SONDERFORSCHUNGSBEREICH 504

Rationalitätskonzepte,
Entscheidungsverhalten und
ökonomische Modellierung

No. 04-61

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December 2004

Financial support from the Deutsche Forschungsgemeinschaft, SFB 504, at the University of Mannheim, is gratefully acknowledged.

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[Version December 13, 2004]

Projection methods and scenarios for public and private pension information

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Summary

Public pensions - the primary pillar of old-age income provision – will, in the future, be less generous than they have been in the past, in particular owing to the impact of demographic change. The pension gap is supposed to be plugged by the second and third pillars of pension provision. However, people require reliable planning information if they are to exercise greater individual responsibility. It is therefore absolutely essential that adequate information is made available about the level of pension benefits that will be generated by each pillar of old-age pension provision.

This paper outlines a number of different means of presenting the level of future pensions and the assumptions on which such extrapolations are necessarily based. Our work is based on an assumed average rate of inflation of 1.5% and an average rate of real income growth not exceeding 1.5%. This last figure is derived from calculations made in the framework of a macroeconomic simulation model. This model also shows that while the funded pillar of old-age pension provision is not entirely immune to population aging, it is not substantially threatened by a substantial decrease in stock market prices, the so-called "asset meltdown".

* We wish to express our thanks to Christina Wilke for making the MEA -PENSIM model available to us and for her helpful comments. We would also like to thank the members of the GVG "Pension Information" working group, in particular Sabine Horstmann, Stephan Fasshauer and Peter Schwark, for a number of interesting discussions and Wilhelm Ruprecht and Stephan Fasshauer for their comments on this paper. We are grateful to the Deutsche Forschungsgemeinschaft, the State of Baden-Württemberg and the German Insurance Association (Gesamtverband der deutschen Versicherungswirtschaft) for their financial support. We thank David Allison for the translation from the German original.

1. Introduction

The "Riester reform" introduced a multi-pillar pension system in Germany. The dominant role previously played by the public retirement insurance system – which has to date provided an average of between 80 and 85 percent of pension income – will be cut back significantly in the future and this in turn will need to be compensated for by strengthening the second and third pillars. Individual responsibility for pension income in old age will thus become an increasingly important factor. However, people require reliable planning information if they are to exercise greater individual responsibility. It is therefore absolutely essential that adequate information is made available about the level of pension incomes that will be generated by *all three* pillars of old-age pension provision.

A key role in personal planning will initially be played by the *statutory* pension information provided in accordance with Section 109 of the German Social Code (SGB VI). Information about *private* pension payments, whether they originate from an occupational pension, life insurance policies designed to provide an old-age pension, or so-called 'Riester pensions', will however play an increasingly important role to the extent that these sources of income are used to close the shortfall in public pensions. This means information must be made available about the future pension entitlements generated by all three pillars – i.e. including occupational and private pension provision - if those paying contributions and premiums are to obtain a simple overview of the financial position they are likely to find themselves in when they reach old age. This was, for example, one of the recommendations made by the "Rürup Commission" and was the subject of work being undertaken by a working party set up by the Gesellschaft für Versicherungswirtschaft und –gestaltung (GVG).[1]

The Riester reform imposed a duty on the agencies responsible for the German public retirement insurance system to provide contributors with information about their projected pension entitlements. These agencies have been sending pension information letters to their contributors since 2002 as part of a trial phase in which the contribution payments made over the previous 5 years are projected into the future in tandem with various scenarios for wage growth. As of this year, information about the public pension entitlements have been provided in edited form to all contributors aged 27 or older. Surveys have shown that contributors' responses to this information have been very positive (Stegmann et. al. 2003). Criticisms, on the other hand, focus on the failure to cite real figures or relative values (pension as

[1] See the Commission on the long-term financial viability of the German social security system (2003).

percentage share of income) as alternatives (e.g. BAK Basel Economics 2003) and the amount of the stated index-linked rates (e.g. Social Advisory Council 2003). Surveys also reveal that the information which has been available to date is not sufficient to satisfy the information needs of citizens and policymakers – i.e. for a simple and reliable planning basis. People in Germany are still not fully aware of the need either for reform of the pension insurance system or of the additional individual responsibility for old-age pension provision that such reform entails (Börsch-Supan, Heiss and Winter 2004).

Information about public and private pensions must meet two challenges. On the one hand, they must reduce the unavoidable lack of certainty inherent in an unpredictable future into an ex ante probable trend plus indicators for an ex ante reasonable margin of fluctuation. This is a problem of economic forecasting. On the other hand, they also need to simplify relatively complex mathematical operations, such as discounting and adjustments for changes in purchasing power, so that they make sense to the consumer. This is a didactic problem, especially given that the scope and breadth of pension forecasts must be limited. These economic and didactic challenges are anything but trivial. The aim of this paper is to sketch out the conceptual basis of the economic variables required in order to project public and private pensions and to propose a clearly defined and didactically coherent presentation format.

Providing reliable information about future pension benefits at an early stage – i.e. at the outset of a person's working life – is problematic given the long planning horizon involved. It is difficult to forecast individual factors such as future participation in the labor force, the development of an individual's earnings, and the success of personal investment strategies, over such a lengthy period of time as an entire working life. Moreover, there is a very large and unavoidable margin of error when forecasting the relevant macroeconomic factors, such as general earnings and interest trends. It is therefore clear from the very start that pension projections cannot take account of the idiosyncratic circumstances which may shape a person's future working life. It is only possible to provide information that outlines an average future trend based on the personal data available at the time the information is produced. This is also true of economic projections which can only be based on long-term averages and cannot take into account the ups and downs of the business cycle.

An essential distinction must, however, be made between these projection risks and the future political risk of interventions in the old-age pension system. Information about both public and private pensions can only be based on the current legal position. Legal changes should

only be allowed to influence information about pension entitlements after such changes have actually taken place in the relevant statutory framework. This allows political interventions in the system to be made transparent and understandable in pension projections and for these to be separated from economic factors such as cyclical fluctuations. The way pension forecast information is currently presented – mixing the new statutory rules with revised assumptions regarding wage trends by means of a flat-rate deduction – must therefore be regarded critically.

As well as projecting the variables influencing future pensions, it is also essential that the information about future pensions is presented in an understandable way. As future pensions are projected on the basis of anticipated ages of retirement, a sophisticated grasp of financial mathematics is needed in order to understand the value of the reported monetary amount in the future. Account must, in particular, be taken of the deprecation in value of money resulting from an all-round increase in consumer prices. A second – frequently neglected – issue, is people's tendency to evaluate their own pension income in relative terms, i.e. relative to the incomes earned by those still in gainful employment. This issue is particularly apparent in the context of the current pension reform discussion: the so-called 'sustainability factor' will continue to bring about increases in pension benefits, even adjusted for purchasing power, such that absolute pensions will also continue to increase as the population ages. They will, however, fall in relation to anticipated wage levels as the pension adjustments are several tenths of a percentage point below the rate of wage growth.

This work is structured as follows: Section 2 begins by presenting the basic concepts for the reported values. The key question here is which of these variables should be communicated and in what form. Section 3 deals with the development of future pensions based on the new rules of the Pension Reform Sustainability Act. The variables needed to project the value of public pension benefits are inferred, the scenarios for plausible rates of inflation and wage trends discussed in the literature are presented, and sensitivity to wage inflation and employment analysed. Section 4 begins with a general account of the problems associated with forecasting before going on to discuss the macroeconomic framework of our aging economy. This section also presents a simulation model developed at the MEA which generates long-term, consistent scenarios for the development of earnings and capital returns. Section 5 draws together these different strands and concludes with a specific proposal for the presentation of information about public pensions.

2. Appropriate information about future pensions

This section discusses the kind of data which ought to be shown in pension forecasts. It is only possible for someone to reach a realistic assessment of the standard of living they might reasonably anticipate in old age if the information provided about pensions from each pillar of old-age income provision is comparable. Monthly pension entitlements – whether from the public pension system, defined benefit or defined contribution schemes, a life insurance policy designed to provide an old-age pension, or a Riester pension scheme – should be presented using the same categories of figures.

It would be unreasonable in this context to assume that pension information recipients have a firm grasp of how pension insurance systems work or of financial mathematics and pension entitlements should therefore be presented in as simple a form as possible. A recent representative survey of people's understanding of the pension insurance system in Germany has shown, for example, that even after the intensive public discussion of the pension system in 2003 only 14 percent of those interviewed were actually aware of the pension contribution rate.[2] Around 40 percent – in other words not far short of half - of those surveyed did not even realise that contributions to a pay-as-you-go system are used exclusively to finance the benefits received by today's pensioners (Börsch-Supan, Heiss and Winter 2004).

Projected future pension benefits can basically be calculated in nominal, real or economic status-preserving euro terms. In contrast to the first of these, the latter two categories take account of future inflation and wage trends. Alternatively, pension benefits can be presented in relative terms (i.e. relative to current or future income) with inflation and pay increases being implicitly accounted for. Inset 1 provides an overview of these presentation options and will be followed by a discussion of the pros and cons of each of them.

