 years reflect quite clearly the effect of postponing the retirement age due to the increase of the statutory retirement until 2029.

The individual pension benefit accrued in the German statutory pension scheme - as a point system - is in principle 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.

Tables 13a to 13c show 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 baby-boomers have retired in the mid-2030s, the number of new pensions will decrease and reach a lower level in 2070 comparable to that in 2019. The pension point value will increase - according to the pension indexation formula - on a lower level than the wages will increase (see also *formula 7 et seqq.*). 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 *tables 13a to 13c*, 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 just 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.

Table 13a - Projected and disaggregated new public pension expenditure (old-age and early earnings-related pensions) - Total

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	6066,5	9772,7	10091,0	15976,5	21792,9	28547,3
I. Number of new pensions (1000)	854,7	1016,7	767,1	856,8	810,9	761,3
II. Point value (EUR/month)	32,3	41,5	55,0	76,7	106,7	150,9
III. Average accrual rate (points/year) (IV/V)	0,80	0,82	0,85	0,86	0,89	0,88
IV. Total pension points at retirement	36,7	38,6	39,9	40,5	42,0	41,4
V. Average contributory period (years)	45,7	47,0	47,0	47,0	47,0	47,0
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
(Monthly average pensionable earnings) / (monthly economy-wide average wage)	0,24	0,31	0,31	0,31	0,31	0,31

Source: EPC-AWG projection, baseline scenario.

Table 13b - Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - MEN

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	3662,9	5935,3	6023,7	9614,0	13107,1	17005,5
I. Number of new pensions (1000)	391,3	478,8	353,6	400,9	382,9	359,6
II. Point value (EUR/month)	32,3	41,5	55,0	76,7	106,7	150,9
III. Average accrual rate (points/year) (IV/V)	1,06	1,06	1,10	1,11	1,14	1,11
IV. Total pension points at retirement	48,4	49,8	51,7	52,1	53,4	52,2
V. Average contributory period (years)	45,7	47,0	47,0	47,0	47,0	47,0
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
(Monthly average pensionable earnings) / (monthly economy-wide average wage)	0,38	0,49	0,48	0,48	0,48	0,47

Source: EPC-AWG projection, baseline scenario.

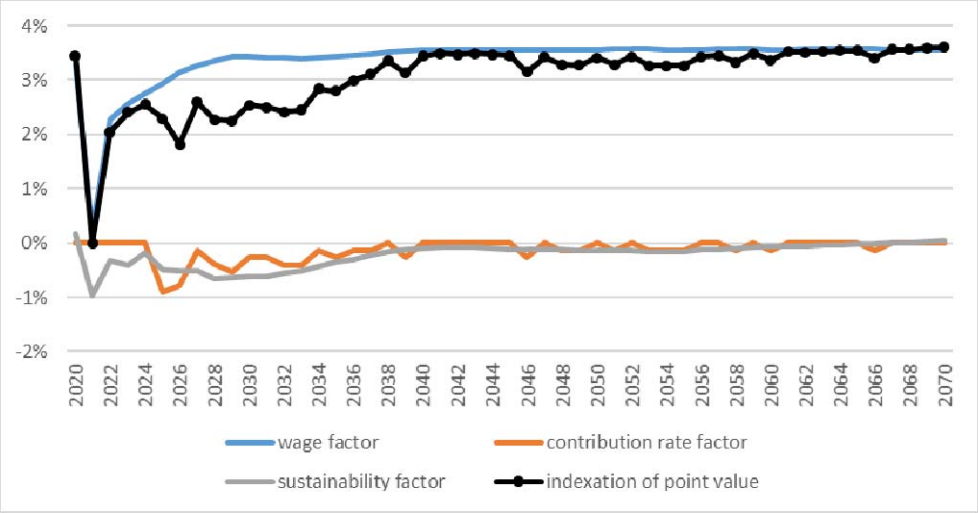
Table 13c - Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - WOMEN

