

## **How sensitive is the German public pension system to economic recessions? An answer based on the current financial crisis.**

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**Abstract.** The financial and economic crisis has drawn attention again on the question how sensitive the German public pension system (Gesetzliche Rentenversicherung) reacts to cyclical shocks. We identify three important channels through which business cycle movements may affect the pension system: (1) An effect caused by changes in the wage sum of the insured labour force (Beitragsgrundlageneffekt), (2) an effect caused by changes in the size of the government subsidy (Bundeszuschusseffekt) and (3) an effect caused by changes in the size of the annual pension adjustments (Rentenanpassungseffekt). We quantify these effects for the current financial and economic crisis using a detailed simulation model of the German pension system (MEA-PENSIM).

Our simulation results show that the public pension system is able to cope with cyclical shocks in the sense that there are no long-run effects on the pension benefit level or the contribution rate. This cyclical stability is inherent in the system's pension adjustment formula that links the size of benefits to the development of wages. However, it can be shown that cyclical shocks lead to increases in the contribution rate in the short and medium run. The new law that was passed in spring 2009, which forbids a decrease in nominal pension adjustments in case of decreasing wages (Rentengarantie), extends and intensifies these negative short and medium run effects because it partially offsets the automatic stability mechanism via the wage orientated pension adjustment formula.

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## I. Introduction

Over the last few years, the discussion on pension policy has been dominated by the effects of the demographic development on the stability of the German public pension system. During the financial and economic crisis, the awareness of another important aspect has increased, namely the question of the stability of the public pension system during times of economic crisis. This is because the public pension system has not remained unscathed by the financial and economic crisis. An increase in short-time work, rising unemployment and a lower rate of increase in earnings dampen the development of the contribution base, making increases in the contribution rate more likely. Lower increases in earnings are reflected in lower pension increases through the pension adjustment formula. This means that both contributors and pension recipients are affected negatively by a shock to the economy. However, the link between pension adjustments and earnings, which causes this detrimental effect on pensions, simultaneously represents the most important stabilisation mechanism in the pension system, since it ensures that the pressure for increased contribution rates on the revenue side is balanced by corresponding adjustments on the pension expenditure side. The so-called “Rentengarantie”, i.e. pension guarantee, approved in mid-2009 weakens this compensation mechanism between revenue and expenditure, since it prevents pensions from decreasing as wages go down. As a result, the pressure for increases in the contribution rate exerted by an economic crisis can no longer be fully compensated for.

This article analyses the sensitivity of the German public pension system to economic shocks by describing the effects of the economic crisis on the public pension system in detail, both in terms of quality and quantity.<sup>1</sup> In order to bring out the fundamental correlations between the economic situation and the pay-as-you-go pension system and distinguish them from the effects of the long-term demographic development, the basic mechanisms of a PAYG pension system will be described first in Chapter II. Chapter III describes the simulation model, in which the effects of economic shocks on revenues and expenditures of the German public pension system as well as the contribution rate and the pension benefit level are calculated by the example of the current economic crisis. Subsequently, the influence channels of the financial and economic crisis affecting the German public pension system are identified in Chapter IV and the extent of this influence is quantified with the help of the simulation model. The simulation calculations also explicitly include the effects of the “Rentenkürzungsverbot”, literally “pension cut prohibition”, (so-called pension guarantee) approved by the Bundestag in June. Chapter V combines the various influence channels into one overall effect by calculating the total impact of a negative shock to the economy on the contribution rate and the pension benefit level. Finally Chapter VI gives a brief conclusion and the resulting implications for pension policy.

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<sup>1</sup> On the influence of the public pension system on the economy see: Faik/Köhler-Rama (2009). On the influence of the financial and economic crisis on the public pension system see: Börsch-Supan et al. (2009), Benz et al. (2009) and Sesselmeier et al. (2009).

## II. Risks to a PAYG pension system from demographic development and economic problems

In order to demonstrate the risks inherent in a PAYG pension system, it is useful to first consider the basic mechanisms of PAYG funding on the basis of a greatly simplified description.

In a stylised PAYG pension system, the pension expenditure  $G$  of each period corresponds to the revenue  $E$ . The payments are calculated by multiplying the average pension  $r$  with the number of pensioners  $R$ . Income is the product of the average contribution per socially insured employee (contributor)  $e$  and the number of contributors  $B$ :

$$(1) \quad G = r \cdot R = e \cdot B = E.$$

The ratio of pensioners to contributors  $R/B$  is described as the pensioner quotient  $RQ$ , giving the following formula for the average contribution:

$$(2) \quad e = r \cdot RQ.$$

If the contribution payable is a percentage  $b$  of the contributing income  $y$  – as is the case in Germany, you get:

$$(3) \quad e = b \cdot y,$$

and if a federal subsidy  $Z$  is paid into the pension system (the so-called “Bundeszuschuss”) as well, the following correlation results for the contribution rate:

$$(4) \quad b = \frac{r}{y} \cdot RQ - \frac{Z}{Y} = \frac{r \cdot R - Z}{Y},$$

with  $Y = y \cdot B$  representing the sum of all contributing wages (simplified: “wage sum”).<sup>2</sup>

Equation (4) first of all demonstrates the *long-term demographic risk* of the PAYG funding model: With a constant average pension benefit level  $r/y$ , the contribution rate  $b$  must be increased if the pensioner quotient  $RQ$  rises. The demographic development, which is found in Germany and in many other countries, influences the pensioner quotient in two ways. On the one hand, the falling birth rate reduces the number of contributors, and on the other hand, the number of pensioners is increasing due to increasing life expectancy. These effects of the demographic development on the contribution rate have dominated the discussion on pension policy over the last few years.

Now, the effects of the financial and economic crisis and therefore the *risks* to the pension system of *economic problems* have attracted more attention again. They too can be understood looking at equation (4). The wage sum  $Y$  plays a central role here, which is why the economy-related risk affecting the PAYG pension system can be expressed essentially as a wage sum risk. If total wages  $Y$  decreases or increases at a lower rate than pension payments  $r \cdot R$ , the contribution rate  $b$  is bound to rise. A decreasing wage sum might, for example, result from a decrease in earnings per employee relevant to the pension system. This effect is strengthened if there is also a decline in employment due to the economic

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<sup>2</sup> Quantity  $Z/Y$  can therefore be interpreted as the “tax payers’ contribution rate” with wage sum  $Y$  as calculation basis and subsidy  $Z$  as contribution payment.

crisis. And this effect would be increased even further by a return of early retirement, which would also raise the number of pensioners  $R$ .

Equation (4) and the above discussion show that the impact of the financial and economic crisis on the contribution rate consists of different components. First, a negative economic shock reduces the contribution base. There is a price component involved in this *contribution base effect*, since the contribution rate generally increases as the average income  $y$  decreases because voluntary pay elements might not be paid during times of crisis, or short-time work could be imposed increasingly. There is also a quantity component to the contribution base. If the number of contributors  $B$  decreases due to the economic crisis, the pensioner quotient  $RQ$  increases, which in turn leads to some increase in the contribution rate.

Secondly, the contribution rate  $b$  depends on the federal subsidy  $Z$ . If the development of the latter follows the negative trend of wage sum  $Y$  while pension payments increase, the contribution rate will have to be increased too. *This is the federal subsidy effect.*

And finally, there can be a counteracting *pension adjustment effect*, if, as was the case in Germany from 1957 to 2009, the variation of benefit benefits  $\theta$  depends on the change in wages  $\omega$  according to the principle of the dynamic pension. In very simplified form the following would apply in this stylised example for each year  $t$ :

$$(5) \quad (1 + \theta_t) = \frac{r_t}{r_{t-1}} = \frac{y_t}{y_{t-1}} = (1 + \omega_t),$$

so that the pension benefit level  $r/y$  remains constant at all times. In the case of increasing wages dynamic, pensioners' living standard would be aligned with that of the working population. In the case of a negative economic shock, this pension adjustment effect would soften the pressure for an increase in contributions on the revenue side by an adjustment on the expenditure side, since the pension payment  $r$  would decrease proportionately to wages  $y$ .

So the contribution base effect and the federal subsidy effect on the revenue side are counteracted by the pension adjustment effect on the expenditure side, thus creating a *balance*. The pension adjustment effect is important for the stability of a PAYG pension system, because this is intrinsically unstable. Higher contribution rates tend to erode the contribution base, because they increase labour costs and therefore tend to have a negative effect on employment. A diminishing contribution base in turn exerts pressure for an increase in the contribution rate.

If the pension adjustment effect, which acts as a stabiliser, is weakened, for instance by preventing pensions from decreasing although wages decrease (*pension guarantee*), this will result in larger increases in the contribution rates. Equation (5) no longer applies,  $r$  is fixed although  $y$  decreases, and the pension benefit level  $r/y$  rises during a crisis with the result that  $b$  in equation (4) must increase further than with a constant pension benefit

level. This means that labour costs rise more strongly as well and this in turn leads to an even greater effect on employment than without the pension guarantee. This in turn causes further pressure for an increase in the contribution rate. If the response of employment to the increased labour costs is strong you get a spiral effect. Without adequate adjustment of pensions to decreasing wages the entire system might thus become destabilised.