[2] With a tolerance for valuation as a correct response of between 18 and 21 percent. Even if intervals were specified for the correct contribution rate, only around one fifth of interviewees chose the range from 15 to 20 percent.

Inset 1: Methods of presenting future pension benefits

1. Nominal values:
In euros, at future prices; future price increases are not taken into account. The euro amounts shown appear very high from today's perspective.

2. Real values:
in euros, at current prices; values are adjusted for future inflation and are therefore expressed in terms of present purchasing power. The value of pension benefits still appear to be very high as they incorporate future economic growth and wage inflation. They yet conceal the fact that, owing to the new pension adjustment formula, the earnings of people in gainful employment will rise faster than the benefits received by pensioners.

3. Relative values:
Future pension benefits are contrasted with future incomes (average incomes of those in gainful employment or a person's final anticipated income) and expressed as a percentage value. This corresponds with familiar concepts such as the pension level or replacement rate.

4. Status-preserving figures:
In euros at current prices, deducting general wage inflation. This corresponds with the picture provided by relative figures (3) expressed however as a euro amount which preserves current status at today's purchasing power.

2.1 Nominal values

Both current public pension information and the pension information typically reported in the private insurance sector once a year are couched in nominal values. As practically all economic transactions take place in nominal money amounts and our laws and most contracts also make reference to nominal money amounts, it would appear perfectly plausible that the average man or woman would also tend to think in nominal terms and take their bearings accordingly; for this reason it might seem reasonable to present the information in pension projections in this form as well.

However, this plausibility is deceptive. The apparent simplicity of nominal variables is by no means beneficial when planning supplementary or even alternative old-age forms of pension

provision as this form of calculation takes no account of the loss in purchasing power of the calculated money amount arising from price inflation over time prior to retirement.[3]

The failure to account for inflation in these projections can be particularly deceptive for young people whose pensions are projected over a very long period in advance and can lead them to seriously overestimate the future pension benefits to which they will be entitled. An inflation rate of 1.5 percent – the long-term reference rate of the European Central Bank – would result over a 38-year period in a reduction equivalent to 430 euros in the purchasing power of a monthly pension of 1,000 euros.[4] The nominal value of 1,000 euros in the future therefore corresponds to future purchasing power of 570 euros at today's prices. Currently, the pension information provided by the pension insurance agencies do make verbal reference to the loss of purchasing power die to an increase in the cost of living. The precise wording of this reference in the public pension information is as follows: "Owing in particular to the increase in the cost of living, these amounts are not comparable with figures for income earned today." It is, however, doubtful whether the majority of people really grasp or are able to quantify in precise terms the meaning of this statement for their own pension plans. From 2005 on, this will be taken into account by adding a more precise purchase power loss into the public pension information. For each individual it will be calculated how much 100 Euros will be worth in the year of retirement entry, assuming an annual inflation rate of 1.5% and a retirement age of 65 (Büchel and Fasshauer 2004).

The term 'money illusion' refers to people's tendency to think in terms of nominal rather than real monetary values when taking economic decisions – in our example to interpret 1,000 euros as equivalent to its current purchasing power rather than as worth 570 euros. A classic example of money illusion is that employees are much less likely to protest against reductions in their real wages than they are against a cut in nominal pay (Tyran 2001). One well-known survey has demonstrated that the money illusion is not the prerogative of employees alone, in fact almost the entire spectrum of economic life is influenced by nominal values (Shafir et. al.

[3] This is demonstrated by a simple example. Let us assume that a father wishes to buy a bicycle for his three daughters. These bicycles cost 100 euros each and are thus relatively cheap. The father also has exactly 300 euros at his disposal in the year in question. In other words, he is able to buy three bicycles. What happens, however, if the father would like to buy the same bikes in the following year and the price of the bicycles and his wages all rise by 10 percent? Each bicycle will now cost 110 euros and the father will have precisely 330 euros at his disposal next year. He would therefore still be in a position to purchase these three bicycles. What the father is interested in is the *real* value of his income – in this case the three bicycles, and the happiness they represent for his daughters. He is not interested in whether these three bicycles have a *nominal* value of 300 euros today and a *nominal* value of 330 euros tomorrow, but only how many *real* bicycles he is able to purchase for the relevant *nominal* amounts.

[4] These figures relate to a period of 38 years as the forecasts received by people for the first time at the age of 27 are based on a retirement age of 65.

1997). If interviewees are explicitly reminded of the effect of inflation, drawing attention to demonstrable losses in purchasing power in the past, recent surveys show an overestimation of the impact of inflation (Leinert 2004). In this survey, interviewees were asked how much they thought 1,000 deutschmarks would be worth in 30 years' time if subject to an annual rate of inflation corresponding to that of the last 30 years. Instead of the actual value of 621 deutschmarks, a median value of 500 and an average value of 483 deutschmarks was cited. Interestingly enough, the scale of this overestimation was higher among respondents with the highest levels of education and income.

Studies of both money illusion and the incorrect evaluation of inflation effects when people's attention is drawn to loss of purchasing power show just how problematic reporting nominal values can be - they do not enable working people to arrive at reliable and intuitive reference values upon which they can base their personal financial response to the pension gap.

2.2 Real values

The money illusion problem can be circumvented by presenting real figures which take account of future increases in prices and thus reflect the true purchasing power of future pensions. This involves reducing future nominal values in line with the expected increase in allround prices. The inflation rate can be selected on the basis of the inflation objectives of an independent institution such as the European Central Bank. Alternatively, the average past rate of inflation can be projected into the future, whereby the average should correspond to the average period over which projections are made, in other words around half of a working life between the first and last pension forecast, in our case around 20 years.

It is very difficult to grasp this adjustment for inflation intuitively as this adjustment has an exponential influence on reported values over a long projection period. An average annual rate of inflation of 1 percent, for example, reduces the initial value of a pension of 1,000 euros to a real value of 685 euros over a period of 38 years. An inflation rate of 1.5 percent, however, reduces this value by 17 percentage points to 568 euros. An inflation rate of 2 percent reduces the purchasing power of the original amount to 471 euros, or less than half of its present value. This is not an argument against reporting values in real terms – on the contrary, most people are simply unable to calculate the true purchasing power of nominal values for themselves, and they are not as a rule intuitively able to realise the huge effects which small differences can have over a long period of time.

2.3 Relative value of pensions

The problem of thinking in either nominal or real terms only arises if pension entitlements are expressed in euros. It is possible, however, to help people imagine what the value of monetary amounts will be in the future by expressing future pensions in relative terms as a percentage of future earned income. As the purchasing power of both forms of income are eroded to the same degree over time, the percentage share of income replaced by a later pension accurately expresses the true value of pensions paid at a later point in time without having to make explicit adjustments for inflation. As public discussion of pension policy in recent years has focused to a very large degree on pension levels – in other words on the relative future pension received by the so-called 'standard pensioner' and its percentage equivalence of average earnings - disclosing individualised pension levels might appear to be an appropriate method of reporting pension information.

There are a number of ways in which this can be done. An individual's projected pension can, for example, be seen in relation to that person's predicted final pre-retirement earnings ("replacement rate"). This method of calculating would appear appropriate given that pensions can in any case only be projected on the basis of predicted earnings. Alternatively, pension payments can be compared with the anticipated average earnings of the entire employed labour force at the time of retirement. The advantage of this second method is that the forecast is based on more reliable comparative data, drawing as it does on predictions of average rather than individual earnings careers. The principal disadvantage of this concept is, however, that working people are provided with figures which say little about the extent to which they will be able to maintain their accustomed standard of living after they have retired.

The advantage of disclosures made in relative terms is that they directly reflect the relative position of pensioners in society or a future pensioner's individual income standing in comparison with their working contemporaries.

The reverse side of the coin is that relative values are expressed in percentage terms - and thinking in percentages poses considerable problems for many people. In a 1998 Emnid survey of 1,000 Germans, one third were unable to provide a correct definition of what "40 percent means" (Süddeutsche Zeitung 1998).[5]

One way out of this dilemma might be to provide the reference values as well, and in fact this leads to the fourth concept which is explained in the following.

[5] The following choices were presented as possible answers: one quarter, 4 out of 10, every fortieth.

2.4 "Status-preserving" values (adjusted for inflation and growth)

In order to achieve the same effect as when pensions are disclosed as a share of current income, but to express the results at current euro values, the relative individual pension level must be multiplied with a reference value in current euro values, as referred to in the previous section, such as current earnings. This concept corresponds best with the kind of purchasing power which wage earners are able to imagine would preserve their current economic status. However, simply forecasting future pension benefits by projecting current earnings into the future and taking account of general wage inflation fails to take account of the fact that, either owing to career moves or pre-retirement seniority, employee's earnings typically tend to rise with increasing age.[6] It would therefore make sense to make allowance for career and seniority-related pay increases when calculating current earnings and to multiply this with the relative individual pension level as explained in the previous section.

