

Long-term outlook for the statutory pension insurance scheme

Over the past few years, the financial situation of the statutory pension insurance scheme has been relatively free of tension. This was due to past reforms, a pause in demographic change, and positive developments on the labour market. The contribution rate decreased and several benefits were expanded. Demographic developments will be putting pension funding under pressure in future, however. Life expectancy is likely to go on rising and the large baby boomer cohorts will be entering retirement from the mid-2020s onwards. The Federal Government is aiming for a long-term pension reform.

Long-term projections are important for this – despite all the uncertainty involved. They highlight key developments and illustrate how reforms, from a current vantage point, are going to affect persons covered by the statutory pension insurance scheme and taxpayers. Projections of this kind are presented here. They demonstrate how the key variables of the statutory pension insurance scheme are correlated: the statutory retirement age, the replacement rate, the contribution rate and government funds.

The simulations make it clear that it is all but impossible to capture future demographic burdens in a convincing manner using only single variables. Even today, burdens are being spread more broadly under the current regulations. By the early 2030s, the statutory retirement age will have been raised to 67, for example. One approach to reform would be linking (indexing) the retirement age systematically to increasing life expectancy. This is also suggested by international organisations. For example, the statutory retirement age could be raised after 2030 so that the ratio of years in retirement and years of contributions remains broadly stable (instead of constantly increasing as would be the case extrapolating from the current situation). Increasing life expectancy would then be tied to a longer period of employment, although the period of pension payment would also become longer. To this end, the statutory retirement age would have to rise to 69½ by 2070. Any resulting more extensive employment would also bolster social security contributions and taxes. Moreover, with a rising retirement age and the associated longer periods of work, pension entitlements would increase. It would therefore make sense to dynamically adjust the standardised replacement rate – in other words, to include more years of contributions in the standard pension in line with the increasing retirement age.

If increasing life expectancy were taken into account in this way by raising the statutory retirement age, this would still leave the financial pressure caused by the lower birth rates since the 1970s unaddressed. The existing regulations distribute this pressure among the other variables: even with an indexed retirement age, the contribution rate and government funds would rise relatively sharply up to around 2040 and the calculated dynamically adjusted replacement rate would fall. There would be much less need for adjustment, however. After 2040, the dynamically adjusted replacement rate with a correspondingly greater number of contribution years would tend to move sideways.

Acceptance of the pension insurance scheme depends, not least, on the replacement rate being considered to be adequate. If consideration were given to a longer-term minimum threshold, it

would seem reasonable to aim for a dynamically adjusted replacement rate as described. It is also an integral part of a reliable outlook that the resulting financial burdens appear sustainable. Even without an additional minimum threshold as reinforcement, such burdens are likely to increase considerably on those subject to compulsory contributions as well as on the federal budget.

■ Introduction

Public old-age provision in Germany

The statutory pension insurance scheme is the most important pillar of old-age provision in Germany, accounting for roughly three-quarters of all incomes from pension schemes.¹ The Federal Government has announced a major reform for the middle of the next decade. The *Kommission verlässlicher Generationenvertrag* ("Commission for a reliable intergenerational contract") is to have made preparations for this by March 2020. The following sections will first provide a brief overview of the statutory pension insurance scheme and developments in it over the past decade. The long-term outlook will then be considered in greater detail. Numerous other aspects of the pension policy debate, such as a minimum level of provision, the role of additional occupational and private pensions and the civil service pension scheme are not discussed.²

■ Basic features of the statutory pension insurance scheme

Statutory pension insurance scheme on pay-as-you-go basis

The statutory pension insurance scheme is organised as a pay-as-you-go system. This means that the receipts of a given year directly fund the expenditure of that same year. Receipts come mainly from contributions on income subject to compulsory contributions (chiefly gross wages and salaries up to the maximum social security contribution threshold).³ Added to this are central government payments, which are financed from tax receipts.⁴ The statutory pension insurance scheme is not allowed to go into debt. Rather, a reserve is to be maintained in order to prevent intra-year liquidity shortages. At the end of the year, this

should be between 0.2 to 1.5 times the average monthly expenditure (after deduction of government funds). The contribution rate is adjusted if it is anticipated that the figure will not fall within this range. It currently stands at 18.6% and is capped at a maximum of 20% until 2025. Until then, any funding gap would have to be offset by additional government funds.

The individual old-age pension essentially depends on the contributions paid beforehand (participation equivalence). What is crucial in this context is the relative income position, i.e. the ratio of an individual's own earnings subject to compulsory insurance to the average earnings of all persons covered by the statutory pension insurance scheme. The insurance scheme members collect earnings points with their contributions every year, reflecting this ratio. If the individual's own earnings match the average, precisely one earnings point is acquired in the year in question. The sum of the earnings points acquired during a working life thus reflects two things: the average relative

Close link between individual contributions and entitlements

¹ For more information, see Federal Ministry of Labour and Social Affairs (2016a).

² See, inter alia, Deutsche Bundesbank (2015, 2016).

³ In 2019 the annual social security contribution threshold is €80,700 in western Germany and €73,800 in eastern Germany. Contributions are also paid for persons receiving unemployment or sickness benefit. The public long-term care insurance scheme pays pension insurance contributions for relatives who act as carers, and the Federal Government pays pension insurance contributions for parents with children below the age of three years. These contributions give rise to matching pension entitlements: in the event of illness or unemployment depending on previous income, for relatives who act as carers depending on the degree and extent of care, and for parents at a flat rate for each of the first three years of the child's life.

⁴ Along with other provisions, about two-thirds of the government funds are linked to growth in per capita earnings and changes in the contribution rate. The other government funds change, first and foremost, with the total wage bill and developments in turnover tax revenue (excluding rate changes).

Definition of key terms in the pension debate: pension formula, standard pension, replacement rate and pension adjustment

Pension formula

The monthly pension R is calculated using the following formula (sections 69 and 70 of the Sixth Book of the Social Security Code (*Sechstes Buch Sozialgesetzbuch*)):

$$R = EP * ZF * ARW * RAF$$

- EP is the sum of the accumulated earnings points. Contributors to the pension insurance scheme acquire earnings points on an annual basis of their contributions. The number of points credited per year depends on the ratio of the individual scheme member's earnings (subject to compulsory insurance) to the average earnings of all members of the statutory pension insurance scheme in the year in question. Where a person's own earnings correspond to the average, precisely one earnings point is acquired.
- ZF is the retirement access factor, which comprises deductions for early retirement (0.3% for each month) or add-ons for postponed retirement (0.5% for each month).
- ARW denotes the pension value, which is adjusted every year on 1 July (see annual pension adjustment). For eastern Germany, a special pension value will apply until 2024.
- RAF stands for the type of pension drawn. The pension type factor amounts, for example, to 1 for old-age pensions or 0.6 for pensions for older surviving dependents.

Standard pension

The standard pension is a benchmark frequently used for comparisons. It results when members of the statutory pension insurance scheme, first, retire at the statutory retirement

age, second, have contributed to the scheme for 45 years, and third, every year have received earnings subject to compulsory insurance corresponding to the average earnings of all scheme members.

Multiplied by the pension value (at present €33.05 in western Germany and €31.89 in eastern Germany), this generates a monthly standard pension of €1,487.25 in western Germany and €1,435.05 in eastern Germany, in each case before taxes and social security contributions.

Replacement rate

The replacement rate reflects the ratio of the standard pension (in western Germany) to average employee earnings subject to compulsory insurance.¹ Both variables are based on the level before taxes, but after deduction of the respective social security contributions due (pension: half of the health insurance contribution rate and full contribution rate for long-term care insurance; earnings: half of the contribution rates for the health, long-term care, unemployment and pension insurance schemes).

$$\text{Replacement rate} = \frac{\text{standard pension} - \text{social security contributions}}{\text{average earnings} - \text{social security contributions}}$$

The calculated replacement rate amounts to 48.1% for 2019. The standard pension is, therefore, just under half as high as the average earnings of all employees covered by the statutory pension insurance scheme (after deduction of social security contributions).

Taxation and thus the replacement rate after taxes differs according to individual circumstances. In this vein, taxation varies depending

¹ Average annual earnings (excluding employers' contributions to the social security scheme) were €37,873 in western Germany and €33,700 in eastern Germany in 2018.

on the retirement year as the taxable share of new pensions is growing from year to year.² By contrast, the tax-free share of pension contributions is likewise growing from year to year. In the case of retirement in 2019, the taxable share of the pension is 78%. For retirement from 2040 onwards, the pension will be fully taxable. Moreover, in some instances, the tax burden depends on numerous other factors (type of tax assessment, other income, deduction amounts). At present, the replacement rate upon retirement, after taxes (excluding any other income and child benefit claims), is likely to be roughly just under 10 percentage points higher than the pre-tax level.³

Annual pension adjustment

In principle, the annual pension adjustment is determined by three factors: first, the rate of change in the average employee's earnings subject to compulsory contributions, second, the change in the pension insurance scheme contribution rate and in contributions paid into assumed supplementary private pension provision, and third, the sustainability factor. Earnings are calculated separately for western Germany and eastern Germany. All other factors are based on uniform national values.

The specific adjustment formula is as follows (section 68 of the Sixth Book of the Social Security Code):

$$ARW_t = ARW_{t-1} * \frac{BE_{t-1}}{BE_{t-2}} * \frac{bBE_{t-2}}{bBE_{t-3}} / \frac{BE_{t-2}}{BE_{t-3}} * \frac{100 - AVA_{t-1} - RVB_{t-1}}{100 - AVA_{t-2} - RVB_{t-2}} * \left(\left(1 - \frac{RQ_{t-1}}{RQ_{t-2}} \right) * \alpha + 1 \right)$$

In the above equation

- *ARW* denotes the pension value. This transforms claims in the form of earnings points into definite euro amounts.
- *BE* refers to gross wages and salaries per employee.

- *bBE* indicates earnings subject to compulsory contributions per employee (excluding civil servants and including recipients of unemployment benefit).
- *AVA* is the contribution paid into a supplementary private pension scheme, which reflects the contribution envisaged for the in part state-funded additional "Riester" pension scheme (unchanged at 4% since 2012).
- *RVB* denotes the pension insurance scheme contribution rate.
- *RQ* is the pensioner ratio, which is the ratio of the number of calculated standard pensions to the number of calculated average contributions, and α denotes a sensitivity parameter which is set at 0.25. Changes in the pensioner ratio thus affect the pension adjustment by up to one quarter.

The final results regarding the development of the average contribution-relevant *bBE* are available only with a delay of just over one year. Therefore, the rate of increase in *BE* as shown by the previous year's national accounts is first used provisionally for the respective mid-year adjustment. Going forward, this is then adjusted with a time lag to *bBE* development by means of a correction factor (correction by the ratio of the development in *bBE* to *BE* two years previously).