### **III. The simulation model MEA-PENSIM**

The mechanisms triggered by economy-related effects described in principle in Chapter II will now be quantified in concrete terms for the German public pension system. For this purpose, a simulation model of the German public pension system (MEA-PENSIM) will be used to calculate the effects of a shock to the economy. This model maps the revenue and expenditure sides of the pension system with all the important mechanisms, thus allowing to estimate the effects of economics shocks and policy measures, both in terms of quality and quantity.<sup>3</sup>

#### **III.1 Assumptions of the model**

*Population development:* One essential prerequisite for evaluating the long-term development of the revenue and expenditure sides of the pension system is the forecast of population development. For its calculations, the MEA uses a self-developed population forecast, which is based on the 11th coordinated population forecast of the German Federal Statistical Office (cf. Statistisches Bundesamt, 2006), but it assumes a life expectancy that in 2050 is 2.2 year greater in the case of men and 3.7 years greater for women, as well as a medium net immigration of 150,000 persons per year, which is closer to the assumptions of demographic research (cf. Schnabel/Kistowski/Vaupel, 2005). Regarding life expectancy, we are basing our figures on an extrapolation from the trend over the last few decades: The virtually linear trend evident since World War II is extrapolated up to 2050 separately for men and women. This yields a life expectancy of 85.7 years for men and 91.7 for women in 2050. These assumptions on life expectancy are clearly higher than the basic assumption and slightly higher than the “high increase” scenario envisaged by the Federal Statistical Office. Concerning the birth rate, an average of 1.4 births per woman were assumed like it was also assumed by the Federal Statistical Office.

The *expenditures of the pension system* consist of the pension payments, the transactions to the pensioners’ health insurance, payments for rehabilitation measures and administrative costs. The main expenditure item – the pension payments in a year – is calculated by multiplying the number of pensions with the average cohort-specific earnings points and the respective current pension value.

The total number of pensioners in this context includes the members of different cohorts who have already retired. The number of new pensioners is derived with the help of

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<sup>3</sup> This model has already been used, for instance, to simulate the consequences of the non-contributory “deferred compensation” (Börsch-Supan/Reil-Held/Wilke, 2008) and the effects of the “Pension at 67” (Bucher-Koenen/Wilke, 2009). For a detailed description of the model see Wilke (2004 and 2009).

estimated probabilities of people retiring for certain age groups (cf. Berkel/Börsch-Supan, 2004) and the number of discontinued pensions from the underlying cohort-specific mortality figures.

In order to determine the size of pension claims of existing pensioners, i.e. the total of the earnings points across all cohorts, *cohort-specific earnings points* are used as a basis for calculations. All pensioners of a given cohort are therefore assigned a number of earnings points, which is typical for their cohort. The pension claims of each cohort are calculated on the basis of cohort-specific earnings histories. This in turn is determined by calculating the proportion of socially insured employees, taking into account the retirement probabilities and multiplying it with an age-specific income profile valid for all cohorts (cf. Fitzenberger et al., 2001). If these earnings histories are summed up across all years of employment of a cohort – from the earliest possible employment age to the latest possible retirement age – you get the cohort-specific earnings points.<sup>4</sup>

The *current pension value* is extrapolated according to the pension adjustment formula. Based on the used model, we calculate the pensioner quotient in the sustainability factor according to Section 68 SGB (German Social Code) VI. This pensioner quotient used in our investigation rises roughly at the same rate as the pensioner quotient quoted by BMAS in the 2008 pension system report (sf. Bundesministerium für Arbeit und Soziales, 2008). As regards the adjustment of the current pension value, we take into account the so-called protection clause pursuant to Section 68a SGB VI in its old version (without pension guarantee) and in its new version (with pension guarantee) as well as the so-called realignment factor (“Nachholfaktor”). The actual values are used for the balancing requirement pursuant to Section 68a SGB VI. The realignment factor will be applied for the first time in 2011. In the simulation of the pension guarantee we also take into account that any omitted pension cuts will increase the balancing requirement and will therefore require realignment in later years.

The *income of the public pension system* are composed of the contributions received from the socially insured labour force and various payments from the federal state. The number of contributors essential for estimating the contributions is derived from the population forecast. The number of gainfully employed persons is obtained by multiplying age and gender-specific labour force participation rates with the corresponding age and gender-specific population numbers of the forecast. The labour force participation rates over time are determined by a number of parameters related to behaviour and the labour market. These include: age of entry into working life, women’s employment rate and the retirement age. The basis for the quantification of the number of gainfully employed persons is the so-called Denmark scenario of the MEA (cf. Börsch-Supan/Wilke, 2009). This scenario is based on the current age and gender-specific employment rates in Denmark. The Danish employment rates of women are currently markedly higher than those of German women

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<sup>4</sup> In addition, the total of the earnings points for cohorts retiring before the statutory retirement age are reduced according to the applicable pension deductions.

in all age groups. For younger men, the employment rates of the two countries are roughly the same. For older men and up to retirement age, however, the employment rates of Danish men are markedly above the employment rates of German men. The Denmark scenario presumes that the German rates will approximate Danish employment rates over time. If you assume that there will be complete alignment by 2040, the resulting future employment opportunities correspond to a development you would expect with a reduction of the average age for starting work by one year, an adjustment of women's employment to equal 90% of men's employment, with a corresponding reduction in men's employment to 95% of the current level and an increase in the average retirement age by two years by 2040. In our opinion, this scenario represents a realistic development, assuming that the reforms of Agenda 2010 are continued consistently.

The *contributing wage sum* for one year is then determined by multiplying the age-specific number of contributors in an age group with the age-specific average earnings and totalling the figures across all cohorts. The relevant age-specific earnings profiles are derived from the calculations of Fitzenberger et al. (2001).

The *federal subsidy* as the second important receipt component is extrapolated according to the actual regulations. The general federal subsidy is adjusted on the basis of the development of gross earnings per employee and the fictitious contribution rate, the additional federal subsidy on the basis of the turn over tax revenue, and the supplement on the basis of total gross wages and salaries, taking into account the statutory time lag in each case.

The *contribution rate* is derived endogenously by dividing expenditures less government subsidies by total wages and salaries. The calculation takes into account the fact that contribution rate changes are only implemented if the sustainability reserve would be less than 0.2 times the monthly expenditures the following year (increase in contribution rate) or if it would exceed 1.5 times the monthly payments (decrease in contribution rate). 2007 is the baseline year for the simulations. Up to that year, historical values from the data of the German public pension system are used (cf. Deutsche Rentenversicherung, 2008, p. 214-217).

### **III.2. The reference scenario**

In this chapter, the effects of economic shocks on the public pension system are described in comparison to a reference scenario by the example of the current financial and economic crisis. The reference scenario chosen is the situation during the autumn of 2008, when the 2008 public pension system report was produced and the expectations regarding the economic development did envisage a weakening of the economy, but did not forecast the abrupt downturn that happened some months later. In concrete terms, the report assumed that those gross earnings per employee relevant for the pension adjustment would increase by 2.4% during 2008 and by 2.8% during 2009. It assumed an increase of the rate of increase of 2.3% from 2010 to 2012. The number of employees was assumed to increase

by 1.5% during 2008 and reduce slightly by 0.1% during 2009. After that, an increase of 0.2% was assumed (cf. Bundesministerium für Arbeit und Soziales, 2008). The reference scenario is calculated on the basis of these key data using the simulation model PENSIM. This indicates that the contribution rate could be reduced to 19.8% in 2010 and then remains at that level until 2015, after which it should rise slightly in 2017 and then relatively strongly to 21.1% in 2020. The calculated contribution rates in the reference scenario varies a little from the calculations of the federal government, which is mainly due to the different assumptions regarding the population development and the corresponding employment figures and the corresponding number of pensions, respectively. Subsequently, the effects of an economic shock relative to this reference scenario are derived by the example of the current financial and economic crisis. Such changes in the level are far less affected by the assumptions than the levels themselves, which means that the subsequently derived results are informative both in qualitative and in quantitative terms.

### III.3. The crisis scenarios

Even during late autumn of 2009, it was not yet apparent how great the effect would be that the financial and economic crisis would have on the earnings relevant for the pension calculations. To be able to map the great bandwidth of the effects of negative shocks to the economy, we are considering two crisis scenarios, which start from different assumptions with regard to the development of earnings. They are likely to cover the actual development.

- *Scenario 1 (falling wages)*: During 2009, earnings go down by 2.3% as forecast in the spring of 2009 by the economic research institutes (cf. Projektgruppe Gemeinschaftsdiagnose, 2009, p. 95). During 2010, earnings stay constant, then they rise by 1.5% in 2011. From 2012, the earnings development corresponds to the reference scenario again.

*Scenario 2 (stagnating wages)*: During 2009 and 2010, earnings stay constant; 2011 sees an increase of 1.5%, and subsequently earnings follow the reference scenario development.

Therefore these two scenarios only differ from the reference scenario for 2009 to 2011 with respect to the development of earnings and from each other only for 2009 (Fig. 1). The differences of the crisis scenarios can be explained, for instance, by a different rate of decline in paid overtime and in voluntary pay components as well as a different rate of increase in short-time work.

