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Pension Projections Exercise 2014

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 a three pillar concept, 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 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]

Nevertheless, 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 pensions to 90 % of the employed population in 2013. 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 2013. Not covered by this pension projection exercise are specific pension schemes for miners and farmers[2] with pension expenditures of about 0.4 % of GDP (in 2013), pension schemes for specific professional groups like architects, attorneys etc. However, means-tested social assistance expenditures for pensioners are projected for this exercise for the first time with a separate model due to the social schemes' 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 0.1 % of GDP in 2013.

The statutory pension system is operated by the German Federal Insurance Fund and administrated by the Federal Ministry of Labour and Social Affairs. 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 2011. Tax allowances for a *Riester* pension are of EET concept, which means that contributions are tax-free while pensions are taxed.

[2] For explanations, please see Box 1.

[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 needs amounted to 8,940 EUR per capita in 2013 for all, who received means-tested old-age provision. At the end of the year 2013 roughly 0.5 million persons of statutory retirement age or older received such a provision, which are 3.0 % of the total population within that age interval. For further details, please see annex.

Statutory Pension System

The statutory pension 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 25 % of total receipts. In 2013, insured employees and their employers each contributed 9.45 % of the employees' gross wages to the statutory pension system. In 2013, total revenues amounted to 254.7 billion EUR while total expenditures aggregated to 252.9 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, for unemployed or for people with long insurance records, have expired - fully affecting birth cohorts from 1952 onwards. Hence, since 2011 there is no possibility to retire for 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 3 months in 2014. 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.

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 to that, there exists a specific exemption for persons with a very long employment (or child care) record of at least 45 years. Those persons can temporarily claim old-age pension without deductions currently at the age of 63 (please, see section 1.2 as well).

Table 1: Statutory retirement age, earliest retirement age and penalties for early retirement

year			2013	2020	2030	2040	2050	2060
Men	with 20 contribution years[1]	statutory retirement age	65/3	65/9	67	67	67	67
		earliest retirement age	65/3	65/9	67	67	67	67
		penalty in case of earliest retirement age	-	-	-	-	-	-
		bonus in case of late retirement (per month)	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	with 40 contribution years[2]	statutory retirement age	65/3	65/9	67	67	67	67
		earliest retirement age	63	63	63	63	63	63
		penalty in case of earliest retirement age	-8.1%	-9.9%	-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%
Women	with 20 contribution years[1]	statutory retirement age	65/3	65/9	67	67	67	67
		earliest retirement age	65/3	65/9	67	67	67	67
		penalty in case of earliest retirement age	-	-	-	-	-	-
		bonus in case of late retirement (per month)	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	with 40 contribution years[2]	statutory retirement age	65/3	65/9	67	67	67	67
		earliest retirement age	63	63	63	63	63	63
		penalty in case of earliest retirement age	-8.1%	-9.9%	-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%

Source: According to the German statutory pension law, SGB VI.
Note: 65/3 indicates 65 years and 3 months.
[1)] Statutory retirement age (§ 235 resp. § 35 SGB VI).
[2)] Old-age pension for long insured persons (minimum 35 years) (§ 236 resp. § 36 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.

Box 1: The Contribution Rate

The *contribution rate* is supposed to be adjusted by mechanism encoded into law. To avoid erratic movements and pro-cyclical adjustments over the economic-cycle, the German statutory pension insurance scheme holds a *'sustainability fund'*, which is allowed to fluctuate between the amount of 0.2 and 1.5 of monthly pension expenditures. If the contribution rate is to be projected (in year *t*) to fail to guarantee the amount of the *'sustainability fund'* between the upper or the lower limit for the next year (*t+1*), a new contribution rate is set to meet the corresponding requirements in *t+1*.

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 May 30th in year *t + 1*.

Formula 1: $pp_t = e_t / e_t^{\varnothing}$, *where*

pp_t = individual pension points in year *t*,

e_t = individual earning in year *t,*

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

Formula 2: $P_{T+n} = \sum_{t=1}^{T} pp_t \times ptf \times ppv_{T+n}$, *where*

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

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

ptf = pension type factor,

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

Formula 3: $ppv_{T+n} = ppv_{T+n-1} \times wf_{T+n-1} \times cf_{T+n-1} \times sf_{T+n-1}$, *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.[6]

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

[6] 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.

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. The 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 2014 amounts to 34,857 EUR for Germany (west) and 29,359 EUR for Germany (east). Hence, the calculation of the pension point value distinguishes between both German regions by considering the respective average wages.[7] Consequently, the pension point values are currently[8] set at 28.61 EUR (west) and at 26.39 EUR (east) - regarding pension benefits per month. Nevertheless, this procedure ensures that different average wages in the Western and Eastern part of Germany still yield the same pension point entitlements.

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

In December 2014 a man/woman wishes to retire exactly two years before the current statutory retirement age of 65 years and 3 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 1,144.4 € per month (40 × 1.0 × 28.61 € × 0.928) at least until the next pension indexation on 1th July 2015

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.

[7] 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. After a dynamic convergence of incomes in the 1990th, this process has lost momentum and stagnated in the recent past. Currently, the ppv for Germany (east) is 92 % of ppv Germany (west).

[8] Period from 1st July 2014 to 30th June 2015.

The disability pension benefit is based on the assumption that the respective person would have worked virtually up to the age of 62 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 age of 62. 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 62. (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[9]. 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.

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

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

1.2 Recent reforms of the pension system included in the projections

Pension reforms since the last AWG projection exercise are incorporated into the 2014 exercise. Please find below a detailed description of all components of the latest pension reform in year 2014.

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

- **Old-age pension:**
  Before the latest pension reform, individuals were able to claim old-age pension at the age of 65 without pension penalties if they had completed an insurance record of 45 years. Under the new legislated pension reform, people can temporarily retire at the age 63 without pension penalties if they fulfil the requirement of a 45 years insurance record. Furthermore, short-time unemployment (UB1) is also accounted for as period(s) of the 45 years of insurance record. To prevent any kind of early retirement - 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 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.
- **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) lasted up to the age of 60. Under the new legislation, this period is extended to age 62. 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 p.a. for the period from the occurrence of disability up to the age of 62. In case of negative influence these respective years will be discounted.
- **Child care benefits:**
  For children born in 1992 or after, one parent is credited for a period of three years with one additional pension point p.a. Before the latest pension reform, one additional pension point had been credited for only one year for children born before 1992. Now, with the new pension legislation, one additional pension point is credited for two years for children born before 1992. These special child-care related benefits (in sum 3 or 2 additional pension points) - as social policy measures - within the public pension system are tax-financed exclusively.
- **Occupational rehabilitation:**
  Before the latest pension reform the budget for occupational rehabilitation has been indexed annually by nation-wide average wage development. With the new pension legislation the indexation additionally includes the population development of the related age-sub group.
- **Continuation of labour agreement after reaching statutory retirement age:**
  Labour law contains no provisions for an automatic expiration of an employment relationship when the statutory pension age is reached. However, in practice collective agreements regularly contain clauses providing for the termination of

employment when reaching the statutory pension age. Part of the latest pension reform is a scheme whereby employers and employees can continue the employment relationship for a certain period of time from the beginning of the statutory pension age to attain more flexibility. The agreement on the postponement must be concluded during the term of the employment relationship.

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

As commonly agreed, all recently enacted pension reforms have been taken into account in the German 2014 pension projection exercise. In addition, all AWG assumptions regarding the demographic and macro-economic context have been completely considered.

