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# Pension expenditure, contributions and funds until the year 2075

Finnish Centre for Pensions, Reports 2005:3

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## TO THE READER

This report presents calculations on the development of the Finnish statutory earnings-related pension scheme in the long term. A simple estimate is also presented of the development in total pension expenditure. Regarding the scheme for the private-sector earnings-related pension, this report includes calculations on the development of both expenditure and financing, but as regards public-sector earnings-related pensions, the report covers only a calculation on the development in pension expenditure.

The previous corresponding report of the Finnish Centre for Pensions was published in 1999. Since then, the Finnish Centre for Pensions has made some long-term calculations, but they have not been published as an extensive report. After 1999, a significant change has occurred in the legislation on earnings-related pensions as well as the views on the future demographic and economic development.

The calculations in this report have been made by using the long-term planning model of the Finnish Centre for Pensions. The compilation of this report has been made possible by a group of researchers. Peter Biström has made the financing calculations for the pensions and the population forecasts for the sensitivity analysis. Tapio Klaavo and Ismo Risku have provided the calculations for the pension expenditure and Hannu Sihvonen has been responsible for collecting the register data for the calculation. This report has been written by Ismo Risku. The authors wish to thank Allan Paldanius from the Local Government Pensions Institution and Risto Kauppinen from the State Treasury for providing information on schemes for the local government and state pension schemes. Ossi Honkanen from Statistics Finland has assisted in the writing of the report by providing the authors with detailed data from the population forecast of Statistics Finland. Kalle Elo has been involved in collecting register data for the model and Merja Raunis has prepared the report for publication. The report was translated into English by Janina Gröndahl. Several persons within the earnings-related pension scheme have provided useful comments during the writing of the report. The authors take sole responsibility for any remaining errors in the report as well as for the interpretations presented in this report.

*Helsinki 5.11.2004*

*Peter Biström, Tapio Klaavo, Ismo Risku and Hannu Sihvonen.*



## EXECUTIVE SUMMARY

This report presents calculations for the development of the Finnish statutory earnings-related pension scheme up until the year 2075. As regards the private sector, this report includes the development of both expenditure and financing. In the pension acts for employees, the main indicators of the funds statement are the contribution level and the amount of earnings-related pension assets, and in the pension acts for entrepreneurs, the two main indicators of the funds statement are contributions paid and state financing. As for the public sector, the present calculations only cover the development in pension expenditure. This report also provides an evaluation of the development in overall pension expenditure (earnings-related, national and other pensions).

The population development in the baseline scenario follows the forecast published by Statistics Finland in autumn 2004 until 2050. The population forecast has been extended until 2075 at the Finnish Centre for Pensions. According to this forecast, by the year 2050, the life expectancy for men aged 62 years increases by almost 6 years and that for women, by about four years and a half. By 2075, these expectancies increase by another a year. The old-age dependency ratio doubles from the current 0.25 by 2030, and after this, the old-age dependency ratio increases slightly towards the end of the calculation period.

In the baseline scenario, the employment rate is expected to rise from the current approximately 67 per cent by about 3 percentage points by 2025 and by about 4.5 percentage points by the end of the calculation period. Associated with improved employment rates are assumptions of growth in the labour force shares, decreasing unemployment rates and higher effective retirement age. The expected effective retirement age for employees is thus assumed to increase from the current age of approximately 59 years by 2 years by 2025, and by 3 years by 2050. An increase in life expectancy and in expected effective retirement age means that at the end of the calculation period, the average time in retirement is a good 3 years longer than it is currently. Furthermore, the real growth in earnings of the baseline scenario is 1.75% a year and the real return on pension assets is 3.5% a year.

The size of old-age pensions and survivors' pensions is adjusted to changes in life expectancy for 62-year-olds through the life expectancy coefficient. In

2025, the value of the life expectancy coefficient will be about 0.93, in 2050, it will be 0.85 and at the end of the calculation period in 2075, it is 0.82.

The forecast is that the statutory earnings-related pension expenditure in the economy will increase steadily in relation to the wage sum from about 23 per cent to 34 per cent by 2030, after which the pension expenditure percentage will decrease by about one percentage point. Moreover, private-sector expenditure increases from the current 19 per cent to 31 per cent by 2030, after which the expenditure is predicted to grow by 2 percentage points over the calculation period. In the public sector, the pension expenditure percentage is at its highest over 40 per cent in the 2020s, after which private and public-sector pension expenditure start converging. The growth in pension expenditure is due to the growth in the old-age pension expenditure.

The pension contribution for private-sector employees increases from 21.6 per cent by about 6 percentage points by 2030, after which the contribution changes only negligibly. Over the same period, the corresponding expenditure increases by about 12 percentage points. The private-sector pension assets increase in relation to the wage sum over the whole calculation period. Currently the assets are 1.6 times the wage sum, in 2030 they will be 2.3 times the wage sum, and in 2075, 2.6 times the wage sum. Also the level of funding in the private sector (existing pension assets in proportion to the amount of money required by full funding) will increase from 27 per cent in 2004 by 4 percentage points by 2030.

This report studies the sensitivity of the results to the most important assumptions about the population and the economy. This sensitivity analysis has been carried out by changing only one assumption or group of assumptions at a time, making all the other assumptions follow the baseline scenario. In the baseline scenario, the total fertility rate is 1.8 children per woman, and in the alternatives, 1.5 and 2.1. Over the next few decades, birth rates do not have a significant impact on pension expenditure and contribution percentages. However, in the long term, a higher birth rate than in the baseline scenario decreases pension expenditure in relation to wages by a good 4 percentage points and contributions by somewhat less than 3 percentage points. By contrast, a low birth rate increases expenditure by almost 6 percentage points and contributions by almost 4 percentage points. Furthermore, the development in life expectancy does not have a significant impact on pension expenditure or contributions. However, it affects the life expectancy coefficient and thus the amount of old-age pensions and survivors' pensions.

The different assumptions about employment rates are immediately reflected in the wage sum as well as in the pension expenditure percentage and the contribution level. Over time, the employment history also carries over to the pensions paid out, however, and the effect of employment rates on expenditure and contribution percentages is levelled out. In the long term, small differences in employment rates do not affect the expenditure and contribution percentages. The growth in earnings level in the baseline scenario is 1.75 per cent. If the rate is 2.25 per cent, the pension expenditure percentage decreases in relation to the baseline alternative by one percentage point in 2020 and by about 2 percentage points in 2075. Nevertheless, the growth in earnings level has a clearly slighter effect on the level of the pension contribution, as the decreasing effect of returns on assets on the contribution diminishes as the wage sum grows faster. Correspondingly, a slower growth in the earnings level as compared to the baseline alternative clearly increases the pension expenditure percentage, whereas pension contributions increase comparatively little. Returns on assets have a cumulative effect on the development of both pension contributions and pension assets. If the annual returns on assets are one percentage point higher than the baseline alternative, the contribution level decreases by 2020 by about one percentage point and by the end of the calculation period, by about 3.6 percentage points. Lower returns on assets than in the baseline alternative mean slightly lower contribution increases.

The previous long-term calculations by the Finnish Centre for Pensions have been based on the Eurostat population forecast, where mortality rates decrease slower than in the new population forecast of Statistics Finland. According to the new calculation, the life expectancy coefficient receives lower values than before, but the pension expenditure and contribution percentages are not significantly affected by the new population forecast. The pension expenditures and pension contributions by the private-sector employees do not differ significantly from the estimates of the Finnish Centre for Pensions in 2002. However, according to the new calculation, the pressures to increase the pension contribution are slightly lower in the near future and they are later slightly higher than shown by the calculation of 2002. When comparing the results with the report of the Finnish Centre for Pensions of 1999, the estimate of the future level of pension expenditure and contribution percentages has clearly decreased.





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## 1 Introduction

In Finland statutory earnings-related pension insurance covers almost all the gainful employment of employees and of entrepreneurs. These pension acts strive to secure a reasonable income for the insured and their families in relation to the earnings while working in the event of old age, disability or death. The private-sector pension acts are the Employees' Pensions Act (TEL), the Temporary Employees' Pensions Act (LEL), the Pensions Act for Performing Artists and Certain Groups of Employees (TaEL) and the Seamen's Pensions Act (MEL). Self-employed persons are insured under the Self-Employed Persons' Pensions Act (YEL) or the Farmers' Pensions Act (MYEL). The main public-sector pension acts are the Local Government Pensions Act (KuEL) and the State Employees' Pensions Act (VEL). In addition, there are other comparatively small pension acts and pension regulations in the public sector.

At the beginning of 2005, the legislation on earnings-related pensions changed considerably. The old practice of calculating a pension separately for each employment was abandoned and thereafter the pension is affected by the earnings of the employee's whole work history. The accrual rates and indexation were also changed. The individual early retirement pension was abolished for persons born in 1944 and later, as well as for the unemployment pension for persons born in 1950 and later. Moreover, the old-age pension can be drawn flexibly between the ages of 63 and 68. Old-age pensions and surviving spouse's pensions are adjusted through the life expectancy coefficient to take into account changes in longevity. If mortality decreases for those who have reached the age of 62, the initial amount of the old-age pension is diminished through the life expectancy coefficient so that the total value of the pension stays at the level corresponding to the current mortality rate. Furthermore, the pension accrual for the periods of the social security benefits was reformed. The increment for credited periods and for what is referred to as one-year rule were substituted by a technique better suited for the new pension calculation mode, where the pension accrues on the actual earned income preceding the period of social security benefit or on a calculated income. At the same time this includes an increase in the number of periods of social security benefits which accrues a pension. For instance, according to the new system, those who study and earn a degree or qualifications, as well as those involved in periods of childcare accrue a pension, as do periods

of social security benefits in between employment contracts, the latter accruing a pension more extensively than before.

The changes in the financing of pensions are mainly a consequence of the changes in the benefits. One such change is that the accrual and funding of old-age pensions now begins at the age of 18 instead of at 23, as it did previously. As the accrual rate for persons aged over 53 is increased from 1.5 per cent to 1.9 per cent, the insured persons are liable to pay a correspondingly higher employee contribution. The contribution increase is funded. The reform also includes an additional funding of pensions, amounting to 7.5 per cent of the private-sector wage sum by 2013.

The calculations in this report have been made using the long-term projection model of the Finnish Centre for Pensions and they show the development of the pension scheme according to the new legislation. This model replicates the functioning of the scheme and especially the legislation on the earnings-related pensions is included in the model in fairly great detail. On the other hand, the descriptions of economic behaviour in the model, such as the demand for and supply of labour, are assumptions and not results. In the starting year of the calculation, the population receives different labour market states (employed, unemployed, retired, etc.) which correspond to the facts. The calculation progresses one year at a time; people move between different states according to given probabilities, accrue pension rights or are possibly pension recipients.

The population in the baseline scenario follows the forecast of Statistics Finland which was published in autumn 2004, but the report also studies the effect of alternative population forecasts. Correspondingly, the economy in the baseline scenario follows a certain path and the alternative scenarios investigate the sensitivity of the results to the main economic assumptions.

Rather than being forecasts, the results presented are rather conditional calculations for the given demographic and economic assumptions. The future development of the pension scheme corresponds to the results of the report if the additional assumptions for the calculation on demographic and economic development are realised and the pension legislation is not changed.

The calculation period in the present report extends until 2075. There is good reason for this long horizon even though the future is unknown and the pension legislation may be changed: a long-term calculation is necessary specifically when evaluating possible needs to change the legislation and the consequences

of the changes. Typically the full effect of legislative changes on pension expenditure shows only over several decades. A good example of the long delay with which new accruals materialise as pension expenditure is the pensions payable on the basis of periods of studies and childcare, and a calculation for this is shown in Chapter 4. The full expenditure effect of the act will not be experienced until the 2070s. Although future demographic and economic developments are unknown, through the projection model, it is possible to study the effects of different assumptions of the future development on pension expenditure, contributions and funds (Chapter 5).

The previous report of the Finnish Centre for Pensions containing long-term calculations of expenditure, contributions and funds was published in 1999.<sup>1</sup> The background report of the SOMERA committee (2002) studies extensively the development in expenditures for and financing of social security, including earnings-related pensions. The publication *The Finnish Pension System* (2003) presents in brief the calculations of the Finnish Centre for Pensions from 2002, which evaluate the effects of the reform in 2005 on expenditure and contributions. This report mainly includes the corresponding results as the report of 1999. New calculations include a cash-flow calculation describing the private-sector pension scheme and estimates of the current level of the funding rate of pensions and of the future development of the funding rate. Furthermore, the sensitivity analysis of the results of the baseline scenario is more extensive than before.

This report contains the following: Chapter 2 describes the Finnish legislation on earnings-related pensions in accordance with the legislation which took effect in 2005 in so far as it is crucial for the long-term expenditure, contribution and fund calculation; Chapter 3 presents the projection model and the main starting data as well as the assumptions regarding the future development. The results of the baseline scenario are presented in Chapter 4, the expenditures for statutory earnings-related pensions have been calculated for TEL, LEL, MEL, TaEL, YEL, MYEL, VEL and KuEL, as well as the Special Act. This chapter also presents the development of total pension expenditure in relation to GDP. This calculation is obtained by combining the earnings-related pension expenditure calculated for this report with the results regarding national pensions as published by the Social Insurance Institution and adding other pensions schematically. In addition

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<sup>1</sup> Kllaavo et al. (1999) "Pension expenditure, contributions and funds to the year 2050".

to pension expenditure calculations Chapter 4 shows the development in the financing of private-sector earnings-related pensions, especially estimates of the development in pension contributions and funds. Next, Chapter 5 studies the sensitivity of the results regarding the assumptions about the demographic and economic development. Although this sensitivity analysis only concerns the pension acts for private-sector employees, it is indicative of the whole earnings-related pension scheme. Chapter 6 compares the results of the report with the previous results of the Finnish Centre for Pensions and Chapter 7 contains a summary of the report.

This report has been written by following, when applicable, the instructions confirmed by the International Actuarial Association in 2002.

## 2 The Finnish earnings-related pension scheme from the beginning of 2005

### 2.1 The acts on the earnings-related pension

The Finnish statutory pensions are made up of earnings-related pensions and national pensions, whereas voluntary pensions play a fairly minor role in the total pension provision. The earnings-related pensions are intended to ensure the maintaining of the insured's level of consumption in the event of old age, disability or the death of a family breadwinner. A pension recipient is entitled to a national pension if the earnings-related pension is small. This report is mainly concerned with the long-term development of the earnings-related pension scheme.

