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ABSTRACT

The central issues when assessing a pension system are the adequacy of pensions and the financial sustainability. In 2004, the Finnish Centre for Pensions published a calculation of the long-term outlook for pension expenditure and pension contributions. This report outlines the future development of the level of earnings-related pensions, mainly that of the old-age pensions.

The future economic development is crucial from the point of view of the evolution of the real value of pensions. In the light of the assumptions fairly generally used in long-term forecasts, the real value of the earnings-related pensions will increase by 50 per cent over the next 20 years and double by the year 2050.

Working careers of 32 to 36 give the average gross replacement rates (pension/wage before pension) for persons born in 1945 and retiring at the age of 63 will be 46 per cent. For those retiring at the age of 65, the replacement rate is over 55 per cent. The net replacement rates are 7 to 9 percentage points higher. In the long term, these replacement rates will decrease somewhat.

The average earnings-related pension for the recipients of an earnings-related pension will increase in relation to the wage level over the next 10 to 15 years. The ratio of pensions to wages will start decreasing as of the 2020s and it will be at approximately the same level as it currently is in the 2040s. The slight decrease continues after 2040. This is directly affected by the life-expectancy coefficient which reduces old-age pensions, if the life expectancy at the age of 62 continues to grow.

The report includes sensitivity analyses of the results referred above.

ABSTRAKTI

Eläkkeiden riittävyys ja eläkejärjestelmän taloudellinen kestävyys ovat eläkejärjestelmän arvioinnin ydinkysymyksiä. Vuonna 2004 Eläketurvakeskus julkaisi laskelman työeläkemenojen ja -maksujen pitkän aikavälin kehitysnäkymistä. Nyt käsillä olevassa raportissa hahmotetaan työeläkkeiden, lähinnä vanhuuseläkkeiden tason tulevaa kehitystä.

Tuleva talouskehitys on ratkaiseva eläkkeiden reaaliarvon kehityksen kannalta. Pitkän aikavälin ennusteissa varsin yleisesti käytettyjen oletusten valossa työeläkkeiden reaaliarvo nousee 50 prosenttia seuraavan 20 vuoden aikana ja kaksinkertaistuu vuoteen 2050 mennessä.

32–36 vuoden mittaisten työurien jälkeen eläkkeiden korvausasteet (eläke/eläkettä edeltävä ansio) vuonna 1945 syntyneellä vaihtelevat keskimäärin 46 prosentin (63-vuotiaana eläkkeelle siirtyneet) ja 55 prosentin (65-vuotiaana eläkkeelle siirtyneet) välillä. Nettokorvausasteet ovat 7–9 prosenttiyksikköä korkeampia. Korvausasteet pysyvät likimain entisellään aina vuonna 1960 syntyneeseen kohorttiin saakka, jonka jälkeen ne alenevat.

Keskimääräinen työeläke suhteessa palkkatasoon nousee seuraavat 10–15 vuotta ja alkaa laskea 2020-luvulta lähtien. 2040-luvulla se on suunnilleen samalla tasolla kuin nykyisin, mutta alenee edelleen vuoteen 2050.

Korvausasteiden ja suhteellisen eläketason loivaan alentumiseen pitkällä aikavälillä vaikuttaa keskeisesti elinaikakerroin, joka tultuaan voimaan pienentää kaikkien 63 vuotta täyttävien työeläkkeitä, jos vanhuuseläkeikäisen väestön elinajan odote jatkaa kasvuaan.

Raportissa on kuvattu myös sitä, miten tulokset muuttuvat, kun tulevaisuutta koskevia oletuksia vaihdellaan.

TO THE READER

When assessing a pension system, the central issues are the adequacy of pensions and the financial sustainability. This report outlines the future development of the level of earnings-related pensions. What does the future of pension levels look like? In 2004, the Finnish Centre for Pensions published a calculation of the long-term outlook for the pension expenditure and pension contributions until the year 2075 (Translated into English in 2005, Biström, Klaavo, Risku and Sihvonen 2005). That calculation contributes to the discussion on the financial sustainability of the Finnish pension system.

The purpose of this report is to assess the long-term development of the adequacy of pension provision. This analysis uses three different approaches. Firstly, by utilizing the long-term planning model of the Finnish Centre for Pensions (PTS calculation), we will present calculations of the development of the average pension levels which are congruent with the development of pension expenditure and contributions. Secondly, by using data in the registers of the Finnish Centre for Pensions and the pension providers on the actual working careers of insured persons, we will calculate future pension levels. Thirdly, we have calculated the pension levels for the example cases which have been agreed on in connection with the European Union work on pension policy.

Pension levels are examined from three points of view: the evolution of the real value of pensions, the level of pensions in relation to previous income (*replacement rate*) and their relation to the general earnings levels (*relative level of pensions*).

This report focuses on old-age pensions, although it also briefly examines early retirement and survivors' pensions. The main focus is on earnings-related pensions, but national pensions are also included in the evaluations. We will take into account only compulsory and statutory pensions (first pillar pensions) – or to use OECD (2005) terminology, first-tier, redistributive pensions and second-

tier, mandatory insurance pensions. The second-pillar pensions have only a marginal significance in Finland.[1]

While the authors are responsible for their respective chapters, the structure and contents of this report have been agreed on jointly.

Jukka Lampi and Heidi Nyman have helped in compiling the statistics presented in Chapter 1. Peter Biström has made calculations to Chapter 2. Christina Lindell and Seija Ilmakunnas have made several suggestions for improvements. The report was translated and proofread by Janina Gröndahl and Kathleen Moore. Merja Raunis has prepared the report for publication.

Helsinki 15.1.2006

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[1] For a description of the Finnish pension schemes, see Marjukka Hietaniemi and Mika Vidlund (eds.): The Finnish Pension System.

EXECUTIVE SUMMARY

This report focuses on the long-term development of earnings-related pensions in Finland. The aim is to answer the following three questions: How does the real value of pensions develop, what happens to their replacement rates and how do pensions develop in relation to earnings? These questions are analyzed by using three different data and calculations. Firstly, the long-term planning model of the Finnish Centre for Pensions is used to produce calculations which are consistent with the estimate of pension expenditure and financing. Secondly, information on real careers and employment incomes of the insured population are used to estimate future pension levels. Thirdly, calculations are presented of the pension levels based on the example cases agreed on in connection with the European Union work on pension policy.

Economic growth increases the real value of pensions

Future economic growth is decisive for the real value of pensions. The calculations based on the long-term planning model of pension expenditure and contributions assume that the annual real growth rate of wages is 1.75 per cent. Since the level of earnings-related pensions are linked to the earnings level, wage improvements lead to improvements in pensions. The calculations imply that the real value of earnings-related pensions increases by 50 per cent in the next twenty years. By 2050, this real value doubles. If earnings accrue less value than assumed in the basic scenario, the real growth of pensions will likewise be slower, and vice versa.

The calculations based on individual career data produce similar results. A person born in 1980 can expect to receive a pension which is, on average, 60 per cent higher than the pension of a person born in 1945.

The replacement rate increases in the next 10–15 years and starts to decrease thereafter

Calculations using individual-level data are based on careers that span 32–36 years. The gross replacement rates are more than 46 per cent for those who take

the pension at the age of 63 and are more than 55 per cent for those who take the pension at the age of 65. The net replacement rates are from 7 to 9 percentage points higher than the gross rates. For the calculations based on example careers, the replacement rates increase from the cohort born in 1940 to the cohort born in 1945. After that, the life expectancy coefficient (a technique which was adapted in the 2005 pension reform to adjust pension expenditure to a longer life expectancy) starts to lower the replacement rates. Example calculations show that lengthening work careers has a considerable impact on the replacement rate. For example, the replacement level can increase 14 percentage points if a person does not take his or her pension at the age of 63 but continues to work five more years.

The relative pension level increases in the next 10–15 years and starts to decrease thereafter

The third window through which we can examine the adequacy of pensions is to relate pensions to average earnings. In this case we talk about the relative pension level.

The average old-age pension for 2003 was about 48 per cent of the average earnings level. If calculated on a net basis, the percentage is 55. These figures refer to the stock of old-age pensions. New old-age pensions are higher in relation to average earnings, close to 60 per cent.

Calculations based on the long-term planning model indicate that the relative earnings-related pension increases over the next 10 to 15 years. This is due to the maturation of the pension scheme. As a result, the relative pension level will start to decrease in the 2020s, and in the 2040s it will be roughly at the same level as it is now. The relative pension level of new old-age pensions (inflow) will remain at the current level in the next ten years or so, after which it will start to decrease. Calculations based on individual earnings careers also display similar developments over time. The relative pension levels of younger cohorts decrease from the level of those cohorts which are retiring now, or do so in a few years.

The results depend on the assumptions we make on population and economic forecasts. Some sensitivity analyses were carried out so as to better understand

the significance of these assumptions. The population development can deviate from the baseline scenario for fertility, migration and mortality. The first two of these factors have an impact on contributions, but not on pension levels. In contrast, the development of mortality has a relatively minor effect on contributions but a major effect on relative pension levels, because the life expectancy coefficient adjusts the old-age and survivors' pensions to the changes in life expectancy. In the short term, changes in employment rates do not have an impact on the relative pension levels, but their impact on the contributions is significant. In the long term, employment rates are important for the relative pension levels, not so much for the contributions. The increase of the growth rate of the earnings level from the baseline assumption lowers contributions to some extent, and improves the real value of pensions greatly. Nevertheless, the relative pension level remains lower if earnings develop faster. Investment yields have a significant impact on contributions, but only a minor impact on the pension levels.

Pension policy implications of the results

This report attempts to calculate the size of pensions that Finns can expect in the future. The sensitivity analyses also help to describe the impact of other developments than those used in the basic scenario.

The ageing population in Finland has raised two kinds of concerns for decision-makers and for the Finnish population in general. The first concern has been whether there will be enough money and enough contributors to finance pensions. In 2004, the Finnish Centre for Pensions contributed to this debate by publishing a report on the long-term developments in pension expenditure and contributions. The results showed that while the expenditure grows considerably, the contributions grow more modestly.

Another public concern has been the adequacy of pension levels. This report contributes to that discussion. However, the results of these calculations cannot be described as dramatic. Perhaps the more accurate expression is that the emerging picture is reassuring.

In the long term the real value of pensions increases depending on the development in earnings. The replacement rates improve for a further decade or

so, after which a modest decline is likely. The relative pension levels display a similar pattern.

The long-term decline in the replacement rates and relative pension levels can be attributed mainly to the life expectancy coefficient, which is expected to lower the new old-age pensions. The effect of this coefficient can be compensated for by using a part, roughly one-half, of the increased life expectancy to work. The other half thus increases the number of years in retirement.

CONTENTS

Hannu Uusitalo

1 Introduction

Central issues when assessing a pension system are its financial sustainability and the adequacy of pensions (see Joint report by the Commission and the Council on adequate and sustainable pensions, 2003). In 2004, the Finnish Centre for Pensions published a calculation of the long-term outlook for pension expenditure and pension contributions which gives substance to the discussion regarding the sustainability of the Finnish pension system (Biström et al. 2005). This report focuses on the future of pension levels.

1.1 Different ways of relating pension levels

The adequacy of pensions is always relative to something, and this something may vary. This report examines pension levels from three different angles: how they are anticipated to develop first, in relation to prices (*real value*), and second, in relation to earnings prior to retirement (*replacement rates*), and third, in relation to economy-wide average earnings (*relative pension levels*).

Adjustment to inflation: real value of pensions

One way to look at the development of pension levels is to take inflation into account and in this way describe the real value of pensions.

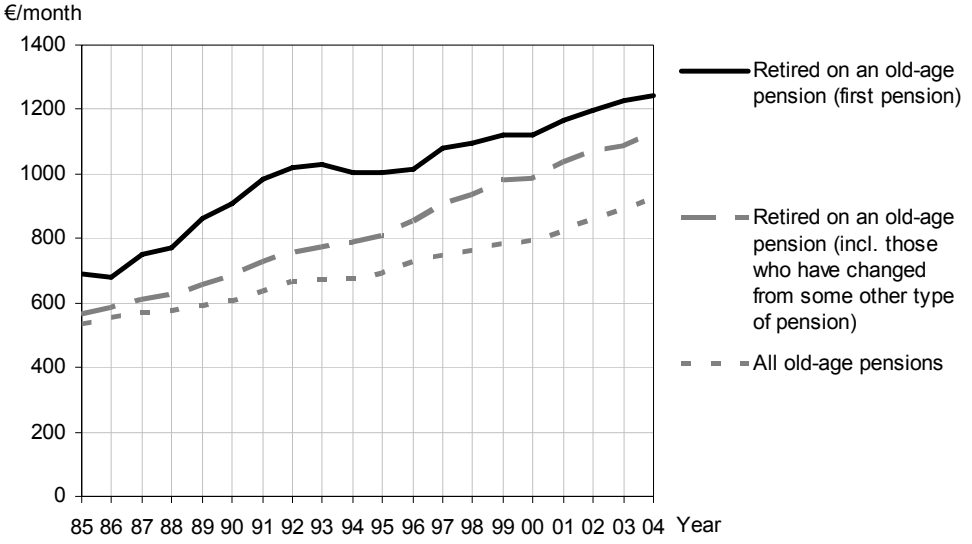
Figure 1.1 describes how the average earnings-related pension has developed over the last twenty years in terms of 2004 prices. The real value of new old-age pensions (i.e. pensions that are paid for the first time in that year, inflow) is now twice its value in the mid-1980s. Moreover, the level of all old-age pensions (stock) is 70 per cent higher than twenty years ago. The main reasons for this improvement are economic growth, the gradual maturation of the earnings-related pension schemes established in the 1960s and the earnings-related pension index, which links pension increases to the earnings index.

In addition, the figure shows that new old-age pensions are higher than the average pension of all old-age pensioners, and this difference has increased in

twenty years. Thirdly, we notice that the pensions of those who have retired directly on an old-age pension are, on average, higher than the pensions of retirees who have had an early retirement pension before drawing their old-age pension.

This figure does not include national pensions. The pension level including national pensions would be considerably higher, but, on the other hand, the real growth of pension levels would be smaller.

Figure 1.1. *The average old-age pension (public-sector and private-sector earnings-related pensions) in 1985–2004 at 2004 prices.*



This report describes how the time series of Figure 1.1 possibly develops in the years ahead. The main focus of this report is on new old-age pensions, but it also includes calculations concerning all old-age pensions (stock).

Change of income level in retirement: replacement rates

Our second window to the adequacy of pension levels is what happens to the income level when one retires. The goal of the Finnish earnings-related pension scheme has been generally defined so that the pension should moderately secure

such an economic welfare that one enjoyed prior to retirement. The ratio of the pension to prior earnings is the replacement rate.

There are many alternatives for defining the replacement rate operationally. For example, this rate can be calculated on the basis of gross or net (after direct taxes) incomes. From the viewpoint of economic welfare, the latter way seems more justified, but when replacement rates are calculated far into the future, assumptions regarding the development of taxation bring new uncertainties into the calculations. Another important issue is the length of the period of calculating pre-retirement earnings. Choices range from one year to an individual's whole career. The results thus depend on the choices made. The replacement rates in this report are calculated in several ways, all of which aim to be true to the idea that the measure should try to get a grasp of the change in income that takes place in retirement.

For the calculations based on real individual earnings careers (Chapter 3), the replacement rates are calculated by relating pensions to the average earnings of the three years before retirement. Here both gross and net replacement rates are calculated. Replacement rates based on the earnings of the whole career are found in the appendix of this report.

The pension policy co-operation of the European Union stipulates that replacement rates will be calculated for certain example careers by using the earnings of one year before retirement. Such gross and net replacement rates are reported in Chapter 4.

Earlier research on the relation of incomes before and after retirement

Accurate information on realized replacement rates is scarce, because, to calculate these rates, we need data on individual incomes over time. Such data is rarely available and therefore, for example, the OECD calculates quasi-replacement rates for different countries, defined as the ratio of the incomes of those who have retired to the incomes of those who are 55–64 years of age (OECD 2001). In Finland, Tiina Mäkinen (2002) has made international comparisons by using the Luxembourg Income Study as the basis for calculating these quasi-replacement rates.

In Finland, Juha Rantala has studied changes in income by using the real income data of individuals before and after retirement. He defined the income ratio as follows: gross pension / (gross earnings + gross unemployment benefit). He studied the incomes of those who took an earnings-related pension in 1996–97 on the basis of a large sample. Rantala excluded formerly self-employed people as well as wage earners who had very disjointed careers, which formed one-third of the original sample. The data was limited to those 48 years of age or older, so that the study does not represent those who have changed to a disability pension before that age. These operational definitions of the study sample are likely to raise the resulting replacement rates.

The results show that income ratios for old-age and disability pensions are very similar. The gross old-age pension was on average 65–67 per cent of the income prior to retirement. For disability pensions, the corresponding figure was 63–65 per cent. In the case of unemployment pensions, the income ratio was much higher, on average 116 per cent. This pension is considerably higher than unemployment benefits in most cases.

Table 1.1 summarizes the results by Rantala. Public-sector pensions provide higher income ratios than private-sector pensions: the medians are 68 and 60 per cent, respectively. For one half of those who have retired from the private sector, the income ratios are between 55 and 66 per cent, while for those who have retired from the public sector the corresponding range is 63–71 per cent. For one-tenth of the retired, the income ratio was less than 50 per cent.[2] These income ratios are quite high, and they are partly explained by the selection of the research material. Other contributing factors are the effect of national pensions, which raises the income ratios of those with small earnings, and the fact that the pension is related to the person's earnings during the last year in the labour force.

[2] Rantala excluded persons who get simultaneously pension income and other income as well as those for whom earnings could not be calculated because of an atypical career. His data describes replacement rates of people who have had a relatively normal career.