Furthermore, we assume that the number of effective contributors will remain unaffected by the financial and economic crisis, i.e. that all quantitative effects would be reflected in the number of unemployed and people on short-time work.<sup>5</sup> This is an optimistic assumption insofar as the statutory reserve might increase due to more widespread early retirement, a decline in the employment of women and the postponement of people's entry

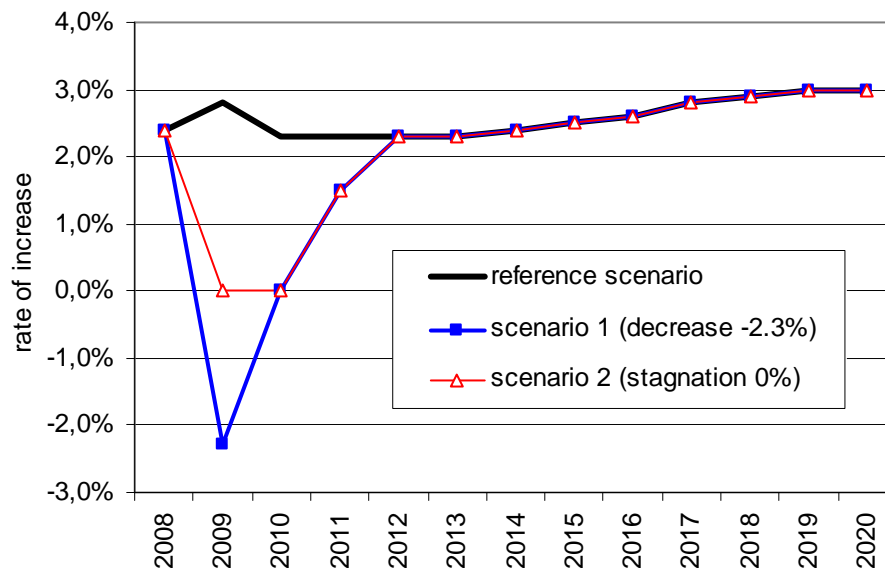
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<sup>5</sup> Effective contributors include those whose contributions are paid by other institutions (e.g. the Federal Labour Agency).

into working life. In addition, an increase in the black economy to the detriment of “official” employment cannot be excluded. To simplify the calculations, we are also assuming that the contributory earnings per socially insured employee will be changing at the same rate as the gross wages and salaries per employee do.<sup>6</sup>

The fact that the assumed rates of increase in earnings from 2009 to 2011 are lower than those in the reference scenario means that the income level in all crisis situations is lower in the long term. You can therefore detect a *permanent effect on income* due to the crisis: The income curves are lower than without the shock to the economy (Fig. 2); for instance by 7.8% in Scenario 1.<sup>7</sup> This effect on the earnings curve could only be avoided, if there was a strong overshoot in the development of income in subsequent years, i.e. if the rate of increase in earnings from 2012 onwards was to greatly exceed the values assumed here.<sup>8</sup>

Fig. 1: Rates of increase in earnings in the different scenarios



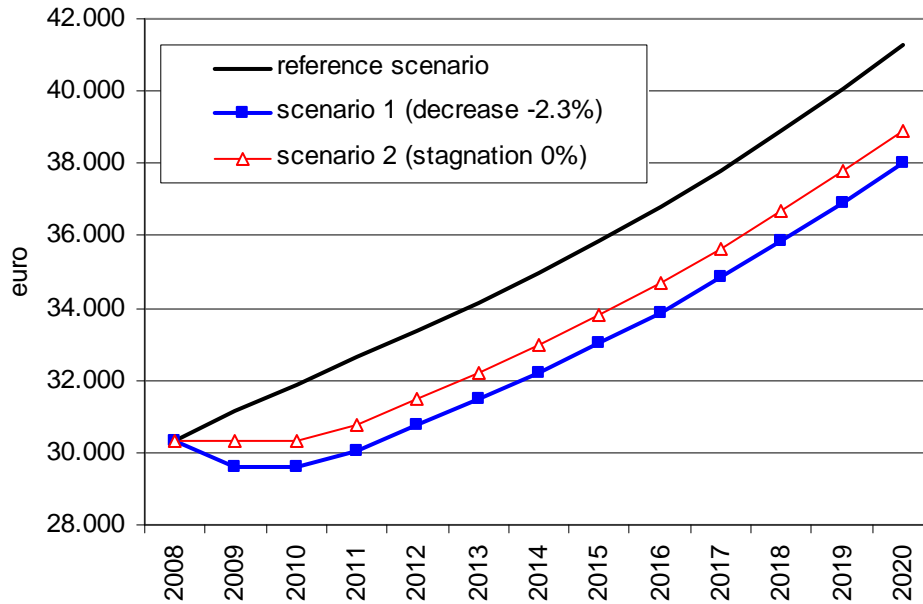
Source: own diagram

<sup>6</sup> This is most likely not an unproblematic assumption, but it is in line with usual practice. In the 2008 public pension system report, the development of the contributory earnings also deviates only very slightly from the development of gross wages and salaries (cf. Bundesministerium für Arbeit und Soziales (2008), overview B12 and overview B13).

<sup>7</sup> Around 5 percentage points of the difference are caused by 2009 alone, since the reference scenario envisages an increase in earnings of 2.8% and Scenario 1 a decrease in earnings of 2.3%.

<sup>8</sup> If the earnings level without the crisis effect was to be re-established within a year, an increase in earnings of 8.5% would need to be realised in Scenario 1. If the catching-up process was distributed over 5 years, starting in 2012, a yearly increase in earnings of over 4% per year would need to be achieved from 2012 to 2016. Even in Scenario 2, rates of increase in earnings of over 3.5% would be required to recover lost ground.

Fig. 2: Development of average income in the different scenarios



Source: own calculations

#### IV. Effects of shocks to the economy in the German public pension system

While the German public pension system follows the basic principles outlined in Chapter II, it is rather more complicated in its detail. The institutional characteristics of the system are described in detail in the following text in order to identify the points where any economic crisis would have an impact. The effects of economic changes on the pension system are divided for analytical purposes into a contribution base effect, a federal subsidy effect and a pension adjustment effect.

The revenue of the German public pension system are essentially comprised of the contributions  $b \cdot Y$  and the different state subsidies. The expenditures comprise the pension payments  $r \cdot R$ , the health insurance contributions paid on behalf of the pensioners  $b^{GKV} \cdot r \cdot R$  and other expenditure such as administrative costs and payments for rehabilitation measures.<sup>9</sup> Therefore the budget equation of the public pension system for one year  $t$  is:

$$(6) \quad b_t \cdot Y_t + Z_t + K_t = r_t \cdot R_t + b_t^{GKV} r_t R_t + S_t - D_t.$$

This yields the following as contribution rate:

$$(7) \quad b_t = \frac{r_t \cdot R_t + b_t^{GKV} r_t \cdot R_t + S_t - Z_t - K_t - D_t}{Y_t} \text{ with:}$$

<sup>9</sup> The contribution rate payable by the pension system is half the difference between the total contribution rate for the GKV (statutory health insurance) and a supplementary contribution rate of 0.9%, which the pensioners themselves must bear.

- $Y_t$ : Total contributing income,  
 $Z_t$ : Federal subsidies,  
 $K_t$ : State contribution for child care periods,  
 $R_t$ : Number of pensions,  
 $S_t$ : Other expenditure (administrative costs, payments for rehabilitation measures),  
 $D_t$ : Deficit or surplus of public pension system,  
 $b_t$ : Contribution rate,  
 $b_t^{GKV}$ : The contribution rate for the statutory health insurance payable by the public pension system,  
 $r_t$ : Average pension benefit.

The points where a shock to the economy impacts on the German public pension system are described in detail in the following text, focusing on the individual components of the budget equation (6) and the contribution rate equation of the German public pension system (7), respectively.

#### IV.1 Contribution base effect

The most obvious impact the economic development has is its effect on the contribution base of the pension system, i.e. the contributing income  $Y$ . Since we get total income by multiplying the contributing income per contributor by the number of contributors:

$$(8) \quad Y_t = y_t \cdot B_t,$$

the contribution base effect can in turn be subdivided into a “price effect” (change in  $y$ ) and a “quantitative effect” (change in  $B$ ).

The factors influencing the *average income per contributor* are numerous. Pay increases, for instance, are generally more difficult to obtain in an economic crisis. Also, the amount of paid overtime and voluntary pay components will be reduced. In addition, a person becoming unemployed will cause a reduction in the contribution base. This is because the unemployment insurance pays contributions into the public pension system that are based on 80% of the person’s last gross income. This reduces the respective portion of the contribution base by 20%. Since unemployed people take longer to find another job during a crisis, there are also likely to be more people claiming unemployment benefit II. For recipients of unemployment benefit II, the contributions are equivalent to those persons earning EUR 205 per month, reducing the contribution base considerably.<sup>10</sup> The increase in short-time work as a result of the economic crisis also reduces the contribution base. Contributions of people on short time have two components: First, contributions based on the employee’s gross earnings reduced by the short-time work (actual earnings) – as usual, the contributions payable from these reduced gross earnings are levied equally on employer and employee. Secondly, further contributions are paid based on 80% of the pay that is lost due to the short-time work. This means that contributions are paid for 80% of

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<sup>10</sup> In order to consolidate the national budget the German government decided in June 2010 that in future no contribution to the pension system at all will be paid for recipients of unemployment benefit II. However, in our model old regulations, as described in the main text, apply.

the difference between the nominal earnings (gross earnings without short-time work) and the actual earnings paid for the reduced working time.<sup>11</sup> The contribution shortfall caused by short-time work therefore amounts to a maximum of 20% in the case of zero short time.