New old-age earnings-related pensions	2019	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	2403,6	3837,4	4067,3	6362,5	8685,8	11541,8
I. Number of new pensions (1000)	463,5	537,9	413,5	455,9	428,0	401,7
II. Point value (EUR/month)	32,3	41,5	55,0	76,7	106,7	150,9
III. Average accrual rate (points/year) (IV/V)	0,59	0,61	0,63	0,65	0,67	0,67
IV. Total pension points at retirement	26,8	28,7	29,8	30,3	31,7	31,7
V. Average contributory period (years)	45,7	47,0	47,0	47,0	47,0	47,0
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
(Monthly average pensionable earnings) / (monthly economy-wide average wage)	0,21	0,28	0,28	0,28	0,28	0,28

Source: EPC-AWG projection, baseline scenario.

Figure 2 shows the annual impact of the three indexation factors concerning the pension indexation during the projection horizon. Due to demographic change, by the 2030s, contribution rates increase and therefore, the contribution rate factor lowers the indexation as well as the sustainability factor. Hence, the benefit ratio is decreasing. Since the demographic development is more favourable from the 2040s onwards, the impact of the contribution rate and the sustainability factor on the pension indexation decreases. Pension benefits will therefore go in line with wage growth. Hence, the development of the benefit ratios is stabilizing.

Figure 2: Impact of the three indexation factors concerning the indexation of the pension point value (in %) - period view



Source: EPC-AWG projection, baseline scenario.

3.4 Financing of the pension system

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

Table 14 – Financing of the 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	3.637	3.637	7.274
Minimum contribution	0	0	0

Source: Commission Services.

Table 15 displays 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-rearing 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 contribution (million), number of contributors in the public scheme (in 1,000), total employment (in 1,000) and related ratios (%)

	2019	2030	2040	2050	2060	2070	change 2019-2070 (pps)
Public pension contributions (%GDP)	10,1	11,1	11,7	11,8	12,1	12,2	2,0
Employer contributions	3,1	3,3	3,5	3,5	3,6	3,6	0,5
Employee contributions	3,1	3,3	3,5	3,5	3,6	3,6	0,5
*State contribution**	4,0	4,5	4,7	4,8	4,9	4,9	1,0
*Other revenues**	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Number of contributors (I) (1000)	36694	34301	33100	32647	31934	31798	-4896
Employment (II) (1000)	42375	39964	38646	38120	37286	37126	-5249
(I) / (II)	0,9	0,9	0,9	0,9	0,9	0,9	0,0

Source: EPC-AWG projection, baseline scenario.

3.5 Sensitivity analysis

In order to analyse the validity of the assumption-setting in the baseline variant, eight additional sensitivity tests were calculated. The respective 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 tests 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.

Table 17 – Public and total pension expenditure under different scenarios (p.p. deviation from the baseline)

Public pension expenditure	2019	2030	2040	2050	2060	2070	change 2019-2070 (pps)
Baseline (% GDP)	10,3	11,5	12,0	12,2	12,5	12,4	2,1
Higher life expectancy at birth (+2y)	0,0	0,1	0,2	0,2	0,3	0,4	0,4
Higher migration (+33%)	0,0	-0,1	-0,2	-0,3	-0,3	-0,3	-0,3
Lower migration (-33%)	0,0	0,1	0,2	0,3	0,4	0,4	0,4
Lower fertility (-20%)	0,0	0,0	0,1	0,4	0,6	1,0	1,0
Higher employment rate of older workers (+10 pps.)	0,0	-0,3	-0,2	-0,3	-0,3	-0,2	-0,2
Higher TFP growth (convergence to 1.2%)	0,0	0,0	0,0	0,0	0,0	0,0	0,0
TFP risk scenario (convergence to 0.8%)	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Policy scenario: linking retirement age to change in life	0,0	0,0	-0,2	-0,5	-0,6	-0,9	-0,9
Policy scenario: unchanged retirement age	0,0	0,5	0,5	0,5	0,5	0,5	0,5
Policy scenario: offset declining pension benefit ratio	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Lagged recovery scenario	0,0	0,2	0,2	0,2	0,2	0,2	0,2
Adverse structural scenario	0,0	0,3	0,3	0,3	0,3	0,3	0,3