Table 1.1. *The ratio of gross pension to the income prior to retirement for those who retired in 1996–97 (%).*

Those whose income ratio belonged to:	Old-age and disability pension		Unemployment pension
	Private sector	Public sector	
Highest 10%	73	75	150
Highest 25%	66	71	127
Median / Mean	60 / 62	68 / 68	109 / 116
Lowest 25%	55	63	96
Lowest 10%	50	53	85

Source: Rantala 2003, 98–102.

Pensions in relation to earnings: Relative pension level

Our third window to the adequacy of pension levels is to calculate the relation of pensions to average earnings. We find that relative pension levels have risen clearly in the past twenty years. The relative old-age pension level (stock) has increased from 34 to 40 per cent of average earnings. In the case of new old-age pensions (inflow), the increase has been from 36 to 49 per cent. For those who have moved directly from work to an old-age pension, the relative pension level was 55 per cent in 2004.

Figure 1.2 presents the development of the relative gross earnings-related pension levels and as such provides too modest a view of the relative pension level. When national pensions and survivors' pensions as well as the effects of direct taxation are taken into account, the relative pension levels are much higher. This is seen in Table 1.2.

Figure 1.2. *Average old-age pension (a person's earnings-related pension from the private and the public sector, excluding survivors' pension) in 1985–2004, per cent of the average earnings of the year (gross).*[3]

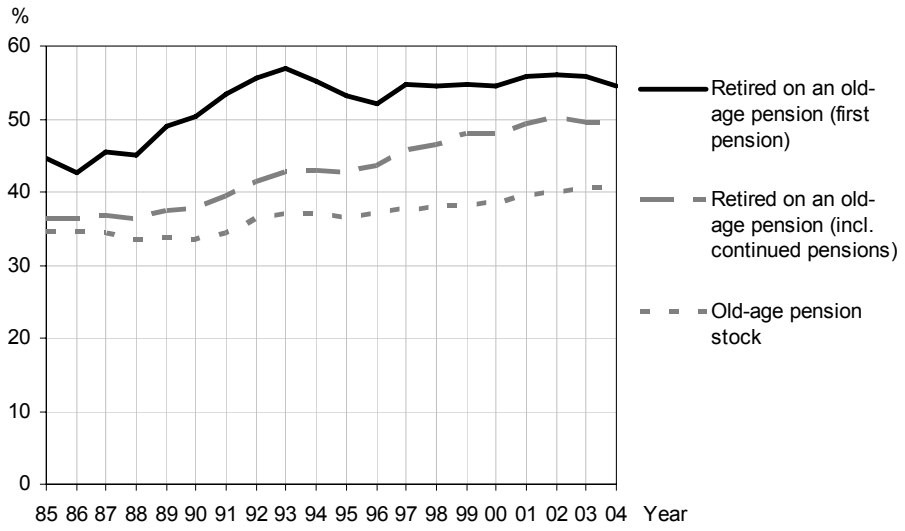


Table 1.2. *Relative pension level in 2004.*[4]

	Gross	**Net**
Total old-age pension (earnings-related pension + national pension, own + survivors' pension), % of average earnings	50.2	57.7
Only earnings-related pension	40.4	(50.1)
New earnings-related old-age pensions (inflow), % of average earnings	49.4	(57.0)
New earnings-related old-age pensions (inflow), % of average earnings (old-age pension is the first pension)	54.6	(60.9)

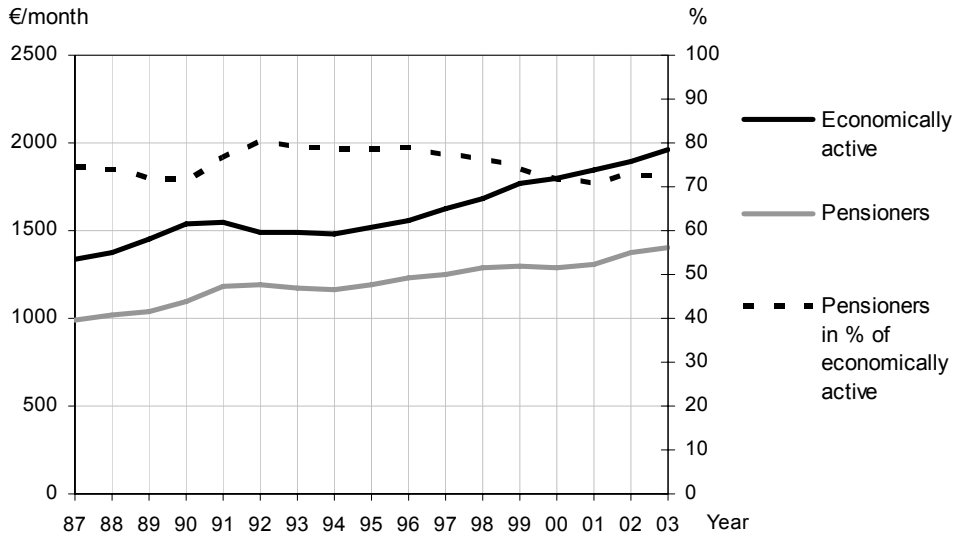
[3] Average earnings refer to the average of wages and salaries and income from self-employment of the economically active population in 2003. (2201 €/month, source: Income Distribution Statistics 2003, p. 78). This has been calculated back- and forwards by using a wage index.

[4] Net figures in parentheses are calculated by assuming that the earnings-related pension is the only pension.

When national pensions and survivors' pensions are taken into account, the total old-age pension is about 50 per cent of average earnings. Calculated on a net basis, this increases to 58 per cent. New relative pensions are higher.

Even the net relative pension levels reported in Table 1.2 provide too modest a view of the economic welfare of pensioner households. Firstly, they also get other income transfers more than economically active households. Secondly, pensioner households are smaller that economically active households, which means that they can achieve the same consumption level with less income than economically active households. Thirdly, the risk of unemployment exists only for the economically active, and when realized, it has an impact on their incomes.

Figure 1.3. *The average equivalent disposable income of economically active and pensioner households per month for 1987–2003, 2003 prices (left axis), and the relative equivalent disposable income level of pensioner households as a % of the relative disposable income level of economically active households (right axis).*



Source: Statistics Finland, time series of income distribution statistics.

Figure 1.3 shows the relation of the equivalent disposable income of pensioner households and the economically active households in 1987–2003. The equivalent disposable income is defined as follows: first, incomes (wages and salaries, income from self-employment and property + received income transfers – direct taxes) of all household members are added together. This sum is then divided by the number of consumption units in the household, in order to make comparable the incomes of households having a varying number of members and different structures. To evaluate this, the OECD modified equivalence scale has been used. On this scale, the first adult has the value of 1, all children under 14 years of age have the value of 0.3 and other members have the value of 0.5. Consequently, a family of two adults and two children under 14 years of age should have an income 2.1 times higher than a one-person household in order to achieve the same level of economic welfare.

Over the 16 years observed in Figure 1.3, the equivalent income of pensioner households has increased by more than 40 per cent, somewhat less than that for the economically active households. The relative equivalent disposable income of pensioner households has varied between 71–80 per cent. During the severe economic recession in the early 1990s this percentage was at its highest, which was due to the drop of the incomes of the economically active population caused mainly by unemployment. After the recession, the equivalent income of economically active households has risen more than that of pensioner households.[5]

This report describes the development of (new) old-age pensions in relation to average earnings in the long term. However, the future development of equivalent incomes is not in focus. It is important to keep in mind that the relative equivalent income of pensioner households is higher than the relative pension level, which is the topic of this report.

[5] The income concept used includes some non-monetary items, the most significant of which is the imputed income based on living in a dwelling owned by the household. Pensioner households own their dwellings more often than others. If we look at cash incomes only, the gap of relative income levels is greater than revealed by Figure 1.3. In a broader comparison of economic welfare, differing consumption patterns and the use of public services should also be taken into account.

1.2 The contents of the report

Chapter 2 presents the calculations of the development in pension levels based on the long-term planning model of the Finnish Centre for Pensions. The result is a calculation which is consistent with the estimate of pension expenditure and financing. In addition to the baseline scenario, sensitivity analyses reveal how the picture of the pension level development changes when assumptions regarding the future are changed.

Chapter 3 utilizes the information on real careers and employment incomes of the insured population by using the registers of the Finnish Centre for Pensions and pension providers. By using some assumptions, these careers are continued into the future. On the basis of this data, their pension levels can then be calculated by using the adequate pension legislation.

Chapter 4 presents calculations of the pension levels based on the example cases as stipulated by the European Union work on pension policy.

These three data are different, and the emerging pictures cannot be directly compared. Together, they outline the long-term development of the pension levels in Finland.

Ismo Risku

2 Development of average pensions and pension expenditures

Projections of the pension benefit levels have attracted much less attention than those of the pension contributions or the expenditures. However, the benefits are firmly linked to the pension expenditure, since the pension income equals the pension expenditure. The long-term projections of the Finnish Centre for Pensions have typically analyzed the future of pension expenditures, contributions and funds with a minor emphasis given to the benefit levels. Lassila and Valkonen (2005) analyse the 2005 pension reform in terms of pension expenditures, contributions and benefits. The focus is, however, on the life-time contributions and life-time pension income of the different cohorts, not on the level of pensions per se.

The aim of this chapter is to show, what the pension benefit level is as implied by the latest long-term pension expenditure projection of the FCP (Biström et al., 2005). The results describe the development of the mandatory earnings-related pension scheme. National pensions and voluntary pension arrangements are excluded from this analysis. Section 2.1 contains a description of the projection model and Section 2.2 presents a discussion of the results of the expenditure projection. The projections of the numbers of the pension beneficiaries and the average pensions are found in the section 2.3. Section 2.4 contains the sensitivity analyses and the Section 2.5 concludes.

2.1 The projection model

The results below have been calculated by the long-term calculation model of the Finnish Centre for Pensions. This model is deterministic and replicates the functioning of the earnings-related pension scheme. This model makes it possible to make calculations to meet the planning and forecasting needs of the statutory earnings-related pension scheme. Typically the model is used to project pension expenditures, contributions and funds far into the future. In addition, the

number of pensions and the levels of average pensions can be obtained using this model. Unfortunately, this is not enough when considering the benefit level per pensioner. More than one pension may be paid to one pensioner. For this reason, a new module projecting the number of the pension beneficiaries was included in this model. The projection of the beneficiaries is consistent with the population projection and pension incidences of the expenditure model. The calculation of the number of the beneficiaries is explained below. For further reference, the projection model is described in Biström et al. (2005).

The ratio of the pension expenditure to the wage sum can be expressed as a product of the relative pension level and as a ratio of the pensioners to the employees as follows:

$$\frac{Pension\,expenditure}{Wage\,sum} = \frac{Average\ pension}{Average\ wage} \times \frac{Pensioners}{Employees}.$$

As noted above, the expenditure projection is based on the number of pensions, not the number of pensioners. Consequently the equation is not included to the expenditure model. The pension expenditure, wage sum, average wage and number of employees can be directly obtained from the expenditure projection. The number of the pensioners must then be calculated separately. When this number is known, the average pension can also be determined from the equation.

Recipients of pensions in their own right

An earnings-related pension may be due to own employment history of an insured (i.e. a pension in own right) or it may be due to spouse's or parent's employment history (i.e. survivor's or orphan's pension).

Let us first consider the number of recipients of pensions in their own right. A starting point is the population forecast which was used in the expenditure projection. Based on this population forecast, a forecast of the insured population[6] is calculated as follows: For those under 55 years old the ratio of

[6] The insured population includes gainfully employed, pensioners and persons with previous employment history, but without current employment or pension. The latter group will be called previously employed.

insured population to the whole population remains at the current level in each age group through whole projection period. Those aged 55 years or more maintain their status as an insured or not insured person for the rest of their lives. The population forecast is decisive; 98 per cent of the future cohorts will be insured when they reach the age of 55.

Next the forecast of the insured population must be divided into three parts: the gainfully employed, previously employed and pensioners. The forecast of the gainfully employed persons is obtained from the expenditure projection. What remains, is to separate pensioners and previously employed from each other. This task is solved by means of the transition probabilities[7] of the expenditure model.

All pension recipients

The number of all the pension recipients is the sum of the recipients of the pension in their own right, the recipients of the orphan's pension and those recipients of surviving spouse's pension who are not recipients of the pension in their own right. The forecast of the recipients of the orphan's and surviving spouse's pensions are calculated by means of the population forecast and the relevant transition probabilities from the expenditure model. In the future the number of the recipients of survivors' pension without a pension in their own right will be relatively small, since the labour market participation among women is high, earnings-related pension scheme is comprehensive and most of the survivors have already reached age to draw an old age pension.

2.2 Pension expenditures

The expenditure projection is essentially identical with that reported by Biström et al (2005) with some differences being due to updates, see below. This section contains a short description of the expenditure projection model. More details can found from Biström et al. (2005).

[7] The expenditure projection contains transition probabilities to the pension and from the pension.

The expenditure model requires the following data, specified by the pension act, age and gender of the insured, as a description of the initial state of the scheme:

1) Population divided into the different pension acts and within acts to the states
2) Wages/salaries of the insured
3) Amounts of pension accruals
4) Technical provisions and amount of pension assets
5) Amounts of pensions payable
6) Transition probabilities between different states, especially starting pensions

The most relevant updated data is the amounts of pension accruals of the TEL-insured population. The previous projection was prepaid in 2004, but due to the pension reform of 2005 lots of relevant data concerning the amounts of the pension accruals became available during 2005 or will became available within a few years.[8] In addition, the numbers of insured, wages as well as amounts of pensions payable were updated.

The assumptions concerning the projection period are the same as those reported in Biström et al (2005):

1) Population forecast from the Statistics Finland 2004.
2) Employment forecast according to the Table 2.1.
3) Change in effective retirement age according to the Table 2.1.
4) Growth in earnings level of 1.75 per cent per year.
5) Yield on pension assets of 3.5 per cent per year.
6) Technical interest rate at 3.3 per cent per year.

[8] According to the old legislation, which was in force until 31.12.2004, the amount of pension accrual in each employment relation could be calculated only after termination of the employment (final salary). A part of the reform was a termination of the employment relations 31.12.2004 in the sense of pension accruals.

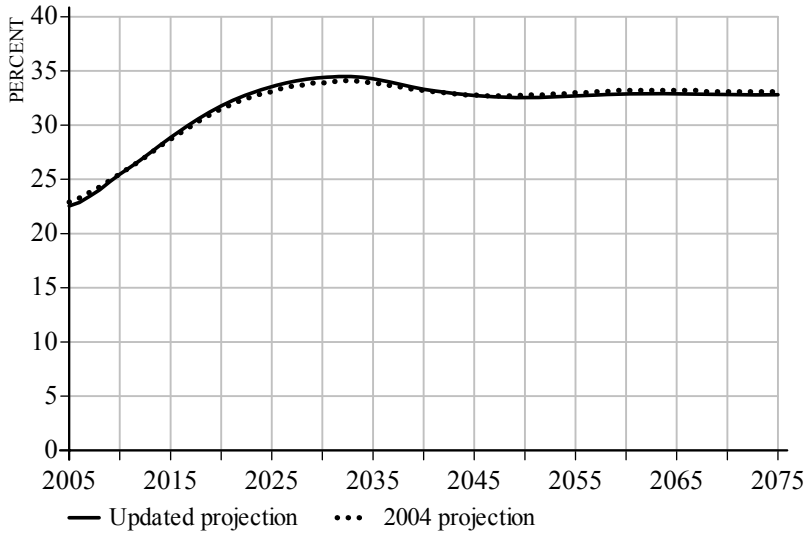
The age structure of the insured population and pensioners in the updated pension expenditure projection has received more attention than in Biström et al. (2005). Details of the age structure are relatively unimportant when yearly pension expenditures or contributions are at stake. The situation changes, however, when the focus is shifted to benefit levels disaggregated by year of birth.

Table 2.1. *Employment and unemployment rates and change in the effective retirement age for employees in the baseline scenario.*

Year	2005	2010	2015	2025	2050	2075
Employment rate	67.4	68.8	69.4	70.1	71.8	71.9
Unemployment rate	10.8	8.2	7.1	7.1	7.1	7.0
Change in effective retirement age	0	0.7	1.2	2.0	3.0	3.0

It is worth noting that the employment rate, as well as the effective retirement age, are assumed to increase 2.7 percentage points and 2 years respectively until 2025. Between 2025 and 2050, the change is slower (1.7 percentage points and 1 year) and after 2050, the employment rate and the effective retirement ages are constant.

Figure 2.1. *Pension expenditure as a percentage of earned income.*



The updated expenditure projection is essentially the same as the Biström et al. (2005) projection. The earnings-related pension expenditure as a percentage of earned income rises from the current 23 per cent approximately 12 percentage points until early 2030s. After that, the expenditure percentage decreases slightly. In the near future, the expenditure percentage will be somewhat lower than reported in Biström (2005). But in 2020–2030 the difference reverses. This is due to new data on the amounts of pension accruals. In the long run the updated projection shows a 0.3 percentage lower expenditure than the previous projection. This difference is due to more exact mortality modelling.

2.3 The number of pensioners and the average pension

Two groups of the pension beneficiaries are considered below: the recipients of pension in their own right and all the recipients of the earnings-related pensions. The following groups are excluded: pensioners living abroad, persons receiving a part-time pension, a part-time disability pension, a farmer's special pension and only national pension. The number of all the beneficiaries was 1.161 million at the end of 2004. In addition, there were 27 000 beneficiaries abroad, 36 000 beneficiaries of the part time pension, 15 000 beneficiaries of the part time disability pension, 34 000 beneficiaries of farmer's special pension and 106 000 persons receiving national pension without earnings-related pension.