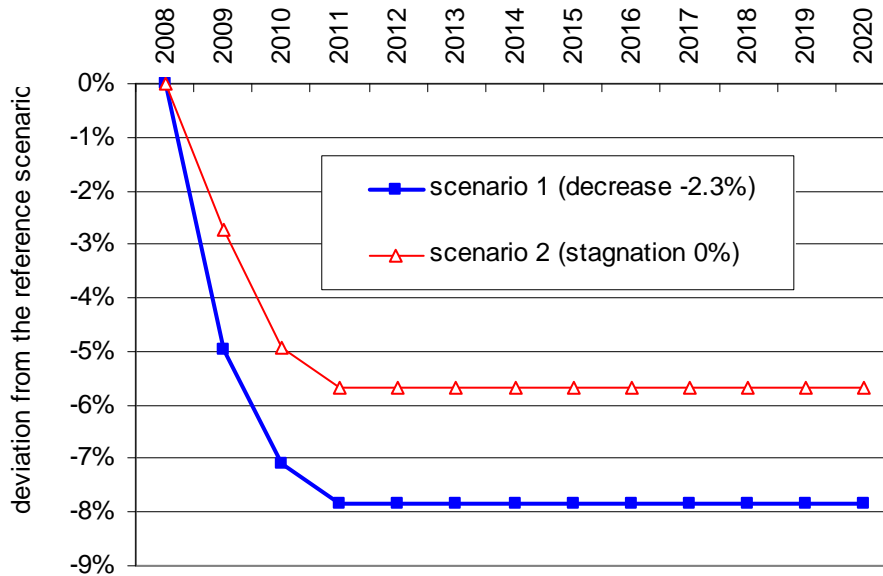
An increase in unemployment caused by an economic shock does not, initially, result in a quantitative effect, i.e. an impact on the *number of contributors*. *This is* because some contributions are still paid for unemployed people. There will be a reduction in the number of contributors if the economic crisis causes a decline in the number of people involved in socially insured employment, for example if the number of people taking early retirement rises, if vacant positions are no longer filled, or if former employment subject to social insurance migrates to sectors not subject to social insurance, such as self-employment or the black economy.

The calculations for both crisis scenarios show that there will be a sudden downturn in the contribution base. It is impossible for this decline to be compensated for over time, even if the rates of increase in earnings and employment would reach the figures of the reference scenario again. Since the rates of increase in earnings start at a lower level, the contribution base will remain consistently below the values as they would have been without the crisis. In Scenario 1, this *contribution base effect* cumulates to 7.8% of the contributing income in the reference scenario. In Scenario 2, the assessment basis is permanently 5.7% lower than it would have been without the crisis (Fig. 3). At a contribution rate of around 20%, the contribution base effect leads to an increase in contribution rate of 1.7 (Scenario 1) or 1.2 contribution rate points (Scenario 2).

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<sup>11</sup> These contributions are paid in equal shares by the employers and the Federal Labour Agency (BA) for the first 6 months of short-time work. From the seventh month, the BA now pays the contributions on its own.

Fig. 3: Deviation of the contribution base from the reference scenario (contribution base effect)



Source: own calculations

#### IV.2 Federal subsidy effect

In addition to a contribution for child-raising benefits, the state pays a federal subsidy to the public pension system from general tax funds. We shall focus on the federal subsidy in the narrow sense according to Section 213 SGB VI. This federal subsidy  $Z$  is composed of a general federal subsidy  $ZA$  and an additional federal subsidy  $ZZ$ . The additional federal subsidy is in turn made up of the (actual) additional federal subsidy and a supplement:

$$(9) \quad Z_t = ZA_t + ZZ_t \quad \text{and}$$

$$(10) \quad ZZ_t = ZZN_t + ZZE_t \quad \text{with}$$

$Z_t$ : Total federal subsidy,

$ZA_t$ : General federal subsidy,

$ZZ_t$ : Additional federal subsidy,

$ZZN_t$ : "Actual" additional federal subsidy,

$ZZE_t$ : Supplement to the additional federal subsidy (eco tax subsidy).

The *general federal subsidy* is considered the contribution of the federal state to the funding of the public pension system. It is, in principle, extrapolated according to the development of gross wages and salaries per employee as per the national accounts ("VGR" in German)  $BE$  and the development of the so-called "fictitious contribution rate"  $b^f$  of the public pension system:

$$(11) \quad ZA_t = ZA_{t-1} \cdot \frac{BE_{t-2}}{BE_{t-3}} \cdot \frac{b_t^f}{b_{t-1}^f}.$$

The fictitious contribution rate is the rate you would get if there was no additional federal subsidy, i.e. if receipts from the additional federal subsidy would also have to be provided by contributions of people covered by the pension system.

If an economic crisis causes gross earnings to fall, the federal subsidy decreases, although this does not happen immediately but with a delay of two years. If the fictitious contribution rate increases due to fallings revenue, this will increase the federal subsidy. This raise might take place even before the reduction due to falling earnings. If the fictitious contribution rate goes up due to reduced earnings in 2009 for instance, the federal subsidy will increase as well. Only two years later, in 2011, will the negative change in wages dampen the federal subsidy. This time lag can thus result in a countercyclical effect since the reduction of the federal subsidy would not come in until a time of renewed increase in the contribution base.

The *additional federal subsidy* was introduced in 1998 with the increase of the standard rate of VAT by one percentage point. The additional turn over tax revenue goes into the public pension system in order to cover all expenditures for “non-insurance” benefits which are not based on contributions (Section 213 para. 3 SGB VI). Since 2000, the additional federal subsidy has been changing each year according to the changes in the revenues from turn over tax:

$$(12) \quad ZZN_t = ZZN_{t-1} \cdot \frac{US_t}{US_{t-1}},$$

with  $US_t$  representing the turn over tax revenue with a constant turn over tax rate. If the latter changes as in 2007, the turn over tax revenues that would have arisen without the tax rate increase must be used. This means that the economic crisis has an effect if it weakens consumption and thereby the relevant tax revenues.

The *supplement* was created in conjunction with the 1999 eco reform. While the entire eco tax revenues still went into the public pension system 1999, the law for the continuation of the ecological tax reform in 2000 meant that the supplement was ultimately determined independently of the development of the eco tax revenues. For the calendar years after 2003, the supplements changed in a ratio equal to that between total wages and salaries ( $BLG$ ) of the previous calendar year and the corresponding total wages and salaries in the calendar year before that:

$$(13) \quad ZZE_t = ZZE_{t-1} \cdot \frac{BLG_{t-1}}{BLG_{t-2}}.$$

For this part of the federal subsidy, it is therefore the development of the wage sum that is relevant and not the development of gross wages per employee as per the national accounts like it is the case for the general federal subsidy. And this adds a further determining factor for the revenues of the public pension system resulting from an economic crisis.

Overall, the direction of the impact that the federal subsidy has is thus not clear. If the fictitious contribution rate rose, the general federal subsidy would initially increase, but the additional federal subsidy, on the other hand, would tend to decrease or increase less strongly. But because of its dependence on the development of wages and of the revenue

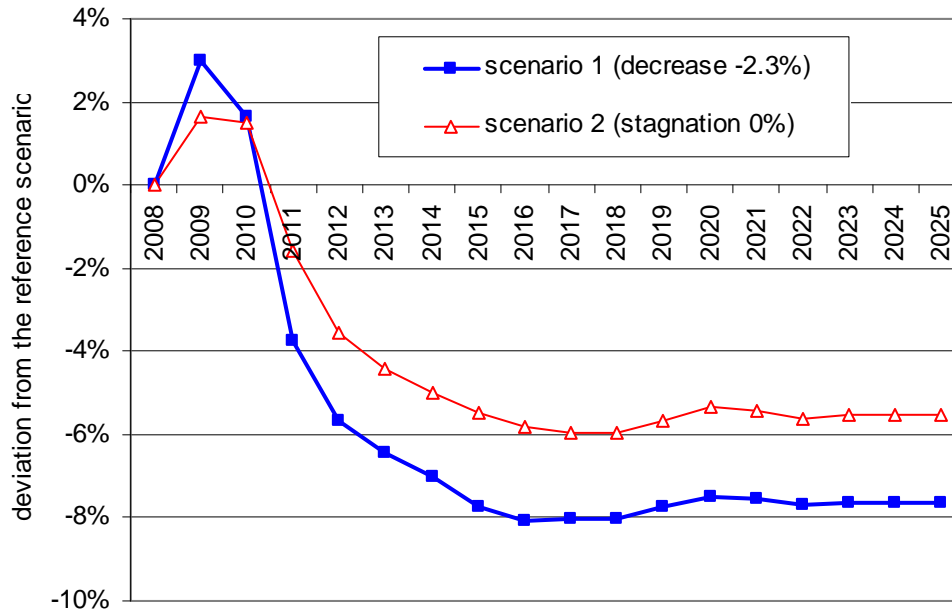
from turn over tax, the federal subsidy is designed in such a way that it is more likely to have a destabilising effect on the pension finances. But since a negative change of wages only comes into effect within the federal subsidy with a certain time lag, the two destabilising effects initially don't act cumulatively.