Total pension expenditure	2019	2030	2040	2050	2060	2070	change 2019-2070 (pps)
Baseline (% GDP)	10,3	11,5	12,0	12,2	12,5	12,4	2,1
Higher life expectancy at birth (+2y)	0,0	0,1	0,2	0,2	0,3	0,4	0,4
Higher migration (+33%)	0,0	-0,1	-0,2	-0,3	-0,3	-0,3	-0,3
Lower migration (-33%)	0,0	0,1	0,2	0,3	0,4	0,4	0,4
Lower fertility (-20%)	0,0	0,0	0,1	0,4	0,6	1,0	1,0
Higher employment rate of older workers (+10 pps.)	0,0	-0,3	-0,2	-0,3	-0,3	-0,2	-0,2
Higher TFP growth (convergence to 1.2%)	0,0	0,0	0,0	0,0	0,0	0,0	0,0
TFP risk scenario (convergence to 0.8%)	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Policy scenario: linking retirement age to change in life expectancy	0,0	0,0	-0,2	-0,5	-0,6	-0,9	-0,9
Policy scenario: unchanged retirement age	0,0	0,5	0,5	0,5	0,5	0,5	0,5
Policy scenario: offset declining pension benefit ratio	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Lagged recovery scenario	0,0	0,2	0,2	0,2	0,2	0,2	0,2
Adverse structural scenario	0,0	0,3	0,3	0,3	0,3	0,3	0,3

Source: EPC-AWG projections.

- *Higher life expectancy (2 extra years)*

Because higher life expectancy will alter the number of pensioners when all other variables remain constant, a slight increase of pension expenditure - compared to the baseline scenario - is being 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) slightly compared to the baseline scenario.

- *Lower fertility*

In comparison to the baseline scenario a lower fertility will reduce 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 employment of older workers (+10pp.)*

Because higher (lower) employment rates will 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 increase of additional pension entitlements is weighted by the sustainability factor, promotes that minor effect.

- *Higher TFP growth (convergence to 1.2%)*

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

- *TFP risk scenario (convergence to 0.8%)*

This scenario with its effects on pension expenditures is almost similar to the lower productivity scenario. Changes of TFP from 1 to 0.8 do not have a clearly recognizable effect on the results of this scenario compared to the baseline variant.

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

This scenario was incorporated into 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 been not 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 when the (earnings-related) public pension benefit ratio would decrease by 10% relative to the base year. Since this is not the case, there is no difference with respect to the baseline scenario.

- *Lagged recovery scenario*
  The temporary shock leads to less pension entitlements, but also induces a stronger increase in pension values relative to wages. This is due to a particularity of the German pension formula, where pension values are guaranteed in a crisis. Supplementary, the so-called “double boundary” is applicable until 2025 and defines lower limits to the pension level. Therefore the recovery after the shock induces larger increases in pension values than in the baseline scenario. As a consequences, we see an increase in pension expenditures.

- *Adverse structural scenario*
  The permanent shock leads to less pension entitlements and, therefore, in absolute terms less pension expenditures. However, relative to the lower GDP we observe an increase in expenditures.

3.6 Description of the changes in comparison with the 2006, 2009, 2012, 2015 and 2018 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 four different projection horizons and varying assumptions.

However, the pension expenditures as share of GDP are projected to increase in the current exercise by 2.1 percentage points from 2019 to 2070. That is less than in the recent projections. A main explanation for that difference are more favourable demographic and economic assumptions.