² In practice, the tax-free pension share is calculated as a euro amount in the year in which a person enters retirement and is then kept constant. As a result, future pension increases will be fully taxable.

³ Standard pension and average earnings without taking account of additional income.

earnings position and the length of the contribution period. The contributions made are the basis for the individual pension entitlement. Unlike in the case of tax payments, pension contributions are accompanied by specifically attributable benefits provided by central government. In contrast to statutory health insurance and the long-term care insurance scheme, the benefits depend on the amount of previously paid contributions.

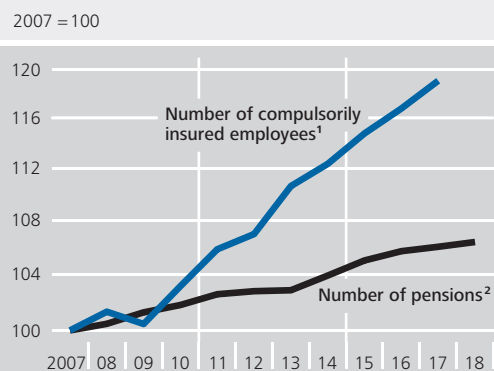
Pensions adjusted in line with regulations

Old-age pensions account for the vast majority (most recently, around 78%) of the statutory pension insurance scheme's pension expenditure. Moreover, pensions for persons with reduced earnings capacity accounted for about 7% and surviving dependents' pensions accounted for roughly 15%.⁵ When retirement begins upon reaching the statutory retirement age, the individual old-age pension is given by the product of the earnings points acquired and the pension value.⁶ The pension value is updated using the pension adjustment formula. This is geared, first of all, to growth in wages. Besides other factors, it also takes due account of burdens resulting from social security contributions and a demographic factor (see also the box on pp. 55-56).

Replacement rate is often a benchmark for coverage by the statutory pension insurance scheme

In the public debate, the coverage provided by the statutory pension insurance scheme is frequently measured by the pre-tax net replacement rate. Roughly speaking, this captures the pension entitlement in relation to previous income. Specifically, this is the ratio of a standard pension to current average earnings, with the relevant social security contributions being deducted (see the box on pp. 55-56). Standard pension denotes a pension after 45 years of contributions with average pay (i.e. 45 earnings points). Defined in this way, the replacement rate is currently at just over 48%. Until 2025, a minimum threshold of 48% applies.

Persons covered by the statutory pension insurance scheme, and pensions in payment



Sources: German pension insurance scheme (2018) and Bundesbank calculations. ¹ Figure for 2018 not yet available. ² Individual persons may draw more than one pension.
 Deutsche Bundesbank

Looking back at trends since 2008⁷

Following financially difficult times, the statutory pension insurance scheme has been benefiting for some years now from favourable underlying conditions and earlier reforms. There has been an improvement, in particular, in the labour market situation: unemployment has fallen, and there has been strong growth in employment, especially in old age. Added to this was a pause in the demographically induced pressure on expenditure, as the post-war cohorts reaching retirement age were comparatively weakly populated. The economic crisis of 2009 and the economic dip around 2013 had only a short and limited impact. The fact that the statutory pension insurance scheme was in good shape made it easier for benefits to be expanded again from 2014 onwards, including retirement on a full pension at the age of 63 for those with a very long contribution history and "mothers' pensions". Des-

Positive development in pension insurance scheme finances owing to favourable underlying conditions and earlier reforms

⁵ For more information, see German pension insurance scheme (2018).

⁶ Deductions and add-ons are incurred in the event of earlier or later retirement. There are separate regulations governing pensions for persons with reduced earnings capacity and pensions for surviving dependents.

⁷ For earlier developments, see Deutsche Bundesbank (1999, 2008).

Financial developments in the statutory pension insurance scheme*

Item	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Receipts	€ billion										
Total contributions of which	167.6	169.2	172.8	177.4	181.3	182.0	189.1	194.5	202.2	211.4	221.6
Compulsory contributions	159.6	160.0	163.7	170.5	174.4	174.8	181.7	187.1	194.7	203.2	212.4
Contributions for unemployed	5.0	6.1	5.7	3.5	3.3	3.6	3.6	3.4	3.4	3.3	3.3
Other contributions	3.0	3.2	3.4	3.5	3.5	3.6	3.8	4.0	4.2	5.0	5.9
Transfers from the Government funds of which	67.9	68.8	70.6	70.5	71.6	71.4	73.2	74.6	77.0	81.0	83.8
General federal government grant	38.2	38.7	39.9	39.6	39.9	38.9	39.8	40.2	41.4	43.8	44.6
Additional federal government grant	18.2	18.7	19.1	19.2	20.1	21.0	21.5	22.2	23.1	24.0	24.9
Contributions for child-raising periods	11.5	11.5	11.6	11.6	11.6	11.6	11.9	12.1	12.5	13.2	14.3
Other receipts	7.3	6.7	6.7	7.1	6.8	6.7	6.8	7.1	7.2	7.4	7.4
Total ¹	242.8	244.7	250.1	255.0	259.7	260.2	269.1	276.1	286.4	299.8	312.8
Expenditure											
Pension payments	204.1	208.5	211.9	212.6	216.4	219.6	226.2	236.6	246.1	255.3	263.3
Contributions to pensioners' health insurance	14.1	14.4	14.3	15.0	15.3	15.5	16.0	16.7	17.4	18.0	18.6
Administrative expenditure	3.6	3.6	3.6	3.6	3.7	3.8	3.9	3.9	4.0	4.2	4.2
Other expenditure ²	17.3	18.0	18.3	19.0	19.2	19.4	19.9	20.5	21.1	21.8	22.3
Total ¹	239.0	244.5	248.1	250.2	254.6	258.3	265.9	277.7	288.6	299.3	308.4
Surplus (+) or deficit (-)	3.8	0.2	2.1	4.7	5.1	1.9	3.2	-1.6	-2.2	0.5	4.4
Financial reserves	15.9	16.1	18.5	24.1	29.4	32.0	35.0	34.1	32.4	33.4	38.2
Memo item: of monthly expenditure	1.0	1.0	1.1	1.4	1.7	1.8	1.9	1.8	1.6	1.6	1.8
Receipts	Annual percentage change										
Total contributions of which	3.3	0.9	2.1	2.7	2.2	0.4	3.9	2.9	4.0	4.5	4.8
Compulsory contributions	3.9	0.2	2.3	4.2	2.3	0.2	3.9	3.0	4.1	4.3	4.5
Contributions for unemployed	-13.1	20.7	-5.4	-39.5	-3.9	7.6	-0.2	-3.8	-2.6	-2.4	-0.1
Other contributions	4.1	5.3	5.8	3.0	2.1	1.6	6.6	4.2	4.8	19.6	18.8
Transfers from the Government funds of which	0.6	1.3	2.6	-0.2	1.7	-0.3	2.5	1.9	3.2	5.2	3.5
General federal government grant	0.4	1.1	3.2	-0.6	0.6	-2.6	2.4	1.0	2.8	5.9	1.8
Additional federal government grant	1.8	2.7	2.2	0.8	4.6	4.3	2.5	3.2	4.1	3.9	3.8
Contributions for child-raising periods	-0.6	-0.1	1.5	-0.5	0.5	-0.4	2.4	2.5	3.1	5.4	8.2
Other receipts	4.7	-7.5	0.6	5.0	-4.1	-0.8	1.5	3.2	1.3	3.5	0.2
Total ¹	2.6	0.8	2.2	1.9	1.9	0.2	3.4	2.6	3.7	4.7	4.3
Expenditure											
Pension payments	1.2	2.2	1.6	0.4	1.8	1.4	3.0	4.6	4.0	3.7	3.2
Contributions to pensioners' health insurance	2.8	2.7	-0.6	4.7	1.8	1.6	2.9	4.5	4.1	3.7	3.1
Administrative expenditure	0.7	1.1	-1.0	2.5	1.4	2.8	2.3	0.9	2.2	4.9	-1.0
Other expenditure	4.2	3.8	1.9	3.6	1.0	1.1	2.6	2.9	3.3	3.2	2.1
Total ¹	1.5	2.3	1.5	0.9	1.7	1.4	3.0	4.4	3.9	3.7	3.0
Memo item:	%										
Contribution rate	19.9	19.9	19.9	19.9	19.6	18.9	18.9	18.7	18.7	18.7	18.6
Net replacement rate before taxes	50.5	52.0	51.6	50.1	49.4	48.9	48.1	47.7	48.1	48.3	48.1

Source: German pension insurance scheme. * Data as defined in the financial statistics. ¹ Excluding payments under the revenue-sharing scheme. ² In particular, refunds to the miners' pension insurance scheme and rehabilitation expenditure.

pite such additional expenditure, the contribution rate has fallen in several stages since 2012 from 19.9% to 18.6% most recently. Nevertheless, the reserve saw an increase on balance and, at the end of 2018, was at just under 1.8 times the scheme's monthly expenditure.

Favourable labour market developments allowed a marked reduction of the contribution rate

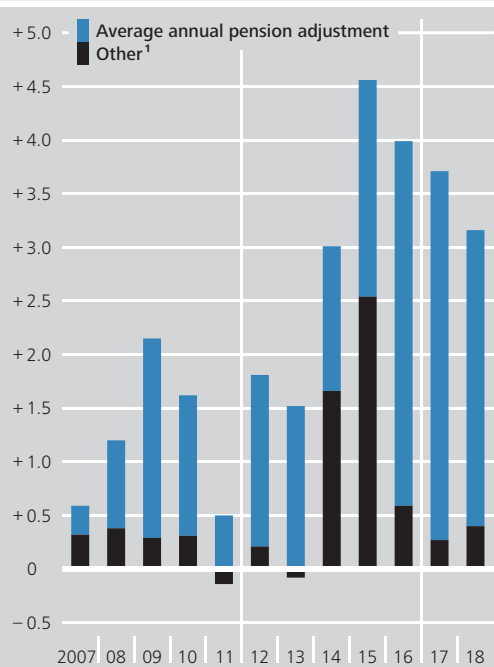
The receipts of the statutory pension insurance scheme benefited, above all, from the favourable developments on the labour market. The number of compulsorily insured employees grew by 5 million in the period from 2008 to 2017. This corresponds to an increase of almost 20%, or just under 2% on an annual average. Contribution receipts rose by an average of nearly 3%, which was weaker than the growth in the total wage bill (just over 3½%). This was due chiefly to the fact that the contribution rate fell by 1.3 percentage points.⁸ The higher contribution receipts were due, not least, to a significantly higher labour force participation rate among older persons. Between 2007 and 2018, the employment rate among persons aged 60 to 64 years doubled to 60%.⁹ Government funds (central government grants and contributions for child-raising periods) grew at a slightly slower pace. Their share of total receipts fell compared with 2007, but it was still more than one quarter at the end of the period under review. The main reason for this was that two-thirds of government funds for the statutory pension insurance scheme are linked to per capita earnings. If employment grows, the government funds increase less strongly than contribution receipts, which depend on the total wage bill.