The described fundamental correlations are confirmed by the simulation calculations.<sup>12</sup> In the crisis scenarios, the fictitious subsidy rate already starts to rise in 2009, since the assessment basis decreases. In those scenarios, the federal subsidy for 2009 therefore lies above that of the reference scenario (Fig. 4), whose increase is determined solely by the development of earnings during previous years. Consequently, the federal subsidy can counteract the contribution base effect to some extent in 2009. From 2010, however, the development of earnings will come into effect within the federal subsidy. This is initially the case via the supplement and in 2011 also via the general federal subsidy. Ultimately, it falls below the level in the reference scenario in all crisis scenarios (Fig. 4). Future increases in the federal subsidy will then start from this lower level. Overall, the negative effects of the economic shock in comparison with the reference scenario will cumulate to produce a decrease of 7.6% in the federal subsidy as a result of falling wages in Scenario 1, a decrease of 5.5% as a result of stagnating wages in Scenario 2. Thus, a shock to the economy will result in a stabilising effect from the federal subsidy in the short term, but pressure for an increase in contribution rate in the long term, due to the strong correlation between the federal subsidy and wages. It is doubtful whether such a dependence of the federal subsidy on economic development makes sense, if its aim is to ensure the long-term financial stability of the public pension system. Even if the federal subsidy is meant to cover in particular those payments by the public pension system that are not directly pension-related, the dependence on the economy is problematic, since the expenditure that are not directly related to pensions do not have this strong link to economic development.

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<sup>12</sup> For the purposes of the simulation, it was assumed that the differences in the VAT development in the crisis scenarios compared to the reference scenario correspond roughly to those in the development of earnings.

Fig 4: Deviation of the federal subsidy from the reference scenario (federal subsidy effect)



Source: own calculations

#### IV.3 Pension adjustment effect

Since the annual pension adjustment generally depends on the changes in gross wages and salaries, economic changes influence pension adjustments and thus pension payments. Therefore if wages go up, so will pensions. Likewise if wages decrease, pensions need to be reduced as well. This ensures the balance between revenue and expenditure of the pension system. This basic principle is integrated into the German pension system, but in a rather complicated way. Pension adjustments are carried out on the 1st July of each year according to the following *pension adjustment formula*:

$$(14) \quad 1 + \theta = \frac{AR_t}{AR_{t-1}} = \frac{BE_{t-1}}{BE'_{t-2}} \cdot \frac{100\% - AVA_{t-1} - RVB_{t-1}}{100\% - AVA_{t-2} - RVB_{t-2}} \cdot \left[ \left( 1 - \frac{RQ_{t-1}}{RQ_{t-2}} \right) \alpha + 1 \right] \quad \text{or}$$

*pension adjustment factor* = *earnings factor* × *contribution rate factor* × *sustainability factor*

with

$\theta$ : Pension adjustment rate,

$AR$ : Applicable pension value: monthly pension a pensioner receives per earnings point,

$BE_{t-1}$ : Total gross wages and salaries per employee with average working time during the foregone calendar year according to the national accounts,

$BE'_{t-2}$ : Total gross wages and salaries per employee with average working time during the foregone calendar year, taking into account the change in the contributing total gross wages and salaries per employee with average working time excluding civil servants but including the recipients of unemployment benefit (i.e. different definition to  $BE_{t-1}$ );

$AVA$ : Old-age provision element in %. From 2010, this is to be increased in steps from 0% to 4.0%; but the increase was suspended for the pension adjustments of 2008 and 2009, which means that the value of 4% won't be reached until 2012 and that the AVA factor will be relevant for the last time for the pension adjustment of 2013.

- RVB*: Contribution rate of the public pension system in %,  
*RQ*: Pensioner quotient = equivalence pensioners/equivalence contributors,  
 $\alpha$ : Weighting parameter for the change in pensioner quotient; it is 0.25.

This shows that in addition to the change in wages, there are two further factors relevant to the pension adjustment, the *contribution rate factor* and the *sustainability factor*. These two factors were introduced on account of the demographic development and have the effect of delaying the impact of the development in earnings on pensions to some degree. This leads to a gradual reduction of the pension benefit level, which helps to stabilise the contribution rate (cf. equation 4). The two factors are therefore necessary to retain the financial feasibility of the public pension system in an aging society where there are more and more pensioners and fewer contributors. Thus they are oriented towards the long term.

The *wage level orientation of pensions* is reflected in the pension adjustment formula in quantity  $BE_{t-1}/BE'_{t-2}$ , which describes the change in gross wages and salaries per employee according to the national accounts. The pensions follow the development of earnings with a time lag, which means that the impact of a negative economic shock on revenues won't be counteracted on the expenditure side by a corresponding pension adjustment until the following year.<sup>13</sup> Also, the earnings quantity relevant for pension adjustment according to the national accounts is not identical to the contributing earnings, since the national accounts include income of civil servants, for instance, who are considered employees as well. Furthermore, this figure also contains income components used for deferred compensation and salaries above the contribution assessment level for the public pension system, i.e. income, which is not subject to the pension system. On the other hand, recipients of unemployment benefit are not included in national accounts, yet the assessment basis of contribution payments by the Federal Labour Agency are included in the contributing earnings. In short: The development of gross wages and salaries per employee according to the national accounts is not necessarily identical to changes in contributing income per contributor which determines the revenues of the public pension system. Therefore, there the link between revenue and expenditure is loosened. This fact was to be counteracted by introducing a corrective factor to the pension adjustment formula as part of the 2004 sustainability reform (the so-called beta factor), which takes account of the development in the funding base of the public pension system. Because the term  $BE'_{t-2}$  is defined as follows:

$$(15) \quad BE'_{t-2} = BE_{t-2} \cdot \frac{\frac{BE_{t-2}}{VE_{t-2}}}{\frac{BE_{t-3}}{VE_{t-3}}},$$

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<sup>13</sup> Faik/Köhler-Rama (2009), p. 130 and p. 134/135 argue that the stabilising effect that the pension system has on the economy is optimal when the lag is half an economic cycle. For the purpose of stabilising the economy the lag could therefore be somewhat higher. As will be shown later, a lag that is as short as possible is optimal for stabilising the pension system. This produces a conflict, depending on whether your main aim is to stabilise the economy via the pension system or to stabilise the pension system in the context of fluctuations in the economy.

with  $VE$  representing income per contributor. This yields the following, regarding the pension adjustment formula:

$$(16) 1 + \theta = \frac{BE_{t-1}}{BE_{t-2}} \cdot \frac{\frac{VE_{t-2}}{BE_{t-3}}}{\frac{VE_{t-3}}{BE_{t-2}}} \cdot \text{Beitragssatzfaktor} \cdot \text{Nachhaltigkeitsfaktor}.$$

The development of gross wages and salaries per employee according to the national accounts thus have a correction factor applied to them, which reflects the ratio between the development of the national accounts earnings and the *development of the contributing earnings* of the two preceding years. If contributing income rose less than earnings according to the national accounts, for example, the pension adjustment will be accordingly lower. Thus the pension development is better aligned with changes in revenue, yet with a further time lag of one year. A negative economic shock will be reflected in the development of both income statistics. However, this effect can differ in scope.. Increasing unemployment, for instance, does not necessarily reduce gross earnings per employee, yet income per contributor and therefore the contribution base will decrease. One point to bear in mind, however, is that a reduced rate of increase in earnings or even a reduction in earnings as a result of the crisis will be reflected in the pension adjustment accordingly, with a time lag.

Moreover, the economy does not only have an impact within the pension adjustment formula through the change in wages, but also via the *sustainability factor*. This is because the pensioner quotient included in the sustainability factor describes the ratio between the number of pensioners and the number of contributors, and more precisely the ratio between equivalence pensioners and equivalence contributors<sup>14</sup>. Generally, an economic crisis will reduce the number of contributors  $B$  and therefore cause the pensioner quotient to increase more strongly. This will in turn reduce the sustainability factor and ensure a lower level of pension adjustment.

One needs to bear in mind that as a result of the so-called *protection clause* pension cuts, which would result from the sustainability factor and the contribution rate factor, may not be implemented. There are plans, however, for these omitted pension cuts to be made up for in later years pursuant to Section 68a para. 3 SGB VI. According to this, the pension adjustment rate determined via the pension adjustment formula will be halved from 2011 until the accumulated backlog is made up for. Thus, in a situation where increases in earnings are very low or negative in the economic crisis, the dampening effect of the sustainability factor on expenditures does not take effect immediately, but only in later years as the omission of the pension cuts is made up for.

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<sup>14</sup> The number of equivalence pensioners is calculated by dividing the total pension volume by the payment amount  $r^*$  of a standard pension. The standard pension is the pension someone receives who has paid 45 years worth of contributions based on average earnings, i.e. who has earned 45 earnings points. The value of one earnings point corresponds to the applicable pension value  $AR$  so that the following applies for the annual standard pension:  $r^* = AR \times 45 \times 12$ . The number of equivalence contributors is calculated as the quotient of the total of contributory earnings and average earnings.