Another method, equivalent to calculating "status-preserving" pension payments in current euro values, is to disclose future pension payments in values which have been adjusted to account for inflation and growth. Simply making adjustments for inflation in order to take account of the depreciation of purchasing power will not be enough for people to really grasp the value of future pensions as long as they continue to assess their own incomes in comparison with those of their contemporaries. A subjective sense of well-being is not the product of the absolute value of a person's pension, but of its relative value in comparison to other people's incomes - both those of other pensioners and those of the gainfully employed.

The public retirement insurance scheme also does account for this principle as pensioners participate in overall economic growth via the link between pension benefits and the rise in earnings of the employed labour force. This means that a growing economy with rising earnings leads to increased pensions, which is why the value of projected pensions is relatively high – despite adjustments for inflation - in comparison with current pension benefits. Pensioners' relative living standards do not improve as a result, however, and the values determined in this wage indexation scenario suggest a more positive situation in retirement.[7] This is demonstrated, for example, by the fact that contemporary Germans do not subjectively feel themselves to be richer despite being considerably more prosperous today

[6] Refer to Essig and Reil-Held (2003) for the development of various earnings profiles based on levels of educational qualification and their impact on old-age pension provision.

[7] In fact pensioners lose out relative to the gainfully employed as a result of the Riester pension formula and the sustainability factor, cf. Section 3.1. Calculations by the VDR (Reimann 2004) show that current earnings would have to rise in the period up to 2030 in real terms by an average of 0.7 percent per annum in order to maintain the same purchasing power as today.

than they were 30 years ago or, to take another example, by the exasperation caused by the reduction in relative pension levels caused by the sustainability factor despite the continued increase in the real value of pension payments in the future. One could argue that a link has already been made between future pensions and income in current prices by disclosing current pension values in the pension information – multiplied by the individually-calculated earnings points. This is incorrect, however, as the current pension value does not take account of the changes, such as those induced by the sustainability factor, incorporated in the Pension Reform Sustainability Act – or Sustainability Act for short. This means that the cumulative impact of the sustainability factor would initially need to be applied to the current pension value. This method is, in turn, equivalent to calculating the pension payment amount as adjusted for inflation and growth.

We propose using the following wording to convey this value in the pension information: "If you retire from work at the age of 65, your pension will be worth xy euros based on the value of the disposable income of people working at the time."

2.5 Conclusion

No matter how you look at it, it is not possible to forecast future pension entitlements without venturing to predict individual earnings history, the inflation rate and average wage inflation. Only then can all the values referred to in 2.1 to 2.4 be consistently calculated. In our view it makes no sense at all to disclose nominal values as the resulting figures are not only much too high, their relation to current purchasing power is also misunderstood by almost everyone. Disclosing values which have been merely adjusted for inflation is problematic as tomorrow's pensioners will also compare themselves with people working at the time. This means that the purchasing power needed to preserve economic status is lower than that conveyed by figures which are only adjusted for inflation. This status-preserving purchasing power can only be communicated by reporting values which are adjusted for inflation and real income growth. An individualised pension level does this automatically, but does have the disadvantage that values are shown in percentages rather than as euro amounts.

Table 1 shows what the current pension value[8] would be in 2030 depending on whether nominal, real, or status-preserving values are used.

[8] The current pension value is the amount equivalent to the monthly pension acquired on the basis of the contributions paid by someone on average earnings. The current pension value is specified by the federal government on July 1 every year. Increases in the current pension value link pensions to changes in earnings by means of the formula described in Section 3.

Table 1: Current pension value in 2030

	Current pension value in 2030 in euros	Monthly Pension received by benchmark pensioner in 2030 in euros (45 earnings points)
Nominal	48.50	2,182.50
Real (1.5% inflation)	32.00	1,440.00
Status preserving	21.17	952.65

Own calculations using MEA-PENSIM based on the assumptions adopted by the Rürup Commission.
In the states of the former West Germany, the current pension value is at present around 26 euros – the corresponding pension payment based on 45 earnings points is approximately 1,170 euros.

Adjustment for inflation results in figures which are significantly lower than the nominal values. It is also apparent that the figures corresponding to purchasing power which preserves economic status are lower than today's values. This reflects the reduction in pension level brought about by the Riester reform and the introduction of the sustainability factor. As the annual pension adjustment is no longer solely determined by wage inflation but also includes other factors which retard the rate at which pensions are raised, adjustment for inflation and growth means that the pension measured in this way for a benchmark pensioner in 2030 is a good 200 euros less than the same pension in 2003.[9]

Finally, the four presentation methods - 2.1 to 2.4 – apply to all of the pillars of the old-age pension provision. Even the proposal to calculate a value which preserves economic status is not restricted simply to information relating to public pensions. The yield on private pension provision can also be adjusted for growth. While income growth reflects increases in labour productivity, the interest yield can be interpreted as the price of the productivity generated by investments financed from savings. The minimum rate of interest can thus also be adjusted downwards to take account of growth. In order to ensure comparability, the rate of income growth is used here in the same way as for public pensions.

[9] The problem with regard to public pension forecasts is that adjustments for inflation and growth can result in disability benefits being shown which are higher than old-age pensions.

3. What assumptions need to be made for pension projections?

3. 1 The pension adjustment formula

The previous section clearly demonstrated that while the rate of inflation is required to determine real term values it is also necessary to make assumptions about the index-linking of pensions. The Sustainability Act specifies the annual adjustment of pensions by calculating the current pension value according to the following (slightly simplified) formula:

$$AR_t = AR_{t-1} * \frac{BE_{t-1}}{BE_{t-2}} * \frac{1 - AVA_{t-1} - RVB_{t-1}}{1 - AVA_{t-2} - RVB_{t-2}} * \left[\left(1 - \frac{RQ_{t-1}}{RQ_{t-2}}\right) * 0{,}25 + 1\right]$$

where AR: Current pension value

BE(t-1): Total gross earnings per average employees subject to levied social security contributions in the last calendar year

BE(t-2): Total gross earnings per average employees subject to levied social security contributions in the calendar year before last

AVA: Private pension component

RVB: Pension insurance contribution

RQ: Old-age dependency ratio (the number of people paying insurance contributions relative to number of people at retirement age)

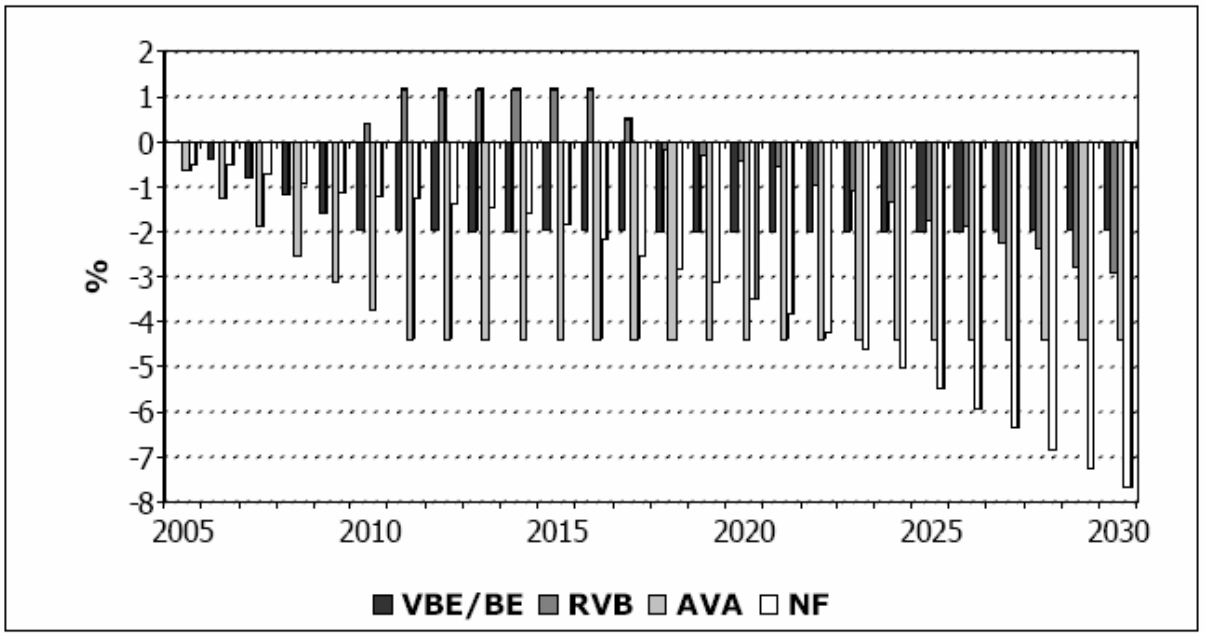
The current pension value continues to be substantially determined by the development of gross earnings. The contributions to the public retirement insurance system and payments paid into private pension schemes (as a lump sum) are also integrated into the pension adjustment. After the sustainability factor is introduced in 2005, pension adjustments will take account of the development of the relative numbers of pensioners and contributors – a relationship which is primarily determined by demographic trends and future participation rates.