Nevertheless, it should be pointed out that some assumptions concerning the demographic and labour market projections naturally do not fully match certain country specifics. For example, in the Europop_2013 for Germany, the results of the latest census are not fully reflected, partly due to the late release of the full-fledged census results. Especially, the age group 100+ is much too high. Furthermore, age-specific mortality rates for females from the age of 91 are projected to be higher than those for males. In addition, certain country-specific assumptions concerning future immigration and emigration numbers, which are mainly driven by Eurostat's theoretical model of long-term migration convergence in the year 2150 for the entire European Union and which naturally are hard to predict, may be further improved in the future. Also, AWG members were not given the possibility to discuss the demographic assumptions with Eurostat adequately before the assumptions were used for the projection of Europop_2013. This time, Eurostat gave that opportunity to the scientific community at the IUSSP meeting in Busan, South-Korea.

Concerning the projection of the labour market participation rates as agreed by the AWG, it should be noted that there is scope for improvement in terms of aligning the participation rate projections and current German law regarding the future increase of the statutory retirement age. It should be kept in mind that the prediction of the future evolution of age-specific participation rates up to the year 2060 is difficult, when these projections are based on current and past empirical data in combination with assumed future changes of participation rates due to pension legislation.

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

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 which is well below the replacement level of approx. 2.1. Hence, the quantity of every new birth cohort is just 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 future, as seen in *table 2*. In addition, Eurostat's migration assumption for Germany accelerates the population decline compared to national estimations.

Table 2: Main demographic variables evolution

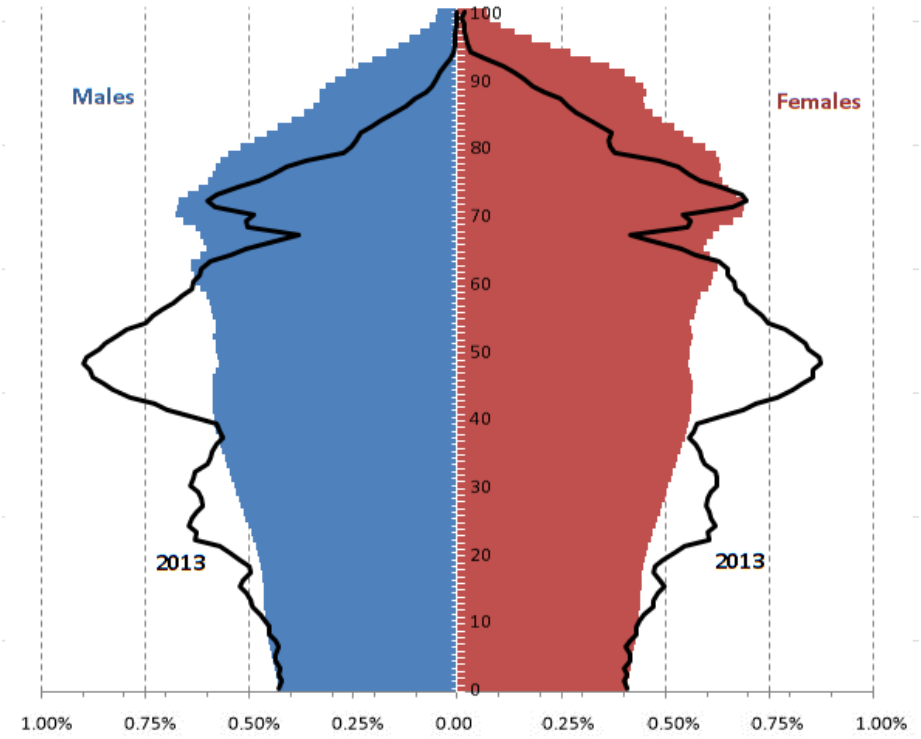
Demography	2013	2020	2030	2040	2050	2060	peak year*
Population	81 348	80 617	79 686	77 678	74 539	70 843	2013
Population growth rate	-0.7**	0.0	-0.2	-0.3	-0.5	-0.5	2015
Old-age dependency ratio (pop65/pop15-64)	31.8	36.2	47.6	55.6	57.4	59.2	2057
Ageing of the aged (pop80+/pop65+)	26.3	32.0	29.2	33.9	44.5	41.5	2051
Men - Life expectancy at birth	78.5	79.6	81.1	82.6	83.9	85.2	2060
Men - Life expectancy at 65	18.0	18.7	19.8	20.8	21.8	22.7	2060
Women - Life expectancy at birth	83.2	84.2	85.5	86.8	87.9	89.1	2060
Women - Life expectancy at 65	21.0	21.7	22.7	23.7	24.7	25.6	2060
Men - Survivor rate at 65+	85.5	87.1	89.0	90.6	92.0	93.1	2060
Men - Survivor rate at 80+	55.7	59.4	64.4	68.9	73.0	76.6	2060
Women - Survivor rate at 65+	91.9	92.7	93.8	94.7	95.4	96.1	2060
Women - Survivor rate at 80+	72.4	75.1	78.7	81.8	84.4	86.7	2060
Net migration	-1 127.0***	228.7	220.2	142.6	119.3	97.9	2014
Net migration over population change	1.9	-6.3	-1.6	-0.5	-0.3	-0.3	2016

Source: Eurostat and Commission Services.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.
** This specific population growth rate is not based on real changes of population number but somehow related to account for census variances (revision effect).
*** Not based on real migration numbers. Eurostat considered the census revision affected by the number of net-migration.

In addition to low fertility, decreasing mortality rates - with the consequence of increasing life expectancy - accelerate the demographic ageing of the German society. Since 1960 the life expectancy at birth has increased from 66.5 to 77.7 years for males and from 71.7 to 82.7 years for females according to the latest national life table. That implies an increase of about 11 years within approx. 50 years for both sexes. Even the remaining life expectancy at age 65 has been increasing during that period by about five years for

males and six years for females. *Table 2* displays a further - almost steady - increase for both indicators in future.

Figure 1: Age pyramid comparison: 2013 (black line) vs. 2060 (blue, red colour)



Source: 2013: National Statistical Office, 2060: Eurostat - Europop_2013.

As a consequence of the past fertility and mortality conditions, the share of people under age 20 in the overall population decreased from 28 % (1960) to 18 % today and the share of people at age 65 and older increased from 11 % to 21 %. In absolute numbers the latter age group has more than doubled over that period. Until 2060 the share of people under age 20 will remain more or less constant while the share of people aged 65+ will increase to 32 % based on Europop_2013.

Migration flows - as the third component which affects population growth - are however, extremely difficult to predict. Different than for future mortality and fertility assumptions, projections for future migration flows should not be based on past observations. Decisions to migrate depend primarily on current political, economical and demographical developments in the sending and destination countries. Those reflections are not part of the Europop_2013. Furthermore, net migration - as an isolated factor - is not a suitable indicator for population growth. Even negative net migration p.a. can result in a positive, increasing population number.[10]

[10] For further reading regarding extending stable population theory by including migration see e.g. Espenshade, T.J., Bouvier, L.F., and Arthur, W.B. (1982). Immigration and the stable population model. Demography 19(1): 125-133.

2.2 Labour forces

In the near future Germany will be faced with a radical societal change based on demographic development. As mentioned above, 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. The latter fact relates primarily to the shrinking working age population in future. 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 politicymakers together.