Expenditure dampened by demographic pause and earlier reforms, but benefits expanded of late

As a result of the positive situation on the labour market and the rising statutory retirement age since 2012, the actual commencement age for old-age pensions has also increased significantly to 64 years on average since 2007 (+7 months since 2007). The increase would have been higher still if the possibility of retirement on a full pension at the age of 63 had not been introduced in 2014. Moreover, the expenditure side has also benefited from the pension reforms over the past decade and the demo-

Pension expenditure

Annual percentage change



Sources: German pension insurance scheme (2018) and Bundesbank calculations. ¹ In particular, number and structure of pensions in payment. This also reflects expanded benefits such as "mothers' pensions" and retirement on a full pension at the age of 63.

Deutsche Bundesbank

graphic pause. Overall, the number of pension recipients has increased by just over 1 million since 2007, or ½% on an annual average. Pension expenditure rose at an average of 2½%, which is weaker than growth in contribution receipts.

The fundamental reforms at the beginning of the last decade mainly dampened pension adjustments.¹⁰ Furthermore, a decision was taken in 2007 to raise the statutory retirement age

Earlier reforms stabilised pension funding

⁸ Added to this was the fact that the contributions made by the Federal Employment Agency decreased as a result of falling unemployment. Since 2011, no pension contributions have been paid for recipients of unemployment benefit II, either.

⁹ For more information, see Federal Statistical Office (2019d).

¹⁰ At the same time, the funded supplementary individual old-age pension provision scheme ("Riester" pension) was boosted more strongly using tax revenue. Occupational pensions were also increasingly promoted during this period. The aim of this is that supplementary funded private pension provision be systematically accompanied by lower replacement rates under the statutory pension insurance scheme.

from 65 to 67 between 2012 and 2031.¹¹ Early retirement was also made more difficult. The reduced pension adjustments, as well as the higher contributions for the long-term care insurance scheme led to a fall in the replacement rate. Starting from 51.3% in 2007, the replacement rate dropped to 48.1% last year. The positive developments in employment bolstered the replacement rate through the sustainability factor in the pension formula. This is designed to limit the rise in the pension contribution rate in the wake of demographic change. In principle, this has the effect of pensions growing more slowly if there is an increase in the ratio of pension recipients to contribution payers (for more details, see p. 56). In recent years, however, this has, in fact, raised pensions, as the number of contribution payers has increased more sharply than the number of pension recipients (see the chart on p. 57 for the figures).

Developments in statutory pension insurance scheme significantly more favourable than expected

All things considered, pension funding since 2008 has thus taken a significantly more favourable turn than was expected at the time. Positive growth in employment was the key factor in this development. Despite the fact that benefits have been expanded in the meantime, the contribution rate is now 1.4 percentage points lower and the replacement rate is 1 percentage point higher than was projected in autumn 2007, for example.¹²

Demographic change will put pressure on pension funding

Demographic change has a major impact on the statutory pension insurance scheme. Key factors are the birth rate, life expectancy and migration. Furthermore, developments in labour force participation have an important influence on the pension insurance scheme.

Pension insurance scheme highly dependent on demographic change

Birth rate and ...

There has been a sharp fall in the birth rate¹³ since the mid-1960s. It has fallen relatively swiftly from around 2½ to somewhat below

1½. Most recently, it was somewhat higher again at 1.57. In the baseline variant of its current population projection exercise, the Federal Statistical Office assumes a broadly unchanged birth rate of 1.55.¹⁴ The sharp decline about 50 years ago has led to a demographic hump. Above all, when the 1960s cohorts with relatively high birth rates (baby boomers) enter retirement from the mid-2020s onwards, they will have to be financed by significantly smaller cohorts. The additional pressure on the pension insurance scheme caused by the extremely unequal cohort sizes will ease again when the baby boom generation dies out.

The cited population projection shows life expectancy continuing to rise steadily. In 1960, remaining life expectancy at the age of 65 was, on average, 13½ years (men and women). Since then, it has increased to 19½ years. It is to be expected that it will have gone up by a further 4½ years by 2070. With an unchanged statutory retirement age, there will be a steady increase in the pension-drawing period.

... life expectancy are negative factors, ...

In recent years, there has been considerable net immigration. Over the past ten years, this has amounted to an annual average of around 400,000 persons. Labour-market-oriented immigration has played a key part in this. What is crucial for the statutory pension insurance scheme is the extent to which migration alters the number and structure of its contributor base and then, at a later date, the number and structure of pension recipients. Three things are of central importance: the age of those immi-

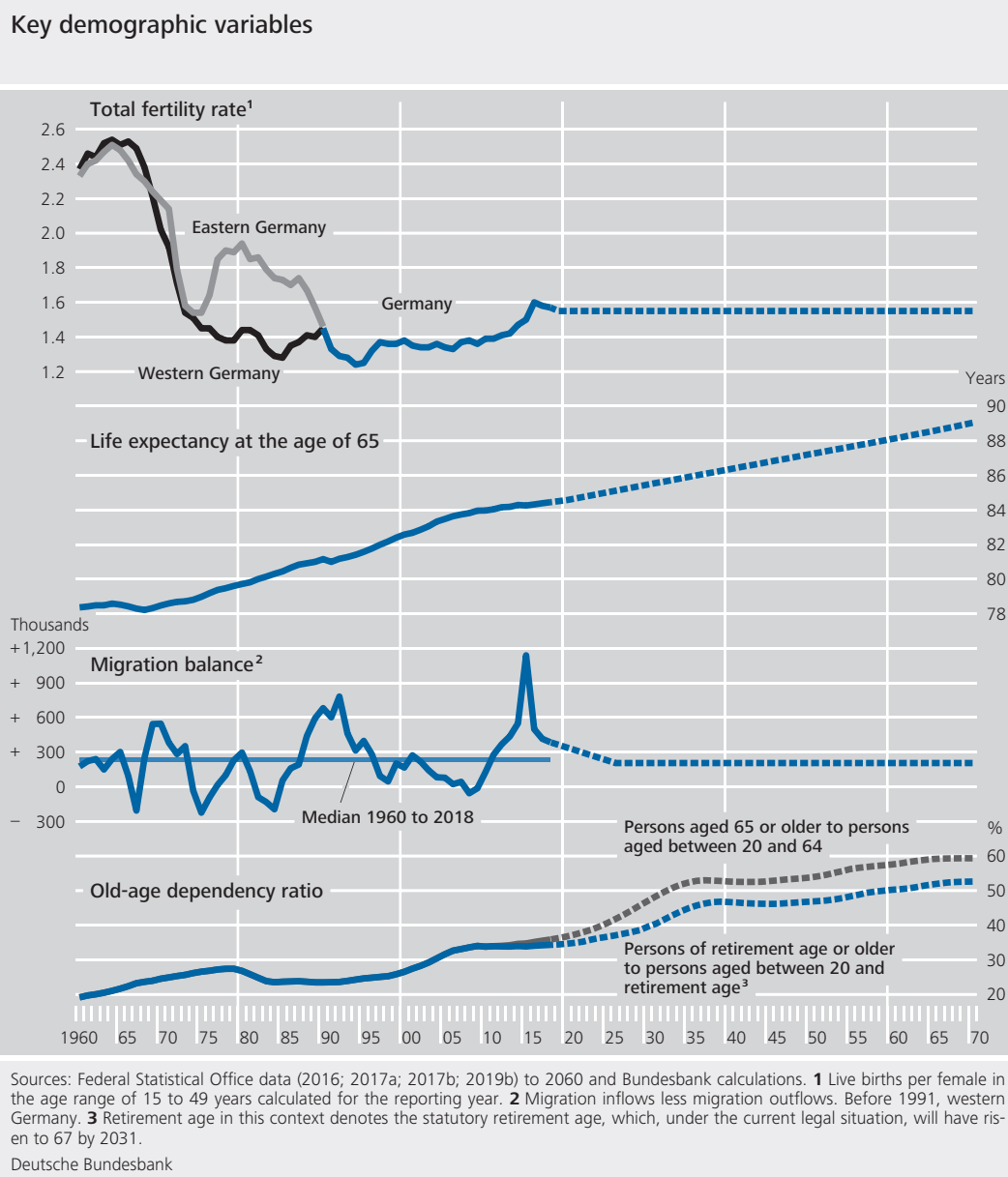
... migration is a positive factor

¹¹ The statutory retirement age of 67 will apply for the first time for those born in 1964. This cohort will therefore enter regular retirement at the age of 67 in 2031, instead of at the age of 65 in 2029 as would be the case under the old legislation. There are various exceptions with regard to the retirement age, one particular example being retirement on a full pension at the age of 63 as cited above.

¹² See Federal Ministry of Labour and Social Affairs (2007).

¹³ The birth rate for each year reflects the extrapolated number of live births per female in the age range of 15 to 49 years. This is the total fertility rate of a given calendar year; for more details, see Federal Statistical Office (2012, 2019a).

¹⁴ Taken in isolation, this would lead to a decline in the population. For more information, see Federal Statistical Office (2019b). The projections range up to 2060.



grating and emigrating, integration into the labour market, and the impact on future demographic developments.¹⁵ In the cited population projection, net migration falls to around 200,000 persons per year by 2026 (corresponds largely to the long-term median). After this, it remains constant. Migration is thus counteracting the effect of the low birth rate.

fined in the following sections as the range between 20 and the statutory retirement age. In 1990, for example, the old-age dependency ratio defined in this way was 24%. In other words, for every person of retirement age and above, there were roughly four persons of working age. With the retirement of the baby boomer generation, the old-age dependency ratio could rise to 45% by 2035. This ratio

Demographic change increases old-age dependency ratio and puts pension funding under pressure

All three demographic factors affect the old-age dependency ratio. This is the ratio of older persons to people of working age. The working age is often defined as the age range from 20 to less than 65 years. As the retirement age is being raised progressively, however, it is de-

¹⁵ Pension entitlements might exist in the case of emigration. Future pressure on the statutory pension insurance scheme will then not be eased, even if there are fewer residents of retirement age. Conversely, this is the case, say, for older immigrants without pension entitlements. The sustainability factor covers all of the pensions paid (including to pension recipients who have emigrated).

would then initially remain largely stable. Although life expectancy will continue to rise, the baby boomer cohorts will gradually die out. If the statutory retirement age were to remain unchanged at 67 years, as under the current legal situation, the expected rise in life expectancy would then make itself felt again, however. The outcome would be a persistent increase in the old-age dependency ratio. In 2070, it would be around 53%. For every person of retirement age and above, there would then be fewer than two persons of working age (see chart on p. 61).