This means that the projection of future pension information, pension insurance contributions and old-age dependency ratios will not only depend on information about wage trends but also on comprehensive assumptions about demographic/economic developments and the participation rate.

The growth of the nominal current pension value – which is set to almost double in nominal terms up to 2030 – is largely caused by annual wage inflation which is estimated at a long-term nominal rate of 3 percent per annum by the Rürup Commission. The average annual percentage change in the current pension value remains below the assumptions made by the Rürup Commission for the period up to 2030 by an average of 0.7 percentage points behind the (constant) annual percentage change in gross earnings. Of this, around one half is due to

the components introduced by the Riester reform, the private pension component, and the increase in pension insurance contributions. Most of the second half of this increase in pensions is caused by the sustainability factor, cf. Figure 1.

Figure 1: Accumulated relative impact of various components of the adjustment formula on the current pension value as of 2005



where: VBE/BE Average earnings subject to levied social security contributions/average earnings (national income accounts)[10]
RVB Pension insurance contribution
AVA Private pension component
NF Sustainability factor Source: Reimann (2004)

3.2 Inflation and wage trend assumptions

Projections of future rates of inflation and wage trends are available from a number of different research institutes and institutions. Table 2 summarises current assumptions in this field.

[10] To date, wage trends have been extrapolated from national income accounts which include the income of dependent employees on whose earnings social security contributions are not levied – in particular tenured civil servants – as well as the income of employees subject to a contribution duty. These accounts incorporate an average for all forms of earnings without taking account of the contribution assessment ceiling. The Sustainability Act does however stipulate that the development of pensions will only be linked to the development of earnings subject to social insurance contributions in the future.

Table 2: Inflation and wage trend assumptions

Institution	Forecast period	Inflation	Annual rate of labour productivity growth in %	Annual rate of income growth in %
RV report (2003)	2008-2017			Three variants: 2,3,4 (nom.)
Social Advisory Council (2003)	2008-2017			2,3,4 (nom.)
Remsperger/EZB (2003)	"long term"	1.5		
IAB (2002)	2015	1.7	1.5	0.9 (real)
Ifo (2002)	2050			1.75 (real)
DIW (2002)	2050	1.5	1.5-1.75	1.5-1.75 (real)
Rürup Commission (2003)	2040	1.5	1.8	up to 2010: 1,1 then: 1.5 (real)

There is a broad degree of consensus as far as assumed rates of inflation are concerned. Most of the scenarios – excluding the IAB – are oriented towards the European Central Bank's reference value of 1.5 percent.

There is a broader range of assumptions for wage trends. The Pension Insurance Report (RV Report) calculations are based on three alternative wage trends whereby annual nominal income growth of 3 percent is taken as the median and thus most realistic variant. The Social Advisory Council, however, explicitly criticises the use of a nominal rate of 4 percent as totally unrealistic, believing that this assumption sends out a false signal despite the assertions in the Pension Insurance Report that it is used purely for modelling purposes. The Social Advisory Council (2003) holds the view that only two variants should be used in the future.

Even with regard to long-term projections there are some astounding differences between the development of labour productivity and earnings. The Institute for Labour Market and Employment Research (IAB) assumes, for example, that average wage inflation up to the year 2015 will be significantly higher than the increase in nominal labour productivity. Projections restricted to the period up to 2015 show, on average, an annual rate of growth in labour productivity of 1.5. Growth in gross earnings for the period 2000 to 2015, in contrast, is estimated at a mere nominal rate of 2.6 percent at a rate of inflation of 1.7 percent (Schnur and Zika 2002). The DIW bases its calculations on the assumption that earnings trends will continue into the future following average productivity plus compensation for inflation. This results in an annual average nominal increase in earnings of 3.0 to 3.25 percent in the period

up to 2050 (Bach et. al. 2002). At 1.75 percent, the Ifo Institute specifies an annual rate of real income growth over its project horizon until 2050 which is somewhat higher than the other scenarios cited in Table 2 (Werding and Blau 2002). The assumptions made by the Rürup Commission differentiate according to the projection period. Over the long term, the Commission assumes an average increase in labour productivity of 1.8 percent and nominal income growth of 3 percent.

Overall there appears to be an accumulation of assumptions for real income growth of 1.5% per annum. The top indexing rate of nominal 2.5 currently disclosed in the pension information provided by the pension insurance agencies would appear reasonable in this context, provided that a rate of inflation of 1.5 percent is also assumed and account is taken of the fact that other factors in the pension formula reduce the adjustment of pensions by around an additional 0.7 percentage points.

Which assumptions should pension projections be regularly based on? As far as the rate of inflation is concerned it would be possible to extrapolate from historical values which would need to refer to a long enough period of time in the past in order to eliminate short-term fluctuations. While it would be a fairly simple matter explaining this approach to the recipients of the information it does neglect new developments and findings. Alternatively, the inflation objectives of the European Central Bank might be used.

The index-linking of public pensions should, for consistency's sake, be oriented towards the annual Pension Insurance Report. The information provided to the public from within the pension system must be consistent in order to provide a firm basis upon which people can forge their own old-age pension plans. However, there is a problem attached to the Pension Insurance Report in that the public assumptions which it publishes have often been the subject of criticism originating from research institutes and the academic world in the past. It may therefore be helpful to involve these institutes by, for example, obliging them to draft an annual long-term wage trend projection. On the other hand, this approach – which would doubtless be useful for the way information is presented in pension projections – may be regarded as problematic in the context of collective bargaining autonomy.

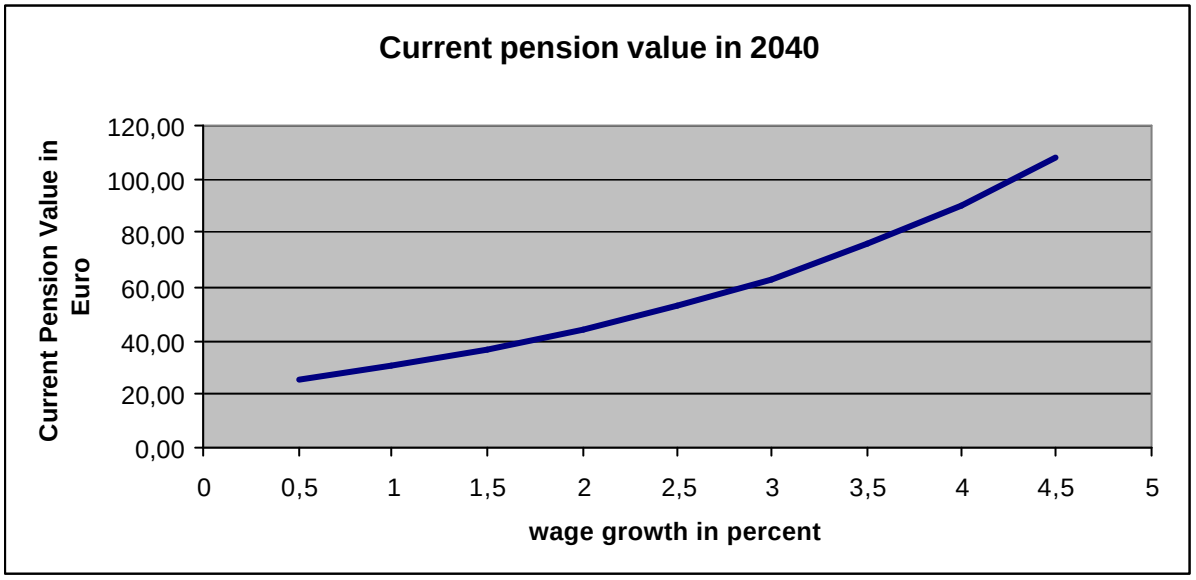
3.3 Sensitivity analysis

The appraisal drafted by the Social Advisory Council points out that the only function of long-term model calculations can be to estimate the impact of various measures and/or possible economic and demographic developments. The Council warns against regarding the results of any one of the nine variants of 15-year model calculations in the Pension Insurance

Report as being the relevant or "most probable" (Social Advisory Council 2003). However, supplementary private pension provision can only be planned on the basis of the most plausible – based on the current state of knowledge - assumptions. Nevertheless, the Social Advisory Council believes it is important to examine how sensitive results are to changes in the underlying assumptions.

Figure 2 therefore shows the connection between the rate of wage inflation and the current pension value in 2040.

Figure 2: Current pension value and wage growth



Source: Own calculations using MEA-PENSIM. All values in nominal euros.

The close link between wage inflation and current pension value is apparent: while income growth of 2 percent, for example, leads to a pension value of somewhat more than 40 euros, the value increases to 60 euros at a rate of growth of 3 percent.

In order to illustrate more clearly the influence of some of the other factors determining the pension adjustment we now examine, as an example, the impact of one variation in the development of the participation rate. While the demographic assumptions made by the Rürup Commission are – with the exception of migration – regarded as fairly reliable, the assumptions made about participation rates are almost certainly optimistic. The Commission assumes that the participation rate in Germany for women and older men in particular will rise significantly becoming roughly comparable with current participation rates in Denmark. These figures assume that the current difference in participation rates for men and women will be ironed out by 50 percent in the period up to 2040, that the actual age of retirement will be raised by the same date by 3 years, and that unemployment will drop by around one third by

the year 2030. Table 3 shows how the current pension value and benchmark pension [11] would be affected if these assumptions failed to materialise.