If an economic shock causes increases in the contribution rate, this will also have a negative effect on the development of pensions via the *contribution rate factor* with a time lag of one year. The protection clause also applies to the pension dampening effect of the contribution rate factor.

Overall, it becomes apparent that a shock to the economy affects the pension adjustment via numerous channels and with different time lags. This in turn produces feedback effects with the result that an economic crisis can have a very persistent impact on the public pension system. Nevertheless, the pension adjustment formula clearly represents a *stabilisation mechanism*. Due to the fact that pensions are linked to wage changes, the pension adjustment effect counteracts the contribution base effect. A more moderate pension adjustment and therefore lower pension payments will compensate for falling revenue from contributions, thereby balancing revenues and expenditures of the public pension system.

However, the pension guarantee approved in mid-2009 partially cancels out the dependency between pension adjustments and changes in wages and with that the inbuilt stabilisation mechanism of the pension system. The pension guarantee is recorded in Section 68a SGB VI with the following wording “In deviation from Section 68, the former applicable pension value will not be reduced if the current applicable pension value calculated pursuant to Section 68 is lower than the former applicable pension value.” The pension guarantee is therefore nothing other than a general pension cut prohibition. Up until now, only those pension cuts were excluded under the protective clause caused by the contribution rate factor or the sustainability factor. A decline in earnings, on the other hand, was permitted to result in corresponding pension cuts. This has now been made impossible so that pension cuts are generally prohibited. In order not to compromise long-term stability, these omitted pension cuts are in future to be *made up for*, just like the pension cuts omitted due to the previously valid protection clause, by having pensions rise more slowly. In concrete terms, any pension increase resulting from the pension adjustment formula will be halved from 2011, until the realignment has been completed. Whether this will be able to be pushed through parliament remains to be seen.

The pension guarantee comes into effect in Scenario 1, because earnings are assumed to fall during 2009. The simulation results for this scenario will therefore be represented below how they would be with and without the pension guarantee in order to illustrate the impact of the latter by comparison. In Scenario 1 without pension guarantee, pensions will fall by 2.3% (Fig. 5) during 2010 as a result of the earnings link of the pension adjustment. In subsequent years, the *pension adjustments* will also be below those of the reference scenario. This is due to the dampening effect of the contribution rate factor and the sustainability factor as well as the realignment measures to successively make up for the omitted pension cuts of previous years. For one, this realignment relates to the omitted pension cuts of 2005 and 2006. But the protection clause also has an impact in the crisis scenarios for 2010 and 2011, because the sustainability factor would cut pensions further

during those years, which is prevented by the protection clause. This then increases the need for realignment in the following years. In Scenario 1 without the pension guarantee as well as in Scenario 2, making up for the omitted cuts is completed in 2015. It won't be until 2020 that the pension adjustment rates in Scenario 1 without pension guarantee and in Scenario 2 will coincide.<sup>15</sup>

A comparison of the pension adjustment rates with and without pension cut prohibition shows that pensions don't fall in 2010 with the pension guarantee in place (Fig. 5). During subsequent years, when pensions increase strongly again without the pension guarantee, making up for the omitted pension cuts will result in lower pension adjustment rates. Consequently, the rates of increase of pensions will not significantly exceed 1% until 2017. This is because until then either the protection clause or the pension guarantee will come into effect, leading to a zero adjustment, or the realignment factor halves the pension adjustment rate from the pension formula.

Thus, the effects of an economic shock on pension adjustment rates will last for up to 10 years. The effects on the size of the applicable pension value, however, are permanent. The pension adjustment rates, which are lower than those of the reference scenario, are reflected in a lower curve of the applicable pension values (Fig. 6).<sup>16</sup> The lower pension adjustments cumulate independently of the pension guarantee until 2025 to produce pensions, which are 7.8% lower in Scenario 1 and 5.7% lower in Scenario 2 (Fig. 7). This means that pensioners experience long-term effects from negative economic developments. Their pensions are lower compared to a situation without such a shock. This applies to pensioners of the current base, but also for all future generations of pensioners, because the pension adjustments will always start from this lower level. The bad news of permanently lower pensions simultaneously represents good news for the public pension system. Assumed that the number of pensioners is the same in all scenarios,<sup>17</sup> the percentages of lower individual pensions illustrated in Fig. 7 also apply for the pension expenditures overall and are therefore indicative of the *pension adjustment effect*.

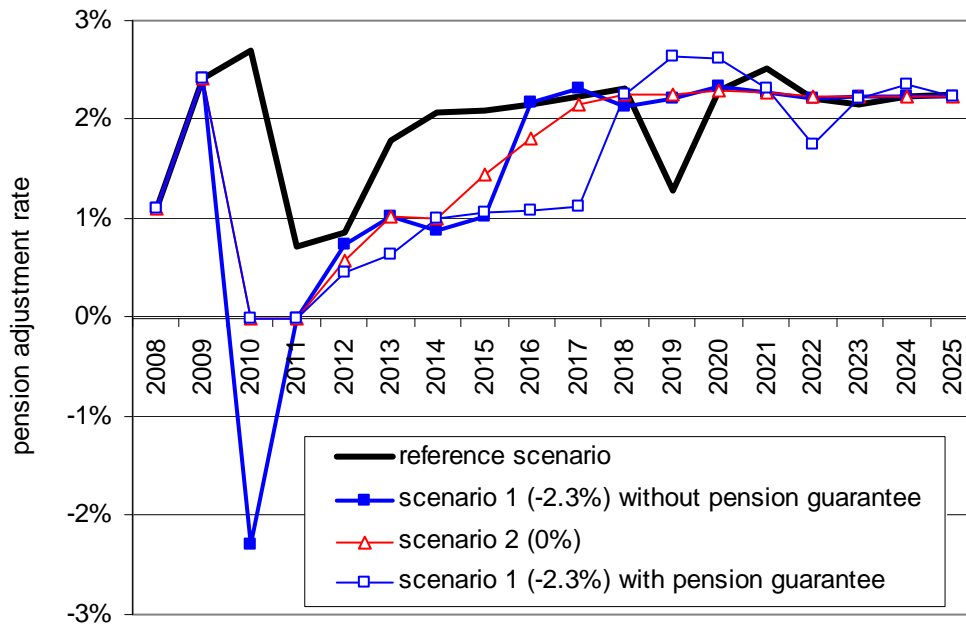
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<sup>15</sup> The low pension adjustment rate in 2019 in the reference scenario is due to the strong contribution rate increase in 2018 (see contribution rate development for the reference scenario in Fig. 9), which has a strongly dampening effect on pensions in 2019 via the contribution rate factor.

<sup>16</sup> This permanent effect on the applicable pension value and thereby on the pension disbursements will only be averted if there is an "overshooting of earnings" after the crisis – rather unlikely in our view – with very high rates of increase in earnings, which would be reflected in higher pension increases (cf. Benz et al., 2009, p. 123/124).

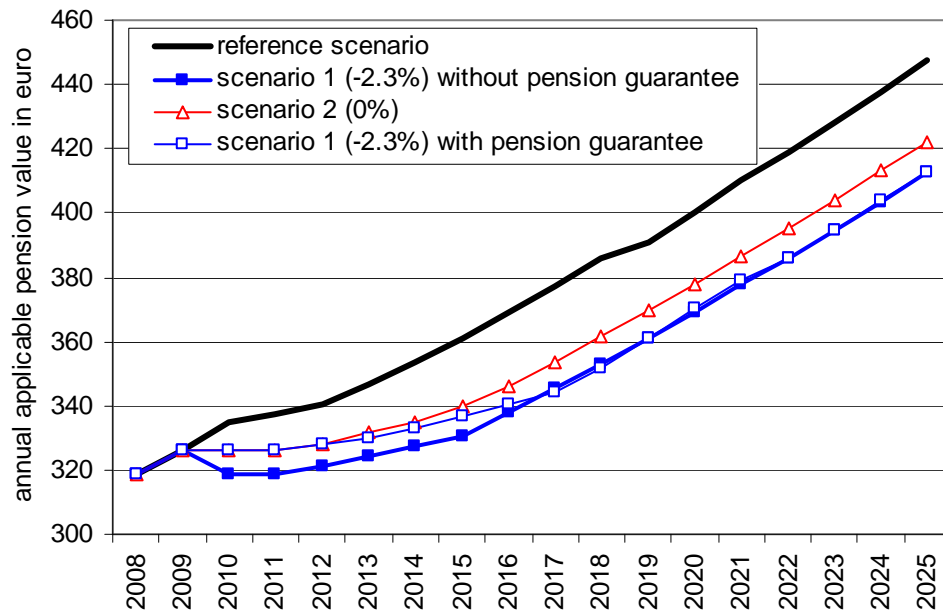
<sup>17</sup> This means that the crisis would not result in a markedly different retirement behaviour, which can, however, not be excluded altogether.