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

Labour force	2013	2020	2030	2040	2050	2060	peak year*
Labour force participation rate 55-64	67.6	71.9	72.5	76.0	75.9	76.1	2046
Employment rate for workers 55-64	63.7	68.3	68.3	71.7	71.6	71.8	2046
Share of workers 55-64 in total labour force	94.2	95.1	94.3	94.3	94.3	94.3	2018
Labour force participation rate 65-74	8.8	15.3	18.5	16.6	19.1	18.1	2048
Employment rate for workers 65-74	8.7	15.1	18.3	16.4	18.9	17.9	2048
Share of workers 65-74 in total labour force	99.0	99.0	98.9	99.0	98.9	98.9	2018
Median age of labour force	43.0	43.0	43.0	43.0	43.0	43.0	2013

Source: Commission Services.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.

Apart from demography, labour force development is strongly affected by age-specific participation rates. During the last years 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 has increased from 37.4 % to 63.7 %. For the same period the employment rate for males (females) increased by 23.5 (28.8) percentage points, starting in 2000 with 46.2 % (28.7 %). While the employment rate for the age group 60-64 gained just 19.6 % in the year 2000 the figure increased to 49.9 % in 2013. Disaggregated by gender, the respective female participation rate has more than tripled to amount to 42.6 % and doubled for men to up to 57.6 % during that period. 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. As already mentioned above, the development of both rates is somewhat elusive. At least until the year 2030, the composition effects within the age brackets pretend a relatively plausible development of the participation and employment rates for the respective age-groups within the concept of a constant policy scenario. However, a review of age-specific ratios between cohorts signalizes a less clearer picture. Additionally, increasing labour force participation and employment rates in (*table 3*) but more or less constant values for the average effective entry and especially for exit age over time signal the weakness of the calculation method and the interpretability regarding the latter indicators.

Considering the constant median age of the labour force in *table 3* and the almost constant average effective entry and exit ages[11] in *tables 4a, 4b* evidence suggests that future participation and employment rates from 2030 onwards have been set too low. Additionally, the average effective exit ages for males and females in 2013 seem too high. Taking already existing real figures for 2013 into account would result in a relatively constant ratio of retirement duration up to the year 2030 which reflects very well the functioning of the increase of the statutory retirement age to age 67.

Due to the definition of the constant policy scenario no meaningfuly further increase of labour market age-specific participation rates is expected after 2030, the year the statutory retirement age will finally converge to age 67 based on current law. Hence, in combination with steadily decreasing mortality rates, the duration of retirement will increase as can be seen for both sexes in *tables 4a, 4b*.

[11] As the Commission Services from the DG EMPL highlighted in a working paper (INDIC/22/071206/EN) the conventional calculation of the indicator 'average effective exit age' is subjected to several shortcomings. Based on the demonstrated restrictions, DG EMPL elaborated an alternative indicator, which is i. a. based on information of age-specific life expectancy. However, for this report the AWG will rely on the conventional method as suggested by DG ECFIN Commission Services.

Table 4a: Labour market entry age, exit age and expected duration of life spent in retirement - male

	2013	2020	2030	2040	2050	2060	peak year*
(1) Average effective entry age (CSM)	21.3	21.1	21.1	21.1	21.1	21.1	2013
(2) Average effective exit age (CSM)	65.6**	65.4	65.7	65.7	65.7	65.7	2031
(3) = (2) - (1) Average effective working career	44.3	44.3	44.6	44.6	44.6	44.6	2031
(4) Contributory period	-	-	-	-	-	-	-
(5) = (4) / (3)	-	-	-	-	-	-	-
(6) Duration of retirement[2]	17.2	18.7	19.0	20.0	20.9	21.8	2060
(7) = (6) / (3)	38.8	42.2	42.6	44.9	46.9	48.9	2060
(8) Percentage of adult life spent in retirement[3]	26.6	28.3	28.5	29.5	30.5	31.4	2060
(9) Early / late exit[4]	1.6	1.6	1.1	0.8	1.0	0.9	2013

Source: Commission Services.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.
** According to national official statistics, the current retirement age of old-age and early pensioners was 64.1 in 2013.
[2] Calculated as the difference between the life expectancy at the average effective exit age and the average effective exit age itself.
[3] Calculated as the ratio between the duration of retirement and the life expectancy diminished by 18 years.
[4] Calculated as the ratio of those who retired and are aged younger than the statutory retirement age and those who retired and are equal or older than the statutory retirement age.

Table 4b: Labour market entry age, exit age and expected duration of life spent in retirement - female

	2013	2020	2030	2040	2050	2060	peak year*
(1) Average effective entry age (CSM)	21.7	22.5	22.5	22.5	22.5	22.5	2024
(2) Average effective exit age (CSM)	65.5**	64.6	65.2	65.3	65.3	65.3	2013
(3) = (2) - (1) Average effective working career	43.7	42.2	42.7	42.8	42.8	42.8	2013
(4) Contributory period	-	-	-	-	-	-	-
(5) = (4) / (3)	-	-	-	-	-	-	-
(6) Duration of retirement[2]	21.0	21.7	22.7	23.7	24.7	25.6	2060
(7) = (6) / (3)	48.0	51.5	53.1	55.4	57.7	59.8	2060
(8) Percentage of adult life spent in retirement[3]	30.7	31.8	32.5	33.4	34.3	35.1	2060
(9) Early / late exit[4]	2.6	2.0	1.3	1.0	1.1	1.0	2017

Source: Commission Services.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.
** According to national official statistics, the current retirement age of old-age and early pensioners was 64.2 in 2013.
[2] Calculated as the difference between the life expectancy at the average effective exit age and the average effective exit age itself.
[3] Calculated as the ratio between the duration of retirement and the life expectancy diminished by 18 years.
[4] Calculated as the ratio of those who retired and are aged younger than the statutory retirement age and those who retired and are equal or older than the statutory retirement age.

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, it is possible to separate the projections into the three components of 'old-age and early pensions', 'disability pensions' and 'survivor's pensions' due to methodological improvements of the projection model.

As a consequence of governmental promotion and tax treatment, occupational and private pension schemes have gained widespread acceptance in the recent past. After twelve years of government-subsidised private pension provision, significant progress in the uptake of the private supplementary pension scheme has been achieved. Meanwhile, the number of occupational pension entitlements (of active employees) increased from 14.6 million in 2001 to about 20 million and the number of "Riester"-contracts in place reached a level of 16 million by the end of June 2014. It can be assumed that well over 70 % of all employees between age 25 to 65 with compulsory social insurance coverage are entitled to a supplementary occupational pension or a "Riester"-pension. But at present, no reliable data is available in order to provide extended projections including these non-mandatory pension schemes into this projection exercise.

Table 5 provides an overview of the pension expenditures between 2005 and 2012 with an additional comparison of ESSPROS and AWG data. *Table 5* illustrates that the scope of the German EPC-AWG public pension projections differs from 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 difference between Eurostat's total and public pension expenditures.

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

year	2005	2006	2007	2008	2009	2010	2011	2012
1 Eurostat total pension expenditure	13.4	13.0	12.4	12.4	13.3	12.8	12.3	12.3
2 Eurostat public pension expenditure	12.1	11.7	11.2	11.2	11.9	11.5	11.1	11.0
3 Public pension expenditure (AWG)	11.2	10.8	10.4	10.4	11.1	10.7	10.4	10.3
4 Difference (2)-(3)	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7

Source: Eurostat, National statistics on pension.

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 2.8 percentage points from 10.3 % in 2013 to 13.1 % in 2060. Due to currently favourable demographic conditions - with regard to the relative age distribution - and past pension reforms, the 2013 rate is almost the lowest value over the projection horizon. From now on, 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 during the remaining projection horizon. Nevertheless, the temporary peak is the final projection year 2060.