Table 3: Development of the benchmark pension and the current pension value in various work scenarios

Scenario	Rürup Commission Reference scenario (1)		Status quo Pessimistic scenario (2)		Medium variant Medium scenario (3)	
	+3yrs +0.5 4%		0 0 8%		+1.5yrs + 0.25 6%	
	Basic pension	Curr. pen val.	Basic pension	Curr. pen val.	Basic pension	Curr. pen val.
2010	1358	30.18	1334	29.64	1349	29.98
2020	1741	36.68	1661	36.91	1710	38.00
2030	2183	48.51	2034	45.20	2122	47.15
2040	2845	63.22	2634	58.53	2760	61.33

Note: The scenarios relate to target figures in 2040 for the raising of the actual age of retirement and a gradual approximation of male and female participation rates. The value of 0.5 in the first scenario means, for example, that the present difference in activity rates for men and women will be reduced by 50% by the year 2040.

Source: Own calculations using MEA-PENSIM. All values in nominal euros.

The first scenario outlined in Table 3 shows the assumptions adopted by the Rürup Commission. In order to demonstrate the responsiveness of the current pension value to deviations from these assumptions, a pessimistic variant is chosen in which present day age-specific activity rates remain unchanged. The pension received by a 'standard pensioner' would then be more than 200 euros – i.e. 7 percent - lower in nominal terms. If, however, we take a scenario somewhere between the assumptions of the Rürup Commission and the status quo, the benchmark pension would be a mere 3 percent lower than in the reference scenario.

The sensitivity analysis in this section reveals how changes in assumptions regarding employment levels and wage trends impact the current pension value. It becomes clear that the most critical assumptions for the projection of pensions are those relating to wage trends. It is important to emphasize, however, that an inflexible link of this kind – on which such a ceteris paribus analysis is based – does not exist in reality. Feedback effects do pertain between wage trends, employment and pension insurance contributions. However, account can only be taken of such effects in the context of macroeconomic models, and we will refer to these again in Section 4.2. First, however, we turn our attention to general projecting issues.

[11] The benchmark pension is defined by 45 earnings points and is calculated accordingly by multiplying the current pension value by 45.

4. A long-term projection of wage and interest trends

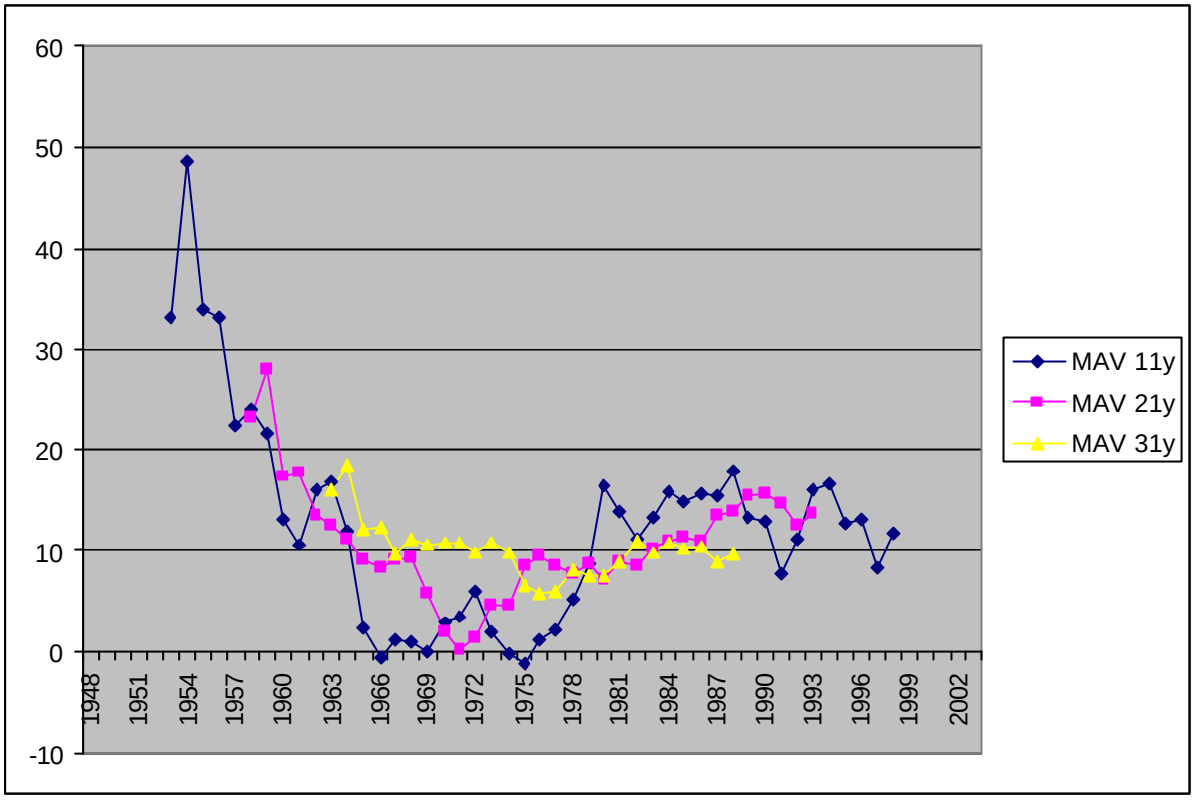
4.1 The forecasting issue

How can we project future wage trends and the capital returns, the latter of which has been neglected to date despite being essential for the funded pillar of old-age pension provision? One usual method – which is problematic due to the weak projection basis - is to infer future developments on the basis of historical data. The next few decades will bring historically unprecedented demographic changes. What is more, simple projections ignore the adaptive and feedback economic effects which usually exercise a moderating influence on long-term developments. Nevertheless, this approach does have the advantage that it is easy to get across to a wider public. Assumptions regarding the rate of inflation can, for example, be expressed quite simply in words. For example: "If prices continue to rise in the future at the same rate as they have done over the last 25 years, your pension will be worth xy euros in today's prices in xy years."

The other option is to set up a macroeconomic model which maps the essential mechanisms of an aging economy. The results of such a model are examined in the next section.

In both cases, projections must be reliable, recognised and stable if they are to meet with acceptance and be useful as a basis for planning. In this respect it would appear appropriate to gear the projections on which pension information is based to long-term trends and to disentangle them entirely from cyclical trends. Long-term projections of average values are – paradoxically perhaps – much easier to undertake than short-term projections and, what is more, they are more stable given that short-term influences can be averaged out. This is demonstrated by the following example which shows the capital returns on shares since 1960 as well as the smoothed mean of such returns over various periods of time.

Figure 3: Annual real rates of return on German blue chip shares in %



Note: Moving averages are displayed (MAV) referring to a time span for smoothing of 11, 21 and 31 years.
Source: Own graph, based on data from Stehle (2004).

The smoothed mean becomes ever smoother the longer the period of time to which the smoothing applies. While annual returns fluctuate wildly and are therefore almost impossible to predict, the 30-year mean only changes very slowly indeed, and was to all intents and purposes stable during the 1960s and 1980s.

The smaller margins of fluctuation contingent on longer timeframes are also demonstrated by Table 4 which shows average nominal capital returns for 4 periods of investment as well as the variances in returns.

Table 4: Fluctuations in capital returns according to period of investment

	Period of investment			
Rate of return	10 years	20 years	30 years	40 years
Mean	8.90	8.64	8.92	9.68
Variance	28.07	12.82	4.73	4.03

Source: Own calculations based on the DAI-Rendite-Dreiecks, Deutsches Aktieninstitut (2004)

However, long-term values geared to the next 25-year period can also be subject to historical influences which cannot be anticipated and long-term projections must therefore be revised and adapted in line with past developments from time to time. The intervals at which such revisions are made must be long enough not to provoke anxiety among contributors when faced with figures that change from year to year. Assumptions could, for example, be specified for the next 5 years. Normally these would then be checked every 5 years and revised as necessary. Such revisions will, by their nature, be minor and should therefore not have any major impact on people's pension plans. Changes in pension policy, on the other hand, must be reflected in the annual information immediately because policy interventions have a direct impact on pension planning and because it must be possible for contributors to appreciate the influence of legislative changes.