The number of these beneficiaries grows steadily until the 2030s, when it reaches 1.6 million. Beyond 2030, the number of the beneficiaries is essentially stable (Figure 2.2). On the one hand, current small birth cohorts cause the number of the pensioners to diminish, but on the other hand, declining mortality increases this number.

Figure 2.2. *The number of all pension recipients.*[9]

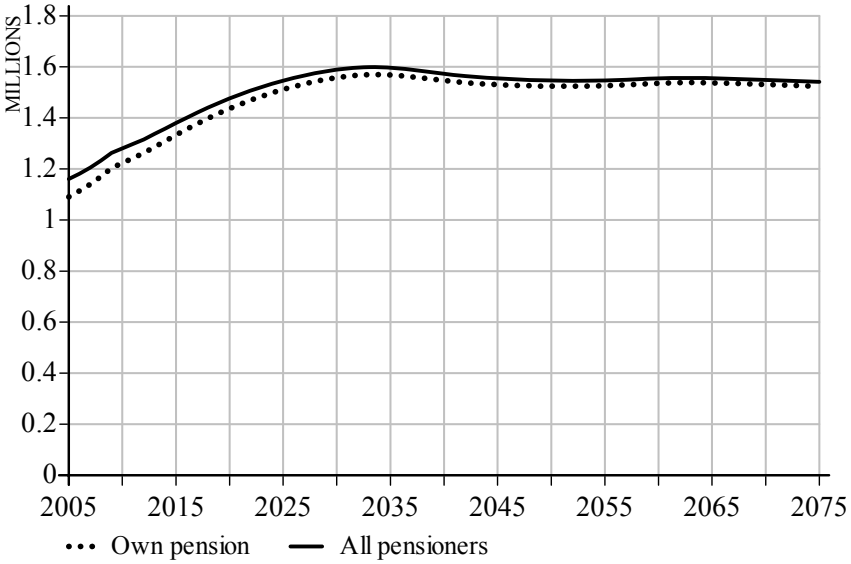
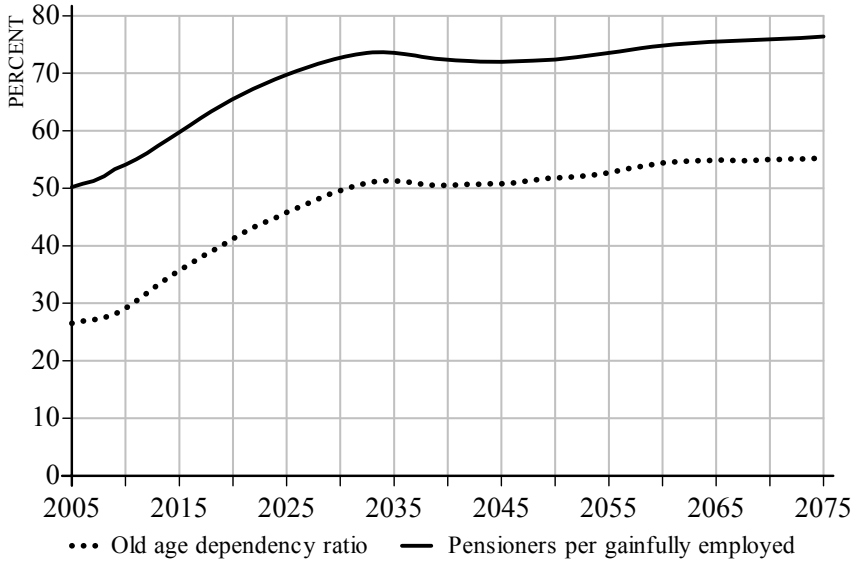


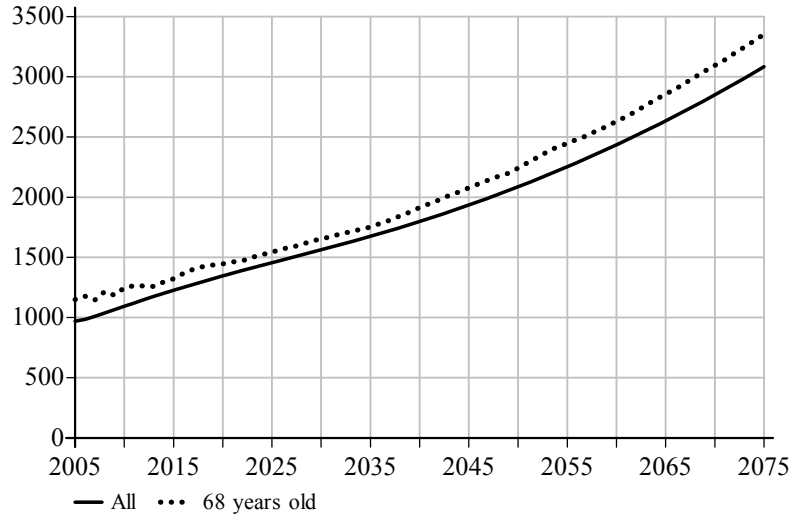
Figure 2.3. *Old age support ratio (65+ per 20–64 years old) and pensioners per gainfully employed, per cent.*



[9] This excludes pensioners living abroad, persons receiving a part-time pension, a part-time disability pension, a farmer's special pension and only national pension.

Currently there are 50 pensioners per 100 gainfully employed. In 30 years this number will be greater than 70. During the same period the old age support ratio will almost double from 27 per cent to 51 percent (Figure 2.3). Growth rate of pensioners per gainfully employed is thus slower than the growth rate of old age support ratio. This is due to fact that all the pensioners are not old (disability and family pensions). This calculation also assumes that the effective retirement age and the employment rate will rise in the future (Table 2.1). If the effective retirement age and the cohort-wise employment rates were fixed to their current levels, the number of pensioners per 100 gainfully employed would rise above 80.

Figure 2.4. *Average earnings-related pension in 2004 prices, all pension recipients.*



It is assumed in the expenditure projection that the annual growth rate of the earnings level is 1.75 per cent. Earnings-related pensions are linked to the earnings level by accrual rules and indexation. Consequently pension levels grow hand-in-hand with the earnings level. Figure 2.4 exhibits the growth of the average pension in 2004 prices. The purchasing power of the average earnings-related pension increases 50 per cent during the next 20 years and in the end of the projection period, the purchasing power of the average pension will be higher than the current average salary/wage.

Figure 2.5. *Average earnings-related pension as percent of the average wage in various age groups, all pension recipients.*

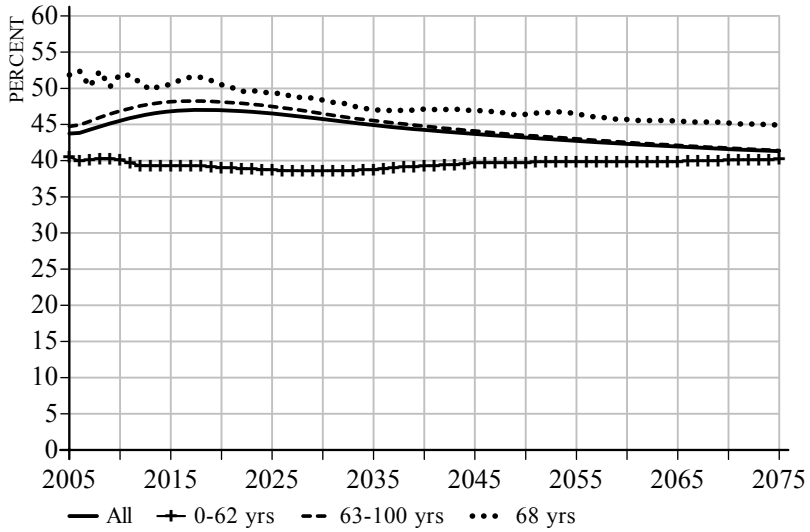


Figure 2.5 exhibits the ratio of the average pension to the average wage implied by the expenditure projection. The relative pension level grows for the next 10 to 15 years. This is due to maturing of the earnings-related pension scheme. Currently only the youngest cohorts receiving an old-age pension have accrued an earnings-related pension during their whole work careers. As time goes by, the older cohorts with a less than full pension will be replaced by younger cohorts with a full pension. The ratio of the average pension to the average wage starts to decline after 2020 and in the end of the projection period, it is slightly lower than it is currently.

The relative pension level of persons younger than 63 is stable for the next 70 years. However, this framing hides the fact that disabled persons will face the life-expectancy coefficient when they reach the age of 63 (Figure 2.9). The life-expectancy coefficient and modest pension index imply that persons retiring early will face an erosion of their relative pensions even though the young pensioners as a group will not face a similar erosion.

The pension levels of different cohorts can be seen by examining the pension levels of the 68 years olds. The old age retirement age is 63–68 years and

therefore 68 years is the minimum age when the pension level of a cohort can be known. The relative pensions of the 68 years-olds will remain at the current level for the next 10 to 15 years, whereas beyond 2020, a slow downward trend is evident. The most important reason for this trend is the increasing life expectancy, which decreases the life-expectancy coefficient. Furthermore, increasing employee pension contribution enforces a relative decline in pensions; as a result a growing share of the wage does not accrue the pension. Yet, growing employment rates and growing effective retirement ages are also included in the projection. These two factors contribute to the higher relative pensions.

Figure 2.6. *Average earnings-related pension as percentage of the average wage in various age groups, recipients of own pension.*

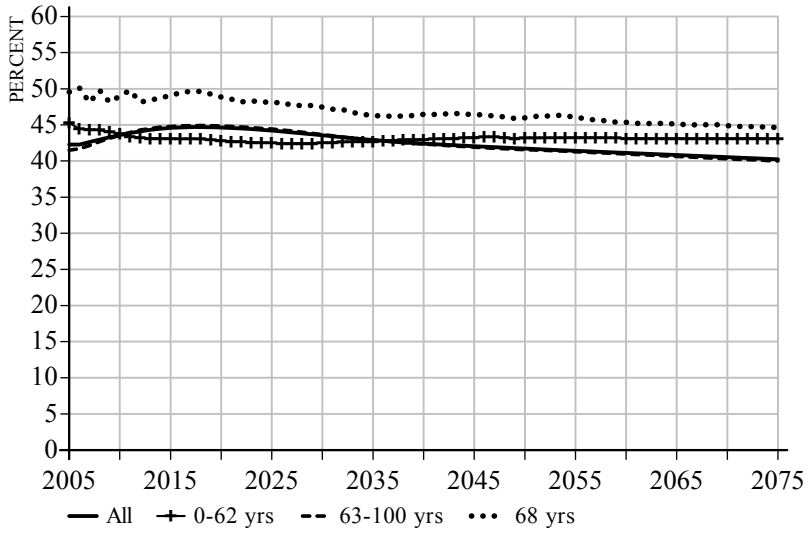


Figure 2.6 exhibits the relative pensions corresponding to Figure 2.5, but only the recipients of pension in their own right are included. Exclusion of the family pensions lower relative pension levels, since most of the persons receiving a family pension receive also a pension in their own right. On the other hand, a down ward trend of relative pensions is also weakened. In other words, the role

of the family pensions will decline during the projection period. This is evident on a basis of the expenditure projection alone: currently 10 per cent of the pension expenditure is used to family pensions, in the end of the projection period this figure is down to 4 per cent.

The effect of the employee contribution

The pension levels above were compared to the average wage which includes the employee pension contribution.[10] The reason for this was that normally the pension expenditure and contribution are expressed as a percentage of the wage sum including employee contribution. An obvious alternative is to express all the results as a percentage of wages without employee contribution. Excluding the employee contribution from the wages increases the relative pension level two percentage points in 2005. This effect increases to four percentage points in the 2030s (Figure 2.7). On the other hand, the current level and the projected increase in pension expenditure would also be higher without the employee contribution as a part of the wage sum (Figure 2.8).

[10] An average employee contribution was 4.8 per cent year 2005 and it is projected to increase to 8 per cent until 2030. Beyond that it will be stable (Biström et al. (2005), pp. 42–23).

Figure 2.7. *Effect of the employees' pension contribution on the ratio of the average pension to the average wage, all pension recipients.*

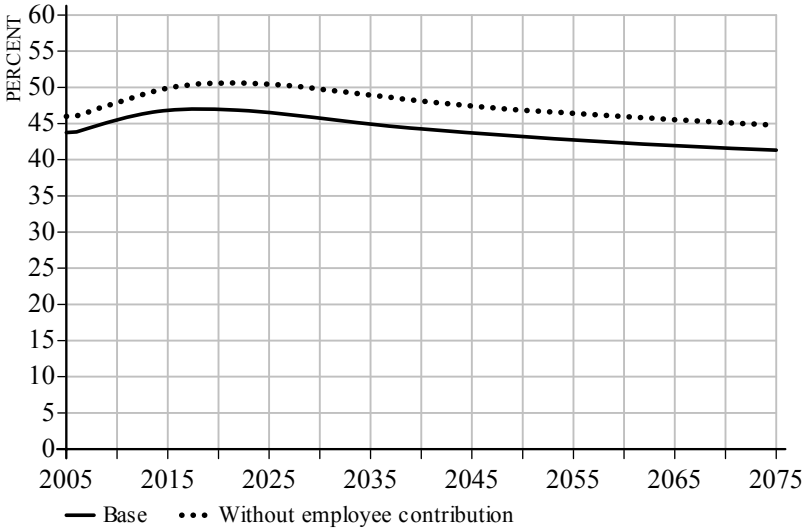
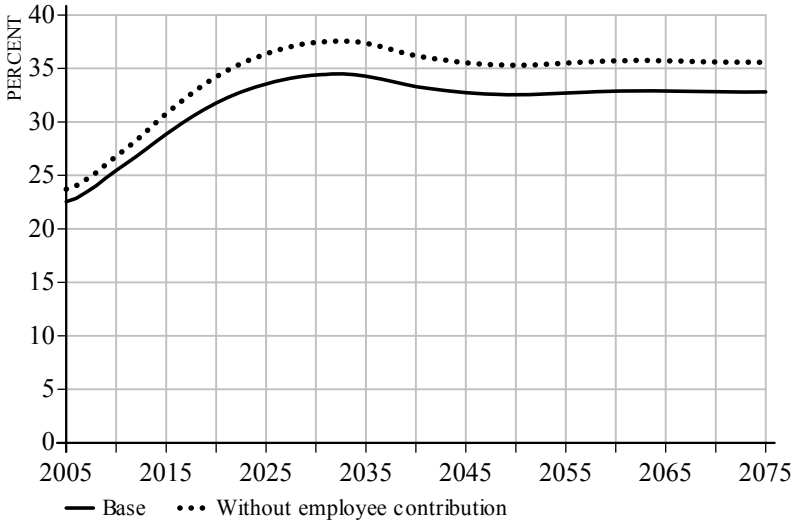


Figure 2.8. *Effect of the employees' pension contribution on the pension expenditure percentage.*



2.4 Sensitivity analysis

The sensitivity of the baseline scenario is examined below with respect to the following assumptions:

i) Mortality
ii) Employment level
iii) Growth rate of the earnings level

The assumptions concerning mortality, employment and growth rate are identical with those reported in Biström et al. (2005), but now the focus is in the examination of the average pension levels in each case. In addition to the above three assumptions, Biström et al. also examine how the effects of birth rates and investment yields affect pension expenditures and contributions. These two factors have, however, a minor effect on the pension levels.

2.4.1 Mortality

In the base line scenario currently observed rate of mortality decline is assumed to continue until 2050, and thereafter this rate is halved. Consider the following alternative mortality scenarios:

1) Rapidly decreasing mortality: the rate of the mortality decline is 1.5 times higher than in the base-line scenario. This means that the same decline which takes 3 years in the base-line scenario is achieved already in 2 years.
2) Slowly decreasing mortality: the rate of the mortality decline is halved compared to the base-line scenario. This means that the same decline in the mortality which takes one year in the base scenario, now takes two years.
3) Current mortality: it is assumed that the current mortality level will prevail until the end of the projection period.

According to Alho (2002), a probability that the mortality decline will be between a slow and rapid alternative is approximately 0.5. By contrast, the probability of the current or weaker mortality development is less than 0.1.