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

year	2013	2020	2030	2040	2050	2060	peak year *
Expenditure							
Gross public/total pension expenditure	10.3	10.6	11.9	12.6	12.8	13.1	2060
Private occupational pensions							
Private pensions							
Mandatory private							
Non-Mandatory private							
Net public pension/Net total pension expenditure	8.6	8.8	9.7	10.1	10.2	10.4	2060
Contributions							
Public/total pensions contributions	10.7	10.9	12.2	12.8	13.1	13.4	2060

Source: EPC-AWG projection, baseline scenario.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.

The net public pension expenditure in *table 6* is increasing sub-proportionally to the total expenditure. However, the respective level is lower. It is adjusted by pensioners' social security contributions to health and long term care as well as 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. For further explanation, please see details in annex.

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

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

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.

Contributions of the pension fund to the statutory healthcare system account for about 0.6 % of GDP p.a. at almost constant level for the projection horizon. 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. However, the almost 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 7a: Projected gross public pension spending: by scheme (as % of GDP)

year	2013	2020	2030	2040	2050	2060	peak year*
Pension scheme							
Total public pensions	10.3	10.6	11.9	12.6	12.8	13.1	2060
of which earnings related:							
Old-age and early pensions	8.0	8.4	9.8	10.6	10.8	11.2	2060
Disability pensions	0.7	0.7	0.6	0.6	0.6	0.6	2016
Survivor pensions	1.6	1.5	1.5	1.4	1.4	1.3	2013
Other pensions	-	-	-	-	-	-	-

Source: EPC-AWG projection, baseline scenario.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.

Table 7a displays how the overall evolution of pension expenditure within the projection interval 2013-2060 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 40 % within the projection horizon. However, in the same time expenditures for survivor and disability pensions respectively will decrease by about 22 % and 12 %. The latter decline results predominantly from a combined situation of an expected future decrease of the labour force (which displays the potential of individuals that can get disabled) in absolute numbers as well as in relative terms to the number of pensioners and 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 the 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.

Box 3: Pension Schemes for Miners and Farmers

As mentioned above, pension schemes for miners and farmers are not part of the pension expenditure projection exercise. Currently, pension expenditures related to miners amount to about 0.3 % of GDP while farmers' pension expenditures account for 0.1 % 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.

Currently, no highly 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.

Concerning to the farmers pension system in the year 2013, this scheme was responsible for 605,000 pensions compared to 237,000 contributors and an overall budget of 2.8 billion Euro. The miners system covers about 70,000 contributors and 1.03 million pensions in 2013 while the overall expenditures amounts to 8.5 billion Euro.

Table 7b: Projected gross public spending for means-tested benefits for persons at the age of the statutory retirement age or older (as % of GDP)

year	2010	2013	2020	2030	2040	2050	2060	peak year*
Total spending	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2060

Source: EPC-AWG projection, baseline scenario.
* This column represents the peak year, in which the respective variable reaches its max. over the period 2013-2060.

As already stated above, within the concept of minimum income provision for individuals from the age of the statutory retirement age, the German social system provides means-tested benefits from social assistance if old-age provision from all income sources is not sufficient. This system of social assistance is completely tax-financed and not part of the public pension system. Nevertheless, these expenditures are part of the public social system and therefore separately shown in *table 7b*.

Individual net-benefits provided by the means-tested social system - and therefore defined as the expenditures - are calculated as the difference between the individuals' gross needs and individuals' available income from all sources. Empirical data illustrate that pension benefits from the public pension scheme are the main source of overall

income. Expenditures for means-tested benefits for individuals at the age of the statutory retirement age or older account for an almost constant share of GDP over the projection horizon of 0.1 %, as seen in *table 7b*. This development is mainly explained by different indexation rules regarding social assistance and pension benefits. For further description and model explanation, please see annex.

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 8a* displays the decomposed factors of the pension expenditure to GDP ratio, generated with *formulas 4 to 6*.

Formula 4:

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

As agreed in the AWG, 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:

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

Formula 6 decomposes the labour market indicator as following:

Formula 6:

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

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. 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 minor.

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 8a: Factors behind the change in public pension expenditures between 2013 and 2060 (in percentage points of GDP) - pensions

year	2013-20	2020-30	2030-40	2040-50	2050-60	2010-60	Ø annual change
Public pensions to GDP	0.4	1.3	0.7	0.2	0.3	2.8	0.057
Dependency ratio effect	1.3	3.3	2.1	0.4	0.4	7.5	0.156
Coverage ratio effect	-0.4	-0.8	-0.4	0.0	-0.2	-1.8	-0.040
Coverage ratio old-age*	0.0	-0.5	-0.1	-0.1	-0.1	-0.8	-0.018
Coverage ratio early-age*	-2.4	0.6	-1.3	0.8	-0.1	-2.5	-0.063
Cohort effect*	0.1	-3.6	-1.8	-0.3	-1.0	-6.6	-0.145
Benefit ratio effect	-0.2	-0.7	-0.8	-0.1	0.1	-1.8	-0.041
Labour Market / Labour intensity effect	-0.3	-0.3	-0.1	0.0	0.0	-0.7	-0.015
Employment ratio effect	-0.2	0.0	-0.2	0.0	0.0	-0.4	-0.009
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.002
Career shift effect	-0.2	-0.3	0.1	0.0	0.0	-0.4	-0.008
Residual	-0.1	-0.2	-0.1	0.0	0.0	-0.4	-0.002

Source: EPC-AWG projection, baseline scenario.
** Sub-components of the 'coverage ratio effect' do not add up necessarily.*

As a consequence of *formula 3*, the *benefit ratio* mitigates the increase of pension expenditures compared to GDP substantially. Basically, the sustainability factor, that 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 until the mid-2040s. Afterwards, the impact of the benefit ratio will be zero or reversed for the remaining projection horizon, 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 8b: Factors behind the change in public pension expenditures between 2013 and 2060 (in percentage points of GDP) - pensioners

year	2013-20	2020-30	2030-40	2040-50	2050-60	2010-60	Ø annual change
Public pensions to GDP	0.4	1.3	0.7	0.2	0.3	2.8	0.057
Dependency ratio effect	1.3	3.3	2.1	0.4	0.4	7.5	0.156
Coverage ratio effect	-0.3	-0.6	-0.3	0.0	-0.1	-1.3	-0.028
Coverage ratio old-age*	0.0	-0.3	0.0	-0.1	0.0	-0.3	-0.006
Coverage ratio early-age*	-2.3	0.9	-1.2	0.8	-0.1	-1.7	-0.048
Cohort effect*	0.1	-3.6	-1.8	-0.3	-1.0	-6.6	-0.145
Benefit ratio effect	-0.3	-0.9	-0.9	-0.1	0.0	-2.3	-0.053
Labour Market / Labour intensity effect	-0.3	-0.3	-0.1	0.0	0.0	-0.7	-0.015
Employment ratio effect	-0.2	0.0	-0.2	0.0	0.0	-0.4	-0.009
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.002
Career shift effect	-0.2	-0.3	0.1	0.0	0.0	-0.4	-0.008
Residual	-0.1	-0.2	-0.1	0.0	0.0	-0.4	-0.002

Source: EPC-AWG projection, baseline scenario.
** Sub-components of the coverage ratio effect do not add up necessarily.*

Table 8b presents the decomposition results for pensioners instead of pensions following the same procedure as *formulas 4 to 6*. Hence, the respective effects of the single components related to the increase of pension expenditures are almost the same as for pension perspective.