At times, rising labour force participation counteracts demographic pressure

In addition to these demographic factors, changes in labour force participation play an important role for pension funding. Rising labour force participation temporarily counteracts demographic pressure – until the corresponding pension entitlements filter through. In Germany, labour force participation is experiencing a stable upward trend. The ratio of paid employees to the population aged between 20 and the statutory retirement age has risen from 66% in 1995 to currently just over 80%. For the most part, the projections are based on the assumption that this ratio will increase somewhat more.¹⁶

Key variables within the pension insurance scheme need adjusting

All in all, these developments nonetheless exert considerable pressure on pension funding. As things currently stand, adjustments to the key pension insurance variables relative to the present values will be necessary: if not, expenditure will significantly outpace receipts in the long term. The key pension insurance scheme variables are the contribution rate, the replacement rate, the statutory retirement age (and thus the average standardised pension-drawing period) and the government funds provided.

Pension policy action plan to 2025

Reforms of the 2000s involved broad-based burden sharing

In important ways, the reforms of the 2000s set the course for managing demographic change in the statutory pension insurance

scheme. The reforms were designed to spread the burden across all variables. First, pension adjustments and consequently the replacement rate are to be curtailed (as an accompanying measure, voluntary private pension provision is being promoted). Second, the reforms include higher contribution rates going forward. Third, government funds are to rise significantly (outpacing the tax base). Fourth, by the beginning of the 2030s, the statutory retirement age will have been raised to 67 years.

Since the pension package of 2014, benefits have been selectively expanded again. In order to finance these benefits, a higher contribution rate and additional government funds will be needed, all other things being equal; at the same time, the replacement rate will be lower overall. The most recent pension package of 2019 altered the underlying mechanisms for adjusting the contribution rate and the replacement rate until the end of 2025: the contribution rate will be subject to a maximum threshold of 20% and the replacement rate will have a minimum threshold of 48% (double thresholds). Funding gaps are, therefore, inevitable from today's perspective. These will have to be closed through higher government funds. A fundamental reform has been announced for the subsequent period. Without further adjustments, the previously applicable legislation would apply again from 2026 onwards, with the burdens shared as described above.

Double thresholds until 2025 and a buffer function for the federal budget

Longer-term outlook – current legal situation

Projections can help to assess the impact of demographic change on the pension insurance scheme. The German government's annual pension insurance report looks at the next 14 years, with its most recent report of November 2018 including projections up to 2032.¹⁷ How-

Longer-term view important for projections

¹⁶ For more details, see the explanations on pp. 63 f. and the Federal Statistical Office (2019c).

¹⁷ For more information, see Federal Ministry of Labour and Social Affairs (2018).

The OLG model and key assumptions of the simulations

Essential features of the OLG model

The simulation results are based on a general equilibrium model with overlapping generations (OLG) developed by the Bundesbank.¹ It contains profit-maximising firms, rational utility-maximising households and the government. A model framework of this nature captures both micro and macroeconomic correlations, meaning that households, for example, react to changes in the statutory pension insurance scheme, such as the retirement age or the replacement rate. Changes in households' behaviour, in turn, impact on macroeconomic developments and public finances. The statutory pension insurance scheme is thus integrated into a macroeconomic model. This is where the present analysis differs from previous analyses conducted by the Bundesbank.² However, the simulations still focus on the pension insurance scheme's budgetary relationships against the backdrop of demographic change, and this explains why certain aspects of the macroeconomic modelling have been simplified.

As the model focuses on Germany, the respective parameters are tailored to the situation there. The development of the return on capital in Germany is likely to hinge primarily on developments in the international capital market. However, this market has not been modelled in the present single country model. In the baseline simulation, it is thus domestic households' propensity to save, which increases as the population ages, that drives the return on capital. This appears to be justified as international demographic developments are comparable. Thus, if the model were to include an international capital market, developments would likely be similar. In this case, demo-

graphic change in itself would also lead to a lower return on capital. However, it seems plausible that German pension reforms have only a limited impact on the international return on capital. In this respect, the yield curve in those simulations that deviate from the baseline simulation has been left unchanged.

The generations in the model

Several generations live in parallel in the model economy. Each year sees the entry of a new generation (more specifically: a cohort of 20 year olds). The generations can be of varying size. A single generation per se is homogeneous and consists of identical households. This is a major simplification and means that it is not possible to analyse questions regarding income distribution within the generations (e.g. the risk of poverty in old age), in particular. At any one time, the various generations are at different stages of life: households go through a life cycle in which they first work and then retire. At the end of each period, there is a given probability that the individual households will die. The older a household, the greater this probability. Cohorts born later have a higher life expectancy.

Demographics and labour force participation

The focus of this OLG model designed by the Bundesbank lies on the demographic challenges for Germany from today's per-

¹ The model is based on the methodological approach of Auerbach and Kotlikoff (1987). Essentially it is the same model as used in Börsch-Supan and Ludwig (2009) and Vogel et al. (2017). It will be outlined in depth in an upcoming Bundesbank discussion paper.

² See, in particular, Deutsche Bundesbank (2016).

Key demographic variables

Variable	Assumption
Birth rate	Constant at 1.55 children per female
Life expectancy at the age of 65	Rises from 84.4 (2018) to 89.0 (2070)
Net migration (balance of inflows and outflows)	Falls to 206,000 persons per year by 2026, then remains constant (2018: 400,000)

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spective. To do this, it models the population growth projected for Germany in detail.

The key demographic variables are birth rate, life expectancy and migration. Up to 2060, the population growth modelled is based on the medium variant from the most recent projections by the Federal Statistical Office.³ After 2060, birth rate and migration are assumed to be constant. Life expectancy initially grows until 2100 in line with the average for the previous years and then remains stable.⁴

In addition to the number of people of working age, a further factor is important here, namely labour force participation. In the model, labour force participation is defined as the ratio of the number of dependent employees to the number of persons aged between 20 years and the statutory retirement age.⁵ The labour force participation of the individual cohorts follows a hump-shaped curve over the life cycle. Over recent years, labour force participation has been increasing, especially for women and older people. For modelling purposes, it is assumed that this trend will continue. A rising statutory retirement age thus means longer working lives. In the model, labour force participation in the baseline simulation under the assumptions made increases from 80¼% in 2018 to 81½% in 2035. It reaches 82¼% by 2050 and then remains

constant. Overall, the assumptions regarding labour force participation are particularly uncertain.

The government in the model

The government imposes proportional taxes on labour income, pensions, capital income and private consumption. The government's budget is assumed to be balanced each year. This is achieved by endogenously adjusting the tax rate on consumption. By modelling the government – albeit in a simplistic form – the picture is more comprehensive than in models which focus solely on the statutory pension insurance scheme.

The model covers the statutory pension insurance scheme in relative detail. The scheme's receipts comprise social security contributions and government funds. These receipts finance the scheme's annual expenditure. In the baseline simulation, the contribution rate is set in such a way that the scheme's annual budget is balanced. For the most part, government funds are determined based on the contribution rate and per capita earnings. The government is thus treated as a contribution payer. A smaller part is determined based on the development of social security contributions.⁶

³ See Federal Statistical Office (2019b). In each case, the assumptions from the second variant (G2-L2-W2) were chosen. In this variant, birth rate, life expectancy and migration balance were in the middle of the range for the other variants.

⁴ The projections also contain information on the age profile of the immigrants and emigrants. However, the model does not distinguish between new immigrants and persons already living in Germany.

⁵ It is assumed that the share of self-employed persons in the labour force (9½%) and the share of employees subject to social security contributions as paid employees (81%) remain constant.

⁶ As a result, if contribution rates rise, the volume of government funds is somewhat overestimated as a portion of federal government grants is not tied to the contribution rate. In the model, government funds have a somewhat broader definition and also contain contribution payments from other social security schemes that have not been explicitly modelled here.

The individual pension amount is derived from the earnings points acquired during employment and the pension value. This is based largely on the pension adjustment formula according to the current legal situation or the respective form that it takes in the divergent simulations.

Besides government funds for the statutory pension insurance scheme, modelling for the government also includes spending on government consumption. The latter is kept stable over time in relation to total value added. By contrast, in all simulations, government funds rise at a faster pace than value added and, therefore, the modelled tax base. This ultimately pushes up the consumption tax rate.

The statutory pension insurance scheme's expenditure

The statutory pension insurance scheme's expenditure included in the model comprises spending on old-age pensions as well as additional expenditure by the scheme: pensions for persons with reduced earnings capacity and for surviving dependents, contributions to the statutory health insurance scheme and expenditure for rehabilitation and administration. With the exception of surviving dependents' pensions, it is assumed that expenditure develops in line with spending on ordinary old-age pensions. In the past, surviving dependents' pensions have shown a clear downward trend. This is most likely due, not least, to the increase in labour force participation of women in particular (at the same time as tighter provisions for deductions). This trend is extrapolated up to 2070. On balance, the share of surviving dependents' pensions falls by roughly half (from the current level) by then.

Quantitative results are clear but definite figures should be interpreted with caution

The article shows quantitative results for the respective simulations. While it is possible to model trends and demonstrate key correlations, these projections do not claim to give an accurate prediction of the future. Given the high level of uncertainty, this is not realistic – neither here, nor in any other type of model. A number of aspects can only be stylised and economic relationships are shown in a simplified form. This is necessary in order for the model to be manageable. In addition, numerous assumptions have to be made for very long periods of time. As a result, caution should be exercised when interpreting the definite figures reported.

ever, this is not long enough to model the already foreseeable consequences of demographic change. Significant changes – for instance in connection with the baby boomers – will not be felt until later. The European Commission, in its most recent Ageing Report, makes projections up until 2070, for example.¹⁸ Although uncertainty rises considerably for longer time horizons, the underlying correlations and challenges for the statutory pension insurance scheme can nonetheless be captured. For instance, the expected developments and effects of possible reforms can be projected from the current standpoint. Longer-term projections therefore provide important information for reform decisions. Overall, they illustrate the outlook for and the risks involved with public old-age provision for both policy makers and pension insurance scheme members.

Long-term forecast using OLG model

The following section will present the long-term outlook until 2070 on the basis of an overlapping generations (OLG) model developed by the Bundesbank. This model uses the Federal Statistical Office's population projection in its medium scenario (for more on the assumptions and the OLG model, see the box on pp. 63 ff.). The following section will start by presenting a simulation based on the current legal situation. After that, further simulations will be used to illustrate the importance of key pension variables. The results of such long-term calculations using a stylised model should be interpreted with caution and should not be seen as precise point forecasts. Rather, they illustrate key correlations and the relative magnitude of the effects of individual measures.

Results of the baseline simulation within the spectrum of other publications

The results of the baseline simulation, which is based on the current legal situation, are within the spectrum of findings for other simulations.¹⁹ Deviations result, inter alia, from differences in the model class, the assumptions made, the starting year (and thus the data used for comparisons) as well as the underlying legal provisions.