The earnings-related pension scheme consists of several pension acts, which together cover the different sectors of the economy. In practice, all work performed by a person aged 18-67 in the position of employee or self-employed person is covered by some pension act. The calculations in this report concern the following pension acts: the Employees' Pensions Act (TEL), the Temporary Employees' Pensions Act (LEL), the Pensions Act for Performing Artists and Certain Groups of Employees (TaEL), the Seamen's Pensions Act (MEL), the Self-Employed Persons' Pensions Act (YEL), the Farmers' Pensions Act (MYEL), the State Employees' Pensions Act (VEL), the Local Government Pensions Act (KuEL) and what is referred to as the Special Act on the basis of which a pension accrues for periods of studies and childcare.<sup>2</sup> The private-sector employees' pension acts, TEL, LEL and TaEL, will probably be unified into a new Employees' Pensions Act (TyEL) starting at the beginning of 2007. Even so, unifying of the pension acts will not significantly affect the development of pension expenditure, contributions and funds.

For the private-sector pension acts, both expenditure and financing calculations are shown, but for local government and state pensions, the report only includes an estimate of the pension expenditure.

Also included in this report simply as estimated partial components of total expenditure are the national pensions, private-sector supplementary pensions,

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<sup>2</sup> The Act on Compensation of the Pension from State Funds for Periods of caring for a child aged less than 3 years and for periods of study.



military injuries compensations, special pensions for farmers, pensions payable on the basis of motor liability and workers' compensation insurance, and the pensions for persons working for the Church, the Social Insurance Institution, the Bank of Finland and the Regional Government of Åland.

As the pension reform in 2005 took effect, determining the pensions under the different pension acts has been to a large extent harmonised. Nevertheless, several different pension acts are needed because they each offer different ways to finance pensions.

The earnings-related pensions are defined-benefit, which means the size of the pension expenditure determines the contribution level and the need for other financing. Due to the defined-benefit structure of the scheme, we will first study the pension expenditure and after that, analyse the financing of the expenditure.

## 2.2 Pension accrual and pension benefits

An earnings-related pension accrues from earnings between the ages of 18 and 67 according to the accrual rates shown in Table 2.1. Persons aged under 18 or over 68 years old do not accrue a pension and they are also not covered by the insurance obligation. For employees, the pensionable income is the salary/wage reduced by the employee contribution. For self-employed persons and farmers, a pension accrues from the insured earned income in its entirety.

*Table 2.1. Accrual rates from the earnings according to the insured person's age. The accrual rate for a person who has reached the age of 63 is 1.5 per cent, if he or she draws an old-age pension.*

Age	Accrual rate
18-52	1.5
53-62	1.9
63-67	4.5/1.5

Under the pension acts, those in the age group 18–62 accrues a pension on the basis of the following periods of social security benefits:

- 1) parent's allowance
- 2) job alternation leave
- 3) earnings-related unemployment allowance
- 4) periods of training comparable to the aforementioned
- 5) sickness allowance
- 6) periods of rehabilitation allowance financed by the pension providers.

In addition, an earnings-related pension accrues from certain benefit periods which are not that significant for the pension expenditure.

The accrual rate for periods of social security benefits is 1.5 per cent annually regardless of age, and the accrual basis is the same earnings from which the actual benefit has been calculated. For parent's allowances, the basis for the pension is 117 per cent of the earnings, for job alternation leave and earnings-related unemployment allowance 75 per cent, and for other daily allowances, 65 per cent of the earnings.

Pensions under what is referred to as the 'special act', accrue on the basis of either studies which terminate with the earning of a vocational or university degree or qualification. Another way to qualify under the 'special act' is to provide childcare at home for a child under three years old. This accrual basis is a calculated monthly income of 523.61 euros in the index level for 2004. The size of the pensionable calculated income is linked to the wage coefficient.

When calculating the initial amount of the pension, the earnings for the different years are adjusted in line with the wage coefficient, where the weighting of the change in the earnings level is 80 per cent and the weighting of the change in the consumer prices is 20 per cent. Pensions are adjusted in line with an index where the weighting of the change in the earnings level is 20 per cent and the weighting of the change in prices is 80 per cent. Disability pensions payable to young and middle-aged persons are increased by a lump-sum increase when the pension has been paid for five years. For persons under 27 years old, the increase is 21 per cent. For persons older than this, the increase is reduced by 0.7 percentage points for each year, until those who have reached the age of 55 receive no increase at all.

The types of pension benefits are disability, unemployment, part-time, old-age and survivors' pensions.

The disability pension may be granted as a full or a partial pension, depending on how much the insured person's work capacity has decreased. The partial disability pension is half of the full pension. The amount of the disability pension is obtained by calculating the pension accrued up to the start of the pension and adding it to the pension for projected pensionable service. The projected pensionable service is the time from the onset of disability until the age of 63. The accrual rate for projected pensionable service is 1.5 per cent a year until the age of 50 and 1.3 per cent a year between the ages of 50 and 62. The wage/salary

used for the projected pensionable service is the average wage for the 5 years preceding the disability. Moreover, the 2005 reform abolishes the individual early retirement pensions. As a result, the last individual early retirement pensions will be granted in 2005-2006.

The unemployment pension may be granted to long-term unemployed persons born in 1949 or earlier when they have reached the age of 60. The age groups entitled to an unemployment pension may start receiving earnings-related unemployment allowance after having reached the age of 55 and after that, start receiving an unemployment pension.

Those born after 1949 are not entitled to an unemployment pension, but after reaching the age of 57, they may receive earnings-related unemployment allowance until their old-age pension starts. These long-term unemployed may take the old-age pension between the ages of 62 and 65, in which case they receive the pension accrued up to retirement without any reduction for early retirement.

The part-time pension may be awarded to an insured person who has reached the age of 58 and who reduces work input so that the earnings are reduced to 35–70 per cent of his or her stabilised earnings. The size of this part-time pension is half of the earnings reduction caused by the decrease in their work input. A pension accrues from the work during the part-time pension as from other work and in addition, an old-age pension accrues at the rate of 0.75 per cent a year on the earnings reduction.

The insured is entitled to a normal old-age pension at the age of 63 and to an early old-age pension at the age of 62. However, the early pension is reduced by 0.6 per cent for each month that the pension is taken early. If the insured continues working after having reached the age of 63 and does not take the old-age pension, the accrual rate for the pension is 4.5 per cent a year. On the other hand, those who draw an old-age pension but also work after the age of 63 accrue a pension at the rate of 1.5 per cent. After reaching the age of 68, the pension accrual and the insurance obligation end. If the insured person does not take the old-age pension upon reaching the age of 68, the pension is increased by an increment for deferred retirement of 0.4 per cent per month.

A survivor's pension can be paid to the surviving spouse, the former spouse and the children. The former spouse is entitled to a surviving spouse's pension if

the deceased was liable to provide maintenance to the former spouse. If the deceased has two or more children under the age of 18, the total amount of the survivors' pensions equals that of the deceased person's pension. If there is one child aged under 18, the total amount of the survivors' pensions is about 80 per cent of the deceased person's pension. If the deceased has no children under 18, the surviving spouse's pension can be at the most half of the deceased person's pension. In this case, the final level of the surviving spouse's pension is determined on the basis of the adjustment of the surviving spouse's pension, which typically reduces the surviving spouse's pension or cancels it out completely.

The initial amount of old-age pensions is adjusted to account for the change in longevity for 62-year-olds through the life expectancy coefficient. This life expectancy coefficient is determined so that the capital value of the old-age pension remains unchanged even if the life expectancy for persons of retirement age changes in comparison to the expectancy calculated from the statistics for 2003-2007. This life expectancy coefficient is also applied to disability pensions when they are changed to old-age pensions at the age of 63 and to surviving spouse's pensions in connection with the adjustment of the surviving spouse's pension. The life expectancy coefficient will only affect the pensions for those born in 1948 and later. The value of the coefficient is defined for each one-year cohort separately.

### **2.3 Financing pensions**

The annual pension expenditure for TEL, LEL and TaEL is financed through the annual premium income, from accumulated funds and from the payment transferred from the unemployment insurance contribution. For the pension expenditure in 2003, the shares of these financing sources were the following: the premium income 75%, funded component 21.1%, and the unemployment insurance contribution 3.9%. A share of the unemployment insurance contribution is transferred to finance pensions, which is estimated to correspond to the amount of pensions accruing on the basis of the unemployment periods.

The general term 'pension fund' is well worth specifying. The private-sector pension providers have to continuously cover those technical provisions which are determined actuarially. To cover technical provisions, the pension providers

have assets (pension assets). The amount of the pension providers' assets which exceeds the technical provisions constitutes the solvency margin, through which the pension providers prepare for investment risks. New technical provisions are continuously being created through pension accrual and old liabilities are released as pensions become payable. For those insured under 54 years old, a share corresponding to an accrual of 0.5 per cent is funded for their old-age pensions. Furthermore, the increase in the employee contribution levied from persons over 53 is funded in full. In addition, the old-age pension liability is annually increased by the yields on the pension providers' investments. When the pension starts, disability and unemployment pensions are funded. The size of this funding is determined so that it is sufficient to pay the pensions until the old-age pension starts, with the exception of the index adjustments to the pensions. In connection with the reform, additional funding by the year 2013 was agreed on, which corresponds to 7.5 per cent of the private-sector wage sum.

Pension expenditure for self-employed persons and for farmers is financed through the annual premium income and the State's share. The State's share is the part of the pension expenditure which is not covered by the premium income. The contribution under YEL more or less corresponds to the average contribution under TEL. In 2003, the State's share of the pension expenditure under YEL was about 7 per cent and of the pension expenditure under MYEL, about three quarters. The high State's share of the pension expenditure under MYEL is due to the unfavourable age structure and to the low contribution level under MYEL. The average contribution under MYEL is about half of the contribution under TEL. Pension expenditure under MEL is financed through employers', employees' and the State's shares. Each party is responsible for a third of the financing. Pension expenditure under the special act is financed through state funds when the pensions become payable. Further information on private-sector actuarial techniques is available in the publication by Tuomikoski and Kilponen (2003).

The state and local government pension schemes were originally based on a pure pay-as-you-go system. The Local Government Pension Institution started funding pensions in 1988 in order to curb the increase in pension contributions. The target has been set at keeping the local government pension contribution below 30 per cent of the wage sum. Furthermore, the State Pension Fund was

established in 1990 to prepare for the State's future pension expenditures. The aim of this Fund is to gather assets so that the cost burden caused by the pensions of the post-war baby-boomers can be lessened in the years when the pension expenditure is at its highest.

This report presents the calculations on the financing of private-sector pensions, but as for the state and local government pension schemes, this report only includes an estimate of the development of the pension expenditure.

## **3 Projection model and assumptions of the baseline scenario**

### **3.1 Structure of the projection model**

The results of the report have been calculated using the long-term planning model of the Finnish Centre for Pensions. This model is deterministic and replicates the functioning of the earnings-related pension scheme. With the help of this model, it is possible to make calculations to meet the planning and forecasting needs of the pension scheme. Unless otherwise stated, the acts and other stipulations governing the functioning of the scheme are presumed to remain unchanged up to the end of the calculation period.

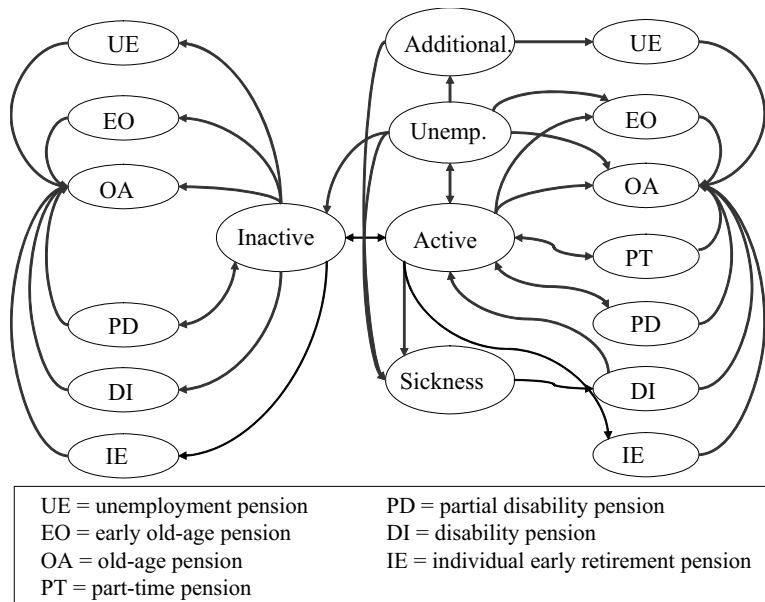
The projection model studies each pension act separately. Each year, pensions are paid to the pensioners, the insured accrue their future pensions and people are transferred between different states (employed, unemployed, pensioner, etc.) according to given probabilities. The states in the model and the transfers between them for the year 2005 are shown in Figure 3.1. Over time, the individual early retirement pensions and the unemployment pensions will disappear and people will transfer from their additional days of unemployment allowance directly to their old-age pensions.

The active people in the model are working, their earnings accrue a pension and contributions are levied on the basis of their earnings. The unemployed are divided into three different states in the model. Persons aged less than 57 who receive earnings-related unemployment allowance are categorised as unemployed. Those over 57 who are the long-termed unemployed are entitled to earnings-related unemployment allowance for additional days until the pension starts. Persons receiving an unemployment allowance for additional days have their own state in the model. These groups of unemployed accrue an earnings-related pension during their periods of unemployment. Other unemployed persons do not accrue a pension (currently about half of the unemployed) and they are therefore categorised as inactive. Persons transferred to the category of inactive also include those who transfer from work covered by the act under observation to work covered by some other act or those who exit the labour force. The inactive are persons who have accrued a pension under the act under observation but

who no longer work in a job covered by this act and who are also not drawing a pension. Pensions accruing on the basis of periods of some other social security benefit than periods of unemployment are ascribed in the model to the active population.

In addition to the transfers shown in Figure 3.1, new employed persons are annually transferred to the active population in accordance with the population and employment forecast. Also, people in each state die each year and part of the deceased leave behind a survivors' pension.

**Figure 3.1.** States of the model and transfers between states, not including survivors' pensions.



Within the states, people are categorised into different classes according to their age and gender. A technique of averages is applied in these classes. The averages are thus calculated as standardised for age and gender, which means that for instance, all 50-year-old men working in employment contracts covered by TEL are assumed to be similar to each other. The technique of averages is much simpler than individual calculation to carry out in practice, but at the same time it produces less information. For example, the size distributions of the pensions cannot be calculated.



The technique of averages in the model does not hinder taking into account the selectiveness connected with the transfers between the different states. The following phenomena have been modelled:

- 1) The accrued pension and the wage for projected pensionable service of those persons transferring to a disability pension are typically lower than for those who continue working.
- 2) The mortality risk for persons drawing a disability pension is higher than the average for the population in general, and the mortality risk for non-disabled persons is correspondingly lower.
- 3) The pension accruals of those who die while still of an age to be included in the active population are lower than on average for the insured.
- 4) For persons drawing an old-age pension, a high pension is associated with a low mortality risk when age and gender are standardised.