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 42.5 % in 2013 to 35.9 % in 2040. Afterwards, the value will be almost constant. This development is a consequence of the sustainability factor performance in the pension indexation *formula 3* (see also *figure 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 future. That results into a situation that 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.

Table 9: Gross replacement rate at retirement (RR), Benefit Ratio (BR) and coverage by pension scheme (in %)

year	2013	2020	2030	2040	2050	2060
Public/Total Pension scheme (BR)	44.6	44.0	40.6	37.7	37.3	37.3
Public/Total Pension scheme (RR)	42.5	41.9	38.7	35.9	35.5	35.5
Coverage	100.0	100.0	100.0	100.0	100.0	100.0
Public scheme old-age earnings related (BR)	40.8	40.9	38.2	35.8	35.4	35.6
Public scheme old-age earnings related (RR)	38.9	38.9	36.4	34.1	33.7	33.9
Coverage	84.9	85.0	87.3	89.0	89.2	89.9

Source: EPC-AWG projection, baseline scenario.

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 2013 the number of pensioners will increase by 20 % by 2030. The number of people aged 65+ will even increase by 31 % within the same period (see EUROPOP_2013). Simultaneously, the number of employed individuals will decline by more than 7 % by 2030. The potential workforce population (age 15 to 64) will even decline by almost 13 % (see EUROPOP_2013) by 2030.

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, due to declining unemployment rates by the year 2030.

As people retire later, they work longer. Because the number of people below the age of 15, who will be part of the future work force and replace the new retirees, will steadily decline, the almost constant number of contributors up to the year 2020 is mainly driven by an increasing old-age labour force participation. Nevertheless, the ratio from contributors to pensioners will decline strongly when baby boomer cohorts enter retirement ages around the year 2030.

Furthermore, *table 10* illustrates that, after an ongoing increase and a following decline, the number of pensioners in 2060 will be almost equivalent to that number in 2030. The same development can be seen for the number of people aged 65+. Hence, from 2031 onwards the number of pensioners and the number of people aged 65+ will change in parallel lines. In contrast, the number of people employed as well as the potential workforce population will rapidly decrease in parallel lines by 2060.

Table 10: System Dependency Ratio and Old-age Dependency Ratio

year	2013	2020	2030	2040	2050	2060
(1) Number of pensioners	20 185.0	21 438,0	24 239.1	25 688.7	25 105.6	24 067.7
(2) Employment	40 270.3	40 105,8	37 313.9	34 759.5	32 929.3	30 831.5
(3) = (1) / (2) Pension System Dependency Ratio	50.1	53.5	65.0	73.9	76.2	78.1
(4) Number of people aged 65+	17 062.4	18 668.7	22 355.2	24 258.5	23 735.9	22 875.1
(5) Working age population 15 - 64	53 731.8	51 625.6	46 999.4	43 668.5	41 353.0	38 663.9
(6) = (4) / (5) Old-age Dependency Ratio	31.8	36.2	47.6	55.6	57.4	59.2
(7) = (3) / (6) System efficiency	1.6	1.5	1.4	1.3	1.3	1.3

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

In 2060, the working force population is projected to be reduced by 28 % compared to the number in 2013, whereas the number of pensioners will have increased by 19 %. The latter is just one percentage point less compared to 2030, due to the fact that the large baby boomer cohorts will already be gone. The same picture can be seen in the development of the population aged 65+, which will be increased by 34 % by 2060. That is only three percentage points more than in 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).

Especially the development of the pensioners/inactive-persons ratio in age group 55-59 as shown in *table 11a* and *table 12a* reflects the effect of an increasing statutory retirement age. While the number of pensioners at age 62 or younger, who mainly

receive disability pensions in the long run, is almost constant over time, the number of inactive people is decreasing. Hence, the pensioners/ inactive-persons ratio is increasing. Due to a future higher female labour market participation, the increase of this ratio is more pronounced for the female population.

The same effects, but to a lesser extent, can be observed for the age group 60-64 for both sexes. Ratios above 100 % can occur, when a person receives 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 schemes) to inactive population ratio by age group (%)

year	2013	2020	2030	2040	2050	2060
Age group -54*	4.9	4.9	4.6	4.5	4.3	4.1
Age group 55-59	49.9	50.0	54.7	59.5	63.8	63.4
Age group 60-64	77.0	62.7	64.0	68.0	72.3	70.6
Age group 65-69	109.8	120.6	114.7	117.1	117.4	119.1
Age group 70-74	104.6	104.1	106.0	103.9	105.2	106.9
Age group 75+	101.2	103.7	104.7	101.8	100.8	100.1

Source: AWG-projection, baseline scenario. *Interval for population in denominator: 20-54.

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

year	2013	2020	2030	2040	2050	2060
Age group -54*	1.6	1.5	1.4	1.4	1.4	1.3
Age group 55-59	9.8	8.8	8.8	8.7	8.9	8.8
Age group 60-64	35.8	25.4	23.3	23.2	24.0	23.6
Age group 65-69	95.8	93.4	83.6	85.0	83.4	84.9
Age group 70-74	98.8	97.8	97.4	95.8	96.5	98.0
Age group 75+	101.2	103.7	104.7	101.8	100.8	100.1

Source: AWG-projection, baseline scenario. *Interval for population in denominator: 20-54.

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

year	2013	2020	2030	2040	2050	2060
Age group -54*	4.9	4.9	4.7	4.6	4.5	4.2
Age group 55-59	41.2	42.7	50.6	57.3	61.8	61.0
Age group 60-64	73.1	59.4	65.3	72.4	77.9	75.2
Age group 65-69	107.8	117.9	111.2	116.3	116.4	117.9
Age group 70-74	105.2	104.4	106.0	104.9	106.6	108.3
Age group 75+	106.7	108.6	109.8	106.9	106.5	106.0

Source: AWG-projection, baseline scenario. *Interval for population in denominator: 20-54.

Table 12b: Female pensioners (public schemes) to population ratio by age group (%)

year	2013	2020	2030	2040	2050	2060
Age group -54*	1.8	1.7	1.6	1.6	1.5	1.5
Age group 55-59	10.4	9.7	9.9	9.5	9.8	9.6
Age group 60-64	39.8	27.8	26.2	26.2	27.1	26.2
Age group 65-69	97.6	95.0	84.9	87.3	85.3	86.6
Age group 70-74	101.2	99.5	99.8	98.9	100.0	101.5
Age group 75+	106.7	108.6	109.8	106.9	106.5	106.0

Source: AWG-projection, baseline scenario. *Interval for population in denominator: 20-54.

Nevertheless, 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 level in 2060 comparable to that in the 2000s. 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.* and *figures 2, 3*). The future increase of the average number of individual pension points is most notably due to an extended working lifetime and the projected higher labour market participation, especially of women and older people.

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 categories "point value", "average pension points

accumulated at retirement" and "average monthly pension", since the latter is the product of the first and the second item. 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

year	2013	2020	2030	2040	2050	2060
New pension						
I Projected new pension expenditure (millions EUR)	4 488.8	7 424.1	11 515.2	11 343.0	17 679.7	22 486.2
Number of new pensions (in 1000)	674.5	901.8	1 051.6	754.1	825.0	734.2
Average monthly pension	1 109.2	1 372.2	1 824.9	2 506.9	3 571.6	5 104.7
Point value	329.7	388.4	512.2	689.4	965.9	1 358.1
Average pension points accumulated at retirement	40.4	42.2	42.8	43.6	44.4	45.1
Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0
Average new pension over economy wide average wage	0.43	0.43	0.40	0.38	0.39	0.39

Source: EPC-AWG projection, baseline scenario.