Due to distinct differences between the latest Eurostat population projection (2019) and the previous projection in 2017 for Germany, the dependency ratio declines in the 2021 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 2018 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 less mitigating than in the last projection exercise. Compared to the last projection exercise, changes in the population projections of Eurostat results is a relatively larger number of contributors that induces relatively larger increases in the pensions over time. Additionally, the temporary lower limit for net pension level before taxation at 48% slightly raises the pension value relatively larger between 2021 and 2025 (see section 1.2). In contrast to that, labour intensity has only a marginal effect.

Table 18 - Overall change in public pension expenditure to GDP under the 2006, 2009, 2012, 2015, 2018 and 2021 projection exercises - pensions

	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

Source: Commission Services

As *tables 19a and 19b* display an overview of the decomposition of the difference between the projection exercise in 2018 and 2021.

Table 19a - Breakdown of the difference between the 2018 projections and outcome figures (% of GDP)

	2016	2017	2018	2019
Ageing Report 2018 projections	10,1	10,2	10,2	10,2
Assumptions (pps of GDP)				
Coverage of projections (pps of GDP)				
Constant policy impact (pps of GDP)				
Policy-related impact (pps of GDP)				
Actual public pension expenditure	0,0	0,0	0,0	10,3

Source: EPC-AWG projections

Table 19b - Breakdown of the difference between the 2018 and the new public pension projection (% of GDP)

	2019	2030	2040	2050	2060	2070
Ageing Report 2018 projections	10,2	11,5	12,0	12,2	12,5	12,5
Change in assumptions (pps of GDP)	0,0	-0,1	-0,2	-0,4	-0,5	-0,7
Improvement in the coverage or in the modelling (pps of GDP)	:	:	:	:	:	:
Change in the interpretation of constant policy (pps of GDP)	:	:	:	:	:	:
Policy-related changes (pps of GDP)	0,1	0,1	0,3	0,4	0,4	0,6
New projections	10,3	11,5	12,0	12,2	12,5	12,4

Source: EPC-AWG projections

4. Description of the pension model and data

4.1 Institutional context

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 Assumptions and methodologies applied

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

4.3 Data used to run the models

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 (2019). 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).

4.4 Reforms incorporated in the models

All legislated pension reforms have been taken into account. In particular, the gradual increase in statutory retirement age - to age 67 by the year 2029 - has been considered.