It would be possible to also take into account other corresponding phenomena, but adding to the details makes the model more complex and presenting reliable estimates of the size of the selectiveness is problematic. Due to the phenomenon stated in item 4, old-age pensions may mean, within the gender groups, income transfers from persons with low earnings to persons with high earnings. When studying all insured together, there is probably no corresponding phenomenon, however, as the earnings and mortality risk are higher for men than for women. Furthermore disability pensions and pension accrual for periods of social security benefits probably mean income transfers over their life span from persons with high earnings to persons with low earnings.

The projection model needs the following data as a description of the initial situation, specified by pension act as well as by the age and gender of the insured:

- 1) division of the population between different pension acts and within each act between different states
- 2) wages/salaries of the insured
- 3) amounts of pension accruals
- 4) technical provisions and amount of pension assets
- 5) amounts of the pensions payable
- 6) probabilities of transfers between states, especially starting pensions.

The numbers describing the initial situation are mainly obtained from the employment and pension registers of the Finnish Centre for Pensions. Most of the starting data are from 2002 and 2003, on all topics not that up-to-date data

are available and in some cases average numbers for the longer term have been used. Observed transfer probabilities have been smoothed.

The main assumptions for the calculation period are the following:

- 1) population forecast
- 2) employment forecast
- 3) changes in the numbers of starting pensions and in other transfer probabilities
- 4) growth in earnings level
- 5) yield on pension assets
- 6) technical interest rate

The most important results of the model are annual pension expenditure, contributions and funds for the calculation period. As the population has been categorised according to age and gender in the model, the model can also be used to calculate generation and gender-specific results.

The development for each pension act is calculated separately. However, it is not worthwhile to present all the results by pension act separately, as there is a total of nine pension acts. Private-sector employees are covered by TEL, LEL and TaEL, and these are presented as one entity. The results for the state and local government pension acts are also combined into one pension expenditure estimate for the public sector.

### **3.2 Population forecast**

The population in the baseline scenario follows the population forecast of Statistics Finland until 2050, which was published in autumn 2004. The main assumptions of the forecast are:

- 1) total fertility rate 1.8
- 2) net migration 6000 persons a year
- 3) current rate of decrease in mortality will continue in the future.<sup>3</sup>

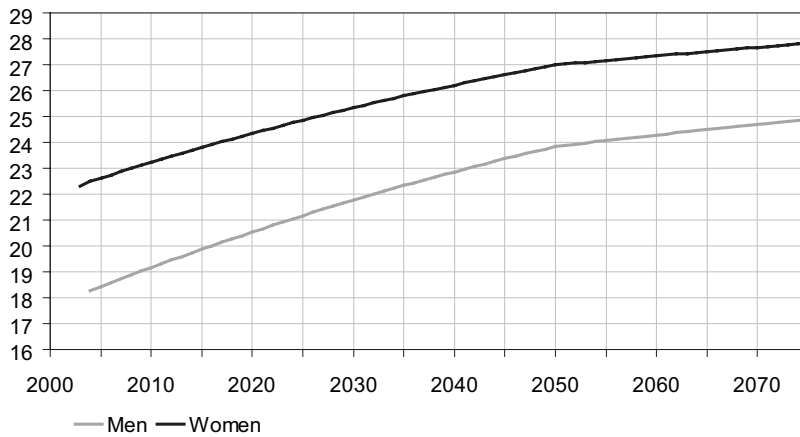
The calculation period of the report extends to 2075. The population forecast has been continued from 2050 onwards as such, except that from 2050, the rate of decrease in mortality is expected to be halved.

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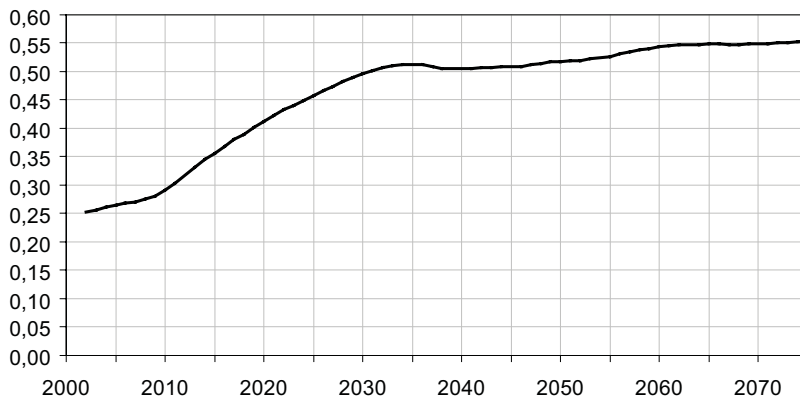
<sup>3</sup> Change from the years 1984–1988 as compared to the years 1999–2003.

When the current rate of decrease in mortality continues, it means a considerable increase in longevity in the long term. Life expectancy for 62-year-old men will increase from the current about 18 years to 25 years over the calculation period, and correspondingly life expectancy for 62-year-old women will increase from a good 22 years to almost 28 years (Figure 3.2). The old-age dependency ratio (the proportion of persons who have reached the age of 65 to persons aged 20–64) will double from the current level of a fourth by 2030, and after that, the old-age dependency ratio will still increase a little (Figure 3.3).

**Figure 3.2.** Life expectancy for 62-year-olds in 2003–2075.



**Figure 3.3.** Proportion of persons who have reached the age of 65 to persons aged 20–64 in 2002–2075.



### 3.3 Employment rates and effective retirement age

The employment rate in the baseline scenario is expected to increase, unemployment to decrease and the effective retirement age to increase in accordance with the figures presented in Table 3.1. The assumptions on the development in the employment rates and effective retirement age are mainly the same as in the previous estimate by the Finnish Centre for Pensions regarding the 2005 reform. The employment and unemployment assumptions in that calculation are slightly more cautious than in the recent government report on future trends.<sup>4</sup> Chapter 4 studies the sensitivity of the results regarding, for instance, the development in employment rates.

**Table 3.1.** *Employment rates and unemployment rates in the baseline scenario and change in the expected effective retirement age for employees.*

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

The unemployment rate is expected to decrease by a third by 2015 and to stabilise after that. The unemployment rate in Table 3.1 has been obtained by calculating the share of persons receiving an unemployment allowance in the labour force. This calculation gives a higher number than the unemployment rate reported by Statistics Finland. The definition of Statistics Finland requires that the unemployed are actively seeking a job. The most significant difference concerns ageing unemployed persons, for which the definition of Statistics Finland gives a lower number than there are persons receiving unemployment allowance.

In the near future, the effective retirement age will increase as the early pensions decrease in number. Over the long term, the population forecast assumes a significant decrease in mortality. It is therefore predicted that future age groups will be in better health than before and at the same time, the life expectancy coefficient makes early retirement a less attractive alternative. As the age groups become smaller, there will also be an increasing demand for the ageing labour force. By the end of the calculation period, the life expectancy for persons having

<sup>4</sup> "Finland for people of all ages" Prime Minister's Office: Publications 34/2004.

reached the age of 62 will have increased by more than 6 years, so despite the increasing effective retirement age, the calculation includes an assumption on an extension of about three years of the time in retirement.

Table 3.1 shows the increase in effective retirement age through the change in the expected effective retirement age for employees. When also taking into account the self-employed persons, the effective retirement age in the calculation will increase by a total of 2.9 years. The effective retirement among self-employed persons is expected to be deferred less than among employees, since the abolishment of early pensions has a smaller effect on self-employed persons. Furthermore, the rapid decrease in the number of farmers does not support the assumption of a strong increase in the effective retirement age. Kannisto (2004) describes the calculation of the expected effective retirement age and the development of the expectancy in recent years.

No changes are expected in the labour force shares of the different pension acts, except that the number of farmers will decrease. The number of persons insured under MYEL is expected to be halved by 2020 and the number of insured private-sector employees is expected to increase correspondingly.

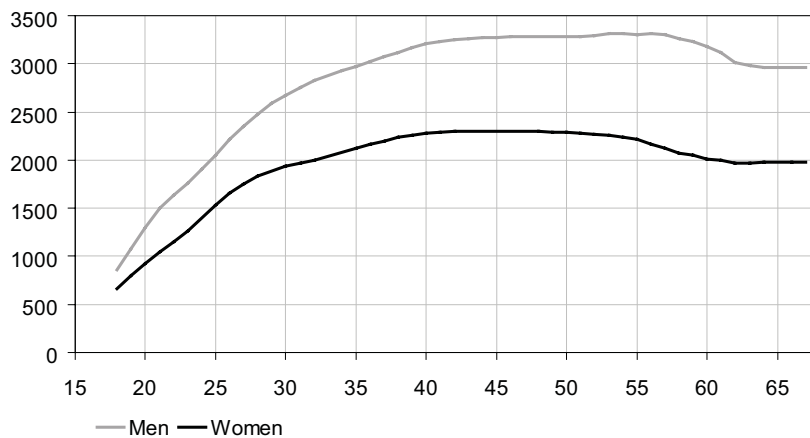
### **3.4 Growth in earnings level and yield on pension assets**

The differences by age and gender regarding earned incomes are not expected to change over the forecasting period, except changes connected with the Farmers' Pensions Act (MYEL). Figure 3.4 shows the age profiles used in the model for the wages under TEL. These profiles have been obtained by smoothing the wage profile based on data from the pension insurance companies along the age axis.

The annual growth in earnings level is expected to be 1.75 per cent in real terms. This corresponds to the average growth of the earnings level index of Statistics Finland in 1970–1999. The earnings level may also increase through structural change, if the number of employees decreases in the low-paying jobs and increase in the high-paying jobs. On the other hand, possibly shorter time at work slows down the growth in the wage sum. The calculations of the report do not assume structural change nor a shorter time at work, except a decrease in the number of persons covered by MYEL. The decreasing number of persons insured under MYEL is expected to have a positive effect on the average earnings under MYEL. This transfer of insured persons from agriculture to salaried employment

also increases the average earnings of the whole economy. The 1999 report assumed the net effect on the earnings level of the structural change and shorter time at work to increase 0.1 percentage points faster than the earnings level index.

**Figure 3.4.** TEL wages in the projection model in 2004, in euros per month.



The average insured salary for farmers is expected to increase annually one percentage point faster than the earnings level index until 2020. In addition, in the calculation for the Farmers' Pensions Act (MYEL), the age structure for the earned incomes of the insured is expected to change. At present the peak in earned income occurs between the ages of 35 and 40. The observed age peak of the earnings is expected to move forward as the cohorts are ageing, so that in the long term, the earnings for farmers aged under 35 increase with age, but after this age, the earnings profile is horizontal. These assumptions regarding earnings level are connected with the shrinking of the number of active people. The farms which disappear are smaller than average and typically they are combined with the remaining farms. According to our calculations, the structural change for MYEL decreases the insured income from agriculture but nevertheless increases the average earnings for those who remain.

The yield in real terms on the investment assets of the pension providers is assumed to be 3.5 per cent per year and the technical rate of interest in real terms is 3.33 per cent. The stipulations governing the investment activity of the

private-sector pension providers have predominately been similar to the current ones since 1997. In 1998-2003, the real yield on all earnings-related pension assets was on average 3.8 per cent. The investment yield of the private-sector pension providers was slightly better than average (TELA 2004).

### **3.5 Pension accrual for periods of social security benefits**

The age-wage profiles of persons who receive earnings-related unemployment allowance and comparable training allowances are based on data provided by the Insurance Supervisory Authority. The model applies insured salaries for the unemployed according to the pension act and unemployment rates by pension act. Dividing the unemployed by pension act is based on data from each unemployed person's unemployment fund and an estimate of the division of the members of each unemployment fund among the different pension acts. The insured salary for the unemployed is expected to increase at a similar rate to the earnings level index, but the number of unemployed is expected to decrease according to the numbers in Table 3.1.

The data on maternity, paternity and parent's allowances, as well as sickness allowances, are based on the sickness insurance and family benefit statistics of the Social Insurance Institution. In the future, the age and gender distribution of these daily allowances is expected to remain similar to the current one. The labour force share of persons receiving sickness allowance is assumed to remain unchanged over time, but the total volume of daily allowances connected with parenthood is linked to the number of children born according to the population forecast.

The data on the use of job alternation leave and the average insured salary are obtained from the Insurance Supervisory Authority. The division by pension act has been carried out in the same manner as for the unemployment allowance. In the future, the popularity of the job alternation leave is assumed to stay otherwise on the same level, but the changes in legislation prevent the youngest age groups from making use of the job alternation leave in the future.

When calculating the accruals under the Special Act, the pensionable period of study for men is 2.9 years and for women 3.4 years. Deriving these numbers exactly from the statistics is problematic. If educational levels, the number of consecutive degrees or qualifications, and the frequency of abandoned studies remain at the current level, studies would accrue a pension for a period which is

about 2 months shorter than assumed in the calculation.<sup>5</sup> The estimate of the share of children aged under 3 who are cared for at home is based on the sickness insurance and family benefit statistics of the Social Insurance Institution. In the future this share is assumed to remain at the current level.

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<sup>5</sup> Ulla Hämäläinen (2004) takes a broad look at young people's incomes and pension accrual from work, studies and periods of social security benefits.



## 4 Baseline scenario

### 4.1 Earnings-related pension expenditure

The life expectancy coefficient strives to keep the capital value of old-age pensions and the surviving spouse's pensions unchanged even when the life expectancy of retirement age persons changes. The estimates of the future development of the coefficient depend on the assumptions made concerning the future development in mortality as included in the population forecast.<sup>6</sup> Figure 4.1 presents the development of the life expectancy coefficient to the year 2075. In the population forecast, mortality is expected to decrease at the current speed until 2050, and from 2050, the rate of decrease in mortality is expected to be halved. The slow-down in the development of mortality shows in the life expectancy coefficient with a slight delay, as the coefficient confirmed for each year is based on the observations of previous years. The horizontal axis in the figure depicts the calendar year when the coefficient is applied for the first time as well as the year of birth for each cohort to which the coefficient is applied. For instance the initial amount of the old-age pension for those born in 1963 is multiplied by the approximate number of 0.93.

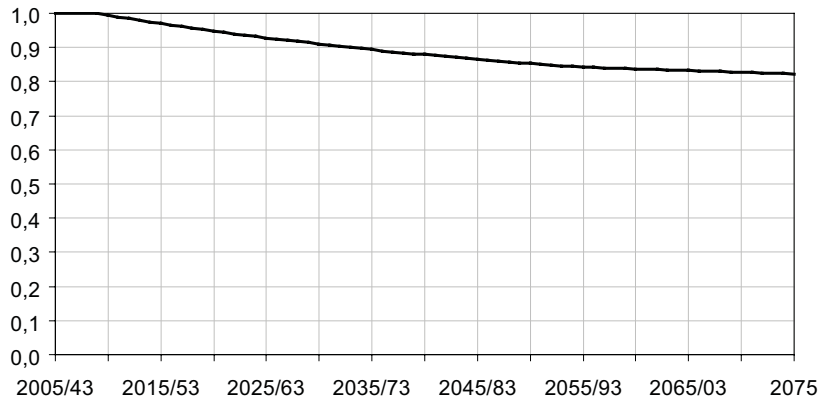
Figure 4.2<sup>7</sup> shows the pension expenditure for private-sector employees under the Self-Employed Persons' Pensions Act (YEL) and under the Farmers' Pensions Act (MYEL) in proportion to the earned income under each act. These numbers do not include the pension components accrued on the basis of studies or for caring for a child aged under 3 years. This pension expenditure based on a what is referred as the 'special act' will be discussed separately later. The distribution of the private-sector pension expenditure, as presented in this report, over the different pension acts, may differ somewhat from the numbers of the statistics. In the statistics, the distribution over the different pension acts follows, as a rule, the pension act of the pension provider which pays the pension, whereas in this report, the pension components accrued under each pension act has been ascribed to the pension expenditure for the relevant pension act.