4.2 Interest and wage trends in a macroeconomic model

In order to obtain consistent assumptions about long-term wage trends, as well as about the interest trends relevant for funded old-age provision, we present the results of a macroeconomic model in this section. The MEA-OLGA simulation model maps the essential mechanisms of an aging national economy. For a precise description of the model and results, refer to Börsch-Supan, Ludwig and Winter (2003). The analysis performed using this model is primarily geared towards the capital market by simulating the future trends in interest rates often discussed under the catchphrase of "asset meltdown". Savings, capital returns and international capital flows are the outcome of complex interactions between supply and demand on German and international capital markets, influenced by demography and the capital and goods markets. The simulation model calculates this equilibrium by drawing on model households which mirror the various generations living together during the phase of demographic transformation ("overlapping generations"). The following discussion focuses primarily on the results for the variant of an open economy in the EU region.[12]

We map the potential scope of development of pension insurance with three scenarios. The first scenario ("Retain the PAYG system in place prior to the Riester reform") keeps the net replacement rate (of approximately 70%) provided by the pay-as-you-go pension system. In

[12] Börsch-Supan, Ludwig and Winter (2003) simulate a total of three scenarios of capital mobility: Germany as a closed economy, Germany as an open economy with perfect capital mobility with other EU countries, and with perfect capital mobility between Germany and all OECD countries. While the assumption of perfect capital mobility within the OECD could well be discussed in a critical light, this paper is based on the undisputed assumption of perfect capital mobility within the EU.

this scenario the contribution rate is raised from 19.5% to 25.7% in the year 2030 to finance aging-related additional costs. The second scenario is for the Riester reform, and the third represents the introduction of the sustainability factor and the lower contribution rates associated with it. If the gaps in the pay-as-you-go pension insurance are fully plugged by individual capital formation, this increase in individual private provision will have displacement effects on other forms of household savings. The calibration of the model to the development of household savings between 1970 and 1995 indirectly produces displacement of around one third. In other words, two thirds of the individual private provision induced by the reduction in the replacement rate represents genuine savings which enhance the capital stock in the economy.

Before presenting the results of our macroeconomic simulation model, Inset 2 provides an overview of the important economic indicators such as gross domestic product (GDP) gross national income (GNI, previously gross national product, GNP) and the rate of income growth. The graph illustrates the relationship between these indicators and how they develop in an aging society.

We restrict our presentation to *real* indicators as these represent the measures which are relevant from today's point of view, as emphasised in Section 2.

Inset 2: Macroeconomic indicators

1 **Gross domestic product (GDP):**
Gross domestic product measures the sum of value added created through the production of goods and services within the economy.

2 **Gross national income (GNI)**:
Gross national income measures the sum of income received by residents and thus overall prosperity. Gross national income equals GDP minus primary receipts to the rest of the world, plus primary payments from the rest of the world.

3 **Per capita gross national income:**
This indicator measures how the sum of value added by all domestically-owned factors of production is distributed among the population. In the context of demographic change, this is the most relevant variable as a *measure of people's welfare*. While a shrinking economy produces less income, it also needs to be distributed among fewer people.

4 Factors of production:

The various inputs or resources used in the production of a country's GDP are referred to as *factors of production*: labour, capital, energy, land, etc. Of greatest relevance in the context of demographic change is the ratio between the production factors *labour* and *capital:* as the population ages, the factor labour becomes progressively scarcer relative to the factor capital.

5 Increases in productivity:

Technical progress affects both factors of production over time as – in simple terms – machines (capital) are constantly improving and people are increasingly skilled at using them. Relatively little is known about the way in which the rate of growth of technical progress is affected by an aging society. On the one hand, people's sheer physical powers decline as they get older – on the other, they have more experience at their disposal. As it is unclear which of these two effects is the most important, we assume constant rates of technological progress.

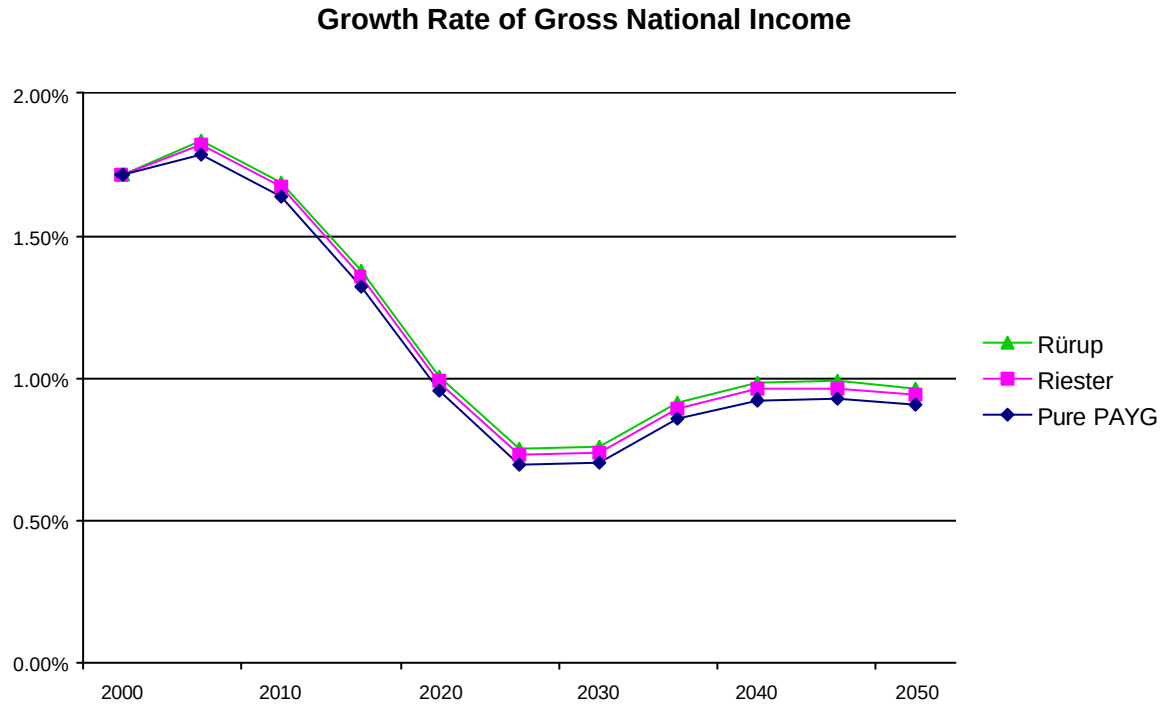
6 Income growth:

As discussed in detail in Section 3, the rate at which the average earnings of the employed labour force grow is an important indicator for the pension insurance system as it has a determining influence on the current pension value and thus of the pension level. Four factors are relevant as far as the development of the rate of income growth in an aging society is concerned: the factors *labour* and *capital, total production* and the influence of *social security contributions* which determine non-wage labour costs. Put more simply, the more a worker produces, the higher the wages he or she receives. In an aging society, the factor labour diminishes in size. As production is still relatively large at the beginning of this process, projected income growth rate is initially higher than today's earnings as the available labour force becomes smaller and smaller but – thanks to the existing capital stock – is still able to produce on a relatively large scale. However, once the baby boom generation starts to consume its savings and there are fewer people to invest corresponding amounts of capital, capital accumulation will begin to decline. This means that production will fall, reducing rates of income growth with it. It is important not to forget the link between the rate of income growth and the rate of growth in per capita GDP or GNI. While the rate at which per capita GDP grows is equal to the rate of growth of total per capita production, rates of income growth are *ceteris paribus* – i.e. if we ignore the influence of social security contributions – equal to the rate of growth of total production per

worker. In an aging society, the total population and the labour force shrinks. The size of the labour force is reduced more substantially than the population as a whole, however, as the percentage of retired people increases of course. This also means that the rates of income growth are less dramatically affected by the aging phenomenon than is the rate of growth in per capita GDP.

Figure 4 begins by outlining the simulated development of the rate of growth of gross national income[13] for a German economy which is open to the other EU countries and in the context of three pension policy scenarios.

Figure 4: Rate of growth of gross national income given free capital mobility within the EU



Source: Own calculations using MEA-OLGA.