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

year	2013	2020	2030	2040	2050	2060
New pension						
I Projected new pension expenditure (millions EUR)	2 786.6	4 547.9	7 106.5	6 837.6	10 749.9	13 661.1
Number of new pensions (in 1000)	342.1	436.7	521.1	365.7	406.2	364.2
Average monthly pension	1 357.8	1 735.7	2 272.9	3 116.3	4 411.3	6 251.6
Point value	329.7	388.4	512.2	689.4	965.9	1 358.1
Average pension points accumulated at retirement	49.4	53.6	53.2	54.2	54.8	55.2
Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0
Average new pension over economy wide average wage	0.52	0.54	0.50	0.48	0.48	0.48

Source: EPC-AWG projection, baseline scenario.

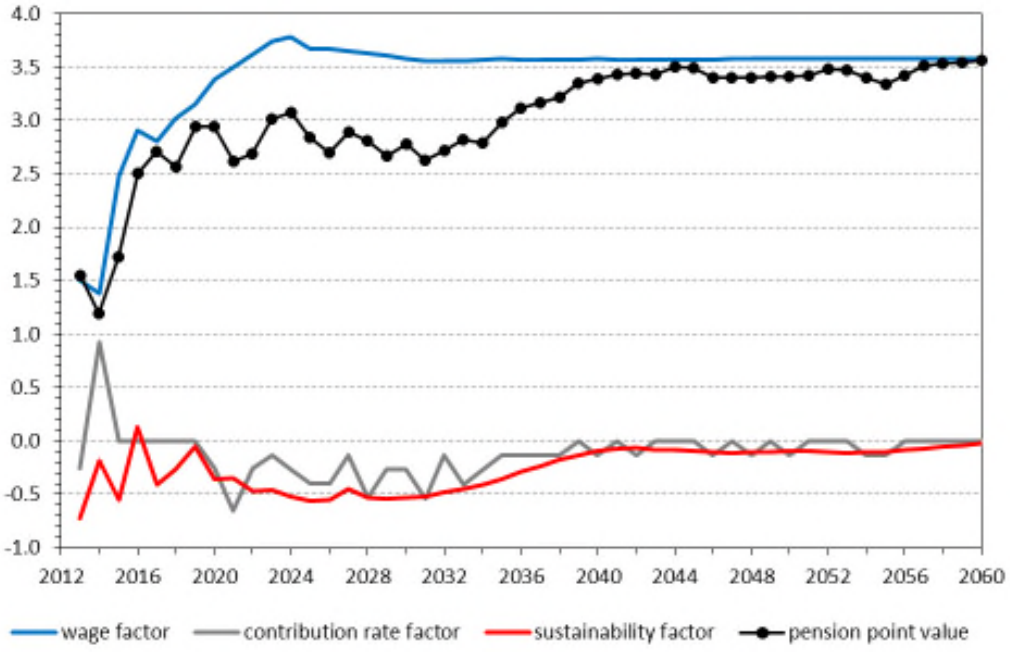
Table 13c: Disaggregated new public pension expenditure (old-age and early earnings-related pensions) - Female

year	2013	2020	2030	2040	2050	2060
New pension						
I Projected new pension expenditure (millions EUR)	1 702.3	2 876.2	4 408.7	4 505.4	6 929.8	8 825.1
Number of new pensions (in 1000)	332.4	465.0	530.5	388.4	418.9	370.0
Average monthly pension	853.4	1 030.8	1 385.0	1 933.1	2 757.3	3 975.6
Point value	329.7	388.4	512.2	689.4	965.9	1 358.1
Average pension points accumulated at retirement	31.1	31.8	32.4	33.6	34.3	35.1
Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0
Average new pension over economy wide average wage	0.33	0.32	0.30	0.30	0.30	0.30

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.

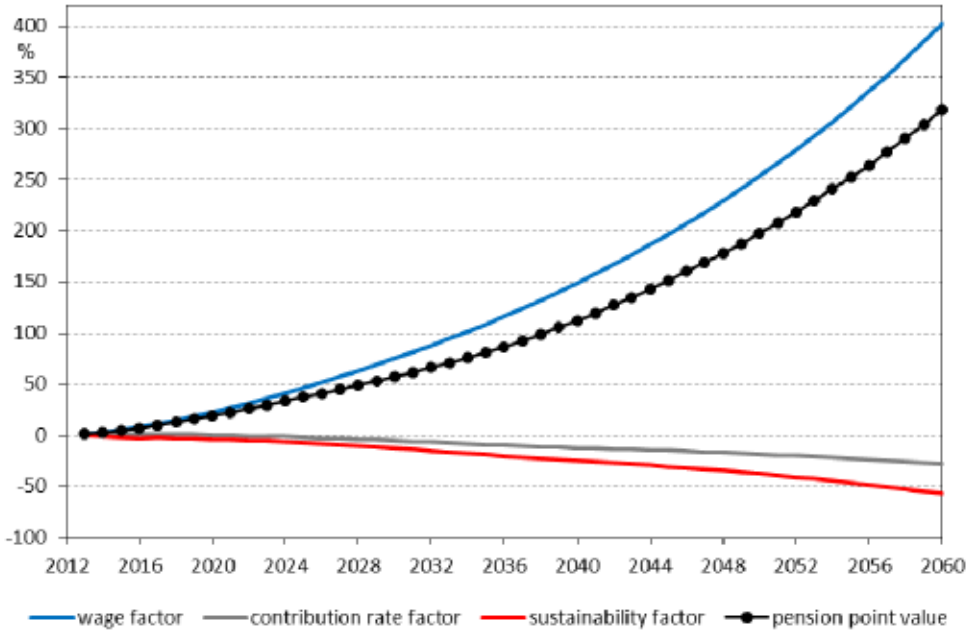
Figure 2: Impact of the three indexation factors concerning the indexation of the pension point value (in %) - period view



Source: Federal Ministry of Labour an Social Affairs.

Figure 3 displays the same issue on a cumulative view. From 2013 to 2060, gross wages per capita increase by slightly more than 400 %, whereas the pension point value increases only to somewhat more than 300 % due to the two additional indexation factors in *formula 3*.

Figure 3: Impact of the three indexation factors concerning the indexation of the pension point value (in %) - cumulative view



Source: Federal Ministry of Labour an Social Affairs.

3.4 Financing of the pension system

Table 14 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.

Table 14: Revenue from contribution (million), number of contributors in the public pension scheme (in 1,000), total employment (in 1,000) and related ratios (%)

year	2013	2020	2030	2040	2050	2060
Public contribution	293 734.9	372 397.5	555 817.7	772 830.9	1 063 739.8	1 447 513.7
Employer contribution	*96 788.0*	*121 781.5*	*181 541.5*	*252 099.0*	*345 936.5*	*464 948.0*
Employee contribution	*96 788.0*	*121 781.5*	*181 541.5*	*252 099.0*	*345 936.5*	*464 948.0*
State contribution	*100 158.9*	*128 834.5*	*192 734.7*	*268 632.9*	*371 866.8*	*517 617.7*
(1) Number of contributors	33 910.2	33 807.7	31 428.2	29 203.1	27 643.7	25 882.5
(2) Employment	40 270.3	40 105.8	37 313.9	34 759.5	32 929.3	30 831.5
(3) = (1) / (2)	0.84	0.84	0.84	0.84	0.84	0.84

Source: EPC-AWG projection, baseline scenario.

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 guarantied.