Figure 2.9. *The life-expectancy coefficient for the different mortality scenarios.*

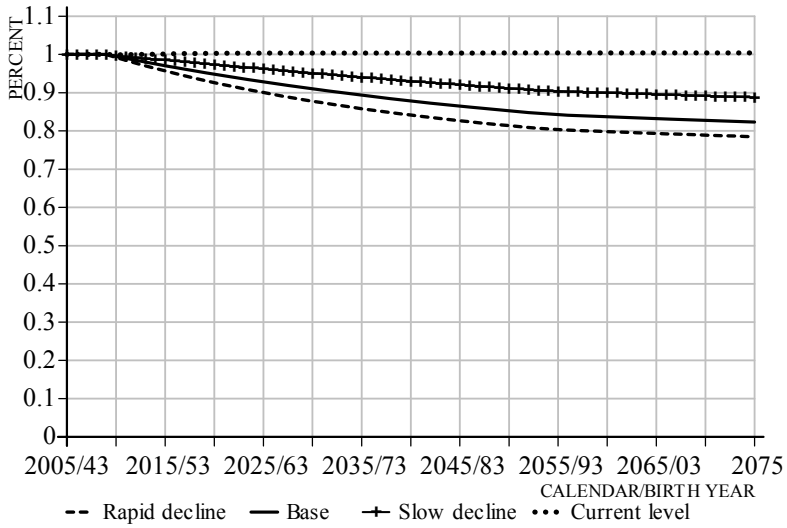
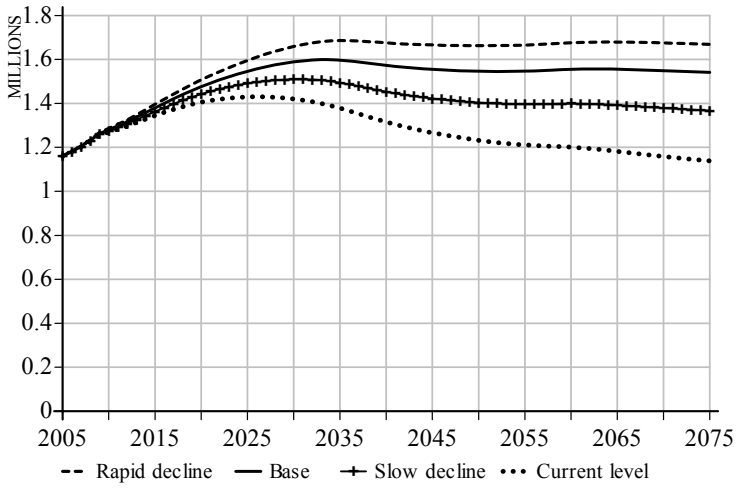


Figure 2.9 shows the value of the life-expectancy coefficient for the different mortality scenarios. If mortality remains at the current level, the life-expectancy coefficient will be slightly higher than one. In this case the relative number of elderly men will increase and at the level of the whole population, the mortality risk will increase for persons of retirement age as will the value of the life-expectancy coefficient. According to the base line scenario, the value of the life-expectancy coefficient in 2020 will be about 0.95. In the slowly decreasing mortality scenario, this level is achieved in double that time, i.e. about 2030. However, the scenario of rapidly decreasing mortality achieves the corresponding level already in 2017.

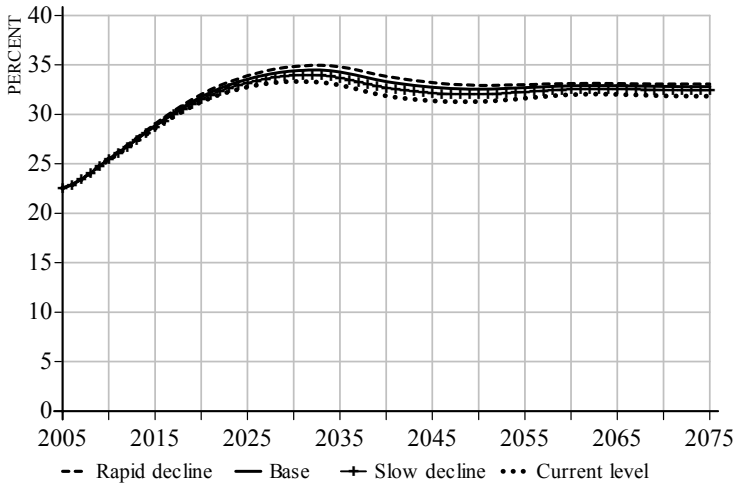
Future mortality will strongly affect the number of pensioners (Figure 2.10). In the scenario of rapidly decreasing mortality, the number of pensioners will reach 1.7 million in the 2030s and it will remain at this level even though the birth cohorts will become smaller and the effective retirement age will increase. For the current mortality scenario, the peak in the number of the pensioners is achieved around 2025. Beyond that, the number of pensioners will decline and the current level will be achieved again in the 2070s.

Figure 2.10. *The number all pension recipients according to the different mortality scenarios.*



Though the future mortality development will strongly affect the number of pensioners, it has a modest effect on pension expenditures (Figure 2.11). This insensitivity is caused by the life-expectancy coefficient.

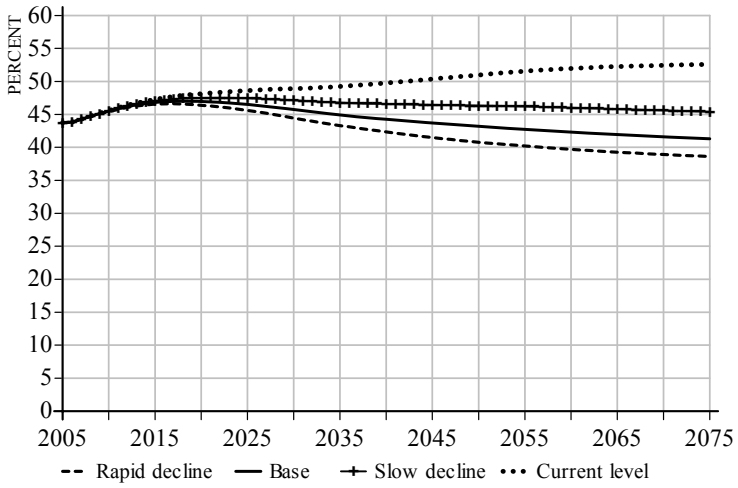
Figure 2.11. *Pension expenditure as a percentage of the wage sum in the different mortality scenarios.*



In the current mortality scenario, the number of pensioners is equal both at the beginning and at the end of the projection period. However, in this scenario, the pension expenditure per wage sum will increase 50 per cent during the projection period. To some extent increased expenditures are explained by higher average pensions, but the declining labour force also contributes to the higher expenditure percent.

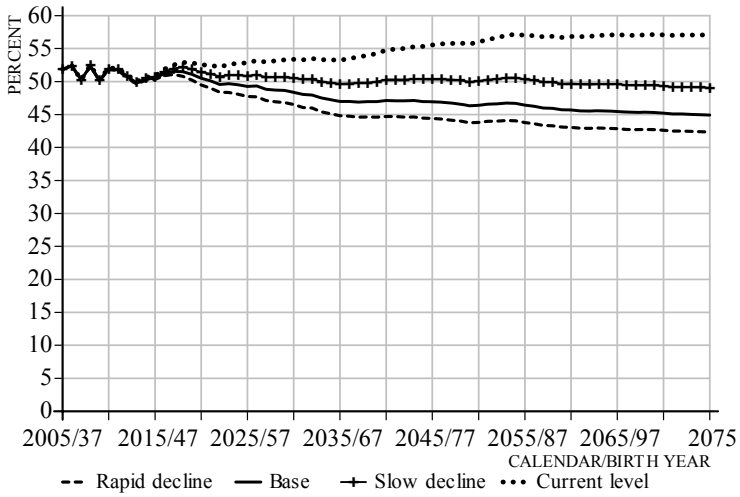
In all the mortality scenarios, the relative pension levels increase for at least the next 10 years due to the maturing of the pension scheme. Mortality assumption has only a modest effect during this relative short period (Figures 2.12 and 2.13). However, in the longer run, the effect of the mortality is far from modest. In all the scenarios, excluding the scenario with constant mortality, a declining trend in relative pension levels can be observed after 2020. In the constant mortality scenario, the relative pension level increases until the end of the projection period as a consequence of the increasing employment rate and increasing effective retirement age.[11] A comparison of the Figures 2.9 and 2.13 confirms that the life-expectancy coefficient explains the differences in the pension levels between the mortality scenarios.

Figure 2.12. *Average earnings-related pension as a percentage of the average wage in different mortality scenarios, all pension recipients.*



[11] Assumptions see Table 2.1.

Figure 2.13. *Average earnings-related pension as percentage of the average wage in different mortality scenarios, all 68 years old pension recipients.*



2.4.2 Employment and effective retirement age

The effects of employment and effective retirement age on the pension expenditures and benefit levels are examined by means of three alternative projections.

In the "base +3" projection, the employment rate rises 0.25 percentage points per year until 2016, and beyond that, the employment rate will remain three percentage points higher than in the base-line projection. In the "base -3" projection the employment rate is symmetrically negative with respect to the base line. For both these projections the effective retirement follows the base-line.

For the "low employment" projection, the number of employees has been calculated under the assumption that currently observed age-group-specific employment rates remain unchanged. The effective retirement age is assumed to rise 1.2 years as follows:

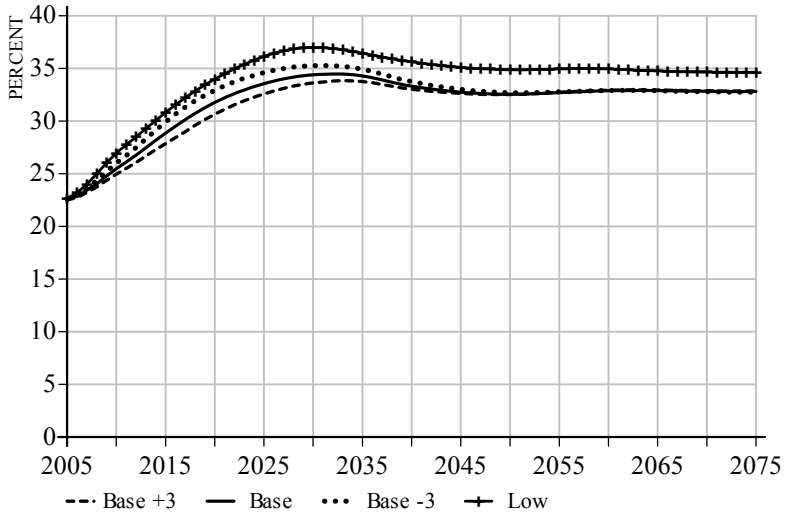
- Until 2010, 0.8 years
- Until 2015, 1.1 years
- Until 2025, 1.2 years

Table 2.2. *Employment rates in the different projections.*

Year	2005	2010	2015	2025	2050	2075
Base-line	67.4	68.8	69.4	70.1	71.8	71.9
Base +3	+0.2	+1.5	+2.7	+3.0	+3.0	+3.0
Base -3	-0.3	-1.5	-2.7	-3.0	-3.0	-3.0
Low employment	-0.6	-3.8	-3.9	-4.5	-6.0	-6.2

No connection is assumed between the average wage and an employment rate. In other words, a marginal worker earns as much as an average worker and the wage sums in different projections are proportional to the employment rates. It is probable that in practice, high employment rates of the "base +3" projection would require part-time and low productivity jobs. In this case the marginal worker would earn less than average worker. Consequently, the results below probably overstate the effects of the different employment assumptions.

Figure 2.14. *Pension expenditure as a percentage of earned income under different employment assumptions.*



The effects of the employment on the expenditure percentage are presented in Figure 2.14. The projections "base +3" and "base -3" differ most from the base-line projection around 2020. Beyond that point, they converge slowly to the base line. This convergence is a consequence of the fact that high employment also

means high pension accrual and vice versa. However in the low employment projection, expenditures will remain permanently 2 percentage points higher than in the base-line projection. In this case not only the employment rate is lower, but also the time spent on pension is longer than in the base line scenario.

The employment rate does not affect the relative benefit levels over the short term, but in the long term the situation changes as the pension accruals are being paid as pensions (Figures 2.15 and 2.16). Note that the earnings level is assumed to be independent of the employment rate. If there were a dependency, then employment would also affect the relative benefit levels in the short run through the effect on the average wage. In the long term, the correspondence between employment rates and benefit levels is almost one-to-one. In the projections "base +3" and "base -3", the benefit levels differ +/- 4 percent from the base-line projection. This is equal to the relative differences in the employment rates.

Figure 2.15. *Average earnings-related pension as a percentage of the average wage under different employment assumptions, all pension recipients.*

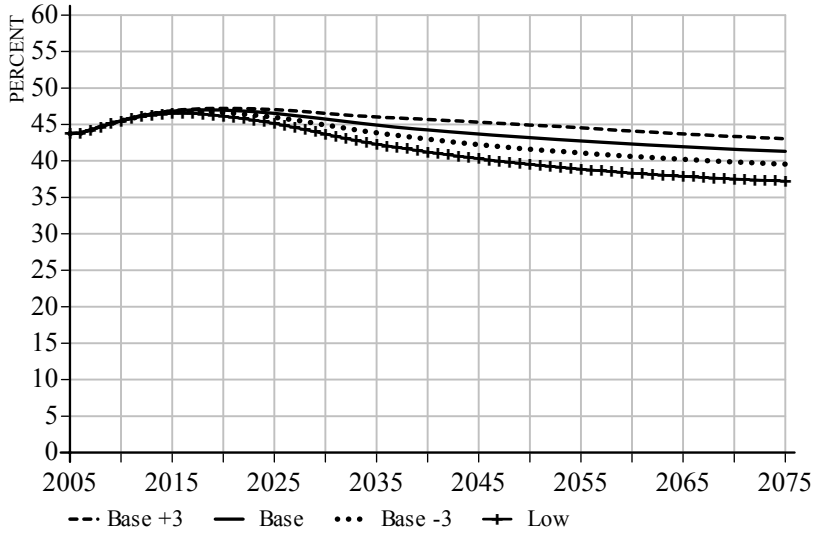
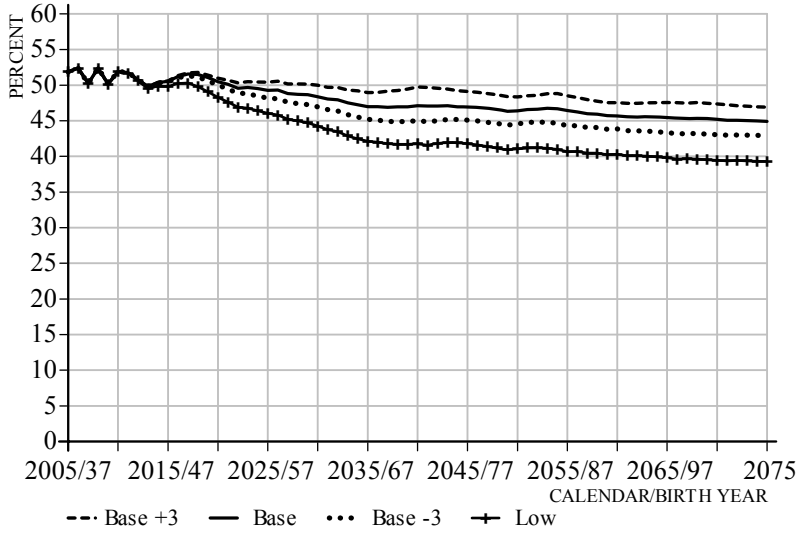


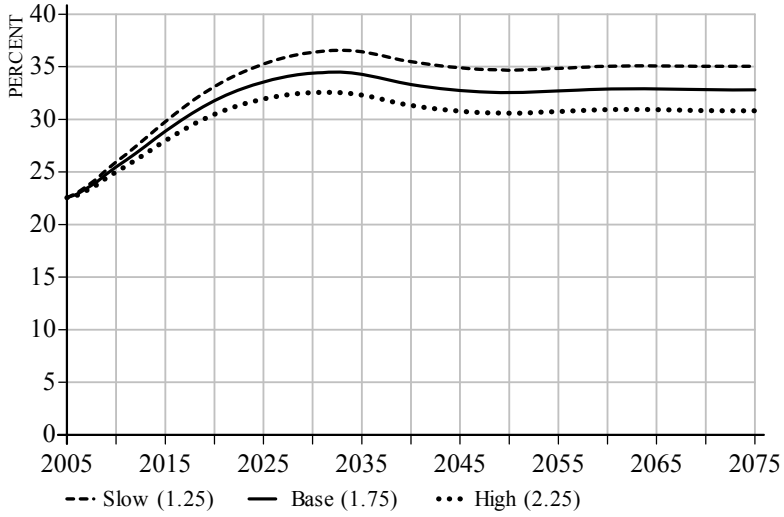
Figure 2.16. *Average earnings-related pension as percentage of the average wage under different employment assumptions, all 68 years old pension recipients.*



2.4.3 Growth rate of the earnings level

The growth rate of the real earnings level in the base-line projection is 1.75 percent per year, in the low growth projection, it is 1.25 percent and in the high growth projection, it is 2.25 percent. These differences lead to large differences in the earnings level and the wage sum. In the end of the projection period, the wage sum under high growth is 1.4 times, and under low growth projection it is 0.7 times the wage sum of the base-line projection. However, the earnings level also affects the pension expenditure through the new accrual and indexation of existing accruals and pensions. Consequently the effects on the expenditure percent are relatively modest. The long-term effect of the growth rate differential of half percentage points is two percentage points on pension expenditure percentage (Figure 2.17). If indexation of accruals and pensions in payment would fully follow the earnings level, even this relatively small effect would disappear.

Figure 2.17. *Pension expenditure as a percentage of earned income under different growth rate assumptions.*



The number of beneficiaries and employed do not depend on the growth rate. As a consequence, the growth rate has the same effect proportionally on the expenditure percent and relative benefit level when all the beneficiaries are considered (Figures 2.17 and 2.18). This does not hold in age-specific sub-groups. The effect of growth rate on the benefits of 68 years old is mild (Figure 2.19), and the relative position of the oldest pensioners is affected most by the earnings growth rate. These age-dependent effects are explained by the indexation rules. The pension accruals are indexed by the wage coefficient, with 80 percent weight on the earnings level and 20 percent weight on the price level. However, pensions in payment follow the pension index with 20 percent weight on wages and 80 percent weight on prices.

High growth rate of the earnings level means a modest erosion of the relative pension levels, but a considerable increase to the purchasing power of pensions. In the end of the projection period the average pension is 4,300 € per month in the fast growth projection, 3,000 € in the base-line projection and 2,100 € in the low-growth projection.