Contribution rate

The contribution rate must be raised if the sustainability reserve would otherwise fall below its minimum permissible size. Up until 2025, however, the contribution rate is capped at 20%. In the light of the demographic situation, the reserves are likely to dwindle from their currently high level to their minimum over the next few years, and the contribution rate will probably have to be raised from its present level of 18.6%. As things currently stand, the contribution rate looks set to reach the maximum threshold in 2025. Based on the simulation using the current legal situation, the contribution rate will subsequently rise particularly sharply (to a magnitude of 24%) up until the end of the 2030s as the baby boomers enter retirement. Up until 2070, growth will remain substantial, albeit slower (to 26%).

Demographic pressure increases contribution rate and ...

Replacement rate after 45 years of contributions

For the replacement rate (see the explanations on pp. 55 f.), the minimum threshold of 48% will apply until 2025. After that, the sustainability factor will apply again under applicable law. This is the main reason why the replacement rate will fall continuously after that.²⁰ At the end of the 2030s, the simulations suggest that the replacement rate will be just under 43%, while the figure for 2070 is 40%. The decline will potentially be compensated by voluntary private pension schemes, which is the aim of

... lowers replacement rate

¹⁸ For more information, see European Commission (2018).

¹⁹ See Federal Ministry of Labour and Social Affairs (2018a), Börsch-Supan and Rausch (2018), Burret and Ehrentraut (2019), Geyer et al. (2019a) and Werding (2018).

²⁰ All other things being equal, an increasing contribution rate for the public long-term care insurance scheme and/or a declining contribution rate for the unemployment insurance scheme reinforce the drop in the replacement rate. Changes to these rates are disregarded in the following as their size is difficult to assess. If, say, the contribution rate for the public long-term care insurance scheme rises by 1 percentage point, the replacement rate will be roughly ¼ point lower than calculated here.

measures to promote such private old-age provision.²¹

More wide-spread and longer labour force participation disregarded

In general, it should be noted that although the recognised replacement rate will drop for a constant 45 years of contributions, the number of years that contributions are paid will increase as the statutory retirement age rises to 67. We will return to this aspect later in this article. In addition, when looking at pension insurance scheme coverage it must be taken into consideration that the percentage of pension recipients within a given cohort will rise noticeably over time. This is because labour force participation in employment subject to social security contributions has grown significantly over time.

Retirement age

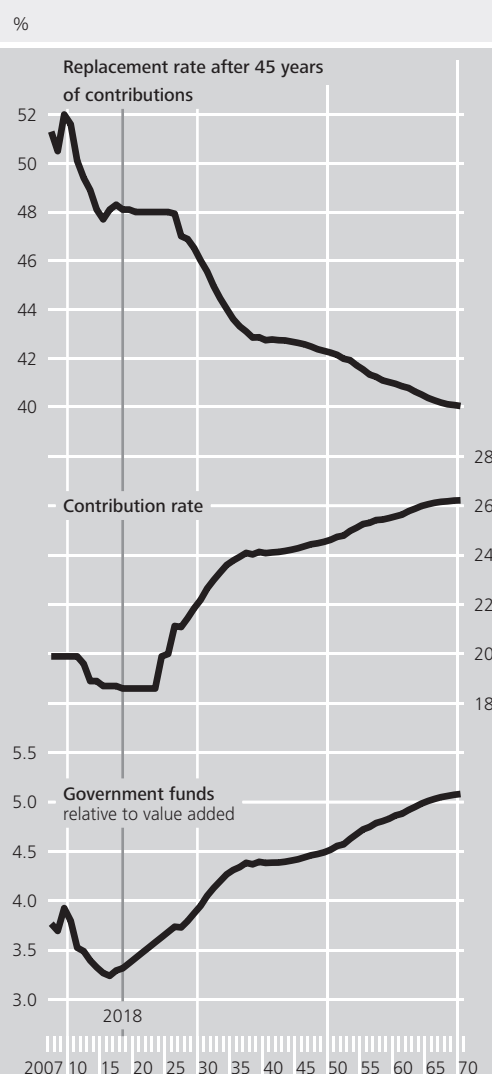
Higher statutory retirement age likely to more or less stabilise relative pension-drawing period

The rise in the statutory retirement age to 67 will prevent increasing life expectancy from raising the relative pension-drawing period up until 2031. The relative pension-drawing period is defined as the ratio of years drawing a pension to years making pension contributions, assuming retirement at the standard age.²² Going forward (from the 2030s onwards), a constant number of years of contributions will have to finance an increasing number of years in retirement again if the statutory retirement age remains unchanged from then on. This will increasingly weigh on the pension insurance scheme. In the past, the relative pension-drawing period has risen sharply as a result of increasing remaining life expectancy among the post-retirement generation: it went up from 30% in 1960 to 42% in 2011. Without a further increase in the statutory retirement age, it would be 47% in 2070 (see the chart on p. 70).

Government funds

The funds that the German government provides for the pension insurance scheme will rise

Simulation: current legal situation



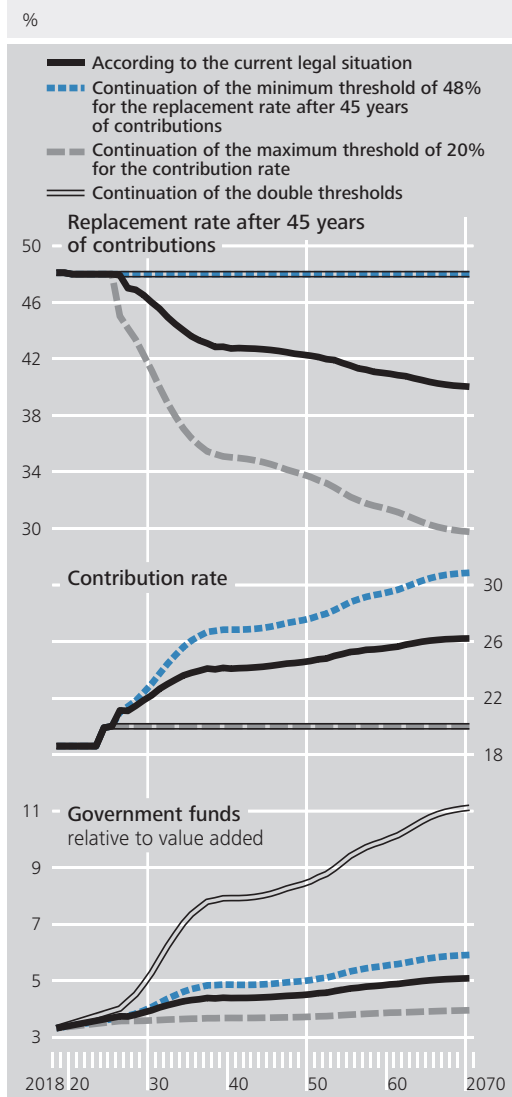
Sources: Federal Ministry of Labour and Social Affairs (2018) and Bundesbank calculations.
 Deutsche Bundesbank

sharply in the longer term. In large part, they will go up in line with per capita wages and the contribution rate. As a consequence, govern-

²¹ When looking at old-age provision as a whole, funded individual and occupational pension schemes may also need to be taken into account. Given the persistent low interest rate environment, their potential returns are the subject of much critical debate. However, this is not the main focus of this article. For information on the overall replacement rate with different rates of return based on the "Riester" pension plan, see, for example, Deutsche Bundesbank (2016).

²² For the purposes of this article, employment is defined as starting at 20 years of age and ending with retirement at the statutory retirement age. The assumption made in the OLG model is that, as the statutory retirement age increases, so too will the actual retirement age – as has been the case so far (see also the box on pp. 63 ff.).

Simulations: one-sided burden sharing*



* Current legal situation up until 2025.
 Deutsche Bundesbank

Government funds rise mainly in step with per capita wages and the contribution rate

ment funds overall are likely to significantly outpace the overall assessment basis for receipts from contributions and taxes. In the following, gross value added (or value added for short) will be used as an aggregate indicator for the tax base. In the model, it captures macroeconomic developments.²³ The increase in government funds relative to value added is the result, first, of the sharply higher contribution rate and, second, of the decreasing employment headcount. As a result, the total wage bill and value added are growing more slowly than per capita wages, to which the majority of government funds are linked.

The fact that government funding is rising much faster than the tax base will put the federal budget under considerable and permanent pressure.²⁴ This can generally be offset by lower expenditure or higher receipts. In addition, the overall burden may be increased or reduced in other areas without any further action being taken. The interest burden depends on developments in the debt ratio and interest rates.²⁵ All of these aspects are disregarded in the following, with the analysis focusing solely on the changes in the burden as a result of the funds that the government has to provide for the statutory pension insurance scheme. This is captured by the rise in government funds relative to value added. In order to further illustrate its magnitude, we also state how many points of the standard rate of turnover tax this would equate to in today's terms.

Funding pressure on the federal budget

The model simulations show that, under the current legal situation, the need for government funds would expand substantially compared with 2018, with requirements rising to around 1¾% of value added a year by 2070. This equates to 4½ percentage points of the standard rate of turnover tax.

High additional burden even under current legal situation

Longer-term outlook: further simulations

The German government has announced a reform of the pension insurance scheme for the period after 2025 – after the minimum and

²³ Gross domestic product (GDP), which is often used as the macroeconomic reference variable, is not modelled. Gross value added currently accounts for about 90% of GDP. It is closer to the national income and consequently probably reflects the assessment basis for taxes relatively well.

²⁴ The specific modelling of the government funds means that the burden for the government is slightly overestimated while the burden for contribution payers and pension recipients is somewhat underestimated in the simulations.

²⁵ For instance, expenditure on pensions for retired post office and railway civil servants as well as on miners' pensions will come down over time. However, many additional demands are also currently being made on the federal budget, for example in connection with defence and the energy U-turn.

Simulations illustrate burden sharing resulting from reform decisions

maximum thresholds expire. The legal situation on which the baseline simulation outlined above is based is therefore likely to change. A key issue in all of this is the future distribution of the adjustment burdens. In order to cover a broad spectrum, various further simulations are shown below. As compared with the baseline simulation, the first simulations distribute the adjustment burdens relatively one-sidedly, with either the replacement rate or contributions bearing the brunt. After that, examples of broader-based burden sharing are presented.

Relatively one-sided burden sharing

Minimum threshold for replacement rate leads to sharp rise in contributions burden

The first simulation freezes the replacement rate (in the current definition) after 45 years of contributions at 48%: in other words, the current minimum threshold is extended beyond 2025. The statutory retirement age remains unchanged at 67 years from the 2030s onwards, as in the baseline simulation. As a result, the contribution rate rises very sharply, as pension expenditure now increases much more strongly than under the current legal situation. The contribution rate is significantly higher in 2070 (in the region of 31%) than in the baseline simulation. In addition, government funds also grow more sharply as they are linked to the contribution rate. By 2070, the ratio of government funds relative to value added would expand by 2½ percentage points. From today's perspective, this would correspond to the revenue from around 7 percentage points of the standard rate of turnover tax. The federal budget would therefore come under significant pressure.