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<sup>6</sup> More detailed information on the determining of the life expectancy coefficient is available in Chapter 2.2 and on the population forecast in Chapter 3.2.

<sup>7</sup> The new act on private-sector employees' pensions includes the current pension acts the Employees' Pensions Act (TEL), the Temporary Employees' Pensions Act (LEL) and the Pensions Act for Performing Artists and Other Groups of Employees (TaEL).

**Figure 4.1.** Life expectancy coefficient: the horizontal axis represents the first year of implementing the coefficient as well as the year of birth of the cohort to which the coefficient is applied.

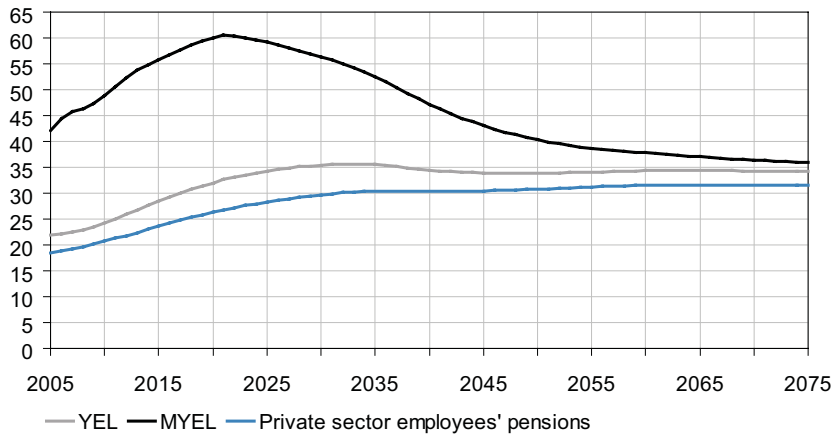


The pension expenditure for private-sector employees will increase from the current 18 per cent to 30 per cent during the 2030s, after which it will increase by about 1.5 percentage points by the end of the calculation period. The shape of the description of the pension expenditure percentage for private-sector employees resembles that of the old-age dependency ratio (Chapter 3, Figure 3.3). The increase in the expenditure percentage can in fact be explained by the growth in the old-age pension expenditure; in 2005, the old-age pension expenditure for private-sector employees is 12.5 per cent of wages, in 2035, 25 per cent and in 2075, 27 per cent.

The currently high pension expenditure percentage under the Farmers' Pensions Act (MYEL) is mainly due to the shrinking number of active persons in that sector. According to the model, the decrease in the number of active people is expected to continue until 2020, at which time the number of persons insured under MYEL will be half of the current number. From 2020 onwards, the development of the number of persons insured under MYEL will follow the development of the other pension acts. The development of the number of active persons is reflected directly in the pension expenditure percentage. From 2020 onwards, the pension expenditure will decrease and in the long run, the pension expenditure percentages under YEL and MYEL will approach each other.

The pension expenditure percentage under the Self-Employed Persons' Pensions Act (YEL) will remain higher than the pension expenditure for employees the whole time. This need not necessarily be so, since differences emerge between YEL and the private-sector employees' pensions which affect the pension expenditure percentage in different directions.<sup>8</sup> The rules regarding pension accrual are mainly the same and from 2005 onwards, they converge even more. From the viewpoint of the future pension expenditure, the main difference between the acts will still be that no deduction corresponding to the deduction for the employee pension contribution is made when calculating the pension for self-employed persons. The higher average age among persons insured under YEL compared to employees increases the expenditure under YEL as compared to the expenditure for private-sector employees' pensions. On the other hand, the pension expenditure for self-employed persons is lowered as self-employed persons accrue less pension rights for periods with social security benefits; they have a lower risk of incapacity for work and the increase in the insured earnings with age is slower than for employees. In addition, it is clear that men form a higher proportion of self-employed persons than of employees in general.

**Figure 4.2.** Pension expenditure under YEL, under MYEL and for private-sector employees as a percentage of earned income.



<sup>8</sup> According to the report 'Pension expenditure, funds and contributions to the year 2050', the pension expenditure for private-sector employees in proportion to the earned income would from the 2030s onwards have been higher than for self-employed persons.

The ratio of pensions paid on the basis of the Special Act to earned incomes is very low for a long period. Typically persons who are currently 30 years old accrue pension rights on the basis of the separate act, so not many pensions will be awarded under this Special Act for the next 30 years. When then the first cohorts covered by this act reach the retirement age, it will take another 30 years before the effect of the act shows in full in the pensions in payment and in the pension expenditure. In the long term, the pension expenditure under this act is about 0.6 per cent of the wage sum in the economy (Figure 4.3, note the scale of the vertical axis).

**Figure 4.3.** Pension expenditure under the Special Act as a percentage of the earned income in 2005-2075.

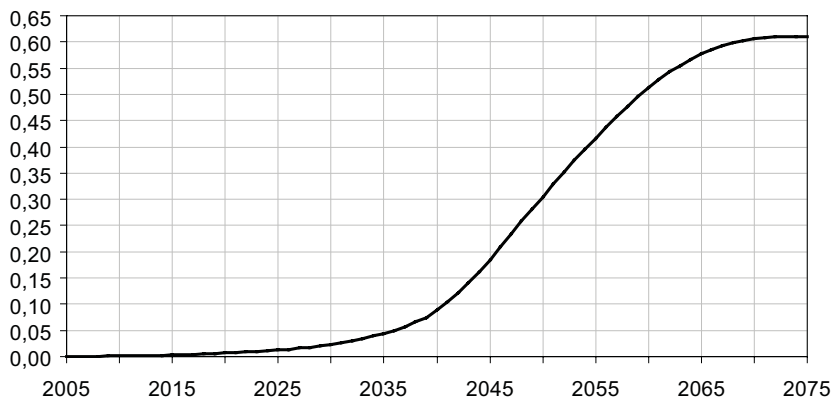


Figure 4.4 shows the development of the statutory earnings-related pension expenditure in the private sector, in the public sector, and for the whole economy in relation to earned incomes<sup>9</sup>. The private-sector pension expenditure percentage includes the pensions act for private-sector employees, the Seamen's Pensions Act (MEL), the Self-Employed Persons' Pensions Act (YEL) and the Farmers' Pensions Act (MYEL) as well as the Special Act, and the public sector includes the State Employees' Pensions Act (VEL) and the Local Government Pensions Act (KuEL) as well as the Special Act.

<sup>9</sup>The numbers concerning the public sector and the whole economy do not include earnings-related pensions for the Church, the personnel of the Social Insurance Institution and for other such small groups. However, they do not significantly affect the pension expenditure percentage in relation to the earnings, since the corresponding wage sums are also excluded from the calculations.

The public-sector pension expenditure in relation to earned income is initially about 12 percentage points higher than the private-sector expenditure. This difference will increase rather than diminish in the coming decades, but over the long term, the differences between the sectors will stabilise. The convergence of the expenditure percentages is a result to be expected, as the pension benefits in the sectors are also harmonised as to their main features. The current difference in pension expenditure percentage between the sectors is probably due to the previously more generous pension benefits in the public sector as compared to the private sector, and privatisations, which has resulted in employees transferring from the public to the private sector. Moreover, the slow convergence of the expenditure percentages can partly be explained by the ageing workforce in the public sector. Due to the differences in age structure, as for the near future, more pension rights will accrue in the public sector in relation to earned income than in the private sector. As of 2005, more than a third of those insured in the public sector are over 50, in the private sector about a quarter have reached this age. However, the differences in pension expenditure percentage between the sectors cannot be explained by the future development of the number of insured. According to the scenario, the number of gainfully employed persons has been assumed to develop uniformly in different sectors.

**Figure 4.4.** Earnings-related pension expenditure as a percentage of earned income in the different sectors and for the whole economy until the year 2075.

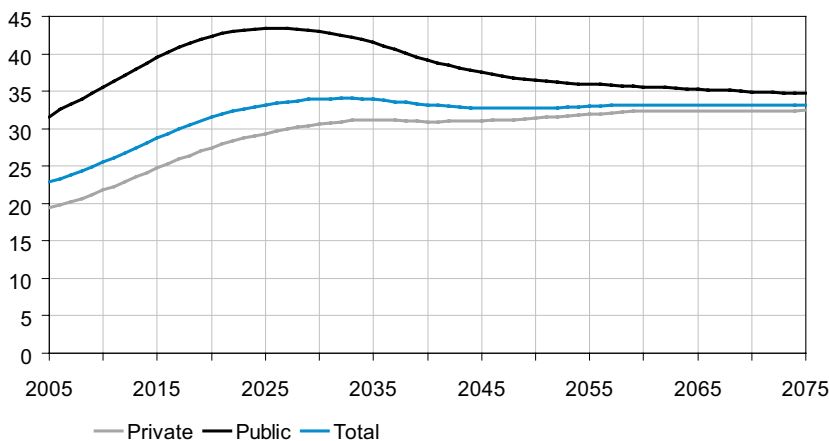
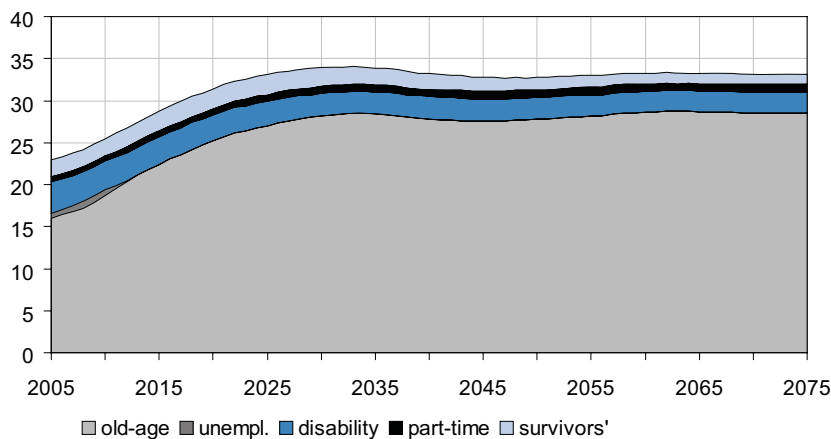


Figure 4.5 analyses the earnings-related pension expenditure according to the type of benefit. Disability pensions and unemployment pensions are changed to old-age pensions at the age of 63. Available statistics indicate that the age limit for early pension and old-age pension is typically 65 years old in the private sector. The difference in the age limit makes it more difficult to compare the scenario and the realised development for each type of benefit.

**Figure 4.5.** Pension expenditure as a percentage of the wage according to type of benefit.



When analysed by the type of pension, the growth in old-age pension expenditure remains the dominating feature of the future development. The unemployment pensions will disappear in slightly less than ten years. The share of the wage sum for other pensions than old-age pensions and unemployment pensions will remain at about 6 percentage points until 2020 and from that level, decrease steadily to about 5 percentage points by the end of the calculation period.

A drop in mortality also decreases the survivors' pension expenditure, since one result of decreasing mortality is a lower number of surviving spouses. The survivors' pension expenditure is especially decreased by the assumption that mortality for men will decrease faster than for women. According to the scenario, the survivors' pension expenditure will comprise 2.2 per cent of the wages in 2030 and 1.2 per cent in 2075. If mortality remained at the present level, the corresponding percentages would be 2.6 and 2.3. Another factor is the diminishing

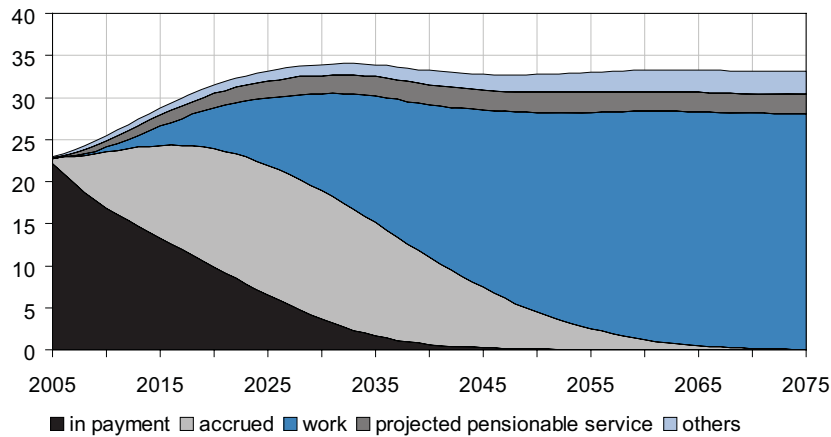
differences between the pensions of the spouses and the decreasing number of marriages all which lower the number of new survivors' pensions. The scenario assumes that these factors will decrease the number of new survivors' pensions by 30% by 2030 as compared to a situation where the differences in the pensions and the marriage rate remained at the present level.

The rate of new part-time pensions is assumed to remain the same over the whole calculation period. The part-time pension expenditure will clearly increase. The reason for this is that, as the effective retirement age is postponed, the share of persons entitled to a part-time pension in the labour force increases.

Besides analysing by type of benefit, the pension expenditure can also be specified by conducting an analysis according to the accrual basis. In Figure 4.6, the total pension expenditure percentage has been divided firstly into pension components accrued up to the end of 2004 and pension components that will accrue in the future. The pensions accrued up to the end of 2004 have been further divided into pensions which are already in payment and pension components that have accrued but that will only become payable in the future. The future pension accrual has been divided into pensions accruing on the basis of earnings, pension accrual granted on the basis of projected pensionable service in disability pensions and other pension accrual.

The accrued pension components will dominate pension expenditure for a long time to come. By the beginning of the 2030s, more than half of the pensions paid out will have already been accrued by the insured. Figure 4.6 can also be interpreted as depicting the coming into force of the 2005 pension reform. This pension reform will not appear full in the pension expenditure until all pensions accrued before the reform have been paid. From this viewpoint the full implementation of the pension reform will take the rest of the lifetimes of those who are currently working.