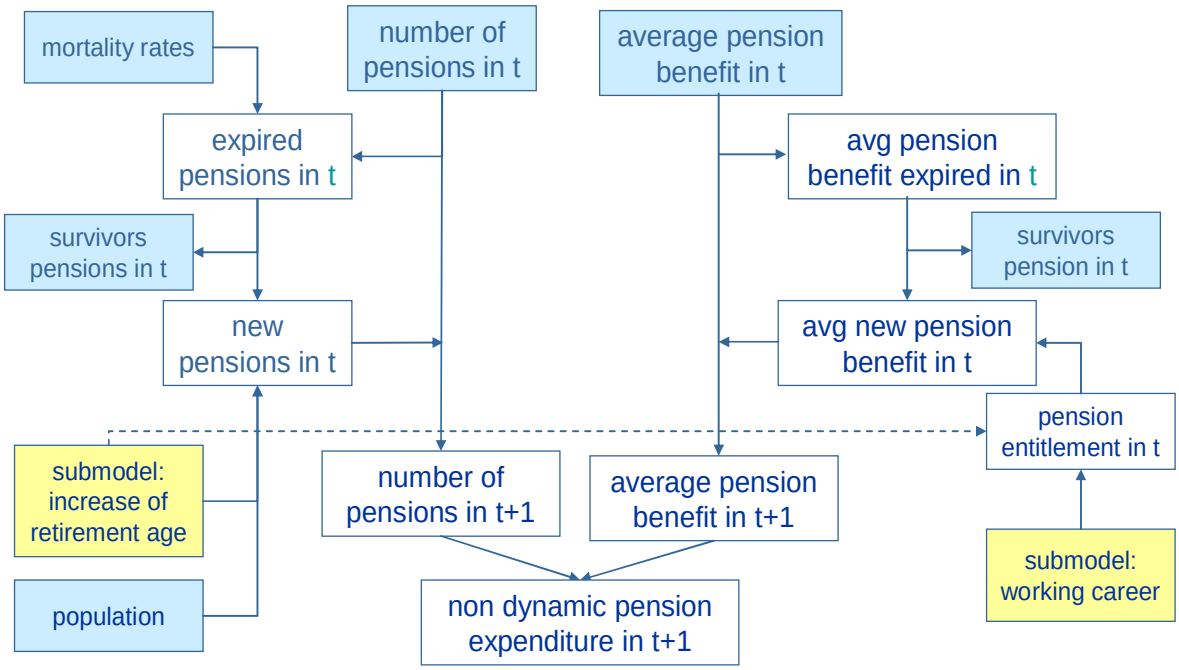
4.5 General description of the models

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). Supplementary, two major sub-modules, which capture the future occupational career developments and the interactions between different pension types, affected by individual performances due to early retirement and the rising statutory retirement age, have been incorporated. 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.

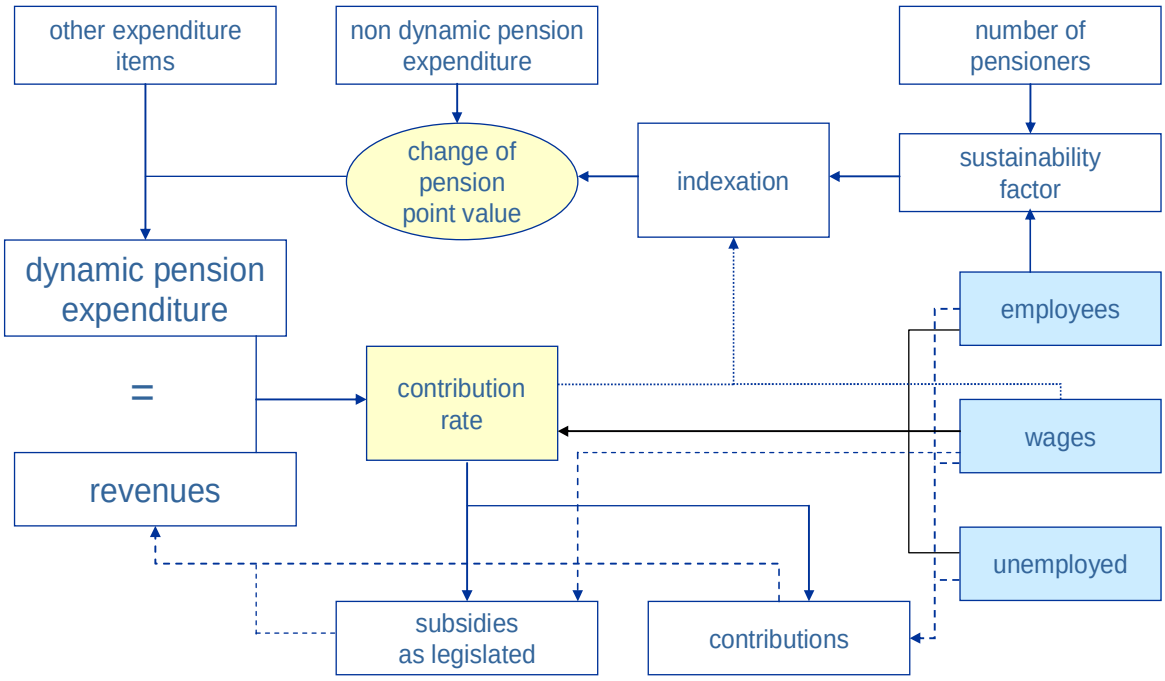
4.5.2 The financial pension model

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



Annex

The indexation formula

Pensions are adjusted annually on 1st of July. *Formula 7* displays the indexation of the pension point value for year *t*.