Maximum threshold for contribution rate radically curtails replacement rate

In a second simulation, the contribution rate rather than the replacement rate is fixed at the level it reaches in 2025, namely 20%. This also considerably dampens the increase in most of the associated government funds. The replacement rate now bears the brunt of demographic change. Up until the end of the 2030s, it drops into the region of 35% and by 2070 to around

30%. The coverage provided by the statutory pension insurance scheme thus shrinks considerably.

In a third simulation, the thresholds for both the replacement rate and the contribution rate remain in place after 2025. The full adjustment burden therefore lies on the federal budget, and the government funds employed shoot upward. In 2070, they are, relative to value added, almost 7¾ percentage points higher than in 2018 (in the region of 20 percentage points of the standard rate of turnover tax). The percentage of the statutory pension insurance scheme's receipts funded by the Federal Government rises to well over 50% (currently: 29%).

With double thresholds, government funds soar

Broader-based burden sharing

The simulations described above concentrate the burden of demographic adjustment on individual variables in a rather one-sided fashion. They thereby illustrate key correlations, and the strongly conclusive results ultimately show why broader-based burden sharing is the obvious choice. We will present further relevant example simulations below.

Extreme options not obvious solution, burden sharing remains sensible

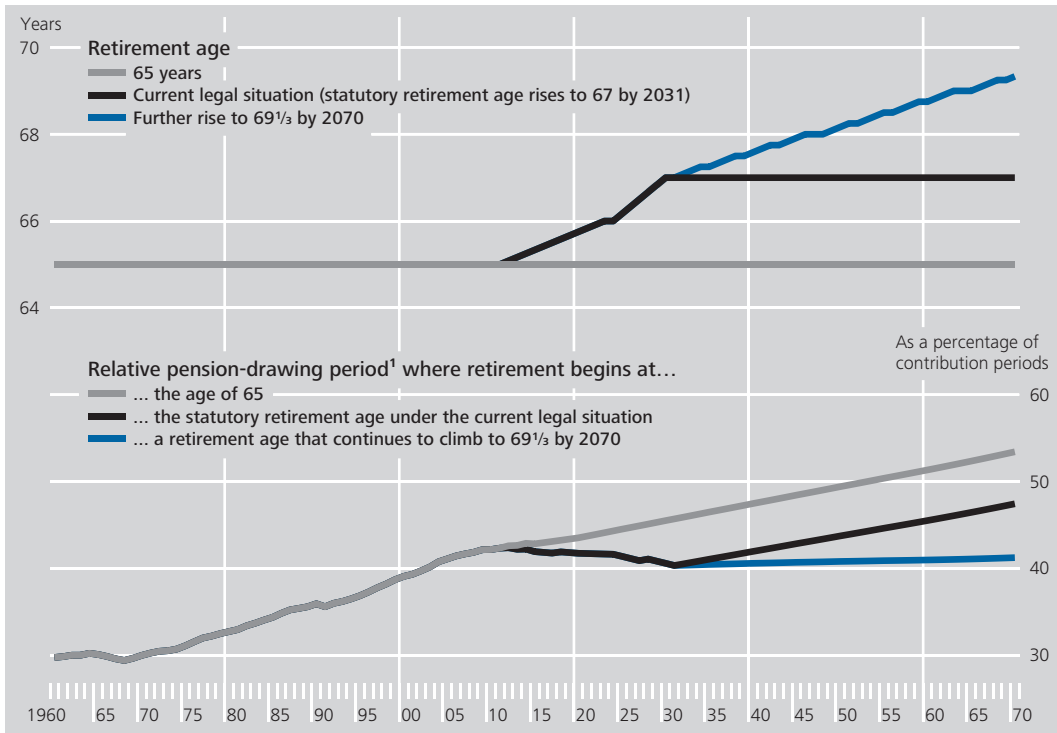
Indexation of statutory retirement age to life expectancy to stabilise the ratio of the period of pension payment to the period of employment

One starting point is the statutory retirement age. Under the current legal situation, it will increase until the early 2030s, before remaining unchanged at 67 years thereafter. However, life expectancy is likely to continue to rise even after that. To take this into account, several countries index the statutory retirement age to life expectancy.²⁶ The OECD, the IMF and the European Commission recommend this proced-

Further increase in statutory retirement age

²⁶ This includes, amongst others, Finland, Portugal, Denmark, the Netherlands and Italy, see European Commission (2018).

Retirement age and relative pension-drawing period



Sources: Federal Statistical Office (2019b) and Bundesbank calculations. ¹ Ratio of pension-drawing periods (defined as remaining life expectancy as of retirement age) to preceding contribution periods (defined as retirement age minus 20 years).
 Deutsche Bundesbank

ure for Germany, too.²⁷ As the statutory retirement age rises, the actual age at which people enter retirement is also likely to increase – as has been the case to date.²⁸ This expands the workforce and is therefore also beneficial for overall economic growth and incomes. Receipts from pension contributions as well as from the other social security contributions and taxes would then likewise develop more favourably.

The number of pensions in payment grows more slowly if the statutory retirement age is raised, which, in turn, supports the replacement rate via the sustainability factor (see the explanations on p. 56). In addition, members of the statutory pension insurance scheme gain more pension entitlements as they pay contributions for longer. The individual replacement rate consequently rises. As the statutory retirement age goes up, it would therefore make sense to stipulate a higher number of years of contributions in the definition of the standard pension and thus in the replacement rate. If, say, the

retirement age is set at 67, the standard pension and, consequently, the replacement rate, would have to be calculated for 47 instead of 45 years of contributions (dynamically adjusted replacement rate; see the box on p. 71).

In principle, there are various conceivable approaches to increasing the statutory retirement age. A very sweeping approach would be for all demographic burdens, i.e. both rising life expectancy and lower birth rates (fluctuating cohort sizes), to be absorbed through increases in the retirement age. However, the retirement age would have to rise very sharply in this case. It would also have to be raised significantly faster than currently envisaged, particularly

In what follows, retirement age is tied to life expectancy and longer contribution periods are factored into the replacement rate

Rising entitlements taken into account in dynamically adjusted replacement rate

²⁷ European Commission (2019); International Monetary Fund (2019); and OECD (2018).

²⁸ Ever since the first increase in the statutory retirement age, this effect has been evident in the data provided by the German statutory pension insurance scheme, see FDZ-RV (2018). When the separate retirement age for women was abolished at the end of 2011, there was a similar effect, see Geyer et al. (2019b).

Dynamic definition of the replacement rate for a rising retirement age with longer contribution periods

The replacement rate plays a key role in the pension debate and in pension policy. It is intended to capture the extent to which a pension determined in the standardised manner is in proportion to an employment income determined in the standardised manner, i.e. in principle, the relative level of a pension as a replacement for earnings. Fundamentally, different definitions are possible and make sense depending on the objective.

The replacement rate offered by a standard pension is at the centre of the current pension debate (for instance, in the Federal Government's pension insurance report). It is also the basis for the statutory threshold of 48%, which will apply to the end of 2025. However, the rising statutory retirement age is not taken into account. Instead, a constant figure of 45 years of pension contributions is assumed. When it comes to illustrating the development of potential pension entitlements over time, however, it would make sense to have a new definition that includes the higher statutory retirement age.

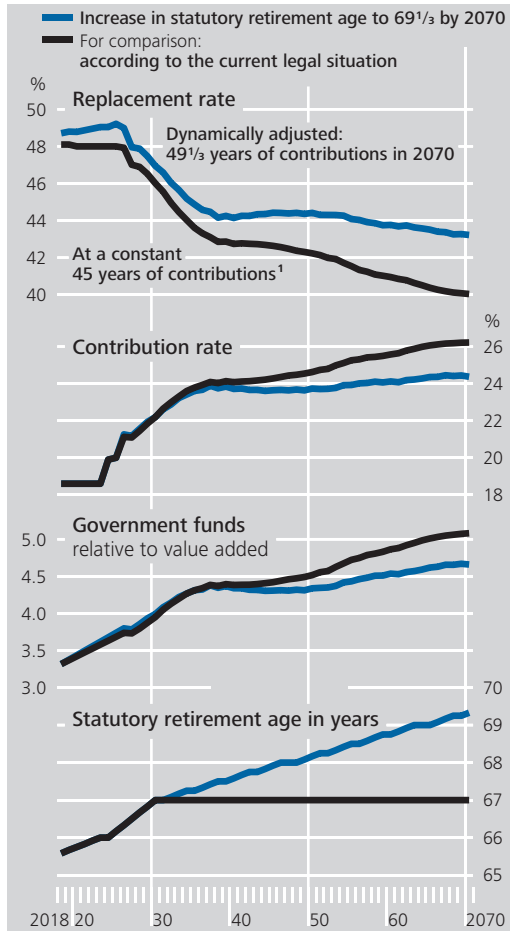
Currently, the replacement rate is still measured at 45 earnings points for a standard pension. This standard pension is intended to reflect a stylised history of employment for persons covered by the statutory pension insurance scheme who have worked for average earnings between the ages of 20 and 65 (in a nutshell: the replacement rate after 45 years of contributions). However, the statutory retirement age is being raised incrementally to 67. The intended longer period of employment is hence not taken into account.

In the past, the individual retirement age was based largely on the statutory retirement age. If this increases, the average employment periods of all persons covered by the statutory pension insurance scheme would most likely be extended. It therefore seems obvious to extend the periods of employment included in the standard pension in parallel with the rise in the statutory retirement age. Moreover, an adjustment in the contribution periods on which the standard pension is based is not a new concept. Until the end of the 1980s, the standard pension was calculated at 40 years of contributions. During a transitional period from 1988 to 1990, the Federal Government provided two standard pensions in parallel. Following this, the standard pension reflected only the new level.

Against this backdrop, a dynamically adjusted replacement rate is provided in the simulations in this section. The underlying standard pension takes into account the additional earnings points acquired by later cohorts in a longer working period (see footnote 33 on p. 73 regarding the adjustment of pensions in payment).

For instance, the following picture thus emerges for the baseline simulation according to the current legal situation presented above: people will reach the statutory retirement age of 67 for the first time in 2031. At this point in time, the dynamically adjusted replacement rate with 47 years of contributions would be about 1 percentage point higher than the traditionally calculated replacement rate after 45 years of contributions.

Simulation: indexed statutory retirement age and dynamically adjusted replacement rate



1 If the replacement rate were dynamically adjusted, i.e. if the years of contributions were increased to 47 parallel to the rise in the statutory retirement age, it would be around 42% in 2070.

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when the baby boomer cohorts enter retirement between the mid-2020s and the mid-2030s. In the following example simulations, by contrast, the adjustment burdens are spread more broadly. The statutory retirement age rises as planned until the beginning of the 2030s, followed by additional rule-based increases. In addition, the replacement rate is dynamically adjusted, with the contribution period for the standard pension increasing in parallel with the statutory retirement age. Compared to the replacement rate based on a static contribution period of just 45 years, the dynamically adjusted replacement rate is higher.