Figure 2.18. *Average earnings-related pension as a percentage of the average wage under different growth rate assumptions, all pension recipients.*

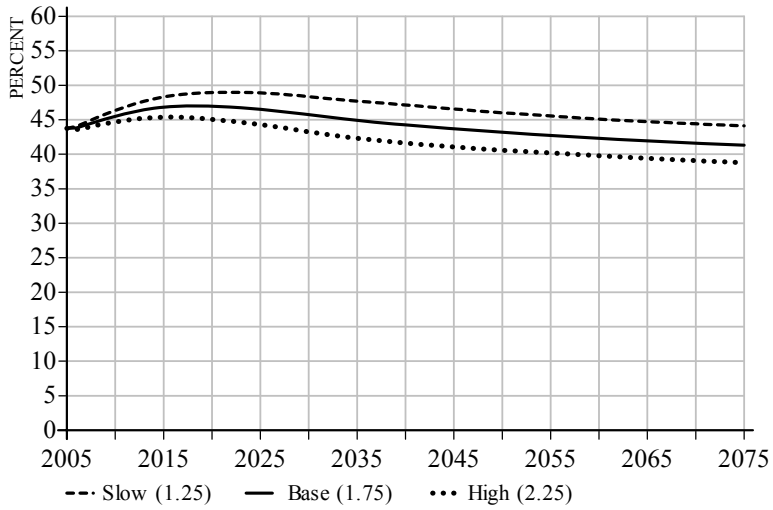
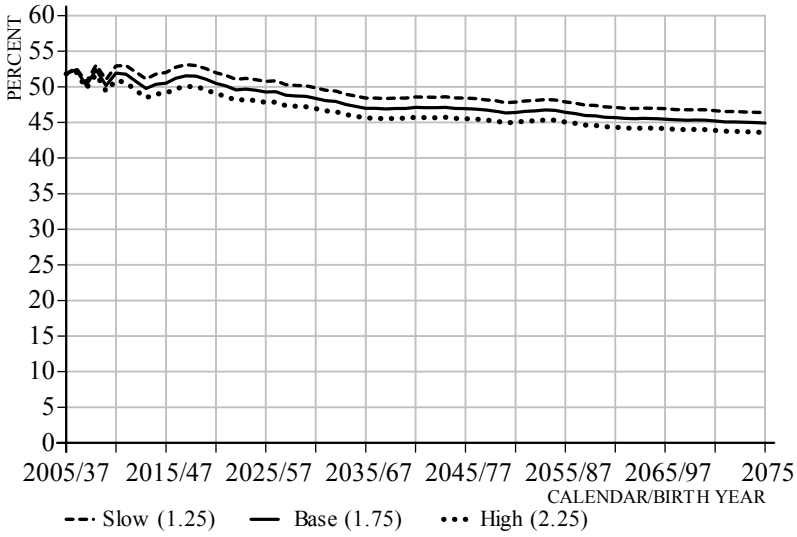


Figure 2.19. *Average earnings-related pension as a percentage of the average wage under different growth rate assumptions, all 68 years old pension recipients.*



2.5 Conclusions

According the to base-line projection, an average earnings-related pension will increase slightly relative to the earnings level in the next 10 years. Pension levels increase since the earnings-related pension scheme is still immature. Beyond that a slow decline takes place, and during the 2040s the relative pension levels will be at the current level again. The lowest age when the pensions of the whole birth year cohort can be observed is 68. The relative pensions of those 68 years old will remain at the current level 10 to 15 years and then they will slowly decline. The main reason for the declining relative pension levels is the life-expectancy coefficient.

It was analysed how sensitive the projected benefit levels are with respect to main assumptions. Biström et. al. contain a corresponding analysis of the contribution projection. By combining these results one can see how a particular factor affects the benefit levels on the one hand and the contribution levels in the other hand.

Future population depends on birth rates, immigration and mortality. The former two factors affect contribution rates and only minimally do they affect benefit levels. Future mortality has a limited effect on contribution rate, instead mortality affects benefit levels thorough the life-expectancy coefficient. If the mortality would remain at its current level, the level of pensions relative to earnings would increase until the end of the projection period.

The employment rate does not affect the level of the pensions in the short term. Rather, short-term effects of the employment level are borne by the pension contribution and funds. However, in the long term the situation changes dramatically. The employment rate affects benefit levels, but does not significantly affect the contributions or expenditures.

Earnings-related pensions are tied to the earnings level by accrual rules and indexation. The higher the earnings level, the higher the real value of the pensions will also be. However, the growth rate has the opposite effect on the relative pension level, because pension accruals and pensions in payment are

indexed partly to prices and partly to wages. The earnings growth rate has little effect on the pension contribution. On the one hand, a higher earnings growth means a lower expenditure percentage, but on the other hand this also means that the yield on the pension asset has less potential of lowering the contribution rate.

Suvi Ritola and Janne Salonen

3 Calculation of the development in pensions based on work histories of the insured

The previous chapter described the development in the pension level by adopting the long-term planning model (PTS) of the Finnish Centre for Pensions. This model is based on averages and the data is based on numbers. This model can be used to describe the average pension amounts when the pension expenditure and number of pension recipients are known. This chapter uses data on the individual level, which brings individual variation into the picture. Another significant difference from the PTS model is that here pensions are calculated for the insured persons who change from work to an old-age pension. In other words, this calculation concerns the development of new old-age pensions.

The data in the article is based on real earnings careers. When aiming at investigating the future development of pensions, these careers have to be extrapolated to the assumed time of retirement. The careers have been extrapolated by taking into account two factors. First, we have used historical data on how people's earnings develop with age. Second, we have also extrapolated the careers in a way which is consistent with the assumptions of the PTS calculations.

3.1 Calculation data

The data used here is based on the earnings development data gathered by the Finnish Centre for Pensions. This includes samples of 400–1000 persons in the age groups born within five-year intervals, for instance, from 1905, 1910, …, 1970. The data also represents people who have at some point during their work history accrued an earnings-related pension. This includes the wages and periods of employment for the people in the samples selected from the registers of the Finnish Centre for Pensions and the pensions providers. On the basis of this data,

the accrued pension rights (vested pensions) can be calculated for the period covered by the data, 1963–1999.

The age groups in the earnings development data chosen for the calculation were persons born in the years 1945, 1950, 1960 and 1970. In addition, those born in 1970 have been used to represent those born in 1980. For these people we know the annual wages under all pension acts for the years 1963–1999. The data is meant to represent persons who have accrued earnings-related pension rights. The calculations use these annual wages (i.e. the real wages for 1963–1999), and the calculated wages derived from them (2000–2045) up to the time of retirement on an old-age pension.

The periods of real wages and of calculated wages for the different cohorts have different lengths. For the younger cohorts the share of calculated wages becomes quite large. For instance, for persons born in 1970, we have from a pension calculation viewpoint real wages for the ages 23–29 and the wages for the ages 30–65 are calculated wages. Since the data based on real work histories has been extended and modified in this study, we will henceforth refer to it as calculation data.

Table 3.1 shows the data size and distribution for those who retire at the age of 63 and those who retire at the age of 65.

Table 3.1. *Background data on the age groups.*

Year of birth (average length of work history)	Persons, N	Retire at age 63 (about 55%)	Retire at age 65 (about 45%)
1945 (33.4)	440	251	189
1950 (33.6)	511	284	222
1960 (34.4)	523	294	229
1970 (34.1)	975	523	452
1980 (34.1)	975	523	452

The examples calculated here are based on the assumption that the total length of the work histories does not increase significantly. Thus this method of calculating provides an estimate of the pension-level development which is not dependent on a significant increase in the length of the work histories of those who retire on an old-age pension.

Main assumptions regarding the formation of the data:

- Some wage data are lacking for the periods of employment before 1999. In 1985–1999 only a couple of per cent have incomplete data, but for the earlier periods 10–23 per cent of the persons have incomplete data. The data have been substituted starting from the first known wages. The average of the first two wages goes backwards +10– -30 per cent a year up to the starting year of the person's first employment contract.
- If a person in some cohort has lacked wage data in 1999, this has been substituted by the average wage for the cohort in question. The data has been supplemented for about 18–31 per cent of the age group.
- The cohort's average calculated wages have been adjusted to fit the wage development in the PTS model. On average, wages develop according to the TEL earnings career in the PTS model regardless of which act actually has covered the person's wages.
- After 1999 each insured person's nominal annual wage* develops variously about +15– -10 per cent from one year to another until the person reaches the age of 63 or 65. By adjusting the annual variance, the average calculated for the whole cohort develops according to the PTS assumptions. Individual variation has been set at more or less the same level as it has been historically.
- Those born in 1970 have been used here to represent those born in 1980. The earnings careers of those born in 1970 (ages 23–29) have been extrapolated ten years ahead, to the correct calendar period. At the same time the wages have been increased nominally by 3.75 per cent a year.
- The calculated working careers of the age groups born in 1960, 1970 and 1980 empty years have been allotted so that the average pensionable working career for the age groups is about 35 years.
- Those born in 1945 have been chosen so that after the extrapolated work histories, the length of the work history was a good 32 years. By leaving out those with the shortest working careers (about 15%), the average length of the work history has increased to a good 34 years, which corresponds to the current working career for persons retiring on a fully effective old-age pension or on an early old-age pension.
- In this analysis the persons continue their working careers until the old-age pension. About 55 per cent of the age group retires at age 63 and the rest, 45 per cent, at age 65. The division is random by allotment.

* The first calculated (for 2000) wage is the weighted average of the wages for 1997, 1998 and 1999. The weightings are 1997=0.25, 1998=0.25 and 1999=0.5.

The calculations indicate that the size and replacement rate of the pensions are influenced by the rules for pension calculation and their changes, as well as by the retirement age (63 or 65 years) and different earnings careers. The average earnings development varies in the data between age groups and it is also slightly different within the age group for those who retire at age 63 and those who retire at age 65. People can have breaks in their work histories at different ages and the age at which their working careers start varies, but everyone in the calculation is assumed to have retired from their work at age 63 or at the age of 65. People born in 1945 thus retire either in 2008 or in 2010, those born in 1950 in 2013 or in 2015, those born in 1960 in 2023 or in 2025, those born in 1970 in 2033 or in 2035, and those born in 1980 retire either in 2043 or in 2045.

Table 3.2. *Data on work histories for those who retire at age 63.*

Year of birth	1945	1950	1960	1970	1980
Year of retirement	2008	2013	2023	2033	2043
Years of work before 2005 (accrual rate of 1.5%)	30	24	17	9	1
Years of work from 2005 onwards	3	8	16	24	32
accrual of 1.5%, in years	-	-	7	15	23
accrual of 1.9%, in years	3	8	9	9	9
accrual of 4.5%, in years	0	0	0	0	0
Total of pensionable years	32.5	32.4	33.4	33.1	33.1

Table 3.3. *Data on work histories for those who retire at age 65.*

Year of birth	1945	1950	1960	1970	1980
Year of retirement	2010	2015	2025	2035	2045
Years of work before 2005 (accrual rate of 1.5%)	29	25	17	9	1
Years of work from 2005 onwards	5	10	18	26	34
accrual of 1.5%, in years	-	-	7	15	23
accrual of 1.9%, in years	3	8	9	9	9
accrual of 4.5%, in years	2	2	2	2	2
Total of pensionable years	34.5	35.0	35.7	35.5	35.4

All age groups in the data have worked both during the previous legislation and after the 2005 pension reform. As of 2005, those in the youngest age group, born in 1980, turn 25, and those in the oldest age group, born in 1945, turn 60. The pension of those in all age groups has thus started to accrue from the age of 23, and the pension rights accrued at ages 18–22 since the reform took effect at the beginning of 2005 do not appear in this data.

Most of the pension for the younger age groups is determined according to the 2005 rules, whereas the older age groups have predominately had their career before 2005 and their pensions are mainly determined according to the 2004 rules (see Tables 3.2 and 3.3). Of the age groups in the data, those born in 1945 are covered by the protection rule in connection with the 2005 pension reform which, however, has not been taken into account here.

The average number of pensionable years varies somewhat mainly due to the methodology used in forming the data. For example, of the age group born in 1980, those who retire at age 63 have 0.6 more years of work and those who retire at age 65 have 0.9 more years of work than the age group born in 1945. The age group which has the highest number of pensionable years is for those born in 1960.

3.2 Calculating the pension

All pensions have been calculated in accordance with the Employees' Pensions Act (TEL), although the details have been simplified. Nevertheless, the data also includes earnings data for the other pension acts.

The pension accrued before 2005 is calculated according to the rules in force in 2004. The separate calculation for each employment has been made by calculating the pension on the basis of the average wage for the last ten years (1995–2004) if the person has a total of only one or two employments[12]. However, if the person has three or more employments, the pension is calculated on the average wage earned from age 23 to the end of 2004. A more detailed account has not been made here of the calculation rules for the pensionable wage or the calculation mode of choosing the earnings of the last four years, which

[12] Real data up to 1999, and thus also the number of employments is known up to 1999. The assumption here is that the last employment has continued until 2004, so the number of employments by 2004 is the same as the data for 1999.

was applied before 1996. From 2005 onwards, the pension is calculated on the basis of the earnings of all years of employment.

To calculate the pension, the nominal wages have been adjusted in line with the realised TEL indices to the level of 2004. After that, it is adjusted up to the year of retirement with the wage coefficient, which in accordance with the PTS model, is based on an earnings development of 1.75 per cent in real terms and an inflation of 2 per cent. The assumed annual development of the wage coefficient is thus 3.4 per cent from 2004 onwards.

The pension is calculated based on the wage from which the employees' pension contribution has been deducted. This calculation uses the realised contribution percentages up to 2005, after which the percentages follow the PTS model. Since the beginning of 2005, the increased contribution for persons having reached the age of 53 has been deducted from the earnings from age 53 onwards.

Pensions have been calculated on the pensionable wage by applying the relevant accrual rules. Before 2005, a pension accrued at the rate of 1.5 per cent a year before the age of 60 and between the ages of 60 and 64 at the rate of 2.5 per cent a year. From the beginning of 2005, a pension accrues at the rate of 1.5 per cent before the age of 53, between the ages of 53 and 62 at the rate of 1.9 per cent and between the ages of 63 and 67 at the rate of 4.5 per cent a year. Tables 3.2 and 3.3 show how many years each age group works on average at ages where the different accrual rates are applied. Here the accrual rate of 2.5 per cent under the rules in force in 2004 does not concern any of the age groups.

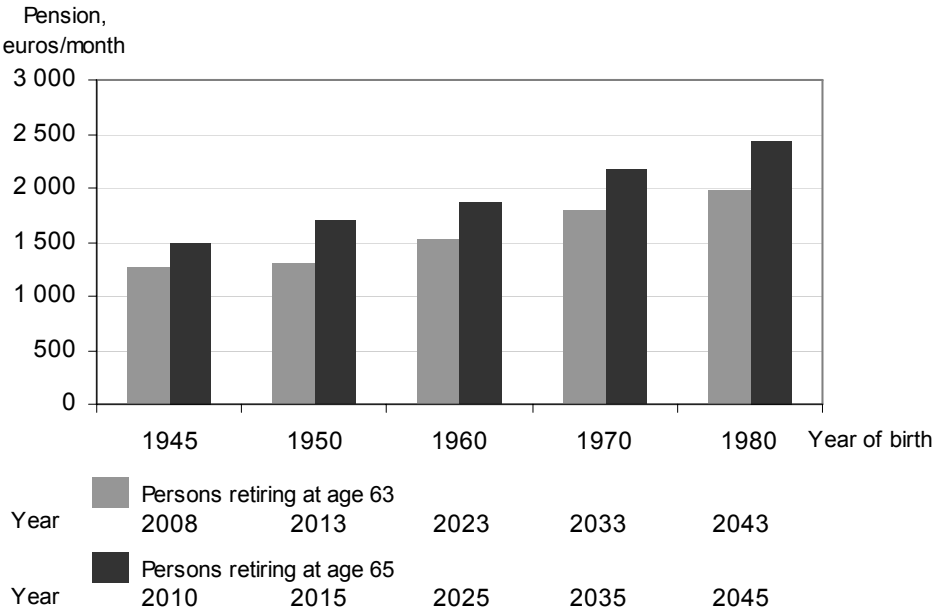
The life-expectancy coefficient has been taken into account in accordance with the base scenario introduced in the previous chapter (see Figure 2.9).

Pension calculation:
- Calculated according to the Employees' Pensions Act (TEL).
- Pension before 2004 calculated from the wage of the last 10 years, if a total of 1–2 employments, otherwise the wage for the whole career.
- Wages adjusted with realised TEL indices up to 2004.
- Wages adjusted with the wage coefficient from 2005 onwards, the wage coefficient increases 3.4 per cent a year.
- Employee pension contributions taken into account as realised up to 2005, after which according to the PTS model.
- Life-expectancy coefficient based on the 2004 population forecast of Statistics Finland.

3.3 Amount of new old-age pensions

Figure 3.1 shows the real growth in the earnings-related pension level for the age groups in the data. If wages increase as is assumed, the average pensions will also increase clearly. The average work histories for people retiring at 63 is about 33 years and for people retiring at 65, about 35 years (see Tables 3.2 and 3.3).

Figure 3.1. *Level of the earnings-related pension for the age groups in the data, €/month in the price level of 2005.*



The average earnings-related pension for those of the age group born in 1945 who retire at age 63 is about 1,270 euros and for those who retire at age 65, 1,490 euros a month. These levels correspond quite well to a new old-age pension starting in 2004 (cf. Figure 1.1). The average pensions for persons born in 1960 have increased from this level in real terms by 21–25 per cent, whereas the average pension for the age group born in 1980 is in real terms 57–64 per cent higher when compared to the average pension for those born in 1945. The pension for persons who retire in 2043 at age 63 is about 1,980 euros and for those who retire in 2045 at age 65 the pension is 2,440 euros a month.

The increase in gross pensions is due to the assumed increase in the wages that these pensions are based on. For instance, the average index-adjusted average wage for the whole work history for persons born in 1980, reduced by the employee TEL contribution, increases in real terms by 77–88 per cent compared to those born in 1945. The pension level is also affected by the calculation rules and the changes to them in 2005, as well as by the introduction of the life-expectancy coefficient. The increase in the employee contribution also has an effect on pension levels, since a pension is based on a wage from which the contribution is deducted.