**Figure 4.6.** Pension expenditure as a percentage of earned income according to accrual basis.



Pension components accruing on some other basis than work or projected pensionable service (heading “others” in Figure 4.6) include pension expenditure arising from part-time pensions, periods with daily allowances and the Special Act. The expenditure development of the Special Act was shown above (Figure 4.3). The actual part-time pension expenditure was shown in Figure 4.5. In addition, part-time pension expenditure arises from a decrease in earnings during the part-time pension, which in the long term amounts to about 0.2 per cent of wages. The share of pensions accruing from periods of earnings-related daily allowances in the wage sum is in the long term about one per cent, of which half accrues on the basis of periods of unemployment allowance and the other half on the basis of periods of other allowances. The pension components accruing on the basis of periods of unemployment may appear small compared to those pension components accruing on the basis of earned incomes (half a per cent as compared to about 28 per cent). However, the result can be explained by the following factors: of the unemployed persons in the calculation only half receive earnings-related unemployment allowance, the unemployment rate is expected to decrease by a third and the salary for insurance purposes for the unemployed is lower than the average wage of all insured persons. In addition, the accrual rate for periods of unemployment is lower than that for gainful employment<sup>10</sup>.

<sup>10</sup> Earnings from work accrue a pension at the annual rate of 1.5, 1.9 or 4.5 per cent and for periods of unemployment, at the rate of 1.125 (0.75 x 1.5) per cent a year.



## 4.2 Total statutory pension expenditure

Above we presented the estimates of the pension expenditure under the most important acts on the earnings-related pension in relation to the wage sum or sum of earned incomes under the corresponding acts. We will now examine the total pension expenditure in proportion to the GDP.

The growth rates of the wage sum and of the GDP are assumed to be equal (Table 4.1). In this case, the share of the earned incomes in the GDP grows slightly, since the earned income in the national accounts includes wages/salaries and employer contributions. The employers' pension contributions grow slightly faster than the wages. A slight change is natural in the functional earnings distribution in favour of earned incomes, since the employment rate in the calculation of the pension expenditure increases during the period of calculation. In addition, the current share in Finland of earned incomes in the GDP is low both historically and internationally. In 2002, the share of earned incomes in the GDP was 49% in Finland, 57% in Sweden and 54% in Germany. In 1990, the share of the earned incomes in the GDP was 57% in Finland.

**Table 4.1.** *Growth in the wage sum and in the GDP over the period of calculation.*

2005-2015	2015-2075	2005-2075
1.85%	1.53%	1.57%

The total pension expenditure will be analysed according to the following four categories of pensions:

- 1) private-sector earnings-related
- 2) public-sector earnings-related
- 3) national
- 4) other

Personal voluntary pensions are not included in the calculation.

Private-sector earnings-related pensions consist of the statutory earnings-related pensions and voluntary pensions in connection with the employment

contract. In 2002, these voluntary pensions amounted to about 5% of the private-sector statutory earnings-related pensions<sup>11</sup>. This share is expected to remain unchanged. Public-sector earnings-related pensions include the aforementioned state and local government pensions, as well as the pension expenditure for the Church, the Regional Government of Åland, the personnel of the Social Insurance Institution and of the Bank of Finland. In 2002, this latter group made up about 3.3 per cent of the state and local government pensions. This share is also expected to remain unchanged.

The estimate of the share of national pensions in the GDP for the year 2050 is based on the baseline scenario of the actuarial report of the Social Insurance Institution (Social Insurance Institution 2003c), where the national pensions are expected to follow only the price level. According to this scenario, the share of national pensions in the GDP will decrease from the current level of about 2 per cent to 0.7 per cent in 2050. After 2050, the share of national pensions in the GDP is expected to stabilise. Other pensions consist of pensions from workers' compensation and motor liability insurance, as well as compensations for military injuries and from the farmers' special pensions. The share in the GDP of pensions awarded on the basis of workers' compensation and motor liability insurance (about 0.23% in 2002) is expected to remain stable over time, whereas compensations for military injuries and farmers' special pensions (about 0.23% in 2002) are expected to disappear steadily by 2025.

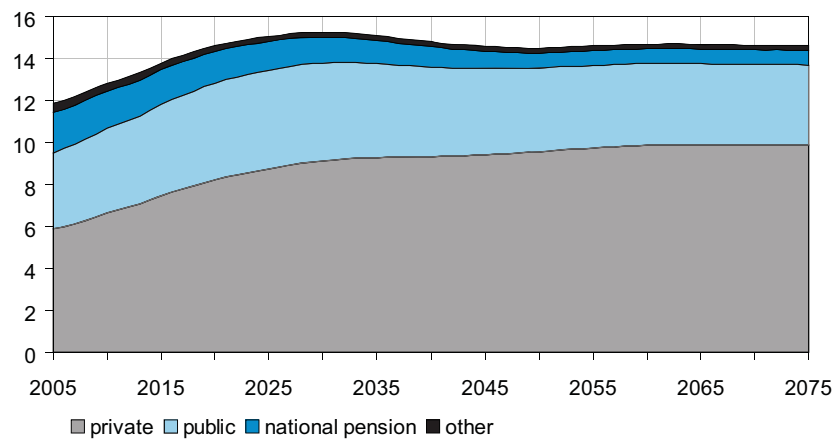
The total pension expenditure in 2003 amounted to about 11.7 per cent of the GDP, and at its highest, this share will rise to a solid 15 % in the 2030s (Figure 4.7). After that, the share of pension expenditure in the GDP decreases slightly, mainly as a result of the decrease in the share of the national pension expenditure. If the level of national pensions were to follow the earnings level, the share of the national pension expenditure in the GDP would remain at slightly less than 2 per cent over the period of observation. In that case, the share of the total pension expenditure in the GDP would settle at a level of slightly less than 16 per cent in the 2030s. The share of the earnings-related pension expenditure in the GDP will reach the level of 14 per cent in 2030 and after that, the

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<sup>11</sup> The data on the total pension expenditure in 2002 are taken from the statistical yearbook of the Social Insurance Institution 2002 (pages 38-39).

expenditure share will, in practice, remain stable. However, the share of private-sector earnings-related pensions will continue to increase after 2030, but the share of public-sector earnings-related pensions will correspondingly decrease.

**Figure 4.7.** Total pension expenditure as a percentage of the GDP.



### 4.3 Financing of private-sector earnings-related pensions

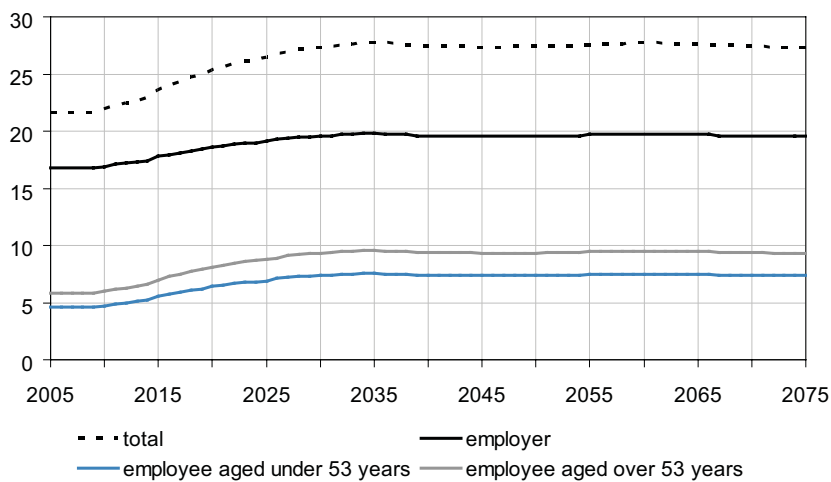
The evaluations presented above cover, in their main parts, the collective pension expenditure. The financing calculations presented hereafter concern private-sector statutory earnings-related pensions. As regards employees, the most important contents of the financing calculation concern the development of the pension contribution and of the pension assets. The most significant quantities to be evaluated in the financing calculation under the Self-Employed Persons' Pensions Act (YEL) and the Farmers' Pensions Act (MYEL) are the premium income and the State's share of the pension expenditure.

The pension contribution for private-sector employees will increase from 21.6 per cent in 2003 by 6 percentage points by the 2030s, after which the contribution levels will no longer change significantly (Figure 4.8)<sup>12</sup>. The employer contribution will level off at slightly less than 20 per cent, the employee contribution for employees under 53 years old at 7.5 per cent and the employee

<sup>12</sup>The contribution in 2003 is the weighted average of the contributions under TEL, LEL and TaEL.

contribution for employees aged over 53 years at slightly less than 10 per cent. The development of this contribution resembles that of the expenditure, but the increase in the contribution is about half of the increase in the expenditure.

**Figure 4.8.** Pension contribution for private-sector employees as a percentage of their wages and the different components of the contribution (total contribution, employer, insured employees under 53 years old and insured employees over 53).

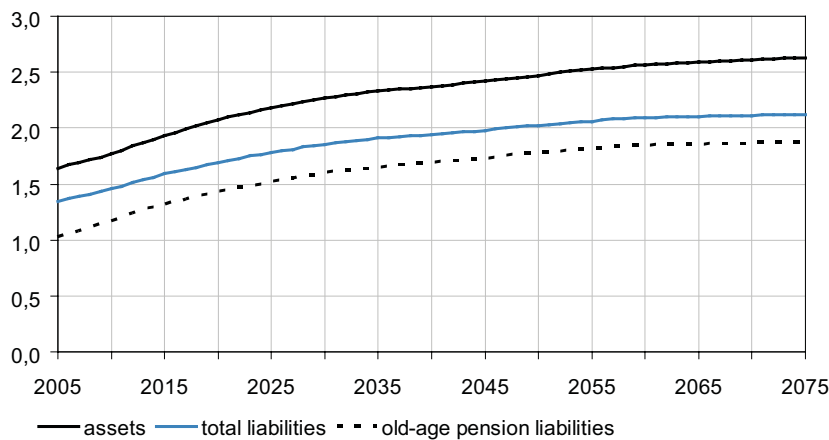


Pension assets refer to the value of the pension providers' investment assets calculated at their market values. This size of this value corresponds to the sum of the pension providers' technical provisions and solvency margin. Through the solvency margin, the pension providers prepare for investment risks, but the significance of these risks is not taken into account in this report, which contains deterministic calculations. As such, the solvency margin is expected to develop more or less in a fixed relation to the technical provisions. The rules regulating the financing are expected to remain unchanged as of the beginning of 2005 until the end of the whole calculation period. The yield percentage in real terms for the pension assets is 3.5 and the technical rate of interest is 3.33 per cent over the whole calculation period.

Over the whole calculation period, the pension assets will grow faster than sum of the private-sector employees' wages. The growth in these assets is a result

of the growth in old-age pension liabilities (Figure 4.9). In 2017, the pension assets will be double the amount of the wage sum and in the 2050s, the pension assets will be 2.5 times the wage sum.

**Figure 4.9.** *Assets for private-sector employees' pensions and technical provisions in relation to the wage sum.*



However, presenting the pension assets in relation to the wage sum gives an incomplete picture of the development of the funds, as assets are not collected for the annual wage sum but for future pension expenditure. The funding level is defined as the ratio

$$\frac{\text{Pension assets at time } t}{\text{Value of accrued pension rights at time } t}$$

The value of accrued pension rights is the amount of money which is sufficient to finance all the pensions accrued up to the time in question after the fund yield and the pension indexation have been taken into account. Figure 4.6 shows the pensions accrued up to the end of 2004. The value of the accrued pension rights at the end of 2004 is arrived at by discounting the accumulated pension expenditure in the figure to the end of 2004.

Table 4.2 contains the development of the funding level to the year 2029 for private-sector employees and in the whole private sector when the used discount rate in real terms is 3.5 per cent. The funding level of the whole private sector is

lower than that for employees, as no significant funds have accumulated under the pension acts for self-employed persons. The funding level for private-sector employees will thus increase from the current 30 per cent by 4 percentage points over the next 25 years. This funding level will increase considerably slower than the funds in relation to the wage sum. In other words, pension rights increase faster than the wage sum. This is natural since the pension expenditure also increases faster than the wage sum.

**Table 4.2.** *Funding level for private-sector employees and for the whole private sector from 2004 to 2029.*

Year	2004	2009	2019	2029
Private-sector employees	30%	32%	33%	34%
Total	27%	28%	29%	31%

Table 4.3 includes calculation of the cash-flow for private-sector employees' pensions for the period 2005-2030. The first row shows the private-sector employees' wage sum in the price level for 2004, the other numbers represent the percentages of the annual wage sum. The pension contribution shown in Table 4.3 does not include refunds, which have been separated in the table as the use of incomes. The investment yield refers to the nominal yield on the pension assets. Payment from the Unemployment Insurance Fund means the payment from the Unemployment Insurance Fund to the pension providers, which is used to finance the pension accrual during periods of unemployment. The pension expenditure consists of the private-sector employees' payable pensions and the expenditure for pensions under the Seamen's Pensions Act (MEL) as well as for registered supplementary pensions, which are financed through equalisation. Other expenditure results from administrative costs, premium losses and refunds. The difference between incomes and costs is manifested as a change in the pension assets. In 2010, the investment yields and the change in pension assets will be almost equal in size, after which more assets are released from the investments than are bound to new investments.

**Table 4.3.** *Cash-flow calculation for private-sector employees' pensions.*

Year	2005	2010	2020	2030
Wage sum, million euros*	39 242	44 879	51 697	59 777
Income (numbers as a percentage of earned income)				
Contributions	21.8	22	25.4	27.5
Investment yields	9.1	9.9	11.5	12.6
Payment from the Unemployment Insurance Fund	0.8	0.6	0.6	0.6
Total	31.7	32.5	37.5	40.7
Use of incomes (numbers as a percentage of earned income)				
Pension expenditure for private-sector employees	18.5	20.8	26.3	29.7
Other pension expenditure**	0.3	0.3	0.3	0.2
Administrative costs and premium losses	1	1	1	0.8
Refunds	0.2	0.2	0.3	0.4
Changes in assets	11.7	10.2	9.6	9.6
Total	31.7	32.5	37.5	40.7

\* In the price level for 2004  
\*\* Expenditure under MEL and for the registered supplementary provision which are financed through equalisation

Table 4.4 shows the cash-flow calculation under the Self-Employed Persons' Pensions Act (YEL). The annual incomes consist of the contributions and the State's share, whereas the costs are the sum of pension expenditure and administrative expenses. Furthermore, the administrative expenses are expected to remain at the present level in relation to the sum of the earned incomes. Table 4.5 shows the corresponding calculations for the Farmers' Pensions Act (MYEL). A calculated level has been used for the administrative expenses which corresponds to that of the Self-Employed Persons' Pensions Act (YEL).