Fig. 5: Pension adjustment rates for the different scenarios with and without pension guarantee



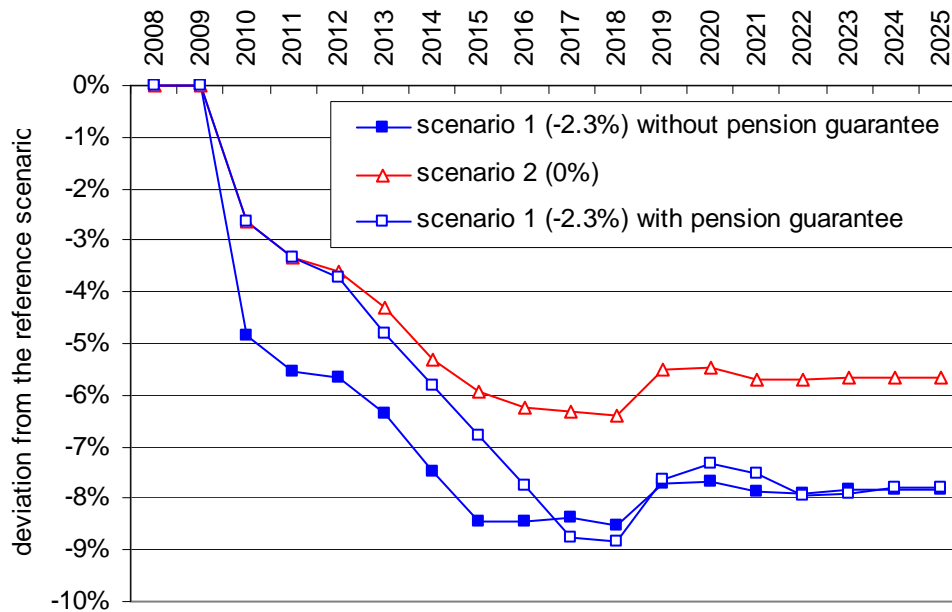
Source: own calculations

Fig. 6: Development of the applicable pension value in the different scenarios



Source: own calculations

Fig. 7: Deviation of the pension benefit level from the reference scenario (pension adjustment effect)



Source: own calculations

The pension guarantee clearly weakens the stabilising impact of the pension adjustment effect (Fig. 7), since the negative pension adjustments, which would actually be required for stabilisation of expenditures, don't take place. Although pensions are lower than in the reference scenario in Scenario 1 with pension guarantee – since a positive rate of pension increase is expected for 2010 and the pension guarantee would only prevent pension cuts – the downturn is far less obvious. With the pension guarantee, pension payments are 2.6% lower than in the reference scenario, without the pension guarantee 4.9% (Fig. 7). The difference then decreases gradually and does not disappear until the omitted pension cuts are made up for in full after a number of years.<sup>18</sup>

This indicates that pensioners will only benefit from the pension guarantee in 2010. During subsequent years, they will have to endure small pension adjustments, which are likely to be below inflation. Ultimately (around 2025), they will be in the same position with or without pension guarantee. The only difference being that the pension guarantee in conjunction with the subsequent compensation measures spreads the effects of the economic shock out over time. Obviously the power of this argument would change if the compensation over the following years would not be implemented, namely for the reason that pension adjustments below the inflation rate for the next eight to ten years are likely not to be easily enforced politically.

<sup>18</sup> On "Nachholberg" (huge need to make up for omitted cuts) in the national accounts see Gasche (2009).

## V. Summary of the effects: impact on the contribution rate and the pension benefit level

The theoretical analysis has shown that economic shocks generate reverse effects on the development of the contribution rate in the German public pension system. Table 1 provides an overview of the influencing factors of the economic crisis and its impact on the public pension system. The quantitative analysis of the contribution base effect, the federal subsidy effect and the pension adjustment effect counteracting these two has shown that the effects on expenditures and the revenues balance out in the long term (Table 2). Revenues are therefore affected by economic shocks to the same extent as expenditures are. Accordingly, there should be no contribution rate effect in the crisis scenarios in comparison to the reference scenario in the long term, which is illustrated by Fig. 9. From 2025, the contribution rate is the same in all scenarios, with or without pension guarantee. Since pensions follow wages over the long term, the pension benefit level as the ratio between the standard gross pension and the average gross income of the contributors is identical in the long term, without or without crisis.

However, up to 2020, the negative economic shock will leave deep marks, both for the pension benefit level and for the *contribution rate*. This becomes apparent by comparing the development of the contribution base effect and of the pension adjustment effect over time (Fig. 8). One can notice that without the *pension guarantee* the pension adjustment effect tracks the contribution base effect with a time lag of one year. Differences other than those due to the time lag result from the other determining factors of the pension adjustment (see above). The lagging character of the pension adjustment effect causes pressure on the contribution rates in the short and medium term, since revenues decrease more strongly than expenditures. Thus, one sees markedly higher contribution rates during the years up until 2020. This effect is exacerbated in the case of the pension guarantee. This is because the pension adjustment effect does not only lag behind, it is also capped. Only several years later, when the omitted pension cuts have been made up for, will the pension adjustment effect with pension guarantee become aligned with the pension adjustment effect without guarantee. Until then, the imbalance between revenue and expenditures is even larger. The increases in the contribution rate are correspondingly larger in the case of the pension guarantee. In 2025, i.e. once the effects of the shock to the economy have on the whole “expired”, the contribution base effect and the pension adjustment effect are the same with or without pension guarantee (Fig. 8). This is an impressive proof of the stabilising function of the pension adjustment effect or the link between pension adjustment and earnings.<sup>19</sup>

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<sup>19</sup> If the pension cuts prevented by the pension guarantee were not made up for, the pension adjustment effect with pension guarantee would be lower over the long term, thereby producing a gap between receipts and disbursements and causing a higher contribution rate in the long term.

Table 1: Factors influencing the public pension system as a result of an economic shock <sup>a)</sup>

	Influencing dimension	Stabilising: + Destabilising: –	Effect on contribution rate
<b>Contribution base effect</b>	Income per contributor	–	increasing
	Number of contributors	–	
<b>Pension adjustment effect</b>	Gross wages and salaries per employee	+	decreasing
	Contributing earnings per employee	+	
	Sustainability factor (equivalence pensioner quotient)	(+) <sup>b)</sup>	
	Contribution factor	(+) <sup>b)</sup>	
<b>Federal subsidy effect</b>	Gross wages and salaries per employee	–	more likely to be increasing
	(Fictitious) contribution rate	+	
	Turn over tax receipts	–	
	Total gross wages and salaries	–	

<sup>a)</sup> Disregarding the pension cut prohibition (pension guarantee).

<sup>b)</sup>: If the protection clause pursuant to Section 68a para. 1 SGB VI is applied, the impact will not come into effect until the measures to make up for omitted pension cuts are implemented.

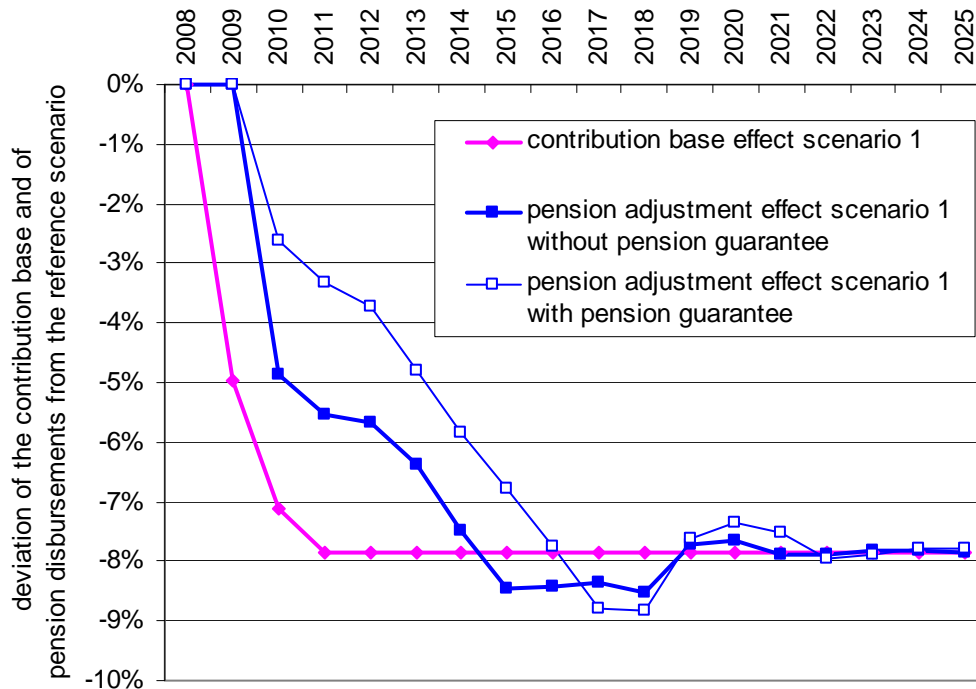
Source: own presentation

Table 2: Effects of a negative economic shock on the public pension system in 2025 by the example of the financial and economic crisis

		Scenarios	
		1: Decrease (-2.3%)	2: Stagnation (0%)
<b>Revenues</b>	<b>Contribution base effect</b>	-7.8%	-5.7%
	<b>Federal subsidy effect</b>	-7.6%	-5.5%
<b>Expenditure</b>	<b>Pension adjustment effect</b>	Without pension guarantee	-7.8%
		With pension guarantee	-7.8%