In concrete terms, the statutory retirement age is adjusted so that the ratio of years in retirement to years of contributions – i.e. the relative pension-drawing period – remains broadly stable as of the 2030s. Essentially, therefore, the current approach continues until the beginning of the 2030s, and even within this time-frame the increasing statutory retirement age largely stabilises the relative pension-drawing period (see the chart on p. 70). The relative pension-drawing period therefore stands at around 40% on a lasting basis. In other words, given the life expectancy projections used here, the statutory retirement age would have to rise, on average, by three quarters of a month per year.²⁹ For example, a person entering retirement at the age of 67 in 2031 has a life expectancy of 86 years. In 2070, the statutory retirement age would be 69½ and life expectancy 89½ years. The period of pension payment would then be just over 20 years and thus more than one year longer than in 2031 (on the topic of health in old age, see also the box on p. 74). In practice, an indexation would take into account the uncertainty connected with future life expectancy. If life expectancy projections were to change, there would be corresponding rule-based adjustments to the statutory retirement age as well. For example, the statutory retirement age would remain constant if life expectancy no longer increased.³⁰

Ratio of pension-drawing period to contribution period stable even post-2030

29 In principle, if life expectancy increases, 70% of the additional years flow into a longer employment period and 30% extend the pension-drawing period. For the purpose of the calculations, however, the retirement age is adjusted in full-month increments. It therefore increases by one month per year for three years and then remains unchanged in the fourth year. The ratio of 70 to 30 thus holds more or less for the entire period of life from the age of 20 onwards.

30 Retiring earlier or later could remain possible, but the statutory retirement age would serve as the reference point for deductions or add-ons. These would have to be largely fair from an actuarial perspective. Currently, deductions are made for early retirement (3.6% per year) and add-ons are made for postponed retirement (6.0% per year). If the current derogations allowing early retirement on a full pension should continue, these rules would also need to be adjusted to take a rising statutory retirement age into account. An obvious solution would be to increase the required contribution periods in line with any rise in the statutory retirement age.

Simulation with an indexed statutory retirement age and a dynamically adjusted replacement rate

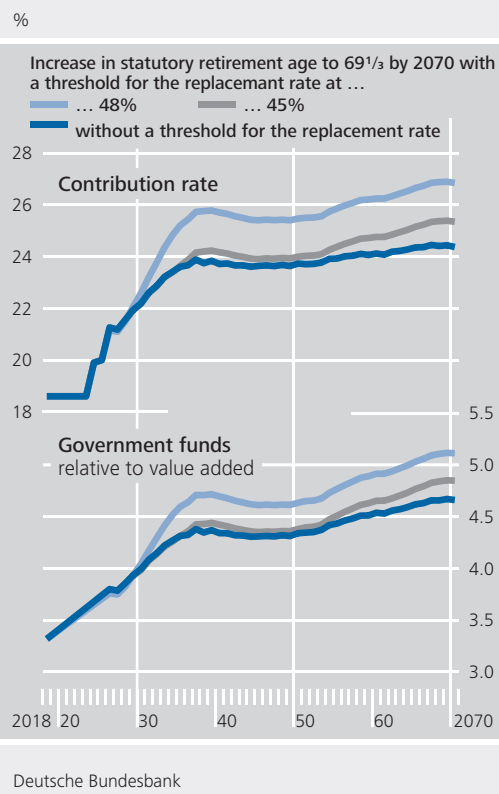
Simulation with further rises in statutory retirement age

The indexation of the statutory retirement age described is illustrated in a further simulation. The ratio of years in retirement to years of contributions is held largely stable from the 2030s onwards. Apart from this, the current legal situation continues to apply, i.e. the burden is distributed relatively broadly across the other variables. They thus absorb the burden arising from the decline in the birth rate. As of 2026, pensions therefore again need to be adjusted in accordance with the pension adjustment formula.³¹ The dynamically adjusted replacement rate falls chiefly due to the strain of baby boomers entering retirement (to around 44% by the end of the 2030s). It then stabilises. Although baby boomers pass away, cohorts with higher labour force participation rates retire. The cohort sizes then change only moderately and, due to the rising statutory retirement age, rising life expectancy no longer exerts any pressure.³² At the same time, the increasing number of contribution years supports the dynamically calculated replacement rate (see the chart on p. 72).³³

Subdued rise in the contribution rate and government funds

In this simulation, the contribution rate still increases significantly to around 24% in 2070. However, the increase is much smaller than would be the case without a further rise in the statutory retirement age. Contribution payers and the federal budget come under less strain. First, the pressure is eased by the smaller number of people drawing a pension and, second, the higher degree of employment leads to a marked increase in the tax base. As a percentage of value added, government funds rise by 1¼ percentage points on their 2018 level (3½ percentage points of the standard rate of turnover tax). Ultimately, the additional burdens from the lower birth rates are thus distributed, on the one hand, among pension recipients (via the replacement rate), and, on the other hand, among contribution payers and taxpayers.

Simulations: indexed statutory retirement age and thresholds for a dynamically adjusted replacement rate



Simulation with an indexed statutory retirement age and an additional threshold

The replacement rate is a key topic in the pension debate. The preceding simulation shows that it falls even when the statutory retirement age is indexed as described above. However, in

Replacement rate at centre of the debate

³¹ The additional years of contributions are taken into account via the sustainability factor.

³² The cohort sizes fluctuate even after the 2030s, as the demographic “hump” of the baby boomers has an impact via their children. However, it is assumed that these effects increasingly taper off. At the end of the simulations presented here, in 2070, the dynamically adjusted replacement rate bottoms out at around 43%. As the descendants of the baby boomer cohorts die in the 2080s, the replacement rate increases again to 44% and then remains at this level in the long term.

³³ The pension adjustment formula was expanded for the simulation. The expansion ensures that the replacement rate over the course of the pension-drawing period corresponds to the replacement rate for new retirees – despite new retirees having longer contribution periods (on account of the rising statutory retirement age). Accordingly, pensions in payment are adjusted to a greater extent. The principle is similar to the current higher valuation of pensions in eastern Germany. Their alignment with the level in western Germany will be completed in 2024.

Health aspects of rising life expectancy

The aim of raising the statutory retirement age is for individuals to have a longer working life and retire later. This is under the assumption that there are no health impediments. Research indicates that gains in life expectancy, on the whole, go hand in hand with better health at a given age.¹ Ongoing technological innovation, such as the recent advances in digitalisation, could lead to a decline in hard manual labour or a progressive reduction in the physical demands of such work.² In the more detailed simulations outlined in this article, longer life expectancy does not translate 1:1 into a higher retirement age. Instead, part of the increase in life expectancy lengthens the period of pension payment over time.

Nonetheless, some individuals are unable to continue in employment, or in full employment, because of ill health. This can be addressed, first, through professional training measures, which might enable those affected to take on less demanding work, for example. Second, it is both important and necessary to ensure adequate protection for cases of disability. Alongside any private cover, this is provided primarily by the reduced earnings capacity pension, which has recently undergone a major benefit expansion.³

¹ See, in particular, Federal Ministry of Labour and Social Affairs (2018b) and Robert Koch Institute (2015).

² Wolter et al. (2016) and Federal Ministry of Labour and Social Affairs (2016b).

³ There are calls for the mismatch in the life expectancy of different groups to be taken into account, say, through varying levels of replacement rates or different retirement ages. The number of years an individual spends in good health, for example, is said to be correlated with socio-demographic status (see Haan et al. (2019) and Unger and Schulze (2013)). However, as the statutory pension insurance scheme does not currently distinguish by socio-demographic factors or levy risk-based contributions, this would entail a fundamental change of system, which will not be discussed any further here.

the long term, it stabilises at 43% to 44%. In this context, supplementary private pension provision can compensate for the fall in the replacement rate. Nonetheless, calls are frequently made for the replacement rate to be prevented from falling any further or for at least thresholds to be put in place.

For that reason, the following simulations are shown with thresholds for the dynamically adjusted replacement rate described above. The adjustment burden thereby shifts further to the receipts side, i.e. to contribution rates and government funds. Risks of more unfavourable developments would therefore be borne by contribution payers and taxpayers.

Burdens increasingly shifted to contribution payers and taxpayers

The costs of thresholds increase significantly after 2025. Once the baby boomers reach retirement age, the trajectory of rising costs flattens. The simulations show, as a rule of thumb, that a 1 percentage point higher threshold for the dynamically adjusted replacement rate requires the contribution rate in 2070 to be around ½ percentage point higher. At the same time, government funds as a percentage of value added are 0.1 percentage point higher (equivalent to ¼ percentage point of the standard rate of turnover tax).

Costs of a higher replacement rate

For example, a contribution rate of 27% is necessary in 2070 if the dynamically adjusted replacement rate is to remain at 48% after 2025. The government funds required then also rise more sharply by a total of 1¾% of value added (4½ percentage points of the standard rate of turnover tax). However, the burden on contribution payers and taxpayers is significantly lower than if the statutory retirement age remains unchanged and a threshold is applied for the non-dynamically adjusted replacement rate based on a constant 45-year contribution period. If the threshold for the replacement rate is set lower at 45%, the contribution rate required is correspondingly lower at around 25%. The increase in government funds needed is also then lower, at 1½% of value added

Dynamically adjusted replacement rate of 48% associated with distinctly higher contributions and taxes

(4 percentage points of the standard rate of turnover tax).

■ Conclusions

Reform will decide scope of the statutory pension insurance scheme and distribution of demographic adjustment burdens

As a result of demographic trends, the pay-as-you-go statutory pension insurance scheme will come under considerable pressure in future, especially from the mid-2020s onwards. The German government has announced a pension reform which is intended to come into effect as of 2026 and put the pension system on a long-term stable footing. The key variables are the statutory retirement age, the replacement rate and the contribution rate. They affect the future scope of the statutory pension insurance scheme and the distribution of demographic burdens across cohorts. A role is also played by government funds, which are provided by all taxpayers.

Projections show long-term developments and reform impacts

The reform debate should take account of the effects of policy changes, including over the long term. For this purpose, long-term projections are used, which, despite all of the uncertainty involved, provide an idea of future developments. This is also the aim of the simulations in this article. They cannot predict the future precisely, but are intended to illustrate important trends and correlations.

Broader distribution of adjustment burdens seems appropriate

The simulations show that individual variables would have to be adjusted very sharply if they alone had to absorb demographic pressure (see the chart on p. 68). This was a major reason why previous reforms distributed the burdens more broadly. After 2025, when the thresholds for the contribution rate and the replacement rate expire under current legislation, burdens would once again be distributed more broadly.