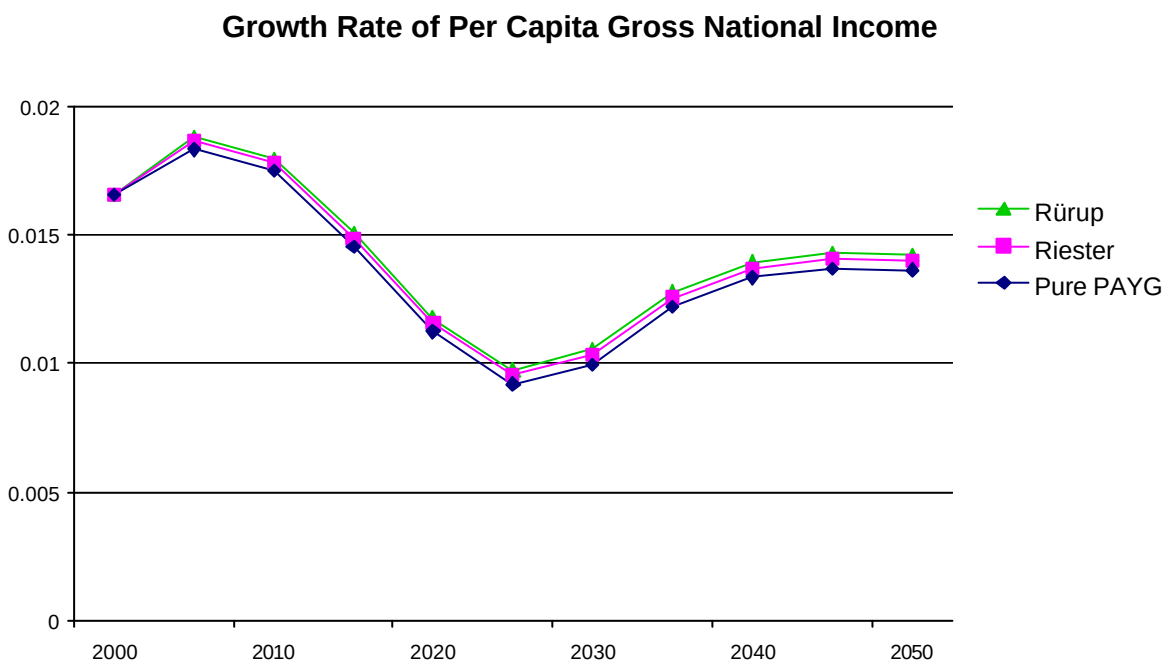
There is a clearly discernible decline in economic growth in an aging society up to around the year 2030. This drop is due to the smaller size of the potential labour force and the lower levels of capital accumulation in an aging society. The analyses presented here also draw on two further channels of growth which are frequently discussed in connection with pension reform in particular, but also in relation to aging societies. On the one hand we here ignore any endogenous response of the labour supply to changed framework conditions. We refer

[13] Previously gross national product.

instead to an exogenous increase in age-specific activity rates produced by longer working lives, an increase in female participation rates, and a drop in unemployment.[14] On the other, we do not take any account of efficiency gains which may be generated by the fillip to capital markets from increased private pension provision. This aspect is discussed by Börsch-Supan and Winter (2001).

As Figure 4 also shows, the model predicts a return to higher rates of growth as of 2030 – although these will still be 0.5 percentage points below the long-term average rate of growth of 1.5 percentage points. Pension insurance reform has only a minor impact on rates of overall economic growth. Lower contribution rates will stimulate slightly higher growth. An increase in the labour supply or strengthening of capital markets induced by pension reform would boost the magnitude of this effect somewhat, although we have neglected this effect, for the reasons referred to above.

Figure 5: Rate of growth of per capita gross national income given free capital mobility within the EU



Source: Own calculations using MEA-OLGA.

For comparative purposes, Figure 5 shows the rate of growth of per capita gross national income. The comparison with Figure 5 clearly shows that this grows substantially faster than gross national income itself in line with the explanation of the dynamics already provided:

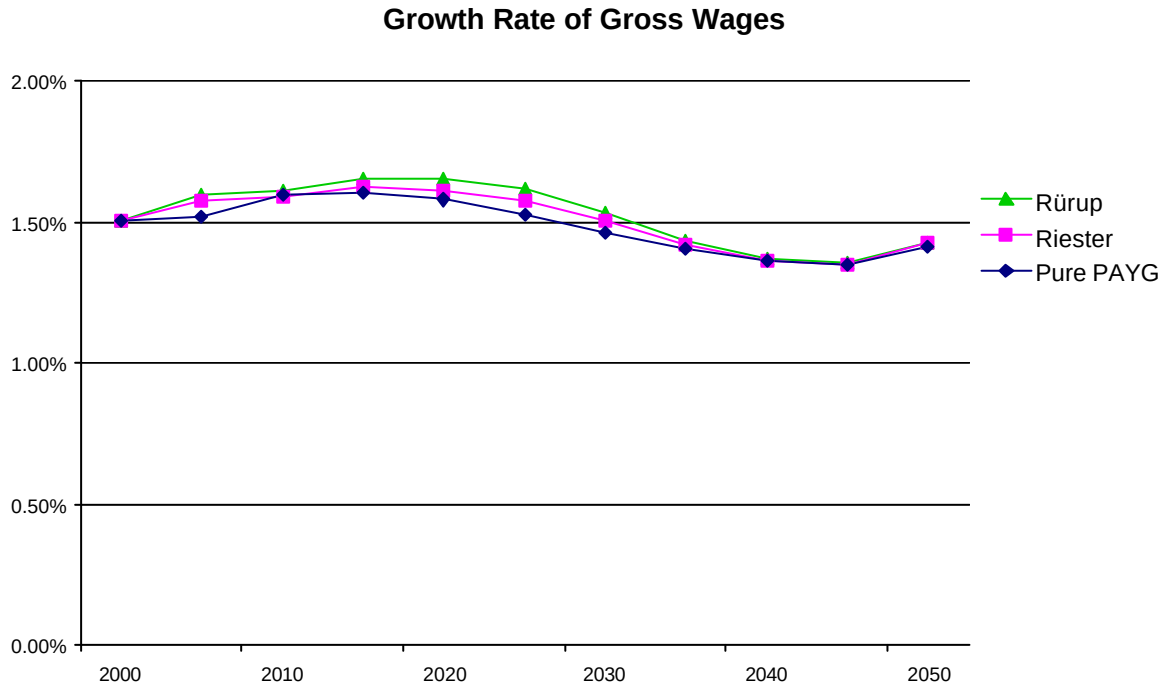
[14] The relevant assumptions are described in Börsch-Supan, Ludwig and Winter (2003). We are currently undertaking research on endogenous factors determining the labour supply.

while total production, and thus total income, falls in an aging society, it also only needs to be distributed among fewer people owing to the dwindling size of the population.

Figure 6 shows the growth rate for gross earnings. As shown above, gross earnings grow faster than per capita income - because the total number of people in an aging society falls. The size of the employed labour force is reduced even more than the size of the population as a whole as the percentage of retired people increases. As a result, total production need only be distributed among fewer people engaged in gainful employment – in other words, the latter earn higher *gross* wages. Average income growth up to the year 2040 will be slightly higher than 1.5 percentage points and thus supports the assumptions made in the previous section.

In order to determine to what extent the assumption of constant rates of growth impact future pensions if rates of growth in fact fluctuate over the long-run, the current pension value has been calculated drawing on the average (constant) rate of growth and the simulated wage trends shown in Figure 6. The difference is marginal. The largest annual deviation between the two values is 3.5 percent. Both current pension values are more or less identical in the target year 2040.

Figure 6: Growth in gross earnings given free capital mobility within the EU

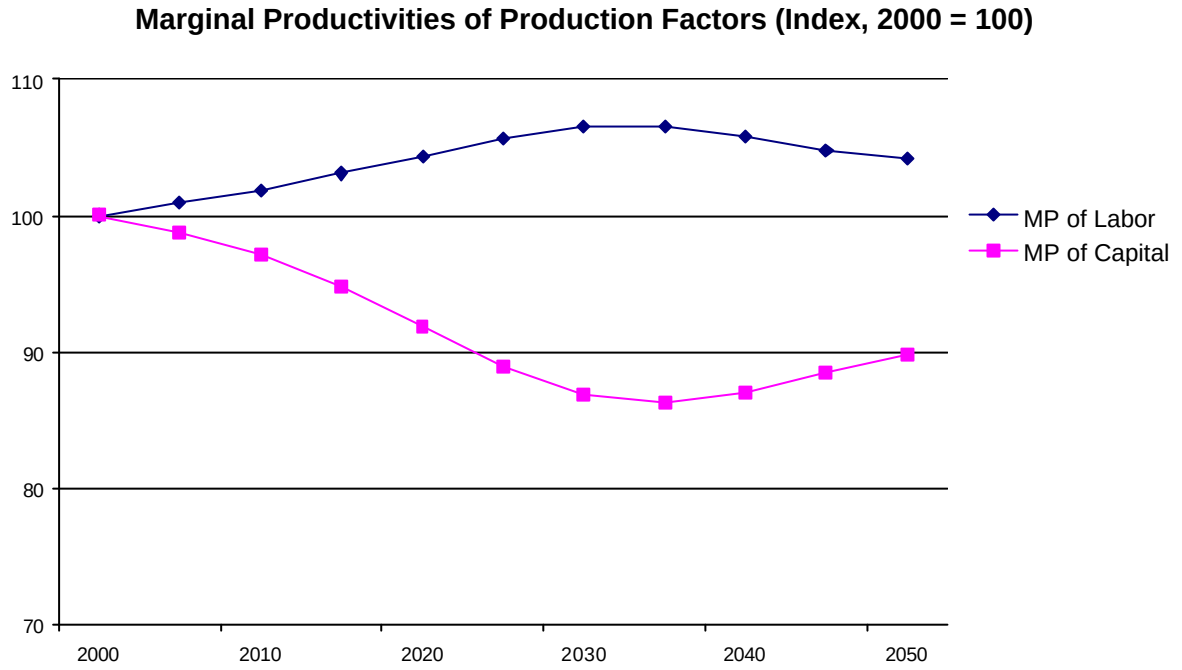


Source: Own calculations using MEA-OLGA.