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 15*. 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 15: Public and total pension expenditures (as % of GDP) under different scenarios (deviation from the baseline)

year	2013	2020	2030	2040	2050	2060
Public/Total Pension Expenditure						
Baseline	10.3	10.6	11.9	12.6	12.8	13.1
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.2	0.3	0.4
Higher labour productivity (+0.25 pp.)	0.0	0.0	0.0	0.0	0.0	0.0
Lower labour productivity (-0.25 pp.)	0.0	0.0	0.0	0.0	0.0	0.0
Higher employment rate (+2 pp.)	0.0	-0.1	-0.2	-0.2	-0.1	-0.1
Higher employment of older workers (+10 pp.)	0.0	-0.2	-0.4	-0.4	-0.3	-0.3
Lower migration (-20 %)	0.0	0.0	0.1	0.1	0.2	0.2
TFP risk scenario	0.0	0.0	0.0	0.0	0.0	0.1
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	0.0	-0.2	-0.4	-0.6

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 labour productivity (+/-0.25 pp.)*

Because pension benefits basically are indexed in line with nominal wages (as a starting point), a change in labour productivity does not alter the results of these scenarios compared to the baseline variant.

- *Higher employment rate (+2 pp.) / Higher employment of older workers (+10 pp.)*

Because higher employment rates will not only result in a higher GDP, but also increase the pension entitlements, only a minor positive effect on the expenditure side is observed. The fact, that the increase of additional pension entitlements is weighted by the sustainability factor, promotes that minor effect.

- *Lower migration (-20 %)*

The different age structure of immigrants and emigrants explains most of the observed results: Because on the one hand lower migration, due to fewer immigrants, reduces labour supply and employment and hence GDP, but increases the pension entitlements due to fewer emigrants on the other hand, the pension expenditure/GDP ratio will increase slightly compared to the baseline scenario.

- *TFP risk scenario*

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.

3.6 Description of the changes in comparison with the 2006, 2009 and 2012 projections

Table 16 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 2.8 percentage points from 2013 to 2060. That is slightly more than in the recent projections. A main explanation for that difference is the fact that during the recent years relatively small birth cohorts (1940 - 1950) reached retirement age, whereas relatively large cohorts (1920 - 1930) attained very old ages with correspondingly high mortality rates. The combination with the strong economic recovery in Germany since 2010 results in a currently low expenditure/GDP ratio.

Despite the fact of biased migration assumptions in the Europop_2013 for Germany, the dependency ratio remains almost unchanged across the different projection exercises. The coverage ratio is affected by various demographic components (e. g., increasing life expectancy, decreasing probabilities of marriage). Nevertheless, the currently lower coverage ratio effect (compared to the 2012 exercise) is also influenced by the projected increase of female labour force participation rates and therefore longer contribution periods. Although the future average pension benefit of new pensioners will be lower than that of the current stock-pensioners, this effect will be partially counterbalanced by the growing female labour participation rates and the postponement of the effective retirement age. That situation will result in increased pension accruals and a more favourable ratio of contributors to pensioners. As a consequence, the benefit ratio will reduce its relative impact to decelerate the increase of the overall pension expenditures. In contrast to that, labour intensity has only a marginal effect.

Table 16: Average annual change in public pension expenditure to GDP during the projection period under the 2006, 2009 and 2012 projection exercises

	Public pensions to GDP	Dependency ratio	Coverage ratio	Employment effect	Benefit ratio	Labour intensity	Residual
2006 *	1.94	7.53	-0.60	-1.12	-3.46		-0.41
2009 **	2.32	7.93	-1.88	-0.75	-2.20		-0.77
2012 ***	2.58	7.90	-1.76	-0.47	-2.23	0.04	-0.90
2015 ****	2.81	7.53	-1.82	-0.38	-1.77	0.03	-0.78

Decomposition periods: *2004-2050; **2007-2060; ***2010-2060; ****2013-2060.

As *table 17* displays an overview of the decomposition of the difference between the projection exercise in 2012 and 2015, all main assumption components (such as, demography, labour force participation and labour productivity) mitigate the increase of pension expenditures in the 2015 projection compared to the last round. Especially the

further expected improvement in labour force participation for the current exercise leads *c.p.* to a higher GDP and therefore to reduced pension expenditures. Those effects are not overcompensated by the expenditure burdens due to additional benefits implemented with the recent pension reform (classified as policy-related changes). As a result, the pension expenditure/GDP ratio in the 2015 projection round is slightly lower throughout the projection period than projected for the exercise in 2012. Additionally, it is worthwhile to note that further model improvement for some specific items has no quantifiable effect.

Table 17: Decomposition of the difference between 2012 and the new public pension projection (% of GDP)

year	2013	2020	2030	2040	2050	2060
Ageing report 2012	10.4	10.9	12.0	12.7	13.0	13.4
Change in assumptions	-0.1	-0.7	-0.5	-0.4	-0.5	-0.5
Improvement in the coverage or in the modelling	0.0	0.0	0.0	0.0	0.0	0.0
Change in the interpretation of constant policy	0.0	0.0	0.0	0.0	0.0	0.0
Policy related changes	0.0	0.4	0.4	0.3	0.3	0.2
New Projection	10.3	10.6	11.9	12.6	12.8	13.1

Source: EPC-AWG projections and own calculations.

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 EUROPOP 2010 assumptions by EUROSTAT. 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.

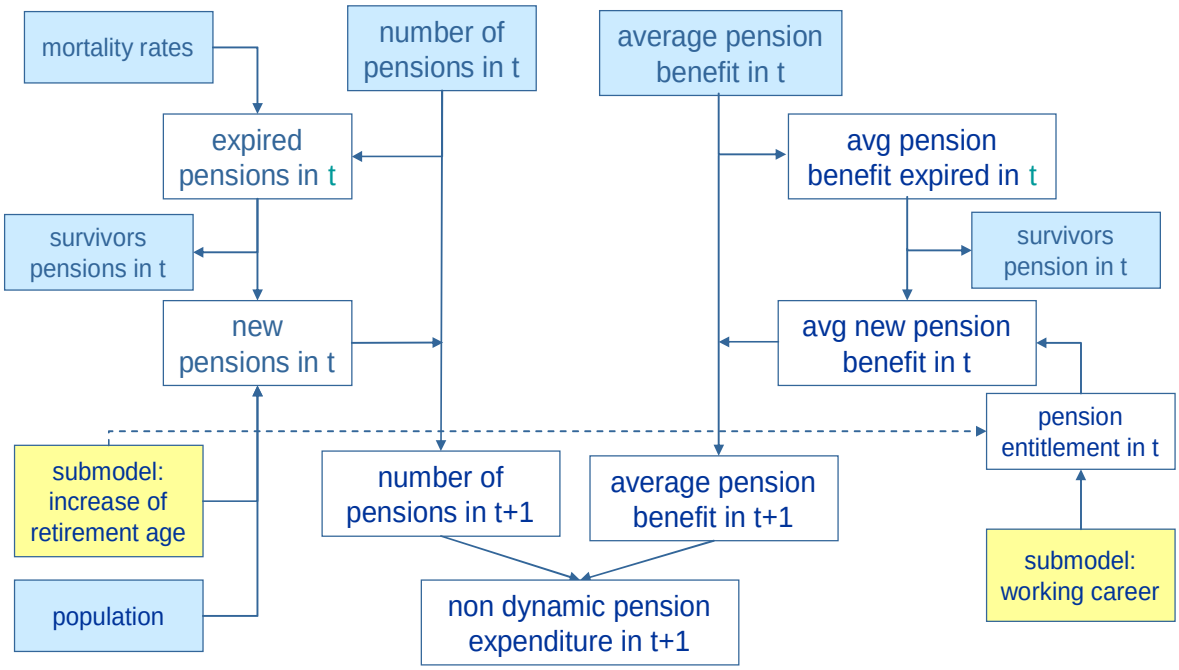
4.5 General description of the models

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 4* illustrates the main interdependencies of this model for Western Germany.