Source: own calculations

Fig. 8: Contribution base effect and pension adjustment effect in Scenario 1 with and without pension guarantee



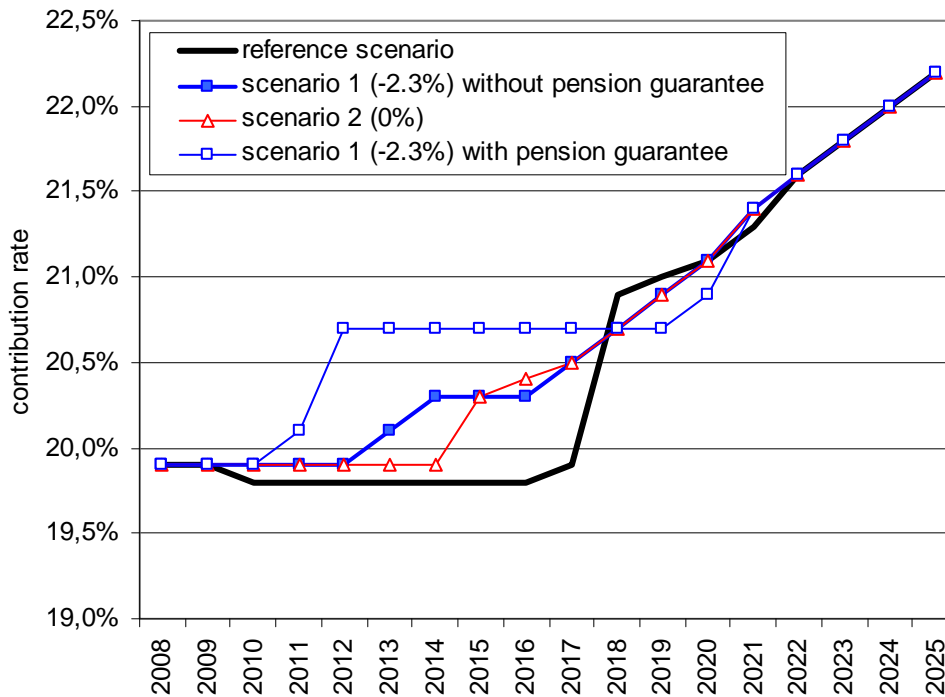
Source: own calculations

The timing of increases in contribution rates depends on the development of wages during the crisis. Initially, the sustainability reserve is sufficient. In Scenario 1 *without pension guarantee*, however, the contribution rate needs to be increased in 2013, and in Scenario 2 in 2015. In 2015, the contribution rate exceeds the one applicable in a situation without crisis by 0.5 percentage points in all crisis scenarios. From 2017, the contribution rate begins to rise in the reference scenario as well due to the demographic development. However, the increase is even higher in the crisis scenarios, with the contribution rate difference between the crisis scenarios (without pension guarantee) and the reference scenario reaching its maximum in 2017 with 0.6 percentage points. The slightly lower contribution rates compared to the reference scenario in 2018 and 2019 are explained by the sustainability reserve. In the reference scenario, the latter will be used up in 2018 so that an upwards jump in the contribution rate will be required. In the crisis scenarios, on the other hand, the sustainability reserve can be spared thanks to higher contribution rates so that such a sudden increase in the contribution rate is not necessary.

*With the pension guarantee*, the contribution rate effects are greater (Fig. 9), since the pension adjustment effect is capped by the pension guarantee. In Scenario 1 with pension guarantee, the contribution rate exceeds that of the reference scenario by 0.9 percentage points in 2011 already. During the next few years the contribution rate also remains at a high level, until the pension cuts omitted in 2010 have been fully made up for. In 2011 to 2017, the contribution rate in Scenario 1 with pension guarantee is between 0.2 and 0.8 percentage points higher than in Scenario 1 without pension guarantee. These higher

contribution rates are the price paid for the pension guarantee.<sup>20</sup> In 2025, however, the contribution rates even out at the same level once the omitted pension cuts have been made up for.

Fig. 9: Contribution rate in the different scenarios with and without pension guarantee



Source: own calculations

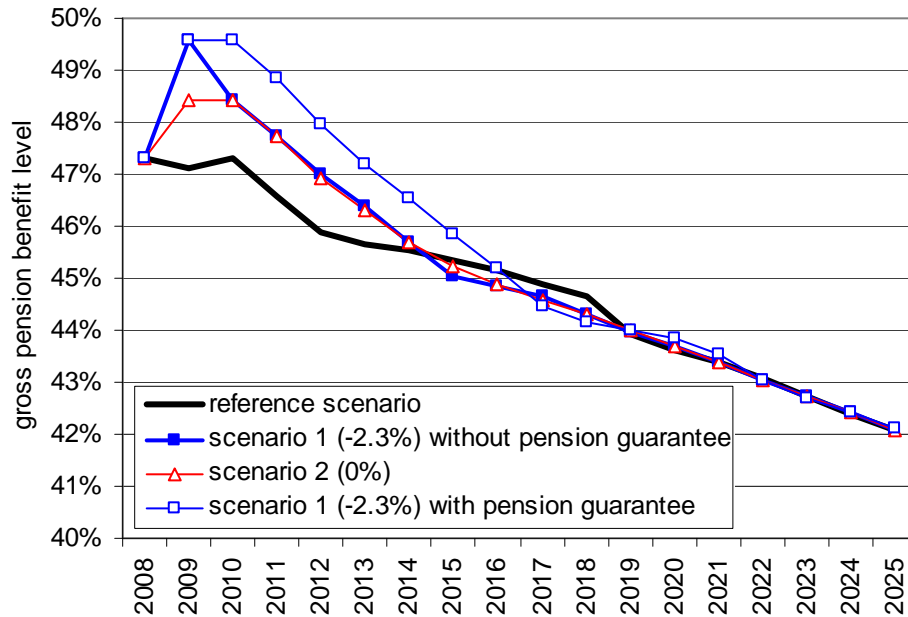
To ensure that there will be no additional pressure to increase contribution rates because of an economic shock in the long term (cf. equation (4)), the pension benefit level must be the same with and without the economic crisis. This is confirmed by the simulation calculations: In all examined scenarios, the *pension benefit level* is identical again in 2020 (Fig. 10). But here too, the economic crisis is shown to have a considerable aftermath in the years before 2020. In 2009, there is a considerable increase in pension benefit level in all three crisis scenarios. This is the case because earnings are falling or stagnating at the same time as pensions are still increasing strongly in 2009. The pension adjustment responds with a time lag in 2010, when the pension benefit level is decreasing again.

The pension guarantee strengthens the effects on the pension benefit level considerably. This is because pensions remain constant, while average earnings are falling in Scenario 1. The pension benefit level faces a sudden change and remains at values above 48% for

<sup>20</sup> The fact that the contribution rates in the scenarios with pension guarantee actually lie below the contribution rate in the reference scenario can be explained with the sustainability reserve. The payment of increased contribution rates for several years in Scenario 1 with pension guarantee allows the reserve to be replenished so that no increase in the contribution rate is required in 2020 contrary to the situation in the reference scenario. But from as early as 2022 onwards, contribution rates are identical to those of the reference scenario.

several years (Fig. 10), the gross pension benefit level that was used for the 2001 Riester reform and the 2004 sustainability reform. Both reforms aimed at lowering the pension benefit level – by allowing pensions to increase less strongly than wages do – and making the pension system more sustainable in spite of future demographic changes. The pension guarantee is now counteracting these reforms.

Fig. 10: Gross pension benefit level for different scenarios with and without pension guarantee



Source: own calculations

## VI. Conclusion

In the past, the discussion on the long-term financial stability of the German public pension system was dominated by questions regarding the ongoing aging of the population. The financial and economic crisis has now drawn attention to the short and medium-term financial stability of the public pension system and the capability of the system to cope with economic shocks. This analysis demonstrates that the impact of these shocks can be significant in the short and medium term, i.e. last for a number of years. Revenues decline rapidly, while expenditures initially remain unchanged so that contribution rates increase. The link of the pension adjustment to the change in wages, however, represents an inbuilt stabilisation mechanism, which ensures that the public pension system can resist economic shocks well in the long term. Our calculations show that although the effects of a negative shock to the economy will have a considerable impact for up to 10 years, economic shocks don't have a long-term influence on the pension benefit level and the contribution rate, because the system stabilises automatically.

The pension guarantee approved in mid-2009 weakens this stabilisation mechanism insofar as the effects of economic changes are prolonged as well as intensified. Making up for

omitted pension cuts does, however, re-establish the link between pensions and earnings with a time lag so that even with a pension guarantee the pension system is capable of withstanding negative economic shocks, in the sense that both the contribution rate and the pension benefit level follow the same development curve in the long term, i.e. after approximately ten years, as without an economic downturn. This result underlines the importance of making up for the omitted pension cuts. If you delay these realignment measures or dismiss them altogether there will be long-term effects economic shocks and the system will therefore become destabilised.

For a sustainable pension policy this implies the following: Firstly, the pension guarantee should be abolished to restore the automatic stabilisation characteristics. And secondly, the measures to make up for omitted pension cuts must be carried through consistently in order for the German public pension system to get back onto a path compatible with future demographic changes.

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