In the present data the pensions for persons retiring at 65 are 18–23 per cent higher than for those retiring at 63, although for persons born in 1950, the difference increases to 29 per cent. Those who retire at 65 work two years longer and receive a pension accrual of 4.5% annually for this period. Yet it should be noted that those who retire at 63 and those who retire at 65 are different groups and their wage developments are somewhat different. For those born in 1950, the wage difference between those retiring at 63 and those retiring at 65 is slightly less than 8 per cent, while it is less for the other age groups. The length of the work histories also varies, as those who retire at 65 have careers that are 2–2.6 years longer than do those who retire at 63. The difference in pension level does not thus describe directly the effect of continuing work after age 63.

When the life-expectancy coefficient is introduced in 2010, this will affect the development of the pension level. The coefficient will not affect those born in 1945, but for the other age groups in the data, it will reduce the new pension. According to an estimate based on the 2004 population forecast of Statistics Finland, the life-expectancy coefficient will reduce the new old-age pension for persons born in 1950 by 1.6 per cent, for those born in 1960 by 6.0 per cent, for those born in 1970 by 9.7 per cent, and for those born in 1980 by 12.7 per cent.

Appendix 1 shows the average wage calculated from the calculation data, as well as the average pension for each age group for those retiring at age 63 and for those retiring at age 65. The figures are also shown as being inflation-adjusted at the price level in 2005 and as an index in which the pension for those born in 1945 is denoted by the number 100.

3.4 Replacement rate of new old-age pensions

The replacement rate shows the pension in relation to the earlier earnings level. Typically the replacement rate refers to the pension in relation to the wage of the last year of work, but when it includes several years, this levels out the effect on the replacement rate of a possible single exceptional year. These calculations compare the earnings-related pension to the average wage for the last three years, the average wage for the last five years, and the average wage for the whole career.[13]

Figure 3.2 compares the earnings-related pension to the average wage for the last three years of work, adjusted by an earnings index at the level of the starting year of the pension. The wage is the gross wage, and the employee pension contribution has also not been deducted. Calculated in this way, the replacement rates are lower than when comparing the pension to a wage from which the contribution has been deducted. The average replacement rate refers here to the average of the individual replacement rates, not the age group's average pension in relation to the age group's average wage for the last three years.

These data indicate that the average earnings development and the structure of the work histories vary for those retiring at age 63 and those retiring at age 65. Moreover, the earnings development in the final years of the work history differs between the age groups, which affects the wage used here in the comparison. Variations of a few percentage points in the development of the replacement rate partly reflect individual variation in the data. However, on a general level, the results show the level at which the replacement rates for different cohorts will stabilise.

[13] From the data we excluded cases where the replacement rate (the pension compared to the average pensionable wage for the last five years of work) exceeds 100 per cent. There were a total of 56 such cases (1.6%). There was reason to exclude these cases, because in them the work histories are very exceptional for persons changing from work to an old-age pension.

Figure 3.2. *Average replacement rate of the earnings-related pension for persons retiring at age 63 and at age 65. Pension compared to the average wage of the last three years of work.*

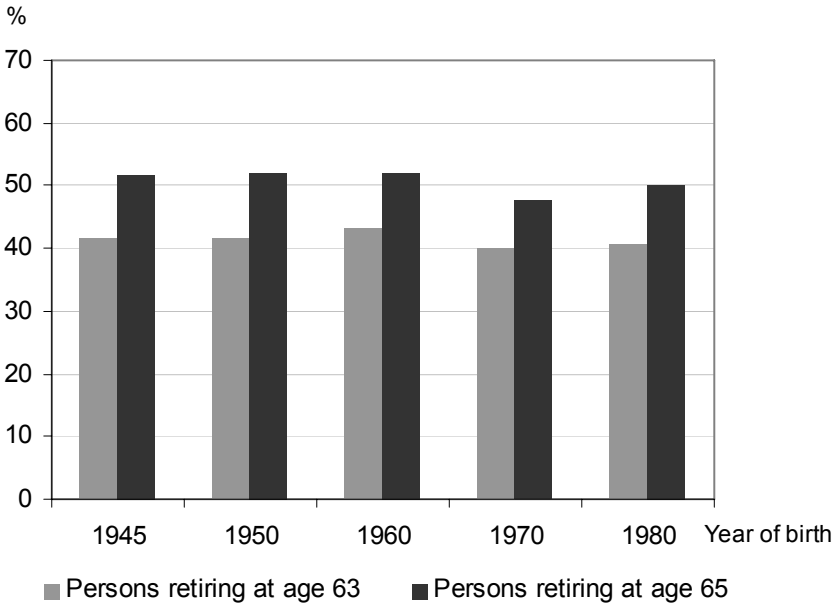


Figure 3.2 as well as Table 3 in Appendix 1 show that those who continue working until age 65 have higher replacement rates than those who retire at age 63, which is mainly explained by two years of work with an accrual rate of 4.5 per cent. As stated above, the groups also differ in other ways, so these figures do not describe only the effect of a continued work history.

A comparison of the cohorts shows that the average replacement rate in this data stays fairly stable until the retirement of the age group born in 1960 and decreases after that by a couple of percentage points. The replacement rates for those who retire at age 63 are about 40 per cent and for those who retire at age 65, about 50 per cent.

In Appendix 1, the replacement rate is calculated from the data by adopting several definitions. Under the new pensions act, the pension is affected by the earnings of the whole work history, so a replacement rate is also included so that the pension is shown in relation to the average earnings for a person's whole work career.

When comparing the pension to the average earnings for the whole work history, the replacement rates for the older age groups are slightly higher than the earnings for the last three years of work. When moving from older to younger cohorts, the replacement rate thus decreases more steeply than when comparing the pension to the wage for the last three years. This shows that for the younger cohorts, the wage development in relation to the development in the general earnings level first rises more steeply and later levels out, whereas the wage development for the older cohorts is more level (see graphs in Appendix 2). When comparing younger and older cohorts, the average wage for the whole work history has thus risen more than that for the last three years.

When comparing the pension to the pensionable wage (adjusted with the TEL index or the wage coefficient, and the employee pension contribution deducted), the replacement rates are higher. When compared to the average pensionable wage for the last five years of work, the replacement rates for those retiring at age 63 remain fairly stable at about 45 per cent and for those retiring at age 65, the rate is about 55 per cent for all age groups.

3.5 Variation in the replacement rate

The individual focus of the data makes it possible to study how the replacement rates of the pensions vary and how this variation changes when going from older cohorts to younger cohorts.

Figures 3.3 and 3.4 describe the median and lower and upper quartiles for the gross replacement rate, i.e. the replacement rate below which half, a quarter, or ¾ of the age group stays. Of this data, half are in between the lower and the upper quartile. Here the replacement rate means the pension in relation to the index-adjusted (earnings-level index) wage for the last three years of work.

Of those born in 1945 who retire at 63, half have a replacement rate of between 34 and 50 per cent, and of those who retire at 65, half have a replacement rate between 42 and 60 per cent. For those born in 1980, this quartile span is 34–45 per cent for those who retire at 63, and 43–56 per cent for those who retire at 65.

Figure 3.3. *Median and quartiles for the replacement rate of the earnings-related pension for persons who retire at age 63.*

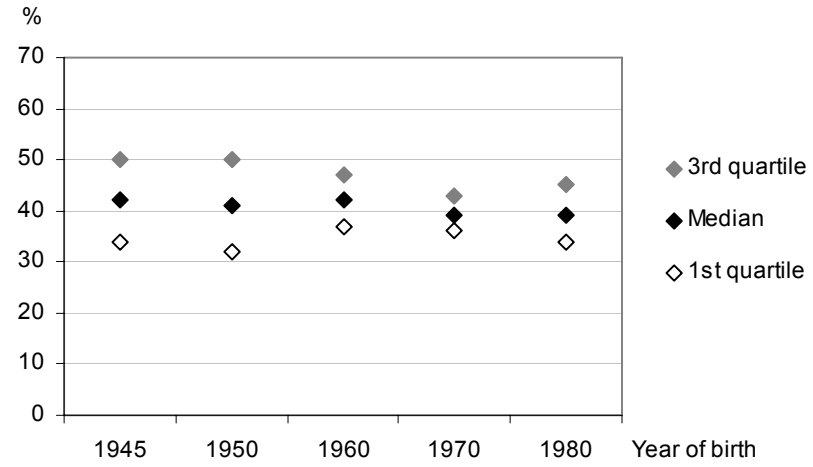
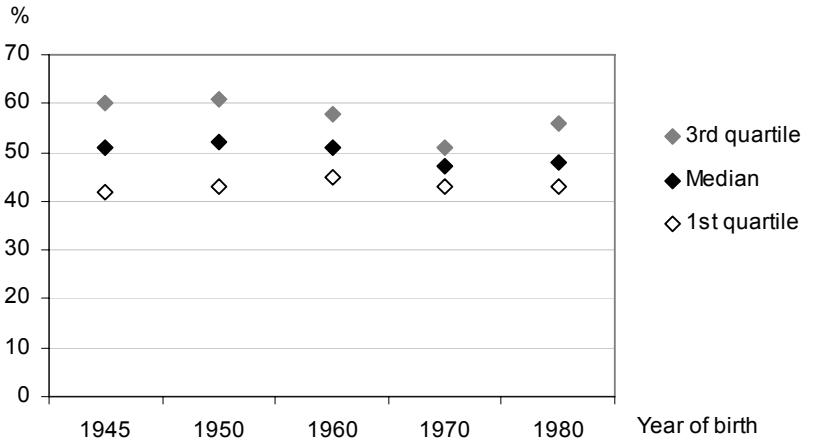


Figure 3.4. *Median and quartiles for the replacement rate of the earnings-related pension for persons who retire at age 65.*



3.6 Gross and net replacement rate of the total pension

For instance, the OECD has calculated gross and net replacement rates. Calculating net replacement rates requires still more assumptions related to the development of the taxation of both wage and pension income.

The following calculations compare the pension to the average wage for the last three years, adjusted with an earnings index[14]. The national pension is included according to current law without real-term increases. The taxation is taken into account according to the principles applied in 2005 and increased in line with the assumed earnings development (the basic deduction is assumed to grow only at the rate of inflation, as it has not been changed for a long time).

Figure 3.5 shows the gross and net replacement rates for different age groups also when taking into account the national pension. The pension is then compared to the average wage for the last three years, adjusted with an earnings index.

Calculating the total pension:

- The tax scale, earned income deduction and work-related deduction in the national taxation for 2005 have been increased by 3.75 per cent annually.
- The municipal tax rate is the average percentage for 2005, i.e. 18.3, and the church tax rate is 1.33. The health insurance contribution is 1.5 per cent.
- The basic deduction increases by 2 per cent annually.
- The employee contribution deducted in the taxation is the average of the contributions of the last three years of work.
- The net pension and net wage for the last three years have been calculated by deducting the taxes from the gross average for the last three years, not as an average of each year's net earnings.
- The national pension is calculated for a single person living in the 2nd category of municipalities.
- National pension index, which affects the national pension level and pension income deduction, increases by 2 per cent a year.
- The national pension for those retiring at age 63 is reduced by a reduction for early retirement for two years (0.4%/month).
- For those retiring at age 65 the earnings-related pension accrued after age 63 does not affect the amount of the national pension.

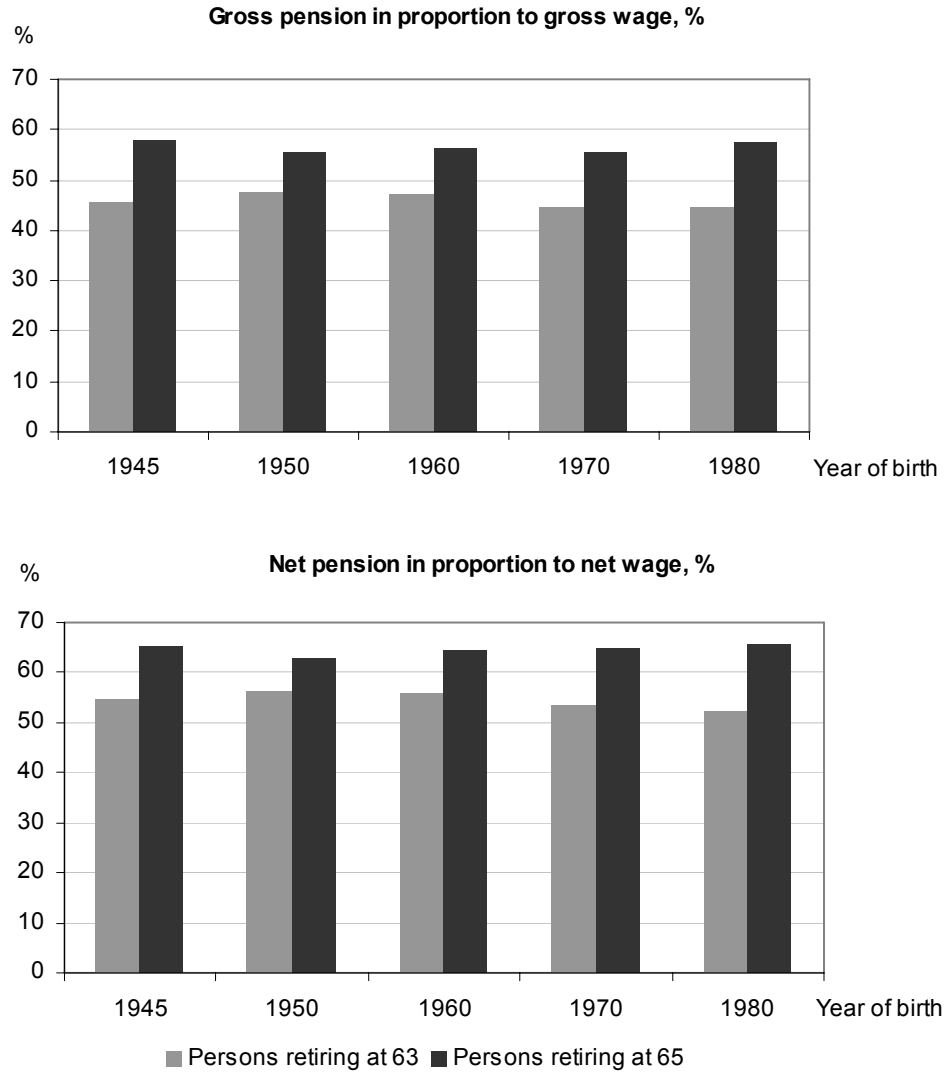
[14] Furthermore, these calculations use data from those cases where the replacement rate of the earnings-related pension (the pension in relation to the pensionable wage for the last five years) exceeds 100 per cent have been excluded. When the national pension is included the replacement rate for some persons becomes very high, since the earnings have been very low and the national pension constitutes the main part of the total pension. Since these exceptional cases strongly affect the average, cases in which the gross replacement rate of the total pension exceeds 300 per cent (14 cases in total) have been excluded from the data at this stage.

Including the national pension increases the gross replacement rates by 4–8 percentage points, which becomes evident when comparing Figure 3.5 to Figure 3.2. The national pension increases the replacement rates for those who retire at age 65 somewhat more than for those who retire at age 63. This is partly due to the fact that for 63-year-olds, a reduction for early retirement for two years is calculated in the national pension, whereas those who retire at age 65 receive the national pension without any reduction for early retirement and it is only reduced by the earnings-related pension accrued up to the age of 63. The national pension affects those who retire at age 63 differently than those who retire at age 65 as well as those who are in different age groups also due to their different respective earnings developments. The gross replacement rate of the total pension for those who retire at age 63 is about 45 per cent and for those who retire at age 65, slightly over 55 per cent.

The net replacement rates are 7–9 percentage points higher than the replacement rates calculated from gross earnings. According to the results, no dramatic changes will occur in the net replacement rates, either.

The national pension is not assumed to increase in real terms, but only in line with inflation. It can thus be expected that the share of the national pension will decrease over time, but such a development is not evident in the replacement rates of the data. The reason for this is that although the number of recipients of a national pension in the data decreases clearly, the national pension amounts increase for those who receive a national pension. This is mainly due to the formation process for the data, where the wages have a larger dispersion in the younger age groups, and thus there are also work histories with low wages.

Figure 3.5. *Average gross and net replacement rates of the total pension (new old-age pension). Pension compared to the average wage of the last three years of work.*



3.7 Relative level of new old-age pensions

Figure 3.6 describes the average pension for each age group in relation to the general earnings level. The average earnings in the economy used here are the earnings from salaried work and self-employment for the economically active from the income distribution statistics for 2003, these earnings are then adjusted in line with the earnings development up to 2005 and after that, in line with the assumed growth rate of 3.75 per cent.

Compared to the steadily increasing average wage in the economy, the pensions of the younger age groups decrease slightly from the pension level of the older age groups. For instance, the relative pension level for those in the data born in 1945 who retire at age 63, is a good 50 per cent and decreases to 44 per cent for those born in 1980. For those who retire at age 65, the relative pension level is about 60 per cent and decreases to 52 per cent.

Figure 3.6 compares the age group's average pension to the average wage in the economy, whereas in Figure 3.2, each person's pension is compared to the person's own wage and an average is then calculated from these replacement rates. The average earnings for the last three years for the age groups in the data are throughout higher than the average earnings in the year of retirement based on the 2003 statistics. Because of this the percentages in Figure 3.6 are clearly higher than in Figure 3.2.