**Table 4.4.** *Cash-flow calculation under YEL.*

Year	2005	2010	2020	2030
Sum of earned income, million euros*	2 774	3 092	3 503	4 041
Income (numbers as a percentage of earned income)				
Contributions	20.1	20.4	23.6	25.4
State's share	3.3	5.3	9.9	11.5
Total	23.4	25.7	33.5	36.9
Use of incomes (numbers as a percentage of earned income)				
Pension expenditure	21.9	24.2	32	35.4
Administrative costs	1.5	1.5	1.5	1.5
Total	23.4	25.7	33.5	36.9

\* In the price level for 2004

**Table 4.5. Cash-flow calculation under MYEL.**

Year	2005	2010	2020	2030
Sum of earned income, million euros*	1 243	1 126	1 031	1 123
Income (numbers as a percentage of earned income)				
Contributions	10.8	11	12.6	13.6
State's share	32.8	39.4	48.9	44.2
Total	43.6	50.4	61.5	57.8
Use of incomes (numbers as a percentage of earned income)				
Pension expenditure	42.1	48.9	60	56.3
Administrative costs **	1.5	1.5	1.5	1.5
Total	43.6	50.4	61.5	57.8
* Sum of earned incomes in billions of euros in the price level for 2004, other numbers appear as percentages of the sum of earned incomes				
** Calculated value				



## 5 Sensitivity analysis

This chapter examines the sensitivity of the results of the baseline scenario as regards to the assumptions about demographic and economic development. By changing one assumption or group of assumptions at a time, we can see how the assumption affects the results. In alternative scenarios, we have striven for clarity and understandability, but if necessary, we have given up on their realism. For instance, when observing the effect of fertility on the development of the pension expenditure percentage migration, the employment rates and wage level have been assumed to remain similar to the baseline scenario. These scenarios probably exaggerate the final effect of the variables on the pension scheme, since the adjustment of the labour market and of the rest of society to different situations has to a large extent not been taken into consideration.

Alternative scenarios are only given for the development in private-sector employees' pensions, as we can thus analyse a concise entity of expenditure, contributions and funds. However, the results also give indications as regards to the whole scheme. The change in external circumstances is assumed to apply equally to all sectors of the economy.

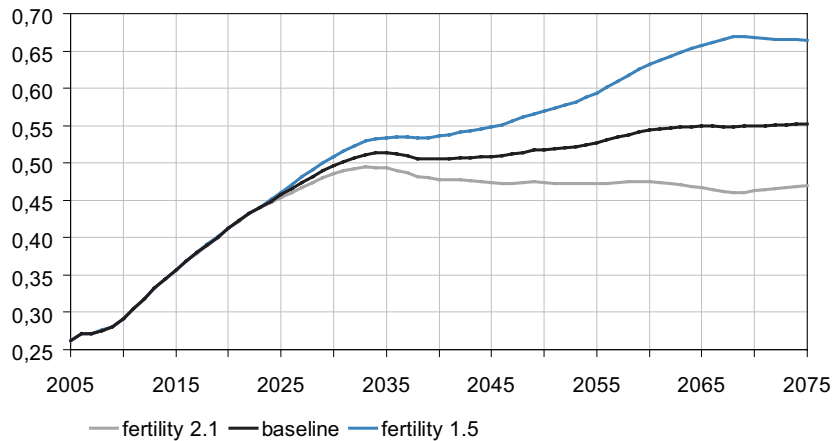
### 5.1 Population forecast

#### 5.1.1 Fertility

The total fertility rate in the baseline scenario is 1.8 children per woman, 1.5 in the low-fertility scenario and 2.1 in the high-fertility scenario. The variation interval has been chosen symmetrically around the baseline scenario so that the high-fertility scenario more or less corresponds to the level needed for population renewal. However, owing to net migration, in the high-fertility scenario, the generations entering working life increase in number. According to Alho (2002), the probability that the total fertility rate in 2030 will be between 1.5 and 2.1 is about 0.5. Before 2030, the 50-per-cent probability band is narrower and after 2030, it is wider. Currently the total fertility rate is 1.76 in Finland, 1.71 in Sweden and 1.8 in Norway. Industrialised countries with fairly high fertility include the United States (2.07) and Iceland (1.99), whereas for instance, in Germany (1.34), Italy (1.29) and Spain (1.29), fertility is low. (Eurostat 2004)

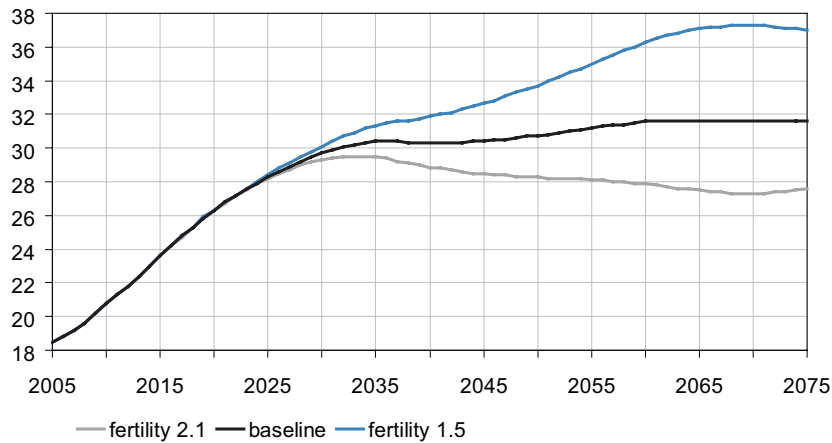
Changes in fertility affect the population development only slowly. Figure 5.1 shows the different fertility scenarios for the proportion of persons who have reached the age of 65 to persons aged 20-64. During the first 20 years, the old-age dependency ratio is not dependent on fertility, and also after this, the change in the dependency ratio is slow. At its strongest, the effect on the dependency ratio is 65 years after the change in fertility, as the first large or small age groups change from being maintainers to being maintained. This turning point appears in the indicator for the dependency ratio just before the year 2070.

**Figure 5.1.** Old-age dependency ratios for different fertility scenarios.



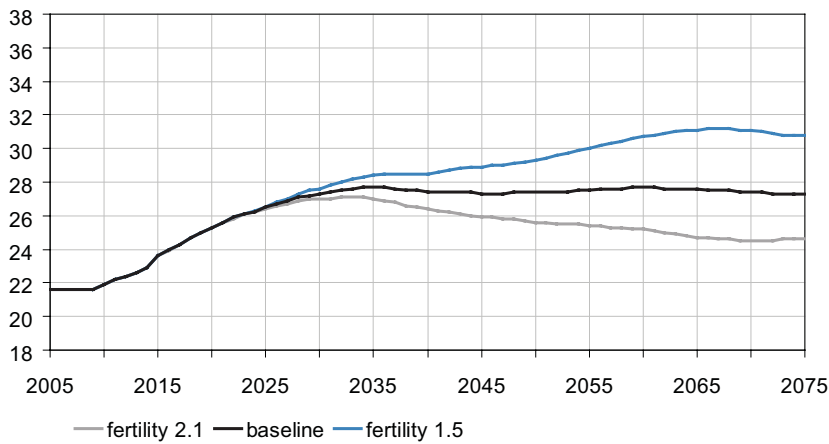
During the next 60 years, fertility will have very little effect on pension expenditure. On the other hand, fertility has a straight-line effect on the wage sum and that way on the pension expenditure percentage, although even slower than on the old-age dependency ratio. For instance, in 2060, according to the high-fertility scenario, the wage sum is about 15 per cent higher than in the baseline scenario, and this growth in the wage sum mainly explains the lower percentage of the pension expenditure as compared to the baseline scenario. Correspondingly, the high pension expenditure percentages in the low-fertility scenario are due to the low wage sum as compared to the baseline scenario (Figure 5.2).

**Figure 5.2.** Pension expenditure for private-sector employees as a percentage of the wage for the different fertility scenarios.



The development of the pension contribution in the different fertility scenarios moves in the same direction as the development of pension expenditure (Figure 5.3). However, the contribution percentage is not as sensitive to the fertility rate as is the expenditure percentage. As the fertility effect will be at its strongest in about 2070, the expenditure in the high-fertility scenario is 4.4 percentage points but the contributions are 2.9 percentage points lower than in the baseline scenario. The corresponding figures in the low-fertility scenario are 5.8 and 3.7 percentage points, respectively. The different reactions of the contribution and the expenditure to fertility rates are natural, when keeping in mind the partial funding of the scheme. In other words, for pure pay-as-you-go schemes, the expenditures and the contributions are of equal magnitude. When applied to a fully funded scheme, our idealised calculation would produce a result according to which the contribution would not in any way react to changes in fertility.

**Figure 5.3.** Pension contribution percentage for private-sector employees in different fertility scenarios.



According to the high-fertility scenario, the proportion of pension assets to the wage sum remains lower than in the baseline scenario, whereas in the low-fertility scenario, the result is the opposite (Table 5.1). In the long term the proportion of assets to the wage sum differs considerably in different scenarios.

**Table 5.1.** Pension assets for private-sector employees in proportion to wages in different fertility scenarios.

	2015	2035	2055	2075
Fertility 2.1	1.93	2.26	2.33	2.38
Baseline	1.93	2.33	2.53	2.63
Fertility 1.5	1.93	2.40	2.76	2.92

### 5.1.2 Mortality

The baseline scenario assumes that the current rate of decrease in mortality will continue until 2050, after which the rate of decrease is assumed to be halved. As for the future development of mortality, we investigate three alternative population scenarios:

- 1) In the scenario of rapidly decreasing mortality, the rate of decrease in mortality is 1.5 times that of the baseline scenario. This decrease in

- mortality, achieved in 3 years in the baseline scenario, is thus already achieved in 2 years in the scenario of rapidly decreasing mortality
- 2) In the scenario of slowly decreasing mortality, the rate of decrease in mortality is halved. The annual decrease in mortality in the baseline scenario is realised in two years.
  - 3) In the scenario of constant mortality, the mortality rate stays at the present level.

According to Alho (2002), the realised mortality will settle in between the scenarios of rapid and slow decrease with a probability of about 0.5. The probability of a development according to constant mortality or a weaker development, is less than 0.1. In the baseline scenario, the life expectancy for men in 2075 is 85.0 years, in the scenario of rapidly decreasing mortality 87.7 years, in the scenario of slowly decreasing mortality 81.0 years and in the scenario of constant mortality 75.3 years. The corresponding figures for women are 88.2, 90.1, 85.6 and 81.9. The old-age dependency ratios for these different developments in mortality are shown in Figure 5.4.

**Figure 5.4.** Old-age dependency ratio for different mortality scenarios.

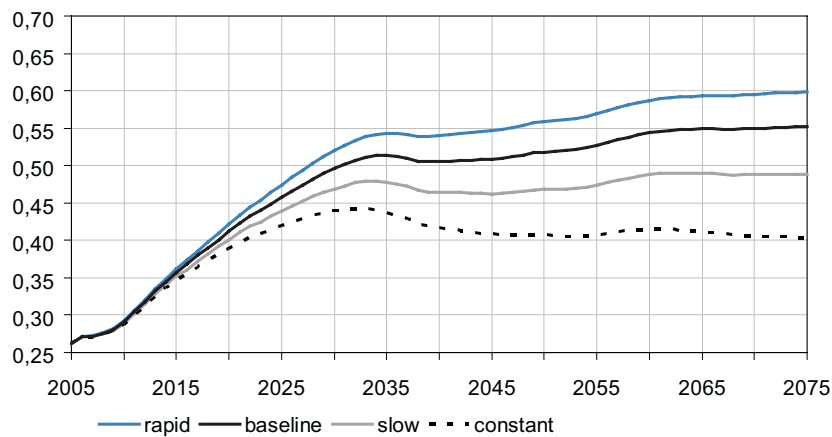
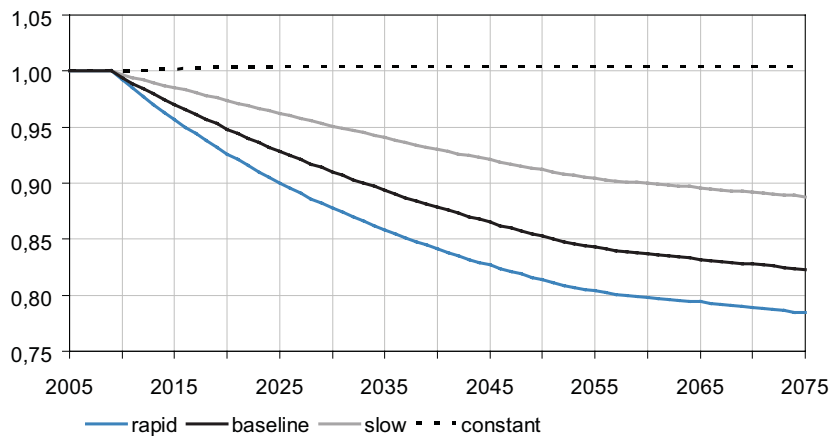


Figure 5.5 shows the value of the life-expectancy coefficient for different mortality scenarios. If mortality remains at the current level, the life expectancy coefficient is projected to be a number of slightly higher than one. For the age groups currently of working age, there is a slightly higher proportion of men than in the older age groups. Thus even in circumstances of constant mortality,

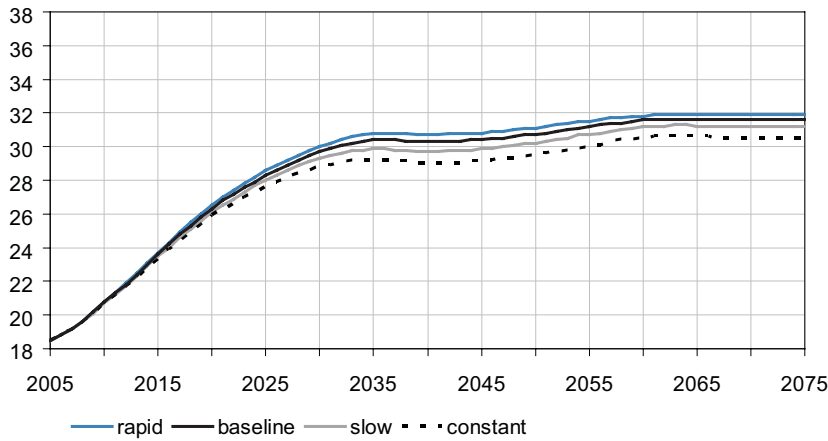
the men's share of the elderly will increase and at the level of the whole population, the mortality risk for persons of retirement age as well as the value of the life expectancy coefficient will increase. According to the baseline scenario, the value of the life expectancy coefficient in 2020 will be about 0.95, in the scenario having a slow decrease in mortality, this level is achieved in double that time, i.e. in about 2030. On the other hand, the scenario of rapidly decreasing mortality achieves the corresponding level in about two-thirds of the time as the baseline scenario achieves, i.e. in about 2017.