Formula 7: $$ppv_t = ppv_{t-1} \cdot \frac{ae_{t-1}}{ae^{\bullet}_{t-2}} \cdot \frac{100 - rf_{t-1} - cr_{t-1}}{100 - rf_{t-2} - cr_{t-2}} \cdot \left(\left(1 - \frac{pc_{t-1}}{pc_{t-2}}\right) \cdot a + 1\right)$$, where

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

ppv	=	pension point value,
ae	=	average wage based on National Accounts,
ae•	=	adjusted average wage,
rf	=	contribution rate to subsidised private pension scheme,
cr	=	contribution rate to statutory pension scheme,
pc	=	equivalent pensioners/contributors ratio,
a	=	allocation factor = 0.25.

Formula 7 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 ($ae^{\bullet}_{t-2}$) is integrated in *formula 7*: 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 8*).

Formula 8: $$ae^{\bullet}_{t-2} = ae_{t-2} * \frac{ae_{t-2} / ae_{t-3}}{ae^{ps}_{t-2} / ae^{ps}_{t-3}}$$, where

ae•	=	adjusted average wages,
ae	=	average wages based on National Accounts,
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. Up to the year 2013, a further reduction occurred due to the implied increase of the contribution rate to the subsidised private pension scheme. A specific amount (2008 2.0 %, 2009: 2.5 %, …,

2012 et seqq.: 4.0 %) of the average gross wage is supposed to be used for private old-age pension plans.

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 9*). The number of equivalent pensioners (*ePen*) is calculated as displayed in *formula 10*. The standard pension is a pension based on 45 pension points multiplied by the current pension point value (e.g. 34.19 € for Western Germany, 2020). 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 9: $$pc = \frac{ePen_W + ePen_E}{eCon_W + eCon_E}$$, where

pc = pensioner/contributor ratio,
ePen = number of equivalent-pensioners,
eCon = number of equivalent-contributors,
W, *E* = Western, Eastern Germany.

Formula 10: $$ePen = \frac{PE}{sp}$$, where

PE = total pension expenditure,
sp = standard pension.

Formula 11: $$eCon = \frac{CR}{sc}$$, where

CR = contribution paid by employees and the unemployed,
sc = standard contribution.

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 worker 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.

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.[16] 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 % in 2013 to 10 % in 2070 for this projection round.

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,

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

the model adopt 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 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 these 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 8a* - 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 decomposition

Table A - Factors behind the change in public pension expenditures between 2019 and 2070 using pension data (in percentage points of GDP) - pensions

	2019-30	2030-40	2040-50	2050-60	2060-70	2019-70
Public pensions to GDP	1,2	0,5	0,2	0,3	0,0	2,1
Dependency ratio effect	2,9	1,4	0,1	0,3	0,1	4,9
Coverage ratio effect*	-0,8	-0,4	-0,1	-0,1	-0,1	-1,5
Coverage ratio old-age	-0,4	-0,2	-0,1	-0,1	-0,1	-0,9
Coverage ratio early-age	0,4	-1,2	0,5	0,1	-0,6	-0,7
Cohort effect	-3,3	-1,4	-0,1	-0,9	0,1	-5,5
Benefit ratio effect	-0,6	-0,4	0,1	0,1	0,0	-0,8
Labour market effect	-0,2	0,0	0,0	-0,1	0,0	-0,2
Employment ratio effect	0,1	-0,1	0,0	0,0	0,0	0,0
Labour intensity effect	0,0	0,0	0,0	0,0	0,0	0,0
Career shift effect	-0,3	0,1	0,0	0,0	0,0	-0,2
Residual	-0,2	-0,1	0,0	0,0	0,0	-0,3

Source: EPC-AWG projection, baseline scenario.