Figure 3.6. *The age group's average earnings-related pension in proportion to the average wage of the whole economy, %.*

The main reason for the differences between Figures 3.2 and 3.6 is the fact that the wages in the data do not increase at the same speed in all age groups, whereas the average wage in the economy is assumed to increase steadily. For instance, the wages for the last three years for those born in 1980 increase clearly more slowly as compared to the wages for those born in 1970 than does the average wage in the economy over the same period. Thus the replacement rate in Figure 3.2 increases, whereas the relative pension level in Figure 3.6 decreases.

3.8 Conclusions

This chapter presents the projection of the future development of the level of new old-age pensions using the data of the Finnish Centre for Pensions on the earnings development and by extrapolating the data into the future. The calculation data includes five age groups, which are divided into persons who retire at age 63 and persons who retire at age 65. Those who retire at age 63 are assumed to work for about 33 years and those who retire at age 65, for about 35 years. Included are those who will retire in the near future and for whom the data are mainly realised data, and there are persons who will retire in 40 years

and for whom the data are mainly calculated estimates. These assumptions regarding the future are the same as found in the PTS model.

In the present data, the new old-age pensions for those who will retire in about 40 years grow in real terms about 1.6 times compared to the pensions of those who will retire in the next few years.

No large changes will occur in the replacement rates for the different age groups. Compared to the wage of the last few years of work, the earnings-related pension for those who retire at age 63 is at a level of slightly over 40 per cent and for those who retire at age 65, at a level of 50 per cent for all age groups included here. The national pension raises the replacement rates for those who retire at age 63 to about 45 per cent and for those who retire at age 65, to 55 per cent. When taxation is taken into account, the replacement rates are 7–9 percentage points higher than are the gross replacement rates.

The development of the replacement rates starts to decrease slightly more steeply when comparing the pension to the average wage for the whole work history and not just to the last few years of work. The reason for this is that the wage profiles of the age groups change in relation to the general earnings development. For the younger age groups, the wages increase faster in the beginning than the average earnings level and more slowly towards the end of the work history, whereas for the older age groups, the index-adjusted wage development is stable.

The relative pension level, where the age group's average pension is compared to the average wage in the economy, is about 50 per cent in the oldest age group for those who retire at age 63 in 2008 and for those who retire at age 65 in 2010, the pension is slightly less than 60 per cent. For those who will retire in about 40 years, the percentages have decreased to 44 per cent and 52 per cent, respectively.

Marjukka Hietaniemi

4 The replacement rate of Finnish old-age pensions in the light of EU calculations

4.1 Background

The indicator sub-group of the Social Protection Committee in the EU has developed indicators for the preparation and evaluation of the National Strategy reports. The hypothetical replacement rate of pensions is one indicator that has been developed among statistical indicators. The replacement rate of pensions provides important information on the adequacy of pensions. The idea of the RR calculation exercise is to monitor the development of the RRs in the EU countries from the present to the future. The latest calculations have been completed in the spring of 2005. These calculations have been carried out according to the principles commonly agreed on in the indicator sub-group and they are being used in preparing the National Strategy reports (see The Finnish National Strategy report 2005). The idea of the calculations is not so much to make comparisons between EU countries as to give an overall picture of how the RRs develop individually in each country.

This chapter presents these RR calculations for Finland. The earnings profiles in these hypothetical calculations are very regular, which makes it possible to calculate the RRs using the last year's wage as the divisor and the pension for the first year as the dividend. The calculations presented here differ from those presented in the previous chapter in the way that in these calculations, those retiring in 2005 and 2050 have exactly the same and regular earning profiles and career lengths. So, these calculations show purely the effect of changes in the pension system itself on the pension level.

4.2 The base case

4.2.1 Specifications

So as to represent as well as possible a worker in a specific country, the base case was chosen to be the worker in the most general pension scheme in the country. In Finland this means that the base case worker belongs to the private sector TEL pension scheme. The person retiring at the beginning of the year 2005 and finishing his or her working career at the end of the year 2004, has his or her pension calculated completely according to the pension rules of 2004, which means the rules before the pension reform. To simplify the calculations, it was assumed that the worker had only one employer. Whether there is only one or several employers affects the level of pension before the reform of 2005. In other countries, the number of employers is not relevant in determining the amount of the pension, so there was no assumption commonly agreed upon concerning the number of employers to be used. In the base case, however, whether the worker has had one or ten employers does not have any effect on the amount of his pension, because the limitation of the pension to 60% of the highest wage is applied in the base case.

The career length was chosen to be 40 years between the ages of 25 and 65, even though this does not represent a typical career length in the EU countries. The person is a single, full-time worker, who has worked his entire career drawing an average wage. In Finland, the person's marital status affects the amount of the national pension and pension taxation. Whether the person is a full-time or part-time worker does not have any effect on how the pension accrues. The level of the pension is of course lower if the wage on which the pension is based is lower.

The Finnish calculations have taken into consideration only the statutory pensions, which means the national pension, the earnings-related pension and the housing allowance for pensioners. The year of retirement is 2005. The RR is the relationship between the pension beginning in 2005 and the wage of the year 2004. For the base case, the RRs were also calculated for the pensions beginning in the years 2010, 2030 and 2050.

It has been assumed that taxation remains at the same level as it is now, which means that all the tax parameters are assumed to rise in line with wages. This implies that the tax rate remains constant through the years in question with the exception of the effect of the rise in pension contribution, which is deductible in the taxation. When the Finnish pension contribution increases from the level of 2004 (4.6%) to the level of 2050 (10.2%, according to the assumptions in the EU-calculations, such as 3% rate of return), the deductible contribution also changes accordingly.

For the indicator sub-group, it was agreed that no discretional increases of benefits would be taken into consideration that are not legislated or automatic. For this reason national pensions and housing benefits are assumed to remain at the 2005 price level. These benefits are often increased by political decisions besides the legislated annual increases according to the prices in Finland. This leads to results that underestimate the future pension level of low-income pensioners. The base case worker's pension income level, however, exceeds the level below which a national pension is paid.

These calculations adopt the assumptions used by Eurostat for future earnings growth. The earnings growth in Finland is on average 1.9% per year from 2005 to 2050. Growth is faster at the beginning of this period and slower in later years. Eurostat has also produced demographic projections which have been used in the calculation of the life-expectancy coefficient that Finland introduced in the 2005 reform and which will affect pensions starting after 2009.

The real rate of return was agreed to be 2.5% from which is deducted 0.5% reflecting administrative charges. Finland, like Sweden used a 3% real rate of return, because the administrative charges in Finland are very low. This real rate of return affects indirectly the pension level through its effect on the pension contribution in the future. The contribution for a certain year is deducted from the earnings for that year when calculating the level of the pensionable wage. In 2050, the difference of 0.5% in the assumption of the real rate of return means a difference of 0.3% in the gross replacement rate accordingly.

Specifications	
Professional status	Worker, one employer, TEL
Marital status	Single
Earnings profile	Constant relation to average earnings
Career length	40 years between the ages of 25 and 65
Pension income	Earnings-related pension, national pension, housing allowance
Taxation	2004 level for earnings, 2005 level for pensions
Real rate of return	3%
Earnings growth	1.9%

4.2.2 The results

Table 4.1 shows that the net replacement rate basically remains at the same level through the years. After the year 2010, the life-expectancy coefficient gradually reduces the level of new old-age pensions and the replacement rates. Until 2010, the replacement rate increases. The reasons for that increase is the higher accrual rate after the age of 63 and the abolition of the integration of earnings-related pensions to the limit of 60% of the highest wage during the working career.

These calculations do not take into consideration the possible lengthening of the working career. If the lengthening were to be included, the results would be slightly different. These results provide, however, an overall picture of how the changes in the pension system affect the pension level when other factors remain constant.

Table 4.1. *Replacement rate in different years, base case, average earnings.*

	2005	**2010**	**2030**	**2050**
Gross replacement rate Earnings-related pension + national pension	56.6	60.3	57.3	53.9
Net replacement rate	62.6	66.2	65.7	63.6

When comparing the years 2005 and 2050, it is apparent that even if the gross replacement rate decreases, the net replacement rate slightly increases. This effect comes from the fact that the employee pension contribution doubles during the period, which leads to the relative decrease in the net earnings.

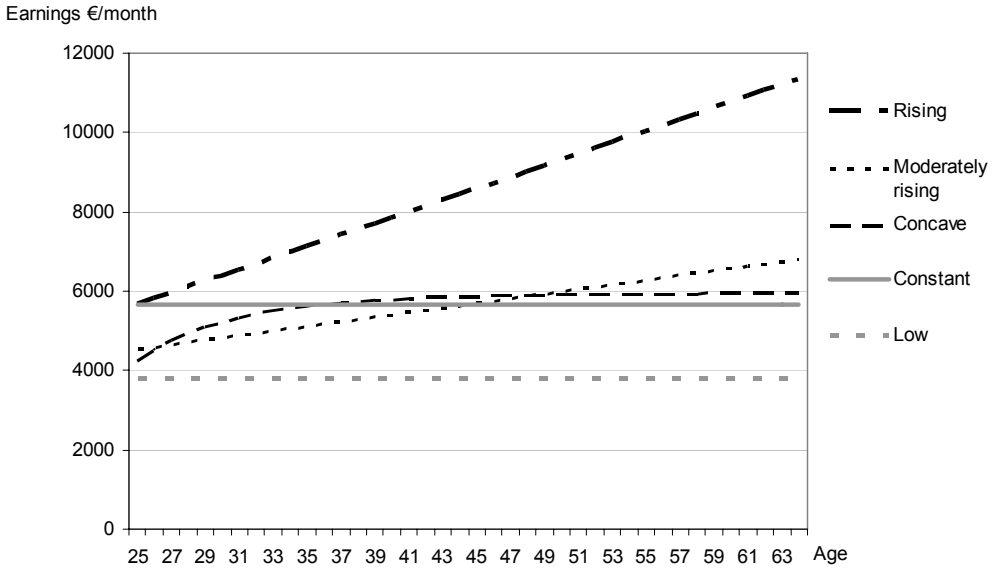
4.3 The effect of different earnings profiles to the replacement rate

As the earnings profile in the base case is rather unlikely to happen, the calculations were also carried out using different earnings profiles to determine whether they significantly affect the results. These earnings profiles were:

Low	Earnings 2/3rd of the average wage through working career
Concave	Concave earnings profile beginning at 75% of average earnings and ending at 105%
Moderately rising	Linear earnings profile beginning at 80% and ending at 120% of average earnings
Strongly rising	Linear earnings profile beginning at 100% and ending at 200% of average earnings

Figure 4.1 presents the real-earnings growth profiles for a pensioner retiring in the year 2050. The constant average, concave as well as the moderately rising earnings profiles are all very close to each other. Even though the constantly rising average earnings profile was chosen for the base case, this was done because of its simplicity. The most realistic earnings profile in the Finnish case would be nearer to the concave profile.

Figure 4.1. *The earnings profiles of a person retiring in 2050, euros per month, revised by wage index.*



The replacement rates change more radically in these variant cases when comparing the present and the future than in the base case (see Table 4.2). The greatest decreases are in the one employer case, where earnings double during the working career. This drop is much smaller, however, when we assume more employers, which is definitely much more likely during a working career.

As for the low-income case, the replacement rates drop because no discretional increases have been assumed in the national pension from the present level. Starting in 2005, some national pension and housing allowance are included in the low-income case, but not in the year 2050, because the level of the old-age pension rises according to the rise in wages. Furthermore, the higher earnings-related pension no longer grants the right to the national pension.

In all the variant cases, the real value almost doubles towards the year 2050.

Table 4.2. *The replacement rate at different income levels and profiles.*

	Low, 67%		**Concave, 75–105%**		**Moderate, 80–120%**		**Rising, 100–200%**	
	2005	2050	2005	2050	2005	2050	2005	2050
Gross replacement rate								
Earnings-related pension + national pension	64.8	53.9	56.6 55.8*	51.8	54.5 49.5*	46.1	53.4 45.2*	42.3
Net replacement rate	74.1	67.0	63.5 62.8*	60.7	60.7 55.9*	56.1	61.5 53.4*	53.2

* the last employment lasted 10 years, but it is assumed there are various employers before that, which means that the pension is determined in practice according to the entire working career.

4.4 How the length of the working career affects the replacement rate

In most EU countries, a 40-year-long working career is rather long when compared to the actual career lengths of present-day pensioners. That is why replacement rates were also calculated for a 30-year-long career over a forty-year period. It was assumed that the person was absent from work between the ages of 40 and 50. It was possible to assume that they took care of children born at five-year intervals during this absence from work.

The 30-year-long career has here been calculated both with and without childcare. It would have been more natural to assume a childcare period earlier in working life, but it probably does not have a significant effect on results. Table 4.3 shows the calculations including childcare. Childcare accrues a pension after the 2005 reform in this kind of career break, but not according to the rules in force before 2005. This is why the difference in the replacements rates between the years 2005 and 2050 is not that high as in other cases.

The average career length of all persons in Finland who retire on an old-age pension was 30.9 years in 2003. Thus, the above-mentioned case of a 30-year-long career length resembles the situation of those retiring now. On the other hand, if we consider only those who retire directly from employment, at present the average career length is 34.6 years. The calculations represent better the

pension of a person retiring directly from employment, because it was assumed that the worker in these cases has had earnings the year before retirement.

In addition, the retirement age was variable, as was the career length with it in the base case. One variant was to calculate a 38-year-long career length until 63 years of age or after 42 years of work until 67 years of age. When calculating the pension according to the 2004 rules, a reduction for early retirement has been assumed for the 63-year-old and the increment for deferred retirement for the 67-year-old. These no longer exist at those retirement ages in 2050.

Table 4.3. *The replacement rates in variant cases of career length, average earnings.*

	Broken career 30 years between 25–65		**Career length 38 years between 25–63**		**Career length 42 years between 25–67**	
	2005	2050	2005	2050	2005	2050
Gross replacement rate						
Earnings-related pension + national pension	45.8	42.3 (44.7)	51.2	46.8	64.2	60.8
Net replacement rate	54.6	54.3 (56.1)	58.5	56.2	66.5	69.5

When comparing the change of the gross replacement rate of the 38-year-case found in this table to the 40-year base case between the years 2005 and 2050, the difference increases. This means that the new system rewards longer careers better than the old system.

If childcare is taken into consideration in the broken career case, we notice that the replacement rate of the person retiring in 2050 is almost the same as for the person retiring in 2005 (these RRs mentioned in brackets).

According to the old system, a person over 65 years of age never paid pension contributions on his or her earnings. In the new system, the person makes pension contributions until the age of 68. This affects the net replacement rate in the 42-year career case, as the pension contribution is deductible in taxation.

4.5 The effect of pension index on the level of old-age pensions

For the indicator sub-group of the Social Protection Committee the effect of pension indexation on the level of pensions in the long run was also one of the issues raised for discussion. That is why the replacement rate calculation was also carried out for the base case after ten years of retirement. The replacement rate of the pension granted in 2005 and in payment for 2015 was calculated in proportion to the earnings of a person receiving an average wage in 2014, comparing the pension after ten years of payment to another person's earnings retiring ten years after the first one. This is not actually a replacement rate calculation where the pension and earnings are the person's own actual incomes, but rather it is the question of a pension-to-earnings relationship, which reflects a pensioner's financial situation compared to wage earners.

Table 4.4. *Pension-to-earnings relationship after 10 years in retirement, a base case.*

	2005	2015
Gross replacement rate		
Earnings-realted pension + national pension	56.6	48.7
Net replacement rate	62.6	55.1

According to the results, the pension-to-earnings relationship decreases significantly. This is due to pensions being indexed according to the pension index, as the earnings rise according to the wage index. The pensions are indexed according to a pension index in which only 20% of the change in annual earnings is taken into consideration.

4.6 Conclusions

According to these calculations the replacement rate decreases some percentage points until 2050. The pension level for a person with one employer decreases rapidly in situations where the earnings profile is strongly rising. This is because in the old system, the pension was calculated according to the last years in each employment, when in the new system, the earnings of each working year affect the level of the pension.

In real life, people tend to have several employers during their working life. The change of the replacement rate in these rising earnings profile cases having several employers is at the same level as in the base case.

These calculations do not take into consideration the possible lengthening or changing of working life. This means that these results reflect purely the change of the pension system itself from 2005 to 2050.

Hannu Uusitalo

5 Conclusions and discussion

The adequacy of pensions and the economic sustainability of the pension system are key aspects of any evaluation of pensions. In 2004, the Finnish Centre for Pensions published estimates on the economic sustainability, i.e. on the long-term development of pension expenditure and contributions. The focus of this report is on the adequacy of pensions, or more precisely, on the long-term development of earnings-related pensions in Finland. This is studied by using three different data and calculations. Chapter 2 uses the long-term planning model of the Finnish Centre for Pensions and produces calculations which are consistent with the estimate of pension expenditure and financing. Chapter 3 utilizes information on real careers and employment incomes of the insured population in the estimation of future pension levels. Chapter 4 presents calculations of pension levels based on the example cases agreed on in connection with the European Union work on pension policy.

This report analyses future pension levels through three windows. The following questions are pertinent: How does the real value of pensions develop? What happens to their replacement rates? How do pensions develop in relation to earnings?

Economic growth increases the real value of pensions

The level of a new earnings-related old-age pension has doubled in real terms over the last twenty years. At the end of 2004, the total gross old-age pension (including the survivors' pension) was 1,146 euros per month, and 917 euros in net terms.[15]

Future economic growth is decisive for the real value of pensions. The calculations based on the long-term planning model of pension expenditure and contributions assume that the annual real growth rate of wages is 1.75 per cent. Since the changes of earnings-related pensions are linked to earnings by

[15] Net pensions are calculated according to the taxation of a single pension recipient.

indexes,[16] wage improvements lead to improvements in pensions. Our calculations show that the real value of earning-related pensions increases by 50 per cent in the next twenty years. By 2050, this real value doubles.