**Figure 5.5.** *Life expectancy coefficient in the different mortality scenarios.*

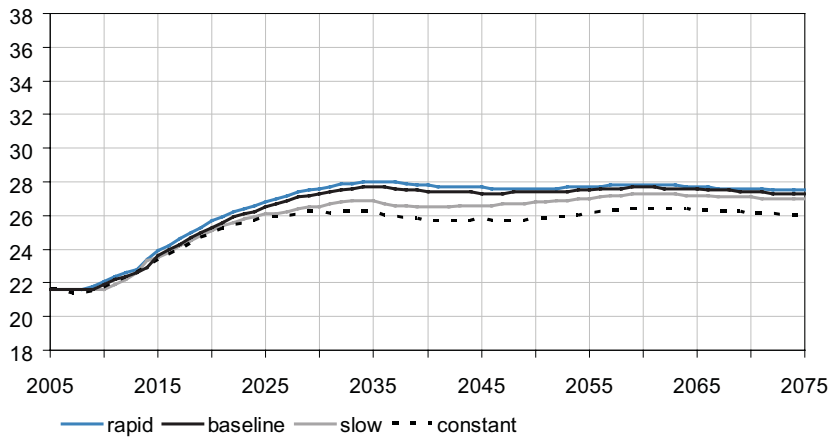


Even though the development in mortality affects the old-age dependency ratio significantly, the effect of mortality on pension expenditure is slight (Figure 5.6). At least in these cases, the life expectancy coefficient functions in the intended way. In the case of constant mortality, the pension expenditure stays more than one percentage point under the expenditure level of the baseline scenario. The reason for this is that the life expectancy coefficient is determined for each cohort at the age of 62. The decrease in mortality after reaching this age will affect the size of the pensions for the following cohorts but will not affect the cohort whose life expectancy actually increased. As to mortality, the pension expenditure and the pension contribution are almost as sensitive, for instance in 2050, according to the scenario of low mortality, both the expenditure and the contribution remain about half a percentage point lower than in the baseline scenario.

**Figure 5.6.** Pension expenditure percentage for private-sector employees in the different mortality scenarios.



**Figure 5.7.** Pension contribution percentage for private-sector employees in the different mortality scenarios.



The old-age pension liability has been calculated using the same calculation bases for the different mortality scenarios. Moreover, the differences in the realised mortality scenarios have been reflected in a surplus in old-age pension liabilities or a need to replenish them. In that case, the development in mortality

has a fairly slight effect on the growth in pension assets. In the two scenarios where life expectancy stays low, the proportion of pension assets to the wage sum stays slightly lower compared to the baseline scenario (Table 5.2).

**Table 5.2.** Pension assets for private-sector employees in proportion to the wage sum in different mortality scenarios.

	2015	2035	2055	2075
Rapid	1.94	2.36	2.53	2.61
Baseline	1.93	2.33	2.53	2.63
Slow	1.94	2.31	2.45	2.53
Constant	1.94	2.34	2.48	2.53

## 5.2 Employment rate and effective retirement age

The effect of the development in employment rates on pension expenditure and contributions is investigated through three alternative scenarios. First, in the scenario ‘baseline +3’, the employment rate increases annually by 0.25 percentage points faster than in the baseline scenario until 2016. After this time, the employment rate stays permanently at 3 percentage points higher than in the baseline scenario. In the scenario ‘baseline -3’ the development of the unemployment rate differs in a corresponding way in a negative direction in comparison to the baseline scenario. In these scenarios, the effective retirement age follows the baseline scenario.

For the scenario ‘low employment rate’, the number of employed has been calculated under the assumption that the currently observed age-group-specific employment rates remain unchanged. This scenario is based on the assumption that the effective retirement age is postponed by 1.2 years with the following timetable, 2010: 0.8 years, 2015: 1.1. years and from 2025, 1.2 years. The employment and unemployment rates for the different scenarios are shown in Tables 5.3 and 5.4.



**Table 5.3.** *Employment rate in the baseline scenario and deviations of the alternative scenarios in comparison to the baseline scenario.*

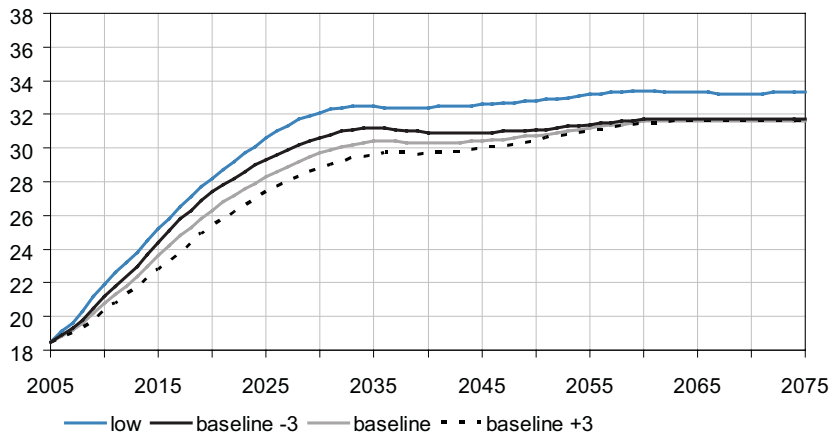
Year	2005	2010	2015	2025	2050	2075
Baseline scenario	67.4	68.8	69.4	70.1	71.8	71.9
Baseline +3	+0.2	+1.5	+2.7	+3.0	+3.0	+3.0
Baseline -3	-0.3	-1.5	-2.7	-3.0	-3.0	-3.0
Low employment rate	-0.6	-3.8	-3.9	-4.5	-6.0	-6.2

**Table 5.4.** *Unemployment rate in the baseline scenario and the deviations of the alternative scenarios compared to the baseline scenario.*

Year	2005	2010	2015	2025	2050	2075
Baseline scenario	11.4	8.7	7.6	7.4	7.5	7.5
Baseline +3	-0.2	-1.0	-1.4	-1.4	-1.4	-1.4
Baseline -3	+0.2	+1.1	+1.7	+1.7	+1.7	+1.7
Low employment rate	+0.4	+2.4	+3.5	+3.6	+3.5	+3.5

For the sake of simplicity, no assumption is made in the scenarios about a connection between the average wage and employment rate. In other words, the average wage of added or deducted employees compared to the baseline scenario is just as high as the average wage of the insured. In practice, achieving high employment rates probably requires an increase in part-time work and low-productivity jobs. In that case the additional employees would earn less than the average wage in the economy. If the marginal employees' wage is 75% of the average wage in the economy, the effects in the scenarios 'baseline +3' and 'baseline -3' when compared to the baseline scenario are about a quarter smaller than presented here.

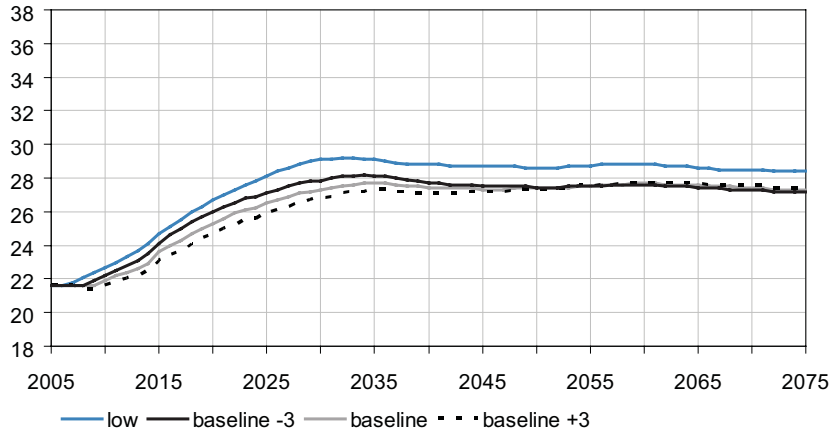
**Figure 5.8.** Pension expenditure percentage for private-sector employees in different employment scenarios.



The strongest effect on the percentage of pension expenditure in the scenarios ‘baseline +3’ and ‘baseline -3’ occurs in about 2020 (Figure 5.8). Here the full effect of the employment rate on the wage sum emerges, but the pension expenditure still corresponds to the level of the baseline scenario. The pension expenditure percentages in proportion to the wage sum deviate by about +/- 1 percentage point when compared to the baseline scenario. When continuing the calculations further, a work history deviating from the baseline scenario will also gradually be reflected in the pensions payments and the effect on the pension expenditure percentage diminishes. However, the small fluctuations in the employment rate do not have long-term effects on the pension expenditure percentage.

In the low-employment scenario, the difference of the pension expenditure percentage from that of the baseline scenario is at its largest at 2.5 percentage points. Even in the long term, the expenditure percentage remains almost two percentage points higher than in the baseline scenario. This long-term difference can mainly be explained by an assumption regarding the effective retirement age. According to this scenario, the number of pensioners in relation to employees remains permanently higher than in the baseline scenario.

**Figure 5.9.** Pension contribution percentage for private-sector employees in different employment scenarios.



The pension contribution reacts in the same direction as the expenditure percentage to the development in employment rates, but the effect on the contribution is about two-thirds of the effect on the expenditure (Figure 5.9). When the largest fluctuations in the pension expenditure were +/- 1 percentage point and 2.5 percentage points, the pension contribution percentage reacted in corresponding cases to the employment rates by about a third less. The development in employment rates is directly reflected in the wage sum and thus in the proportion of pension assets to the wage sum. In the long term, the proportion of the assets to the wage sum will nevertheless level out (Table 5.5).

**Table 5.5.** Pension assets for private-sector employees in proportion to the wage sum in the different employment scenarios.

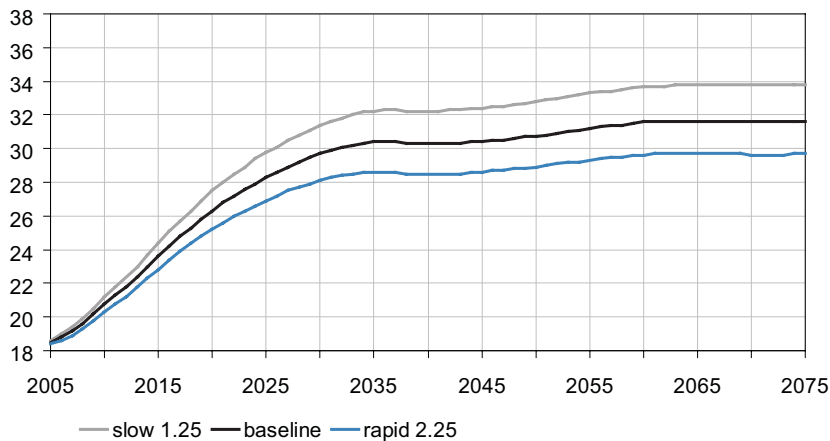
	2015	2035	2055	2075
Low	2.03	2.41	2.58	2.64
Baseline -3	1.99	2.38	2.55	2.64
Baseline	1.93	2.33	2.53	2.63
Baseline +3	1.88	2.29	2.51	2.62

### 5.3 Growth in earnings level

Growth in earnings level in the baseline scenario in real terms is 1.75 per cent annually, in the slow-growth scenario, 1.25 per cent and in the rapid-growth scenario, 2.25 per cent. These differences in the growth rate have a very large impact on the size of the wage sum in the long term; for the rapid-growth scenario in 2075, the wage sum is about 1.4 times that of the baseline scenario and in the slow-growth scenario, it is about 0.7 times that of the baseline scenario.

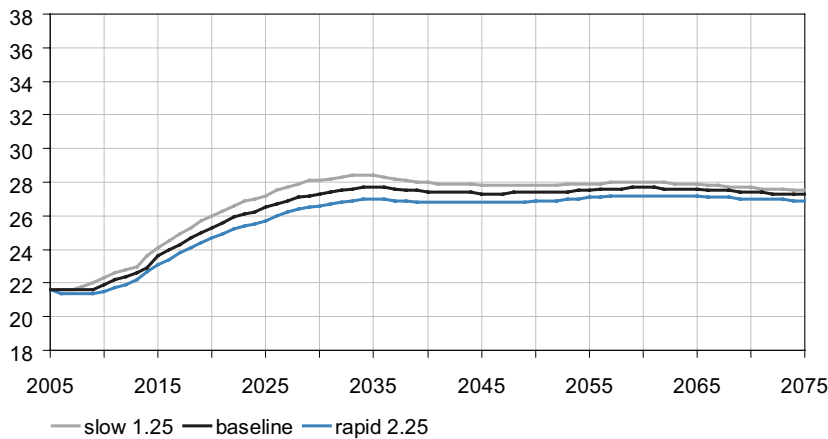
The growth in earnings level is, nevertheless, to a large extent also reflected in the pension expenditure, so the short-term and long-term effects on the pension expenditure percentage are considerably smaller than the effect on the wage sum (Figure 5.10). If all pensions and pension accruals were linked to an earnings-level index in full, the growth rate in the earnings level would in no way affect the pension expenditure percentage. Thus the reaction of the pension expenditure percentage to the growth rate in earnings level reflects the effects of incomplete indexation in comparison to an earnings-level index. As the growth in earnings level slows down, the pensions catch up on the wages, and when the growth rate accelerates, the opposite occurs.

**Figure 5.10.** Pension expenditure for private-sector employees as a percentage of the wage in different scenarios for earnings level growth.



The pension contribution depends very little on the growth rate in the earnings level (Figure 5.11). The stability of the contribution is due to two factors: first, funding in general is prone to dampen the reflection of changes in the pension expenditure percentage on the contribution level; Second, as the growth in earnings level accelerates, the difference between the growth rate in the wage sum and the real yield on the investments narrows, and thus the decreasing effect of funding on the contribution level is weakened. In the opposite case, as the growth rate in earnings level slows down, the difference between investment yields and the growth rate in the wage sum widens, and then the decreasing effect of funding on the contribution level is emphasised.

**Figure 5.11.** Pension contribution for private-sector employees as a percentage of the wage in different scenarios of earnings level growth.



When the earnings level grows rapidly, the proportion of pension assets to the wage sum remains lower than in the baseline scenario. In case of a slow growth in the earnings level, the development is the opposite (Table 5.6).

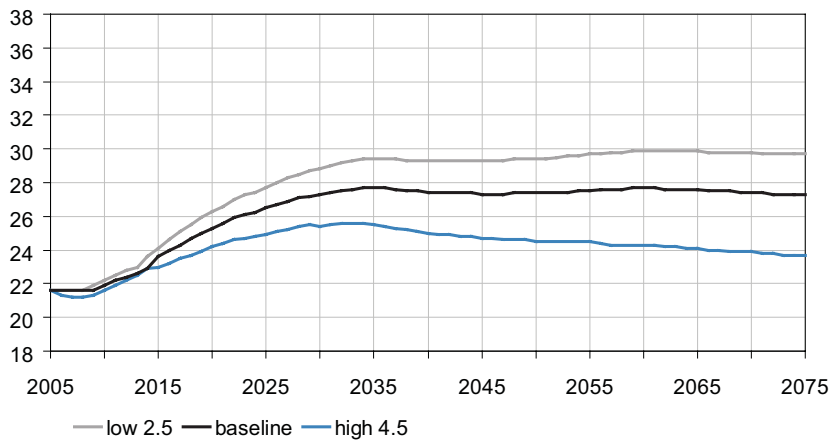
**Table 5.6.** Pension assets for private-sector employees in proportion to the wage sum at different growth rates in their earnings level.