The fall in rates of income growth may appear surprising at first glance, bearing in mind the relative scarcity of labour in an aging national economy. Account must be taken of the fact

that, while its relative scarcity increases the price of the factor labour in comparison with the factor capital, the rate of income growth nonetheless maps the *change* in this price over time. For the sake of clarity, the relative prices of the factors labour and capital are shown in Figure 7 which maps the marginal products of both.

Figure 7: Marginal product of labour and capital



Note: In order to demonstrate the aging effect, the marginal product of labour shown here is based on exogenous growth in labour productivity. The graph shows projected development following implementation of the "Rürup reform".

Source: Own calculations using MEA-OLGA.

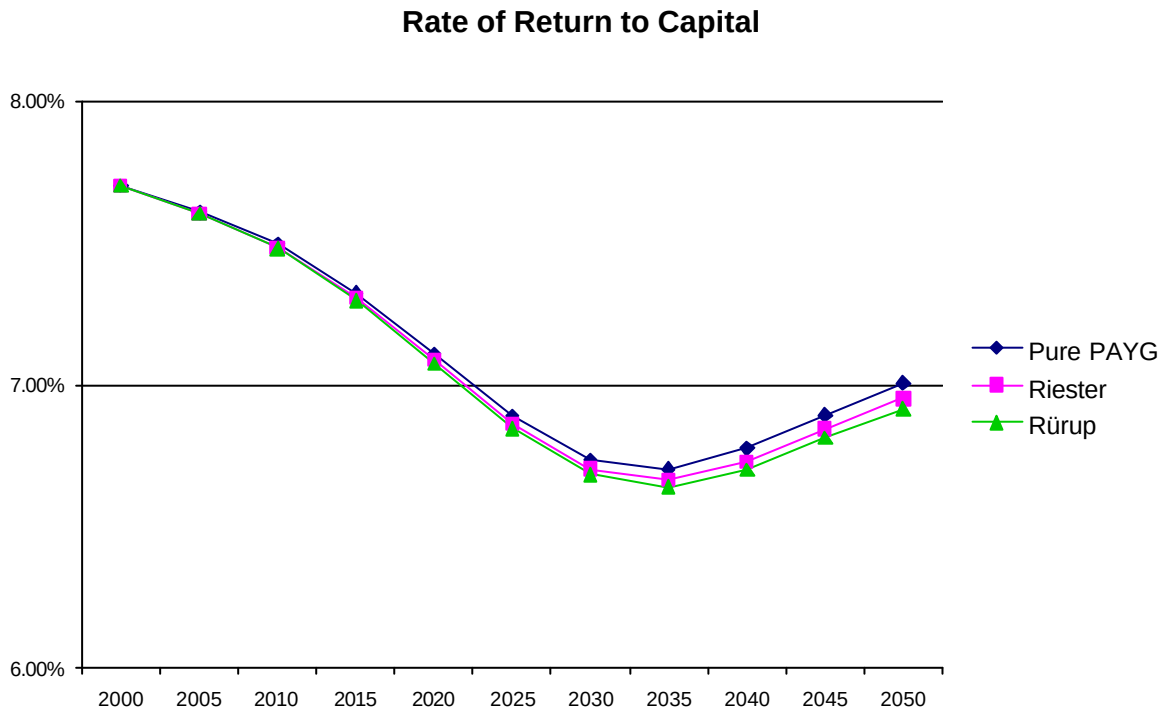
The expected pattern is apparent: as labour becomes relatively scarce and capital relatively plentiful in an aging society, the marginal product of labour increases while that of capital falls up to the year 2040. The increase in the marginal product of labour flattens out over time, however, and this explains the reduction in rate of income growth shown in Figure 6.

We now turn to interest rates. Population aging will have numerous direct and indirect effects on capital markets. Empirical evidence suggests that older people save less than younger people and that overall household savings will fall as a result. This process might accelerate, particularly around the time at which the baby boomers consume their assets, and the resale value of capital investments may collapse as a result ("meltdown hypothesis). On the other hand, the consistent implementation of the Riester reform or other further-reaching reforms of a similar nature might well stimulate household saving. This would further increase the

pressure on current capital returns if the additional financial capital is put to productive use. After all, the aging process is by no means identical across the world. This will bring about shifts in international capital flows as capital basically tends to flow from countries with relatively older populations to those with a relatively young population in which capital returns are higher.

Figure 8 presents the long-term capital returns on total productive capital. This yield includes fixed-interest securities (industrial securities and bonds) as well as shares and direct investments. The basic rate of capital return is calculated in the model and corresponds closely with the empirical values in Börsch-Supan (1999) for the period 1970-1994. In year 1 (2000), the rate of return is approximately 7.7%.

Figure 8: Development of capital returns in an open economy



Source: Own calculations using MEA-OLGA.

Household savings do indeed fall, particularly when the baby boomers enter retirement. While aging has a tangible impact on capital returns the effect is by no means as dramatic as to justify melodramatic warnings of a "meltdown". Germany's integration in international capital markets enables the negative impact of population aging on capital returns to be reduced.

6. Conclusion

Information about future pension expectations provides an important instrument for the successful implementation of the multi-pillar pension system launched in Germany with the Riester reform. This is demonstrated by the positive response to the new pension information scheme introduced by the pension insurance agencies (Stegmann et. al. 2003). People will only be able to rationally plan the additional provision they wish to make for old age if they have reliable information upon which they can base such planning. In order to present the value of projected pension figures in a way which makes imaginative sense to those paying contributions and premiums, it will be necessary – as a minimum – to disclose real values and to take account of price inflation in order to counter the problem of money illusion. From 2005 on, the Federation of German Pension Insurance Institutes (VDR) will take a first important step by displaying the real value of 100 Euros by the time of retirement entry of each insured person in the public pension information. It would, however, be more appropriate to disclose the purchasing power actually required in order to maintain a person's current economic status; this would need to take account of the fact that, in comparison with those in gainful employment, living standard expectations rise as income increases. Alternatively, pensions could be disclosed as a percentage of projected current or last expected earnings.

It is not a simple matter projecting pensions and earnings into the future owing to the long projection periods involved. However, this problem is not entirely avoidable, regardless of the disclosure method used. While there is likely to be agreement that the inflation target of 1.5% of the European Central Bank provides the best assumption for rates of inflation, assumptions relating to the index linking of public pensions, determined mainly by income growth, is less clear cut. Long-term average real income growth of 1.5 percent per annum over the next 25 years is an assumption on which most observers could probably agree. However, this depends on a negligible influence of aging on labour force productivity. As the new pension formula means that, depending on patterns of gainful employment and compared with the Riester reform, pensions will lag behind income growth by around an additional 0.2-0.5 percentage points, nominal rates of growth for the value of pensions of over 2.8 percent would seem to be fairly unrealistic in the long term. This assessment is supported by simulations based on a macroeconomic model according to which population aging in Germany will be accompanied by lower rates of economic growth than in the past. Nonetheless, these simulation results also show that – despite these unfavourable circumstances – the long-run annual growth of average earnings will be at about 1.5 percentage points in real terms. The simulation model

also shows that funded pillars of pension provision in Germany are not threatened by a crash in capital returns as a result of an “asset meltdown”.

As the second and third pillars of old-age pension provision are intended to compensate for the lower pension level in the future, it is also extremely important that the information in the pension projections for each of these pillars is presented in comparable form. Those paying contributions and premiums must be given an overview of *all* their future pension entitlements to enable them to identify gaps in provision and to take commensurate action to deal with such shortfalls. One relatively simple solution proposed here is to include a table in the public pension information. This table could be used to enter people’s benefit entitlements from the public pension system, and from occupational and private pension insurance schemes. An example is given in Figure 9. This does, of course, depend on the agencies responsible for each of the pillars agreeing on uniform rules regarding the form of data (nominal, real, adjusted for growth) and the other parameters – such as age of retirement - needed in order to compare the various sources of income.

In order to inform contributors about just how negative an effect early retirement can have on the level of pensions they receive, the pension information should disclose the amount of pension payable at the earliest possible age of retirement as well as at the normal age of retirement. As pension projections should not be loaded down with too many scenarios illustrating potential future developments, it would also be conceivable to offer supplementary programmes, downloadable from the internet, which could be used by those interested in more information to run through the various alternatives.

Figure 9: Pension information in the multi-pillar model

The pension which you can expect to receive from the public pension system has already been entered in the following table. In order to obtain a picture of all the retirement pension payments and benefits to which you will be entitled, you should enter the pension payments you expect to receive from your private and occupational pension schemes.

If I retire at the age of 65 I expect to receive a...	Pension from the public retirement insurance system	Pension from a private pension scheme ("Riester pension" or similar)	Pension from an occupational pension scheme	Total pension
Monthly payments at today's purchasing power (real, i.e. future price inflation of 1.5% excluded)				
Monthly payments in euros in the year in which you retire (nominal, i.e. no account has been taken of depreciation due to future inflation)				
Monthly payments in euros, measured according to the disposable income of people working at the time				
If I retire at the age of 63 I expect to receive a monthly payment of .... euros measured according to the disposable income of people working at the time.				

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