Statutory retirement age as a starting point

The statutory retirement age is an important factor in further reforms. It will increase to 67 years by 2031. As a result, the ratio of the pension-drawing period to the contribution period will not increase, despite the fact that life expectancy is rising. If the statutory retire-

ment age subsequently remained constant, a static number of contribution years would once again be set against a continually growing period of pension payment (see the chart on p. 70), which would put pension funding under pressure. To address this, the European Commission, the IMF, and the OECD, among others, have suggested further increases in the statutory retirement age in line with rising life expectancy. Other countries have already put such a link in place. Health impediments are sometimes pointed out in this context. However, research indicates that gains in life expectancy are generally accompanied by better health. Nevertheless, it should be noted that – as per the current situation – it will not be possible for everyone to remain in employment until reaching the statutory retirement age. Adequate protection in the form of a reduced earnings capacity pension is therefore important and necessary. This coverage has recently been expanded markedly.

With an indexed statutory retirement age, further targeted stabilisation of the relative pension-drawing period from the beginning of the 2030s onwards would be possible, for example. Persons covered by the statutory pension insurance scheme in future would first have to contribute to the scheme for longer, but would subsequently also draw a pension for longer. They would therefore be no worse off in terms of the ratio of the period of pension payment to the contribution period. According to current life expectancy projections, under such an approach the statutory retirement age would rise by an average of three quarters of a month per year as of 2032. Those born in 2001 would enter regular retirement at the age of 69 and four months from May 2070 onwards. If life expectancy were to develop differently, this would also have an impact on the statutory retirement age, provided it were indexed. In order to give those who are affected by this time to adjust, changes to the statutory retirement age could be smoothed and set out well in advance.

Rising statutory retirement age could stabilise the relative pension-drawing period

Longer working lives help to manage demographic change

This adjustment to the statutory retirement age would not only ease the burden on the statutory pension insurance scheme. Through increased employment, it would also strengthen macroeconomic potential and thus boost the assessment bases for taxes and social security contributions. Overall, it makes it easier for an employment-friendly policy to address the challenges posed by demographic change.

Replacement rate should cover longer periods of employment

Longer periods of employment and more years of contributions also lead to greater pension entitlements. It would therefore be logical to take this into account in the projections of the replacement rate and the thresholds applying to it. For instance, the number of contribution years factored into the calculation of the replacement rate could rise in line with the statutory retirement age. For example, such a dynamically adjusted replacement rate would require 46 years of contributions on the basis of average earnings in 2024, and 47 years of contributions in 2031 (see the box on p. 71). It would not be unprecedented to change the number of contribution years in terms of the replacement rate. Up to the end of the 1980s, the replacement rate was based on 40 years of contributions rather than on the current 45 years.

Remaining adjustment caused by lower birth rates

Indexing the statutory retirement age as described would absorb the pressure caused by longer life expectancy. However, other factors would still need to be addressed, including, in particular, the impact of lower birth rates since the 1970s. The vast majority of these adjustments would be concluded by the end of the 2030s. This means that, from this point onwards, almost no additional pressure on pension funding would arise. In the simulations presented here, the dynamically adjusted replacement rate – with adjustment mechanisms otherwise remaining unchanged – falls from

about 48% today to 43% by 2070, before stabilising at 44% thereafter. The contribution rate increases from 18.6% to 24%. Over time, government funds also increase significantly relative to value added. The increase in this ratio by 2070 corresponds, for instance, to the current funding volume of 3½ points of the standard rate of turnover tax. The respective developments are, however, much milder than is the case if the statutory retirement age is not indexed (see the chart on p. 72).

For the statutory pension insurance scheme to be accepted, it is important that the replacement rate is largely deemed to be adequate. A permanent threshold in this regard is therefore often seen as important. If such a threshold is desired, and the statutory retirement age increases, it would be logical to apply the threshold to the dynamically adjusted replacement rate.

Nevertheless, if the threshold is extended, both the impact of lower birth rates as well as the remaining funding risks would be shifted almost entirely to contribution payers and taxpayers. The burden of taxes and contributions would potentially rise sharply. Furthermore, this problem cannot be solved by additionally capping the contribution rate, for although this would relieve adjustment pressure on the statutory pension insurance scheme, it would place additional burdens on the federal budget and thus on taxpayers. The current legal situation will already lead to a sharp increase in financing needs, which is sometimes neglected in the debate on pensions policy. It is essential that this aspect is taken into account in the specific design of the pension reform. At the very least, the financial impact of a reform should be disclosed on the basis of official projections over the very long term and as comprehensively as possible.

Any thresholds should relate to the dynamically adjusted replacement rate and ...

... financial burdens of a reform should be disclosed fully and transparently

■ Annex

Selected legislative reforms concerning the funding of the statutory pension insurance scheme since 2008

Pension Adjustment Act 2008 (*Gesetz zur Rentenanpassung 2008*, 26 June 2008)

The dampening effect of contributions paid into a supplementary state-funded private pension scheme ("Riester steps") in the pension adjustment formula was suspended for two years, but was then made up for in 2012 and 2013. As a result, pensions rose by around an additional 0.6 percentage point in both 2008 and 2009.

Third Act Amending the Fourth Book of the Social Security Code (*Drittes Gesetz zur Änderung des Vierten Buches Sozialgesetzbuch*, 26 June 2008)

A safeguard clause was incorporated into the pension adjustment formula. From mid-2008 onwards, a reduction in the nominal pension payment amount was no longer permissible even if nominal per capita wages declined. Pension cuts waived were to be compensated for with deductions on pension increases over the following years.

Act Securing Employment and Stability in Germany (*Gesetz zur Sicherung von Beschäftigung und Stabilität in Deutschland*, 2 May 2009)

The general contribution rate for the statutory health insurance scheme applicable to pensions was reduced to 14.9% as of 1 July 2009.

Act Accompanying the 2011 Budget (*Haushaltsbegleitgesetz 2011*, 9 December 2010)

From 2011 onwards, recipients of unemployment benefit II were exempted from compulsory participation in the pension insurance scheme. As central government no longer pays any contributions, recipients of unemployment benefit II no longer accrue any pension entitlements.

Statutory Health Insurance Scheme Financing Act (*GKV-Finanzierungsgesetz*, 22 December 2010)

The general contribution rate for the statutory health insurance scheme was increased to 15.5% as of 1 January 2011.

Contribution Rate Act 2013 (*Beitragssatzgesetz 2013*, 5 December 2012)

The pension contribution rate for the year 2013 was lowered to 18.9% by law. In contrast to this Act, the usual contribution rate regulation would have required the approval of the Bundesrat, the Upper House of the German parliament.

Act on Amendments in the Area of Low-Paid Part-Time Employment (*Gesetz zu Änderungen im Bereich der geringfügigen Beschäftigung*, 5 December 2012)

The existing exemption from participation in the pension insurance scheme for low-paid workers with the option to opt in was replaced by compulsory participation in the pension insurance scheme with the option to opt out.

Act Accompanying the 2013 Budget (*Haushaltsbegleitgesetz 2013*, 20 December 2012)

The central government grant to the statutory pension insurance scheme was cut by €1 billion in 2013 and by €1.25 billion each year from 2014 to 2016.

Contribution Rate Act 2014 (*Beitragssatzgesetz 2014*, 25 March 2014)

In anticipation of the additional funding required as a result of the planned Act on Improvements in Pension Insurance Scheme Benefits, a reduction in the pension contribution rate was prevented contrary to the normal rules. It remained at 18.9%.

Act on Improvements in Pension Insurance Scheme Benefits (*RV-Leistungsverbesserungsgesetz*, 23 June 2014)

As from mid-2014 onwards, persons with an exceptionally long contribution history were entitled to re-

ture on a full pension at the age of 63. This retirement age will be increased incrementally to 65 up to 2029 in line with the gradual increase in the statutory retirement age to 67.

The crediting of child-raising periods for children born prior to 1992 in pension entitlements (“mothers’ pensions”) was doubled from one year to two years. In future, two earnings points in each case will thus be credited, leading to an increase in pension entitlements.

The non-contributory supplementary period for persons with reduced earnings capacity was raised from 60 to 62 years; in future, upon retirement, it will therefore be assumed that persons with reduced earnings capacity would have been in receipt of earnings up to the age of 62.

Act Improving the Financial Structure and Quality of the Statutory Health Insurance Scheme (*GKV-Finanzstruktur- und Qualitäts-Weiterentwicklungsgesetz*, 21 July 2014)

The general contribution rate for the statutory health insurance scheme was reduced from 15.5% to 14.6% on 1 January 2015. A supplementary contribution introduced to compensate for this – at a rate set by each individual health insurer – is to be paid solely by the insured persons.

Act on Making the Transition from Work to Retirement More Flexible and Strengthening Prevention and Rehabilitation in Employment (*Gesetz zur Flexibilisierung des Übergangs vom Erwerbsleben in den Ruhestand und zur Stärkung von Prävention und Rehabilitation im Erwerbsleben*, 8 December 2016)

In particular, the regulations for receiving part-pensions were made more flexible and it now became possible for employees to acquire full additional pension entitlements, including through gainful employment after reaching the statutory retirement age, by paying a supplementary employee’s contribution.

Final Pension Transfer Act (*Rentenüberleitungs-Abschlussgesetz*, 17 July 2017)

The current pension value in eastern Germany is to be aligned to the current pension value in western Germany in seven steps by law, irrespective of actual wage developments in eastern Germany.

Act on Improvements in Benefits for Reduced Earnings Capacity (*EM-Leistungsverbesserungsgesetz*, 17 July 2017)

The non-contributory supplementary period for persons with reduced earnings capacity is to be increased incrementally for new retirees from 62 to 65 years by 2024.

Act on Benefit Improvements and the Stabilisation of the Statutory Pension Insurance Scheme (*RV-Leistungsverbesserungs- und -Stabilisierungsgesetz*, 28 November 2018)

The pre-tax net replacement rate may not fall below 48% and the contribution rate may not exceed 20% up to the end of 2025. Any funding gaps are to be bridged with additional government funds. The contribution rate may not fall below 18.6% between 2019 and 2025.

“Mothers’ pensions” were expanded – in future, 2.5 earnings points will be credited for child-raising periods for children born prior to 1992, leading to an increase in pension entitlements.

The sliding scale within which low earners pay lower social security contributions even above the “mini-job” threshold of €450 per month was raised from €850 to €1,300 as of mid-2019. Furthermore, the reduced pension contributions within this sliding scale no longer result in reduced pension entitlements.

The non-contributory supplementary period for persons with reduced earnings capacity was raised to 65 years and 8 months in a single step as of 2019. This will be increased further to 67 years for new retirees by 2031. Deductions resulting from early retirement will therefore no longer be applicable for persons with reduced earnings capacity.

Act Providing Relief for Persons Insured under the Statutory Health Insurance Scheme (*GKV-Versichertenentlastungsgesetz*, 11 December 2018)

be financed in equal parts by the statutory pension insurance scheme and employers.

From 2019 onwards, the supplementary contribution to the statutory health insurance scheme is to

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