	2015	2035	2055	2075
Slow (1.25%)	2.01	2.56	2.81	2.94
Baseline	1.93	2.33	2.53	2.63
Rapid (2.25%)	1.86	2.13	2.29	2.38

## 5.4 Investment yields

The yield on pension assets in real terms is 3.5 in the baseline scenario, 2.5 in the scenario of low yield and 4.5 per cent in the scenario of high yield. In the different scenarios, the technical interest rate also follows the yield percentage of the investments.

**Figure 5.12.** Pension contribution for private-sector employees under different yield assumptions.



Investment yields do not immediately have a large effect on the contribution level, but already after 15 years, the deviations from the baseline scenario are on the level of about one percentage point. As the horizon is lengthened, the effect of investment yields on the contribution level becomes significant (Figure 5.12). In addition to the effect on the contribution level, the investment yields have a cumulative effect on the amount of pension assets (Table 5.7).

**Table 5.7.** Pension assets for private-sector employees in proportion to the wage sum under different yield assumptions.

	2015	2035	2055	2075
Low (2.25%)	1.77	1.98	2.09	2.15
Baseline	1.93	2.33	2.53	2.63
High (4.25%)	2.11	2.78	3.13	3.26

Through the employees' pension contribution, investment yields to some extent also affect the pension expenditure. High investment yields mean a low employee contribution, and thus an increase in pension expenditure. In 2030, this effect is about +/- 0.1 percentage point. At the end of the calculation period, the scenario of high yields gives an expenditure level which is 0.6 percentage points higher than that of the baseline scenario and the scenario of low yields gives an expenditure percentage which is 0.4 percentage points lower than that of the baseline scenario.

## 6 Comparison with previous calculations by the Finnish Centre for Pensions

In the following, we compare the results of this report (PTS04) to the previous expenditure and contribution calculations by the Finnish Centre for Pensions regarding private-sector employees. The scenarios in the report Klaavo et. al. (1999) are referred to with the abbreviation PTS99. In 2002, the Finnish Centre for Pensions made calculations both according to the legislation then in force (PTS02f) and according to the legislation which took effect in 2005 (PTS02e)<sup>13</sup>. Table 6.1 shows the assumptions for the different calculations.

**Table 6.1.** Assumptions in the long-term calculations of the Finnish Centre for Pensions.

	PTS99	PTS02f	PTS02e	PTS04
Life expectancy in 2050, men	79	80	80	83.5
, women	85	85	85	87.2
Old-age dependency ratio in 2050*	0.46	0.48	0.48	0.52
Employment rate in 2050	72%	70.4%	72%	71.8%
Expected effective retirement age in 2050	-	60.4	62	62
Growth in earnings level	1.5%	1.75%	1.75%	1.75%
Investment yields	3%	3.5%	3.5%	3.5%

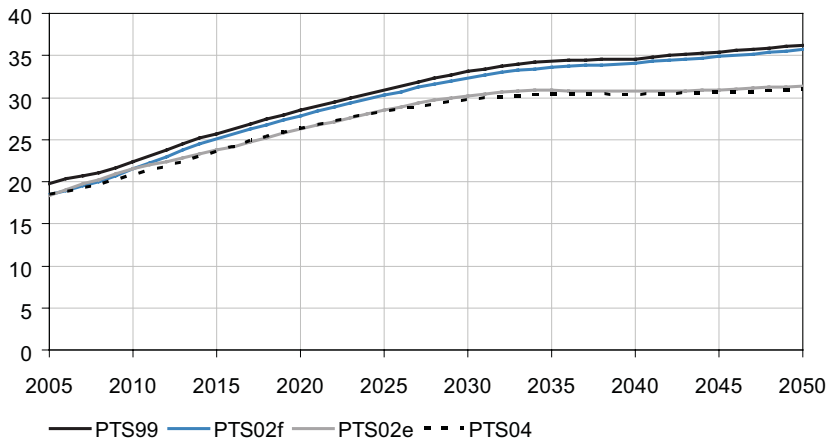
\* Persons who have reached the age of 65 in proportion to persons aged 20-64.

In the calculations PTS99 and PTS02, the population follows the Eurostat forecast, which was updated at the beginning of the 2000s. The effect of the update shows as an increase in life expectancy for men and in the old-age dependency ratio. The calculation PTS04 follows the population forecast of 2004 by Statistics Finland, where the life expectancies and the old-age dependency ratios are clearly higher than in the Eurostat forecast. Due to the life expectancy coefficient, the change in life expectancy for the elderly does not, however, in any crucial way affect the pension expenditure or the contributions. The fertility rates and net migration are also slightly higher in the forecast by Statistics Finland than in the Eurostat forecasts.

<sup>13</sup>The results of the 2002 calculation have been published in an abbreviated form in the publication The Finnish Pension System (2003).



**Figure 6.1.** Pension expenditure for private-sector employees as a percentage of the wage sum in the latest calculations by the Finnish Centre for Pensions. The effect of the special act on the expenditure is included in the calculations PTS02e and PTS04.

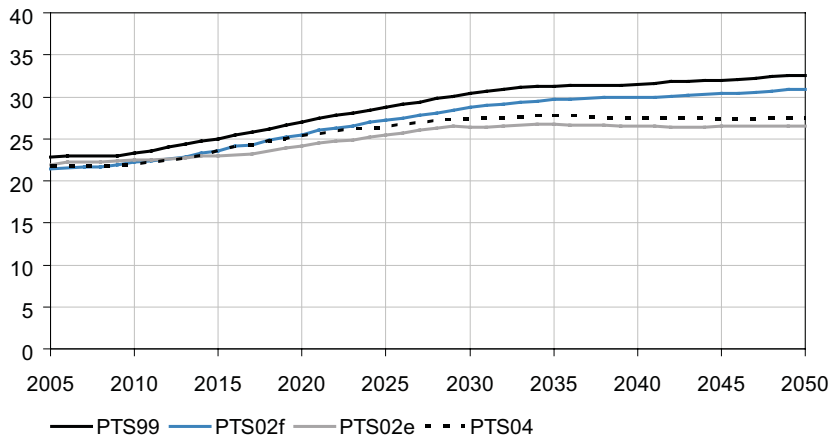


The assumptions in the calculations PTS99 and PTS02f differ from the assumptions of PTS04 with regard to legislation and economic development. Legislative changes included for instance abolishing the unemployment pension and lengthening the period of earnings-related unemployment benefits. On the other hand, the assumptions of the calculations PTS02e and PTS04 are for the most part similar. However, the calculation PTS04 is based on new starting data and many details in the calculation have been adjusted more closely than before to correspond to the functioning of the pension scheme and to the available register and statistical data. For example, the unemployment pathway to retirement has been included in the new calculation more precisely than before. Furthermore, the size of new disability pensions has been reduced in the new calculation in order to better correspond to the register data. As a result of small adjustments affecting the calculations in different directions, the new calculation shows the level of the pension expenditure for private-sector employees as being on average slightly lower than previously estimated (Figure 6.1).

The new expenditure and fund calculation follows the calculation bases in closer detail than previously and the solvency is kept on a higher level than before. In between the calculations, the rules for funding have been changed so that the increase in the employee contribution for persons aged over 53 is funded.

In addition, the increase in life expectancy in the population forecast increases the amount of old-age pension liabilities in the new calculation. As a result of these changes, the calculation PTS04 shows a contribution level which, in the near future, is lower than in the calculation PTS02e, but in the long term, the difference will turn the other way around. According to the new calculation, the pension assets in 2050 will amount to 2.5 times the wage sum, whereas the corresponding figure in the previous calculation is 2.3. The contribution level in the new calculation is also increased as the calculation PTS02 reports the development of the contribution under the Employees' Pensions Act (TEL), whereas the new calculation depicts the contribution for private-sector employees.

**Figure 6.2.** Pension contribution percentage in the latest calculations by the Finnish Centre for Pensions, PTS04 contribution for private-sector employees, the others the contribution under TEL.



## 7 Conclusions

Private-sector earnings-related pension expenditure in proportion to the earned incomes will increase from the current level of about 19 per cent to slightly over 30 per cent by 2030. Thereafter, the pension expenditure percentage increases slowly. The pension expenditure for private-sector employees is about one percentage point lower, but the development of the expenditure moves in the same direction as the development for the whole private sector. The public-sector earnings-related pension expenditure will increase from the current level of slightly more than 30 per cent to more than 40 per cent of employee wages in the 2020s. From the 2030s, the public-sector expenditure percentage will decrease and, in the long run, it will approach the level of the private-sector expenditure. The whole economy's statutory earnings-related pension expenditure will increase steadily until the beginning of the 2030s, after which the pension expenditure settles at about a third of the wage sum. The growth in pension expenditure is a result of the increase in the old-age pension expenditure, which is due to an ageing population. In the long term, the life expectancy coefficient will significantly decrease the effects of an ageing population on the pension expenditure.

The earnings-related pension contribution for private-sector employees will increase from the current 21.6 per cent by about 6 percentage points by the 2030s, after which the contribution will not change significantly. The partial funding diminishes the pressure to increase the contribution as half of the expected growth in the expenditure percentage is directed to an increase in the contribution. The proportion of pension assets to the wage sum will grow steadily over the whole calculation period. At present, the pension assets for private-sector employees are about 1.6 times the corresponding wage sum. In the 2030s, this proportion increases to 2.3 times the wage sum. The funding rate for private-sector employees' pensions also increases in the next few decades, but the growth is clearly slower. At the end of 2004, the funding rate for private-sector employees' pensions was about 30 per cent and in 2030, it will be about 34 per cent.

This report studied the effect of changes as regards trend-like demographic and economic development on the functioning of the pension scheme. Many of the external changes are such that the pension expenditure and especially the pension contributions are automatically balanced. However, in the long term,

the level of investment yields and of fertility have a cumulative effect on the main quantities observed here. The calculation did not study the effects of immigration or emigration deviating from the baseline scenario, but from the viewpoint of the pension scheme, the effects of fertility and migration go in the same direction. Due to the life expectancy coefficient, the alternative mortality scenarios do not strongly affect the expenditure or the contribution level. Furthermore, improved employment rates have an immediately decreasing effect on the pension expenditure and pension contributions. However, in the long term, the effects are levelled out, since the future pension expenditure accumulates from gainful employment. The growth rate in earnings level has a significant effect on the pension expenditure percentage, but not that much on the contribution level. The sensitivity analysis shows that in most cases, the pension expenditure percentage reacts clearly stronger to external changes than does the contribution percentage. From this viewpoint, advance funding of pensions is necessary in order to prepare for an unknown future.

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## APPENDIX TABLES

*Appendix table 1. Life expectancy coefficient (Figure 4.1).*

2005	1.00
2010	0.99
2015	0.97
2025	0.93
2035	0.89
2055	0.84
2075	0.82

*Appendix table 2. Earnings-related pension expenditure as a percentage of earned income (Figures 4.2 and 4.3).*

	YEL	MYEL	TyEL	Special Act
2005	21.9	42.1	18.5	0
2010	24.2	48.9	20.8	0
2015	28.4	55.8	23.6	0
2025	34.3	59.2	28.3	0.01
2035	35.5	52.5	30.4	0.04
2055	34.1	38.6	31.2	0.42
2075	34.3	35.9	31.6	0.61

*Appendix table 3. Earnings-related pension expenditure as a percentage of earned income per sector (Figure 4.4).*

	Private	Public	Total
2005	19.5	31.6	22.9
2010	21.8	35.6	25.5
2015	24.7	39.5	28.7
2025	29.3	43.4	33.1
2035	31.2	41.5	33.9
2055	31.9	36.0	33.0
2075	32.5	34.8	33.1

**Appendix table 4.** Earnings-related pension expenditure according to type of benefit (Figure 4.5).

	Old-age	Unempl.	Disability	Part-time	Survivors'
2005	16.0	0.6	3.7	0.6	2
2010	18.7	0.7	3.4	0.6	2.1
2015	22.4	0	3.3	0.7	2.3
2025	27.0	0	2.9	0.8	2.4
2035	28.4	0	2.6	0.8	2.1
2055	28.2	0	2.5	0.9	1.4
2075	28.5	0	2.5	0.9	1.2

**Appendix table 5.** Earnings-related pension expenditure according to grounds for accrual (Figure 4.6).

	Before 1.1.2005 accrued		Accrual after 1.1.2005		
	In payment	Accrued not paid	Work	Projected pensionable service	Other
2005	22.1	0.6	0.0	0.1	0.1
2010	16.8	6.7	0.6	0.8	0.6
2015	13.3	11.0	2.3	1.3	0.8
2025	6.5	15.4	8.1	2.0	1.1
2035	1.7	13.4	15.1	2.3	1.4
2055	0.0	2.5	25.7	2.4	2.4
2075	0.0	0.0	28.1	2.3	2.7

**Appendix table 6.** Pension expenditure as a percentage of GDP (Figure 4.7).

	Private	Public	National pension	Other
2005	5.9	3.6	1.9	0.4
2010	6.7	4	1.8	0.4
2015	7.5	4.4	1.6	0.3
2025	8.7	4.7	1.4	0.2
2035	9.3	4.5	1.1	0.2
2055	9.7	3.9	0.7	0.2
2075	9.9	3.8	0.7	0.2

**Appendix table 7.** *Contribution percentage for private-sector employees (Figure 4.8).*

	Employer	Employee aged under 53 years	Employee aged over 53 years	Total
2005	16.8	4.6	5.8	21.6
2010	16.9	4.7	6.0	21.9
2015	17.8	5.6	7.0	23.6
2025	19.1	6.9	8.8	26.4
2035	19.8	7.6	9.6	27.7
2055	19.7	7.5	9.5	27.5
2075	19.6	7.4	9.3	27.3

**Appendix table 8.** *Assets for private-sector employees' pensions and technical provisions in relation to the wage sum (Figure 4.9).*

	Assets	Total liabilities	Old age pension liability
2005	1.6	1.3	1.0
2010	1.8	1.5	1.2
2015	1.9	1.6	1.3
2025	2.2	1.8	1.5
2035	2.3	1.9	1.7
2055	2.5	2.1	1.8
2075	2.6	2.1	1.9



**The Finnish Centre for Pensions** is the statutory central body of the Finnish earnings-related pension scheme. Its research activities mainly cover the fields of social security and pension schemes. The studies aim to paint a comprehensive picture of the sociopolitical, sociological and financial aspects involved.

**Eläketurvakeskus** on Suomen työeläkejärjestelmän lakisääteinen keskuslaitos. Sen tutkimustoiminta koostuu pääasiassa sosiaaliturvaan ja työeläkejärjestelmiin liittyvistä aiheista. Tutkimuksissa pyritään monipuolisesti ottamaan huomioon sosiaalipoliittiset, sosiologiset ja taloudelliset näkökulmat.

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