If earnings grow less than assumed in the basic scenario, the real growth of pensions will likewise slower, and vice versa.

As for the calculations based on individual career data, the result is very much the same. This was expected, because realized careers have been extrapolated into the future so that the average career displays the same pattern as the earnings profile in the long-term planning model. Consequently, a person born in 1980 can count on getting a pension which is, on average, 60 per cent higher than the pension of a person born in 1945.

In conclusion: provided that the assumptions of the calculations regarding the economic, employment and population developments are correct, and that the pension legislation remains as it is after the 2005 reform, the future pensioner generations can expect to get considerably higher pensions than current pensioners. After a few decades, pensions will be higher than today's earnings. Built-in automation in the pension legislation sees to it that the future pension development depends on how earnings develop. This has an impact not only on real pension levels, but on replacement rates and relative pension levels as well.

The replacement rate increases in the next 10-15 years and starts to decrease thereafter

The goal of the Finnish earnings-related pension scheme has been set to enable maintaining the achieved living standard in retirement. The relation of the pension to prior earnings, i.e. the replacement rate, has been understood to be 60 per cent in order to attain this goal. The replacement rate can be calculated not only on the basis of earnings-related pensions, but including national pensions and on gross or net bases as well.

[16] From the very beginning of the earnings-related pension schemes in Finland, pensions have been tied to earnings. From the beginning of 2005, pensions in current payment are adjusted with a pension index, where the weighting of the consumer price index is 80% and that of the earnings level index 20%. Pensionable wages are adjusted to the level of the year of retirement with a wage coefficient, where the weighting of the earnings level index is 80% and that of the consumer price index is 20%.

Table 5.1. *The development of replacement rates.*

A. Calculation based on individual earnings careers. Total pension (earnings-related and national pension, excluding survivors' pensions) in per cent of the average earnings of the last three years in employment.
The average length of the career 32–36 years.

		Year of birth				
	Age at retirement	1945	1950	1960	1970	1980
Gross pension % of gross earnings	63 y	46	47	47	45	44
	65 y	58	56	56	55	57
Net pension % of net earnings	63 y	55	56	56	54	52
	65 y	65	63	64	65	66

B. Calculation based on example careers. Total pension (earnings-related and national pension, excluding survivors' pensions) in per cent of the earnings of the last year in employment.
The length of the career 40 years, average wage level.

	Year of birth / Year of retirement			
	1940/2005	1945/2010	1965/2030	1985/2050
Gross pension % of gross earnings	57	60	57	54
Net pension % of net earnings	63	66	66	64

The individual careers in the calculations are 32–36 years long. The gross replacement rates are more than 46 per cent for those who take the pension at the age of 63 and more than 55 per cent for those who take the pension at the age of 65. This difference is not only due to the fact that the latter group works two years at the age (from 63 to 65 years of age) when the accelerated accrual rate of 4.5% of earnings per year improves the pension considerably. Another contributing factor is that the number of years in employment is about two years longer. Net replacement rates are from 7 to 9 percentage points higher than the gross rates.

The replacement rates are relatively stable until the cohort born in 1960, after which they become lower. For those retiring at the age of 65, no decrease seems to take place, but this may be due to the contingency in the formation of the data. If the earnings-related pension is related to the average earnings of the whole

career, the replacement rates decrease after the cohort born in 1960 also among those who retire at the age of 65 (see Appendix 1, Table 3).

The replacement rates vary depending on the length of the career. In the 1945 cohort, the gross replacement rates vary between 34 and 50 per cent among those who retire at the age of 63. For those who retire at the age of 65, the replacement rates vary between 42 and 60 per cent. In the 1980 cohort, the replacement rates vary between 34 to 45 per cent and 43 to 56 per cent, respectively. The variation of these replacement rates over time does not display any clear trend.

The indicator group of the Social Protection Committee of the EU has agreed on shared calculation rules, which are followed when calculating future pensions in the member countries. In the agreed example careers, the development of the earnings is stable, which makes it possible to relate the pensions to the earnings of one year prior to retirement. The significance of these calculations is that the results over time reflect the changes in the pension system.

For the calculations based on example careers, the replacement rates increase from the cohort born in 1940 to the cohort born in 1945. After that, the life-expectancy coefficient starts to lower the replacement rates. In this case the length of the career was 40 years. Replacement rates were also calculated for careers of 30 years. For a thirty-year career, the decrease in the replacement rates was larger than in the case of a 40-year career, showing that the 2005 reform encourages longer careers better than the earlier legislation.

Furthermore, example calculations show that the relationship of the old-age pensions to the general earnings level decreases in relation to the number of years in retirement. After ten years the decrease is about eight percentage points, in net terms, somewhat less. This is due to the pension index, where the weighting of the consumer price index is 80 per cent and that of the earnings level index is 20 per cent.

Working longer has a significant impact on replacement rates

The example presented in Table 5.2 shows the impact of the lengthening of the working career on the replacement rate. Three careers are presented, each having a different length. The pension legislation which was effective until the end of 2004 is represented by a person born in 1941 who receives an early old-age

pension or a disability pension at the age of 63.[17] For this scenario, the gross replacement rate is 36 per cent in the case of the early old-age pension and 41 per cent in the case of the disability pension. By contrast, a person born 40 years later (in 1982) having a similar career can expect to have a replacement rate of 37 per cent. If that person works three years longer and then takes the pension at the age of 66, the replacement rate increases to 46 per cent. A similar impact of the prolongation of the career can be observed for a person who at the age of 65 continues to work.

Table 5.2. *The impact of working longer on the gross replacement rates of the earnings-related pensions. Example calculations. Started to work at the age of 25, ten years of zero earnings during the career. The length of the careeris 28–31 years.*

Year of retirement and age	Gross replacement rate
2004 63 y (early old-age pension)[18]	36
2004 63 y (disability pension)	41
2004 65 y (old-age pension)	45
2045 63 y	37
2046 64 y	40
2047 65 y	43
2048 66 y	46
2049 67 y	48
2050 68 y	51

The relative pension level increases in the next 10-15 years and starts to decrease thereafter

The third window to through which the adequacy of pensions can be examined is to relate pensions to average earnings. In this case we talk about the relative pension level.

[17] In the private sector, the qualifying age for the old-age pension was 65 until the end of 2004. Therefore in this example the person has been transferred to an early old-age pension or a disability pension.

[18] This person gets a national pension only in the case of an early old-age pension. In the calculation, this has been taken into account.

Table 5.3. *The development of the relative pension level.*

Current situation (2004) The average old-age pension (earnings-related + national pension) in relation to average earnings; 50% (gross), 58% (net), average earnings-related old-age pension (excluding survivors' pension) in relation to average earnings: 40% (gross), 50% (net). Pension stock. Average earnings-related old-age pension (excluding survivors' pension) in relation to average earnings: 49% (gross), 57% (net). New old-age pensions, inflow.
Calculations based on long-term planning model The average earnings-related old-age pension in relation to average earnings increases over the next 10–15 years, starts to decrease in the 2020s, and is roughly at the same level as now in 2050. Pension stock. The average new earnings-related old-age pension in relation to average earnings remains roughly at the current level for more than ten years, after which it decreases by four percentage points until 2050.
Calculations based on individual earnings careers Compared to the cohort born in 1945, the average old-age pension as a percentage of average earnings of the cohort born in 1950 decreases if the person retires at the age of 63, but increases slightly if the retirement age is 65. For the cohorts born in 1960 and after, the relative pension level decreases so that in the case of the cohort born in 1980, the relative pension level is 6–7 percentage points lower than that of the cohort born in 1950.

The average old-age pension for 2003 was about 48 per cent of the average earnings level. If calculated on a net basis, the percentage is 55. These figures refer to the stock of old-age pensions. New old-age pensions are higher in relation to average earnings, close to 60 per cent.

Calculations based on the long-term planning model indicate that the relative earnings-related pension increases over the next 10 to 15 years. This is due to the maturation of the pension scheme. New retiring cohorts have had more years to accrue their pension entitlements than older cohorts, whose number decreases due to mortality. In the future, the relative pension level will start to decrease in the 2020s, and in the 2040s it will be roughly at the same level as it is now. The relative pension level of new old-age pensions (inflow) will remain at the current level in the next ten years or so, after which will start to decrease.

Naturally the results depend on the assumptions we make on population and economic forecasts. Some sensitivity analyses were carried out to better understand the significance of these assumptions. As far as pension expenditure and contributions are concerned, the results have been reported by Biström et al. (2005). The population development can deviate from the baseline scenario for fertility, migration and mortality. The first two of these factors have an impact on contributions, but not on pension levels. In contrast, the development of mortality has a relatively minor effect on contributions but a major effect on relative pension levels, because the life-expectancy coefficient adjusts the old-age and survivors' pensions to changes in expected years of life. In the short term, changes in employment rates do not have an impact on the relative pension levels, but their impact on the contributions is significant. In the long term, employment rates are important for the relative pension levels, not so much for the contributions. The increase of earnings from the baseline assumption lowers contributions to some extent, and improves the real value of pensions greatly. However, the relative pension level remains lower if earnings develop faster. In addition, investment yields have a significant impact on contributions, but only a minor impact on pension levels.

Calculations based on individual earnings careers display similar developments over time. The relative pension levels of younger cohorts decrease from the level of those cohorts which are retiring now or do so in a few years. According to calculations for those who retire at the age of 63, the relative pension level is 51 per cent for the cohort born in 1945, and 44 per cent for the cohort born in 1980. For those retiring at the age of 65, the corresponding figures are 60 and 52 per cent, respectively.

Discussion of the results from the viewpoint of pension policy

This report tries to calculate the size of pensions that Finns can expect in the future. The results are dependent on forecasts regarding both population and economic developments. Nevertheless, the results should be understood as calculations. Perhaps their importance lies in the consistency of the calculations of pension contributions, pension expenditure and pension levels. The sensitivity analyses help to describe the impact of other developments than those used in

the basic scenario. Moreover, calculations based on individual earnings careers and example cases give a similar picture of temporal developments.

The ageing population in Finland has raised two kinds of worries for decision-makers and for the Finnish population in general. The first concern has been whether there will be enough money and enough contributors to finance pensions. The Finnish Centre for Pensions contributed to this debate by publishing a report on the long-term developments in pension expenditure and contributions. The results showed that expenditure grows considerably and contributions grow more modestly. Another public concern has been the adequacy of pension levels. This report contributes to that discussion.

The results of the calculations cannot be described as dramatic. Perhaps the more accurate expression is that the emerging picture is reassuring.

In the long term the real value of pensions increases depending on the development in earnings. The replacement rates increase for a further decade or so, and turn into a modest decrease thereafter. The relative pension levels display a similar pattern.

The significance of the life-expectancy coefficient

The long-term decline in the replacement rates and relative pension levels can be attributed mainly to the life-expectancy coefficient, which is expected to lower the new old-age pensions. The effect of this coefficient can be compensated for by using a part, roughly one half, of the increased life expectancy to work. The other half thus increases the number of years in retirement.

Table 5.4. *The expected development of the life-expectancy coefficient 2010–2050.*

Year of birth	Year of retirement	Life expectancy at the age of 62	Life-expectancy coefficient	Time of work compensating the impact of the coefficient	
				Accrued pension 50% of the wage	Accrued pension 60% of the wage
1947	2010	21.2	1.000		
1957	2020	22.4	0.953	6 m	7 m
1967	2030	23.5	0.914	11 m	1 y 1 m
1977	2040	24.5	0.881	1 y 4 m	1 y 7 m
1987	2050	25.4	0.855	1 y 8 m	2 y 0 m

If the economy develops as it has during the existence of the earnings-related pension legislation, the future generations of pensioners can expect to have considerably higher pensions than the current pensions. According to population forecasts, they can also expect to live longer than the present generations of pensioners. In order to maintain the replacement rates and relative pension levels, these future generations will have to use a part of their increased life expectancy to work and thereby work longer than the present generations of pensioners. The new pension scheme includes a significant incentive to encourage such a decision, i.e. the accrual rate of 4.5 per cent of earnings between the ages of 63 and 68.

Final note

This report is limited to the average pension levels. As regards the adequacy of pensions, this is an important but not the only question. It would be interesting to examine how the distribution of pensions is likely to develop. What is going to happen to the poverty risk of pensioners?

Another important question for further research could focus on those who do not have the opportunities for prolonging their working careers. Furthermore, the longer life expectancy motivates studies focusing on the development of incomes during the years of retirement.

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APPENDICES

Appendix 1. Calculation results based on earnings career data

Table 1. *Average wage and pension for persons in the data who retire at age 63.*

Year of birth	1945	1950	1960	1970	1980
Year of retirement	2008	2013	2023	2033	2043
Average monthly wage for the whole career, index-adjusted to the level of the year when the pension starts and employees' pension contribution deducted					
in current prices	2528	2856	4139	6412	8959
in 2005 prices	2382	2438	2898	3683	4222
for those born in 1945 =100	100	102	122	155	177
Pension, euros/month					
in current prices	1344	1534	2185	3127	4207
in 2005 prices	1267	1309	1530	1796	1982
for those born in 1945 =100	100	103	121	142	157

Table 2. *Average wage and pension for persons in the data who retire at age 65.*

Year of birth	1945	1950	1960	1970	1980
Year of retirement	2010	2015	2025	2035	2045
Average monthly wage for the whole career, index-adjusted to the level of the year when the pension starts and employees' pension contribution deducted					
in current prices	2577	3199	4447	6711	9676
in 2005 prices	2334	2625	2993	3705	4382
for those born in 1945 =100	100	112	128	159	188
Pension, euros/month					
in current prices	1645	2061	2774	3917	5395
in 2005 prices	1490	1690	1867	2162	2443
for those born in 1945 =100	100	113	125	145	164

In the table the pensionable wage means the wage which has been revalued in line with the TEL index or with the wage coefficient to the level of the year of retirement, and from this wage, the employees' pension contribution has been deducted starting in 1996. The pension is thus compared to the wage, which is also the basis for calculating the pension. The pension in the last two rows is compared to the wage which has been revalued in line with the earnings-level index to the level of the year when the pension starts. The wage is thus the gross wage from which the employees' pension contribution has also not been deducted.

Table 3. *Replacement rates of the earnings-related pension, %*

	Age of retirement	1945	1950	1960	1970	1980
Pension / average pensionable wage for the whole career	63	53	53	52	49	47
	65	64	63	61	58	55
Pension / average pensionable wage for the last 5 years	63	45	44	47	44	46
	65	55	55	56	53	55
Pension / average wage for the whole career (earnings index)	63	46	46	46	43	41
	65	56	55	54	50	48
Pension / wage of the last 3 years (earnings index)	63	42	42	43	40	41
	65	52	52	52	48	50

Appendix 2. Wage development in calculation data formed from earnings development data

Figure 1. *Average wages for persons retiring at age 63 adjusted in line with the earnings-level index to the level of the year when the pension starts.*

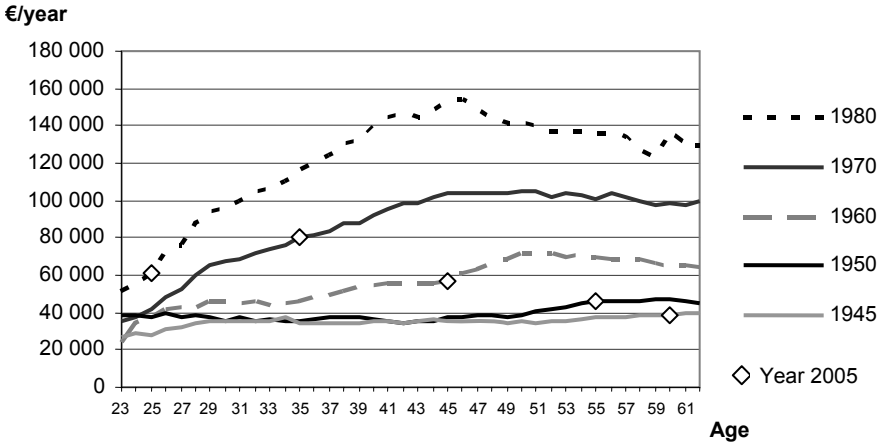
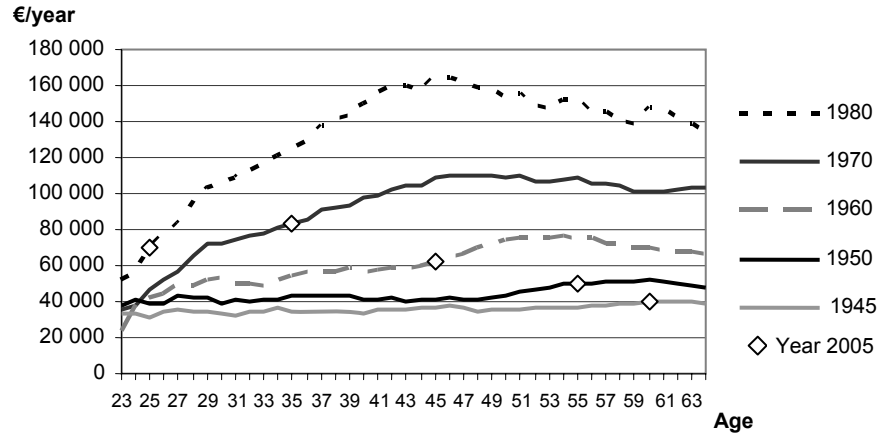


Figure 2. *Average wages for persons retiring at age 65 adjusted in line with the earnings-level index to the level of the year when the pension starts.*



Realised earnings-level indices have been used up to 2004, after which the earnings-level index is assumed to increase by 3.75% a year.