Figure 4: The demographic cohort pension model



The projection of the average pension benefits is similar to the calculation of the number of pensions (see, *figure 4*). 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.

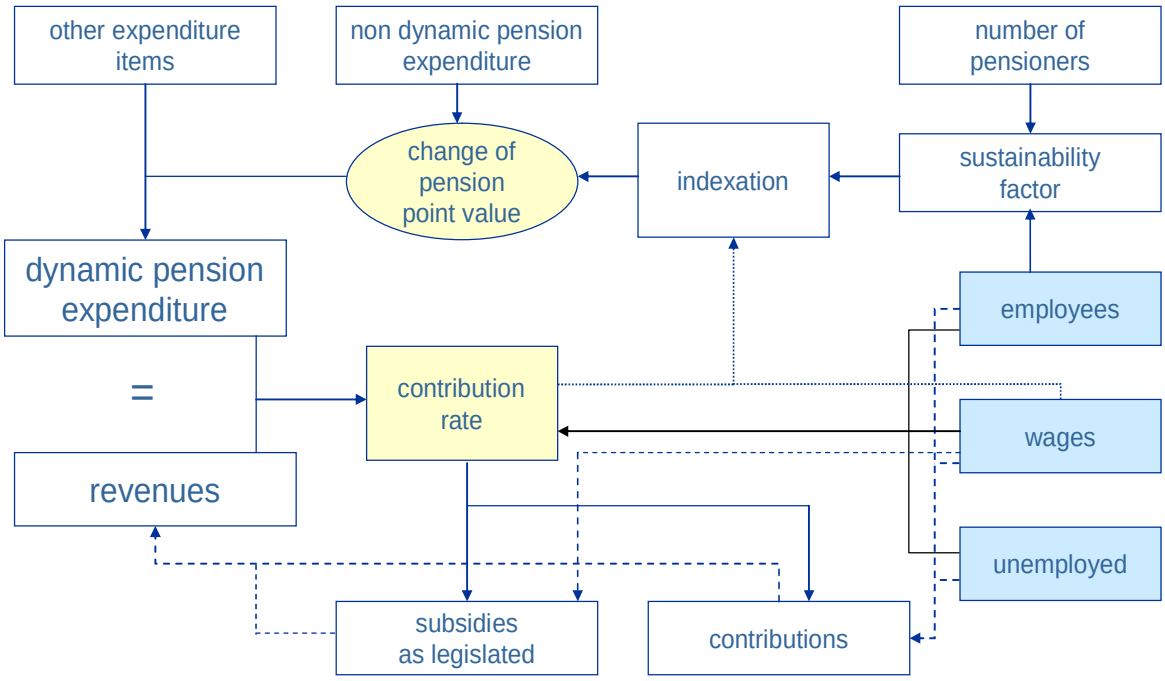
4.5.2 The financial pension model

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 5*). 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 5: 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: $$ppv_t = ppv_{t-1} \times \frac{ae_{t-1}}{ae^{\bullet}_{t-2}} \times \frac{100 - rf_{t-1} - cr_{t-1}}{100 - rf_{t-2} - cr_{t-2}} \times \left(\left(1 - \frac{pc_{t-1}}{pc_{t-2}} \right) \times \alpha + 1 \right)$$, where

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

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

$ae^{\bullet}$	=	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. 28.61 € for Western Germany, 2013). 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. As seen in *table A1* we keep the ratio constant over time. It might be, that we already will have new insights available for this issue at the next projection round which will improve the assumption setting.

Table A1: Economy-wide average wage at retirement evolution (in 1,000 EUR)

year	2013	2020	2030	2040	2050	2060
Economy-wide average wage	31.2	38.5	55.1	75.5	111.1	157.8
Economy-wide average wage at retirement	32.8	40.4	57.8	79.3	116.6	165.7

Source: EPC-AWG projection assumption.

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.[13] 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.

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

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 in linear increase of tax burden from 7 % in 2013 to 10 % in 2060 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, 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

The eligibility criteria for means-tested benefits from social assistance for older people 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 for this round but will be clearly recognizable from the year 2015 onwards due to a new legislation for improving the

social assistance data performance. Currently, the projection is based on stock information with a distinction of relevant sex-specific expenditure items and state of housing.

The results - as presented in *table 7b* - are mainly influenced by 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 A2: Factors behind the change in public pension expenditures between 2013 and 2060 (in percentage points of GDP) - pensions

year	2013-20	2020-30	2030-40	2040-50	2050-60	2010-60
Public pensions to GDP	0.4	1.3	0.7	0.2	0.3	2.8
Dependency ratio effect	1.4	3.8	2.7	0.6	0.6	9.1
Coverage ratio effect	-0.4	-0.7	-0.3	0.0	-0.1	-1.6
Coverage ratio old-age*	0.0	-0.5	-0.1	-0.1	-0.1	-0.7
Coverage ratio early-age*	-2.3	0.5	-0.9	0.5	-0.1	-2.3
Cohort effect*	0.1	-3.1	-1.1	-0.1	-0.4	-4.7
Benefit ratio effect	-0.2	-0.6	-0.6	-0.1	0.0	-1.5
Labour Market / Labour intensity effect	-0.3	-0.3	-0.1	0.0	0.0	-0.7
Employment ratio effect	-0.2	0.0	-0.1	0.0	0.0	-0.3
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.2	-0.2	0.1	0.0	0.0	-0.4
Residual	-0.1	-0.9	-1.1	-0.2	-0.2	-2.5

Source: EPC-AWG projection, baseline scenario.
** Sub-components of the coverage ratio effect do not add up necessarily.*

Table A3: Factors behind the change in public pension expenditures between 2013 and 2060 (in percentage points of GDP) - pensioners

year	2013-20	2020-30	2030-40	2040-50	2050-60	2010-60
Public pensions to GDP	0.4	1.3	0.7	0.2	0.3	2.8
Dependency ratio effect	1.4	3.8	2.7	0.6	0.6	9.1
Coverage ratio effect	-0.3	-0.6	-0.2	0.0	0.0	-1.1
Coverage ratio old-age*	0.0	-0.3	0.0	-0.1	0.0	-0.3
Coverage ratio early-age*	-2.2	0.7	-0.8	0.5	0.0	-1.8
Cohort effect*	0.1	-3.1	-1.1	-0.1	-0.4	-4.7
Benefit ratio effect	-0.3	-0.8	-0.7	-0.1	0.0	-1.9
Labour Market / Labour intensity effect	-0.3	-0.3	-0.1	0.0	0.0	-0.7
Employment ratio effect	-0.2	0.0	-0.1	0.0	0.0	-0.3
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.2	-0.2	0.1	0.0	0.0	-0.4
Residual	-0.1	-0.9	-1.1	-0.2	-0.2	-2.5

Source: EPC-AWG projection, baseline scenario.
** Sub-components of the coverage ratio effect do not add up necessarily.*[14]

[14] If there is need for further clarification, please contact Dr. Thomas Salzmann at the German Federal Ministry of Labour and Social Affairs, Wilhelmstraße 49, 10117 Berlin. Email: thomas.salzmann@bmas.bund.de.